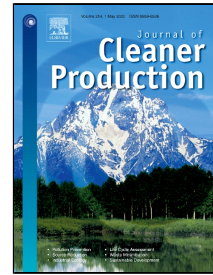


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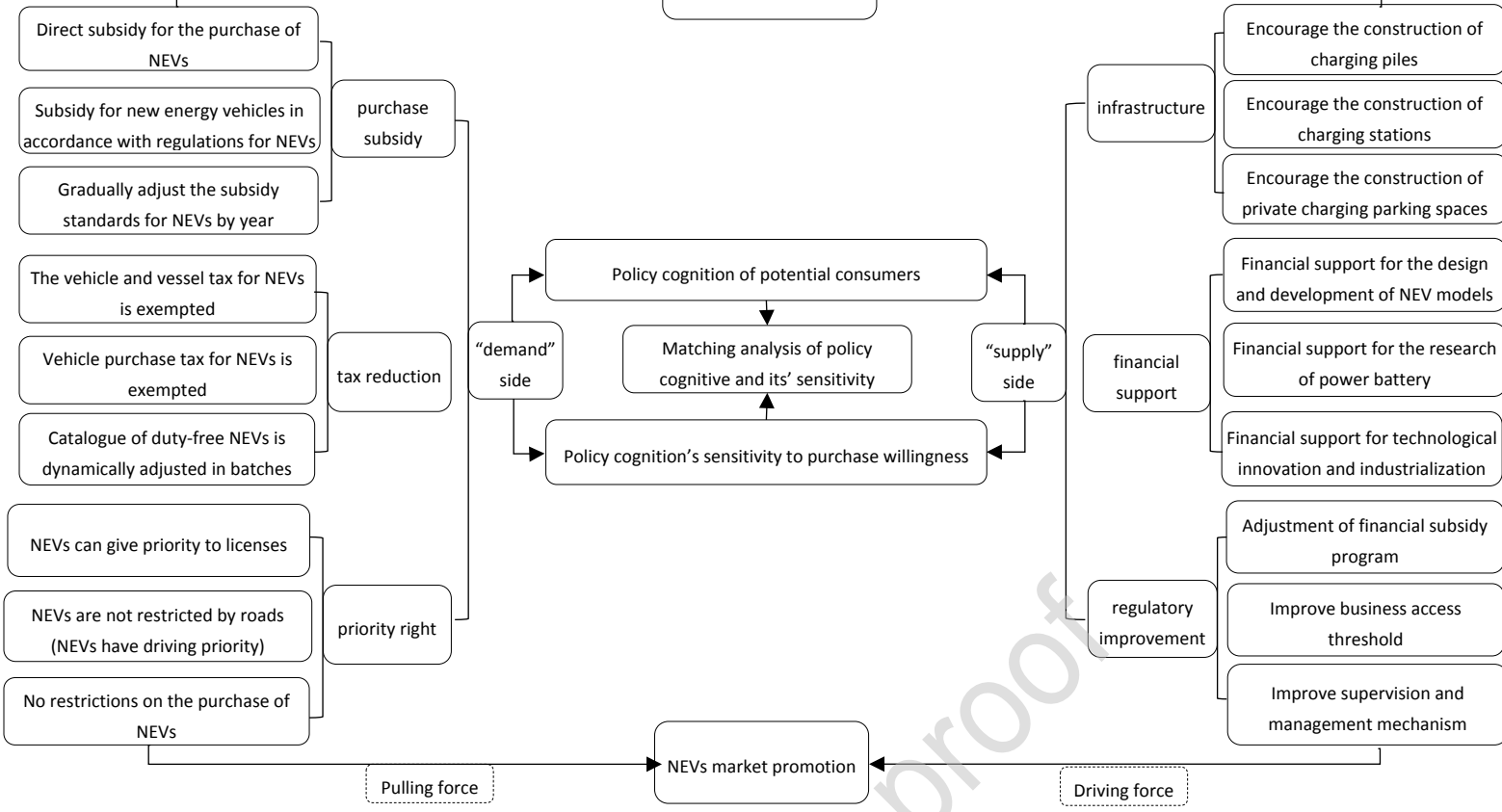


PII: S0959-6526(20)31079-9
DOI: <https://doi.org/10.1016/j.jclepro.2020.121032>
Reference: JCLP 121032
To appear in: *Journal of Cleaner Production*
Received Date: 20 December 2019
Accepted Date: 09 March 2020

Please cite this article as: Yongqing Xiong, Liuying Wang, Policy cognition of potential consumers of new energy vehicles and its sensitivity to purchase willingness, *Journal of Cleaner Production* (2020), <https://doi.org/10.1016/j.jclepro.2020.121032>

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7595words included in this paper

Policy cognition of potential consumers of new energy vehicles and its sensitivity to purchase willingness *

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Abstract: The implementation effect of the marketing policies of new energy vehicles is based on a high policy cognition of potential consumers. By using questionnaire survey and experimental research and dividing the consumption promotion policies of new energy vehicles into two categories: “supply” and “demand,” this study analyzes potential consumers’ policy cognition and its sensitivity to purchase willingness. Results indicate that the policy cognition and purchase willingness of the potential consumers of new energy vehicles are currently at a low level. Policy announcements can also help increase consumer policy cognition and purchase willingness. The sensitivity to the purchase willingness of potential consumers’ policy cognition of either “supply” or “demand” side is very significant, and the sensitivity of the “demand side” policy cognition is greater than that of the “supply side” policy. The “purchase subsidy” policy in the “demand side” has the highest sensitivity, whereas the “tax reduction” policy has the lowest sensitivity. The “infrastructure” policy in the “supply side” has the highest sensitivity, whereas the “financial support” and “regulatory improvement” policies are less sensitive. The policy cognition of “purchase subsidy” and “priority right” in the “demand side” and the policy cognition of “infrastructure” in the “supply side” do not match the policy sensitivity. To this end, comprehensively improving the policy cognition of potential consumers in various policies of new energy vehicles and effectively changing the current situation in which the number of the marketing policies of new energy vehicles is promulgated are necessary. However, the policy cognition is low, and the policy “hanging” phenomenon is relatively common. Changing the one-sidedness and incompleteness of the current “subsidy retreat” policy propaganda process and guide consumers to correctly recognize that “subsidy subsidence” can evidently increase new energy vehicle consumers’ “gain of acquisition.” To change the mismatch status of the policy cognition in and policy sensitivity to new energy vehicles, the policy must focus on improving the policy cognition of “priority right” in certain non-limited cities and intensify the promotion and implementation of incentive policies for the construction and optimization of “infrastructures” such as charging piles of new energy vehicles.

Key words: new energy vehicles; “supply side” policy; “demand side” policy; policy cognition;

***Fund project:** National Natural Science Foundation of China, Multi-dimensional Matching Analysis and Dynamic Transformation of the Two-sided Policy of Supply and Demand in New Energy Automobile Industry(71874208);

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policy sensitivity

I. Introduction

To promote the maturity of commercialization conditions, such as the consumer market of new energy vehicles, China has successively launched a series of related policies from the supply and demand sides of new energy vehicles in recent years(Xiong,2016). Doing so effectively promotes the application of new energy vehicles, but a gap still exists(Miao,2017) in the expected goals of the policy. The implementation of the consumption promotion policies of new energy vehicles is based on the general cognition of potential consumers. If consumers have cognitive biases in the policy and value of new energy vehicles, then such biases may make the consumption promotion policies of new energy vehicles "hanging". Therefore, an in-depth analysis of the policy cognition of potential consumers of new energy vehicles and its sensitivity to purchase willingness are practically important to further improve the accuracy of China's consumption promotion policies on new energy vehicles.

The theoretical community has conducted research on the policy awareness of the consumers of new energy vehicles and its relationship with the implementation effect of policies. Existing research mainly includes two aspects. First is the policy awareness and influence of the consumers of new energy vehicles. Certain scholars have studied the level of policy awareness. Lou et al.(2017) reveal that potential consumers have insufficient awareness of the policies on new energy vehicles, and a gap exists in consumer policy perceptions in different regions. Zhang et al.(2011) believe that consumers have a limited understanding of relevant public awareness, including policies on new energy vehicles. Musti et al.(2011) argue that consumers' awareness of new energy vehicle policies is generally low, and further enhancing consumers' clear perceptions of tax incentives and other policies can increase consumers' confidence in buying new energy vehicles. Sang et al. (2015) suggest that most consumers know that policies interfere with the promotion of new energy vehicles, but consumers do not understand the content and value of policy interventions. Laibson et al.(1997) claim that consumers generally have a short-sighted cognitive bias, the same for policies on new energy vehicles. Other scholars have further studied the influencing factors of policy cognitions. For example, Subrahmanyam et al.(2005) believe that the low awareness of policies generally stems from the information asymmetry among policy publishers, policy recipients, and potential consumers. Accurately understanding or grasping the meaning and value of policies as expected by the government is impossible. Greene et al.(2014) reveal that consumers are not that aware of the policies on new energy vehicles due to the incompatibility of such policies during the economic transition period. Green et al.(2014) suggest that most consumers have stereotypes about the policies on new energy vehicles that often hinder consumers from truly understanding policies.

Second is the relationship between the policy awareness of the consumers of new energy vehicles and the effect of policy implementation. Certain scholars believe that consumers' awareness of the policies on new energy vehicles is a direct influencing factor for consumers to purchase new energy vehicles. For example, Zheng et al.(2012) find that consumers' policy cognition is an important factor affecting the promotion of new energy vehicles. Musti et al. (2011) reveal that favorable policies and tax incentives have become the sources of confidence and consumption motivation for many consumers of new energy vehicles. Consumers' policy perception is a direct source of purchasing confidence. Lane et al.(2006) argue that one of the

reasons for public attitudes and behavioral gaps in new energy vehicles is the public's low awareness of policies. Ozaki et al.(2011) find that consumers' understanding of subsidy policy is one of the important prerequisites for consumers to purchase new energy vehicles. Wang Z et al.(2013) reveal the impact of the policy cognition incentives for consumers to purchase new energy vehicles cannot be underestimated. Ye Ma et al.(2019) argue that China's policies are important in the marketing of new energy vehicles. Zhang et al.(2013) reveal the public's perception of government policies play a leading role in consuming new energy vehicles. Certain scholars have further studied that consumers' current low awareness of the policies on new energy vehicles has hindered the market penetration of new energy vehicles. Zhang et al. (2018) find that various complex reasons lead to the lack of publicity of the policies on new energy vehicles, thereby hindering potential consumers' willingness to purchase new energy vehicles. Xiong Yongqing et al.(2018) claim that the expansion of government policies cannot be quickly understood and accepted by consumers due to information asymmetry and other reasons. Thus, the market of new energy vehicles is hindered. Al-Alawi et al.(2013) suggest that consumers' inaccurate perceptions of new energy vehicle policies have not maximized the effectiveness of policies. Lane et al.(2011) believe that consumers are both sides of supply and demand. The low level of policy cognition affects consumers' willingness to purchase new energy vehicles. Min et al.(2011) believe that consumers' low awareness of policies is one of the reasons for the market of new energy vehicles to be "satisfied." Zhang et al.(2013) suggest that consumers likely buy new energy vehicles when they can understand related policies.

Although certain studies have considered that the policy cognition of the consumers of new energy vehicles has an impact on their purchase willingness, two shortcomings are observed. First, the consumption promotion policies on new energy vehicles can be divided into "supply" and "demand" sides. Differences in the application mechanism and actual efficacy are found in the two categories. Few scholars have analyzed the differences in the consumer cognition levels of the "supply" and "demand" side policies of new energy vehicles. Second, research on consumer policy cognitions and their sensitivity to consumer purchase willingness is rare. Therefore, the present study divides the consumption promotion policies on new energy vehicles into two categories: "supply" and "demand" sides. Questionnaire survey and experimental research are combined to analyze the policy cognition of the consumers of new energy vehicles and its sensitivity to purchase willingness, with a view of providing decision-making reference for promoting the "landing" of the consumption promotion policies on new energy vehicles.

II. Research design

A. Experimental design

(1) Screening of potential consumers (experimental subjects). A potential consumer is an individual or organization that may become a real customer(1970), with two characteristics. First, he (or she) needs this product. Second, he (or she) can pay for the product. Several studies have shown that at this stage, new energy vehicle users are mainly young and middle-aged consumers with certain income and social status(Zhang ,2018). Therefore, this study selects 813 in-service MBA students from a university to find students who want to purchase or change their car in the near future (within five years) as potential consumers. These MBA students meet the characteristics of potential consumers. Moreover, their education, age, income, and other aspects

are consistent with the current user characteristics of new energy vehicles. A total of 101 eligible subjects are recruited, including 44 males (43.56%), 57 females (56.44%), 78 aged 18–35-year-olds (77.23%), and 23 aged more than 36 years old (accounting for 22.77%); 37 people (36.63%) with an annual income below 200,000 yuan and 64 people (63.37%) with an annual income of 200,000 yuan and above are also recruited.

(2) Design of the experimental questionnaire. This study conducts pre- and post-tests in a single group, which is mostly used in the measurement of policy cognitive effects (Faul, 1992). The questionnaire consists of two parts. The first part is “Introduction,” which sets the experimental scene and collects the basic information of the survey object. The second part is “Policy Document” and “Measurement Item,” whose design is based on the energy vehicle policy that China released from 2009 to 2018. Drawing on our previous research results (Xiong, 2016), the policy is divided into two categories: “supply” and “demand” sides.

On the basis of the pre-experiment, the measurement items are optimized several times. The formal questionnaire structure and examples are shown in Tables 1 and 2, respectively. The Cronbach’s α of the questionnaire is greater than 0.9, and the KMO values are all greater than 0.7, which satisfies the reliability and validity requirements.

Table 1 Questionnaire structure (“Policy Document” and “Measurement Item” sections)

Policy category	Policy tool	Item code (policy basis/file number)	Policy cognition (please choose the one that you think is the most accurate)	Purchase willingness 1 (very low)–5 (very high)
Supply Side	Financial support	FC1: State Council issued [2012] No. 22; State Council issued [2010] No. 32; State Council issued [2011] No. 47; State Council, Ministry of Commerce issued (No. 12); National Science and Technology Development [2012] No. 195; FC2: State Council issued [2012] No. 28; Ministry of Finance [2012] No. 780; Ministry of Finance [2013] No. 551; National Science Fund issued [2017] No. 294; State Council issued [2015] No. 28; Five ministries [2015] No. 12; FC3: National Development and Reform Commission Energy Bureau [2016] No. 513; Ministry of Industry and Information Technology [2017] No. 53; Published by the Ministry of Transport [2017] No. 110; Ministry of Industry and Information Technology [2017] No. 266; People’s Bank of China released [2017] No. 234; State Council issued [2018];	Note: Provide and options for policy content description, one of which is the correct option; Judge the policy awareness according to whether the test object is correct; See Table 3 for examples.	Note: The extent to which this policy affects your purchase decision: The purchase willingness is given by the test subject (using the Licott five-point scale method)
	Infrastructure	IN1: Published by the General Office of the State Council [2014] No. 35; Published by the Ministry of Transport [2013] No. 323; Published by the General Office of the State Council [2014] No. 35; National Development and Reform Commission Price Division released [2014] No. 1668; Ministry of Finance [2014] No. 692; [2015] No. 73; IN2: National Development and Reform Commission Energy Bureau [2015] No. 1454; National Energy Administration released [2015] No. 394; Housing Construction Department released [2015] No. 199; Ministry of Finance [2016] No. 7; National Development and Reform Commission Energy Bureau [2016] No. 392; National Development and Reform Commission [2016] No. 353; National Energy Administration Division [2016] No. 212; IN3: National Development and Reform Commission Energy Bureau [2016] No. 1611; National Development and Reform Commission [2016] No. 2826; National Energy Board [2017] No. 19; National Energy Board [2018] No. 22; State Council issued [2018] No. 22; CPC Central Committee [2018] No. 17		
	Regulatory improvement	PR1: Ministry of Industry and Information Technology [2009] No. 44; Ministry of Industry and Information Technology [2010]; Ministry of Industry and Information Technology [2010] No. 529; Ministry of Industry and Information Technology [2011] No. 320; State Council issued [2011] No. 42; Five ministries [2013] No. 15; Ministry of Finance [2014] No. 11 PR2: National Development and Reform Commission [2015] No. 27; Ministry of Industry and Information Technology [2015] No. 534; Ministry of Industry and Information Technology [2015] No. 534; Ministry of Industry and Information Technology [2016] No. 377; Ministry of Industry and Information Technology [2016] No. 241; National Development and Reform Commission [2016] No. 1768; Ministry of Industry and Information Technology [2016] No. 377; PR3: Ministry of Industry and Information Technology [2016]; State Council issued [2016] No. 67; State Council issued [2016]; Ministry of Industry and Information Technology [2016] No. 6; Ministry of Industry and Information Technology [2016] No. 95; Ministry of Industry and Information Technology [2016] No. 377; Published by the General		

Office of the State Council [2016] No. 99; Ministry of Industry and Information Technology No. 39; Ministry of Industry and Information Technology [2017] No. 29

Demand Side	Purchase subsidy	PS1: Ministry of Finance [2010] No. 219; Ministry of Finance [2010] No. 23; State Council issued [2013] No. 30; State Council issued [2013] No. 37; PS2: Ministry of Finance [2010] No. 219; Ministry of Finance [2015] No. 134; Ministry of Finance [2015] No. 159; Ministry of Finance [2016] No. 958 PS3: Ministry of Finance and State Administration of Taxation [2016] No. 84; Published by the Ministry of Finance [2017] No. 20; National Development and Reform Commission [2017] No. 1055; Ministry of Finance [2018] No. 18; National Department of Ecology and Environment [2018] No. 179
	Tax deduction	TD1: Ministry of Finance and State Administration of Taxation [2012] No. 19; Ministry of Finance and State Administration of Taxation [2016] No. 84; Ministry of Finance [2015] No. 134; National Development and Reform Commission [2017] No. 1055; TD2: Ministry of Industry and Information Technology [2014] No. 53; Ministry of Finance and State Administration of Taxation [2015] No. 51; Ministry of Industry and Information Technology [2017] No. 53; TD3: State Council Tariff Commission [2018] No. 3; Ministry of Finance and State Administration of Taxation [2018] No. 74; State Council Tariff Commission [2018] No. 65; State Council issued [2010] No. 32
	Priority right	TD1: Ministry of Industry and Information Technology [2018] No. 136; Ministry of Industry and Information Technology [2017] No. 53; State Council issued [2012] No. 22; TD2: Ministry of Environmental Protection released [2013] No. 104; State Council issued [2018] No. 22; Published by the General Office of the State Council [2014] No. 35; State Council issued [2011] No. 42; TD3: Published by the General Office of the State Council [2018] No. 91; National Energy Board [2018] No. 22; The Central Committee of the Communist Party of China [2018] No. 17; National Development and Reform Commission Energy Bureau [2016] No. 392

Table 2 Example of the experimental questionnaire (limited to the length of the book; only the "purchase subsidy" is considered an example)

Policy tool	Item code (policy basis/file number)	Policy cognition (The one that you think is the most accurate)	Purchase willingness (how much this policy affects your purchase decision) 1 (very low)–5 (very high)				
Purchase subsidy	[PS1: Direct subsidy for car purchase] State Council issued [2012] No. 22; State Council issued [2010] No. 32; State Council issued [2011] No. 47; State Council, Ministry of Commerce issued (No. 12); National Science and Technology Development [2012] No. 195;	What do you think is the maximum scope of subsidy for purchasing an electric car? () (A) 60,000–80,000 (B) 30,000–50,000	1	2	3	4	5
	[PS2: Subsidy according to the specified model] State Council issued [2012] No. 28; Ministry of Finance [2012] No. 780; Ministry of Finance [2013] No. 551; National Science Fund issued [2017] No. 294; State Council issued [2015] No. 28; Five ministries [2015] No. 12;	The correct statement about the subsidy model of new energy vehicles is () (A) The same subsidy can be obtained for all new energy vehicles. (B) Only models of new energy vehicles can be subsidized.	1	2	3	4	5
	[PS3: Subsidy standards are adjusted year by year] National Development and Reform Commission Energy Bureau [2016] No. 513; Ministry of Industry and Information Technology [2017] No. 53; (Published by the Ministry of Transport [2017] No. 110; Ministry of Industry and Information Technology [2017] No. 266; People's Bank of China released [2017] No. 234; State Council issued [2018] May	The policy proposes that the subsidy standards for other models, except for fuel cell vehicles, will () in 2017–2020 (A) increase (B) retreat	1	2	3	4	5

(3) Experimental procedure. The experiment time is approximately 90 minutes, and the experimental procedure is shown in Table 3.

Table 3 Experimental composition and process

Experimental procedure	Step	Purpose
Experimental preparation	① Guide the test object into the experimental area; ② Experimental host reads the experimental lead;	Ensure that test subjects accurately understand the experimental requirements;
Pre-test	① Issue the first round of test questionnaires; ② The test subjects fill out the questionnaire independently and are not allowed to communicate with each other for 10 minutes; ③ Take back the first round of test questionnaires;	test the policy cognition and purchase willingness of consumers without any policy announcements;
Manipulation policy cognition	① The experiment host uses PPT and combines video to preach the policies of new energy vehicles; ② The policy presentation sequence is divided into six stages: “purchase subsidy,” “tax reduction,” “drive priority,” “infrastructure,” “regulation improvement,” and “financial support” policies. After each stage, the test object is required to fill out a form. Cards on the willingness to purchase new energy vehicles (a total of six); ③ Allow test subjects to ask questions and communicate with each other during policy presentations (45 minutes);	Ensure that test subjects have a good understanding of the policies of new energy vehicles; examine the impact of individual policy awareness improvements on purchase intentions
Post-test	① Issue the second round of test questionnaires; ② The subjects independently fill out the questionnaire after recalling the training content and are not allowed to communicate with each other for 10 minutes; ③ Take back the second round of the test questionnaire; End of experiment.	Test how much consumers’ policy cognition and purchase willingness change after each policy announcement.

B. Model and Method

(1) Analysis model of the sensitivity of the influence of policy cognition on purchase willingness

The binary response Logit model is widely used in the analysis of the impact of policies on emerging products (Cecere, 2018). By combining this model with experimental research, analyzing the specific probability of the marginal impact of the unit variables in the case of the discrete choice of consumers is possible. Therefore, the binary Logit model for the sensitivity analysis of potential consumers’ policy cognition of new energy vehicles and purchase willingness is as follows:

$$\ln \left(\frac{P_i}{1 - P_i} \right) = \beta_0 + \sum \beta_j X_{ij} + \varepsilon, \quad (1)$$

where $\frac{P_i}{1 - P_i}$ is the ratio of the probability of increase in potential consumers’ purchase

willingness to the probability of decline (or constant), and P_i is the probability that potential consumer i ’s purchase willingness increases; $1 - P_i$ is the probability that potential consumer i ’s purchase willingness decreases (or does not change). X_{ij} is the supply–demand bilateral policy cognitive variable, $j = 1, 2, 3 \dots 6$, which represents the six policies in the “supply” and “demand” sides. β_j (Odds Ratio, OR) is the amount of change in the natural logarithm of the ratio of the

purchase willingness increase and the decrease (or constant) event $\frac{P_i}{1 - P_i}$ for each unit of the

independent variable, which can be used as a measure of policy cognition sensitivity. This study uses the marginal effect to determine the policy cognition sensitivity to purchase willingness on

the basis of the β_i (*Odds Ratio, OR*) Valuation. The relevant variables and indicators are described in Table 4.

Table 4 Variable description

Variable	Composition variable and its code	Variable value
Demographic Expenditure planned at or y var ia bl es	Priority right (PR)	No restrictions on the purchase of new energy vehicles (public service car priority) (PR 3); New energy vehicles are not restricted by roads (new energy vehicles have driving priority) (PR 2); New energy vehicles can give priority to licenses (PR 1).
	Tax deduction (TD)	Catalogue of duty-free new energy vehicles is dynamically adjusted in batches (TD 3); The vehicle and vessel tax for new energy vehicles is exempted (TD 2); Vehicle purchase tax for new energy vehicles is exempted (TD 1).
	Purchase subsidy (PS)	Gradually adjust the subsidy standards for new energy vehicles by year (PS3); Subsidy for new energy vehicles in accordance with regulations for new energy vehicles (PS2); Direct subsidy for the purchase of new energy vehicles (PS1).
	Regulatory improvement (RI)	Improve supervision and management mechanism (RI 3); Improve business access threshold (RI 2); Adjustment of financial subsidy program (RI 1).
	Financial support (FS)	Financial support for technological innovation and industrialization (FS 3); Financial support for power battery and other key components of research and development (FS 2); Financial support for the design and development of new energy vehicle models (FS 1)
Explained variable	Infrastructure (IN)	Encourage the construction of private and public charging parking spaces (IN3); Encourage the construction of charging stations (IN2); Encourage the construction of charging piles (IN1).
	Purchase willingness (PW)	I want to have a new energy car in the future (PW 1); If buying a car is necessary, I will choose a new energy car (PW2); I plan to use new energy vehicles frequently in the future (PW 3).
	Change in purchase willingness (Y)	Difference between purchase willingness post-test (HPW) and purchase intention pre-test (QPW) (Y)
		The policy values are obtained from the mean of the three component variables. 1 (strongly disagree)–5 (strongly agree) HPW – QPW > 0, Y = 1 HPW – QPW ≤ 0, Y = 0

(2) Policy Cognitive Index of the Potential Consumers of New Energy Vehicles

Potential consumers' policy cognition and its sensitivity to policies are cross-analyzed. On the one hand, we can understand the level of consumers' policy cognition and the importance of policies to consumers. On the other hand, we can reveal the gap between the acceptance of potential consumers' policy status and policy expectation. Such an acceptance can help determine the key direction of policy optimization. Previous studies have used the consumer satisfaction index model (CSI) and public policy sensitivity analysis to investigate the direction of policy optimization (Zhao, 2017). De Ona et al. (2015) combine CSI with public policy sensitivities to propose the recommendations for the transit line detection service strategy optimization that meet the needs of different users. Allen et al. (2018) integrate the CSI index with tourism policy to suggest policy recommendations. Rajendran et al. (2017) combine the CSI index with a bank's performance policy to propose an optimization direction for the bank's performance measurement policy. Drawing on existing research, the present study introduces CSI into the cognitive analysis of potential consumers regarding the policies of new energy vehicles. A model of potential consumers' overall cognitive index is also constructed.

$$CSI = \frac{\sum_{i=1}^n w_i \bar{x}_i - \sum_{i=1}^n w_i}{(Max(x_i) - Min(x_i)) \sum_{i=1}^n w_i} \quad (2)$$

where x_i is the measured variable of the latent consumer cognition, w_i is the weight, and n is the quantity of the measured variable.

III. Empirical results and discussion

A. Stationarity and robustness test

The STATA and EQS models are used to estimate the robustness of the equation. The test results are shown in Table 5.

Table 5 Model estimation and test results

Dimension	Independent variable	OR	P value	STATA Model statistic	Chi-square value	P	Degree of freedom
Demand side	PS	2.233	0.061		23.05	0	6
	TD	1.903	0.106				
	PR	1.861	0.049				
					Pseudo R2 = 0.056		
					Log likelihood = -195.607		
Supply side	IN	1.727	0.076	EQS Model fit value	GFI	RMSEA	RMR
	FS	1.242	0.488	Reference	0.081	0.064	0.018
	RI	1.088	0.802		> 0.08	< 0.08	< 0.05

The ratio of chi-square value to the degree of freedom is 3.84 (23.05/6), which is between [1, 5]. The results are also significant, indicating that the model has a high degree of fit. The respective variables have a significant influence on the dependent variable. Pseudo R2 is 0.0566, indicating that the model has good representation. Log likelihood is -195.607, and the absolute value is large. According to the model adaptation test, RMSEA is less than 0.08, RMR is significantly less than 0.05, and GFI value is greater than 0.08. Therefore, the logistic regression model has a good estimation effect and meets the requirements of robustness.

B. Descriptive analysis of the status of policy cognition and purchase willingness

In the two rounds of experiments, consumer policy cognition and purchase willingness are presented in Table 6.

Table 6 Consumers' cognitive scores and purchase willingness in policy dimensions in the two rounds of experiments

Dimension		Cognition		Purchase willingness		Dimension		Cognition		Purchase willingness	
		Pre-test	Post-test	Pre-test	Post-test			Pre-test	Post-test	Pre-test	Post-test
Demand side	PS	0.333	0.769	3.302	3.476	Supply side	IN	0.198	0.671	3.711	3.841
	TD	0.484	0.762	3.476	3.557		FS	0.552	0.857	3.841	3.872
	PR	0.306	0.786	3.557	3.711		RI	0.413	0.782	3.872	3.889

(1) The policy cognition and purchase willingness of potential consumers of new energy vehicles are at a low level, and the difference in policy cognition between supply and demand is not evident. Increasing policy propaganda can help improve the policy recognition of potential consumers and further promote their willingness to buy. The data in Table 6 show that in the two rounds of experiments, the average perceived policy cognitions of the "supply" and "demand"

sides are 0.556 and 0.580, respectively. These cognitions are generally at a low level and are not much different. The average purchase willingness is 3.302, which is also at a low level. After the policy announcement, 'potential consumers' policy cognition in the second round of experiments is 0.771, and the purchase willingness is 3.889, which is higher than the policy cognition in the first round of experiments of 0.381. The purchase willingness value is 3.302, indicating that the policy announcement is helpful in improving the policy cognition and purchase willingness of potential consumers. Although China has introduced a series of promotion policies on new energy vehicles, potential consumers' understanding of these policies is unsatisfactory. The low cognition of such policies is also one of the most important reasons for potential consumers' low willingness to purchase new energy vehicles.

(2) Differences exist in the specific policy cognition of the potential consumers of new energy vehicles. Consumers have low policy cognition for PR and PS. By contrast, the cognition for TR policy is relatively high. IN and RI policies on the "supply side" are less recognized, whereas FS policy is relatively more recognized. The data in Table 6 indicate that the average value of PR, PS, and TR in the "demand side" policy is 0.558, 0.560, 0.623, respectively. PS policy has the lowest cognition, whereas TR policy has the highest recognition. In the "supply side," the IN, RI, and FS policy cognition mean values are 0.397, 0.567, 0.704, respectively. The IN policy has the lowest cognition, whereas the FS policy has the highest cognition. Potential consumers have large differences in different policy cognitions. The low cognition of the IN policy on the "supply side" may be due to the large construction investment of charging piles and charging stations and the long construction time, resulting in a serious "lag effect" on consumers' policy cognition. The low cognition of PS and PR policies in the "demand side" may be due to the fluctuation of the PS of new energy vehicles. Potential consumers' policy understanding is slower than the policy's updating speed. The implementation of PR has regional differences. The implementation of high-capacity cities is relatively large, whereas that of low- and medium-capacity consumer cities is relatively small. Attaining a unified understanding is difficult for consumers in different regions.

C. Sensitivity analysis of the impact of policy cognition on purchase willingness

Logistic sensitivity analysis has two main forms. First is to examine the marginal effect at the mean (MEM)(Bartus,2005) of sample consumers' purchase willingness when the mean value of the independent variable is taken. Second is to examine the average marginal effect value of the possible rise of consumers' purchase willingness when all the samples of the independent variable are changed (AME)(Williams,2012). This study, under the control of other policy cognitions, uses the MEM and AME values for sensitivity analysis. The results are shown in Table 7. The difference between the two test results is small, indicating that the sensitivity estimation results of this study are robust and reliable.

Table 7 Sensitivity estimation results of policy cognitive impact on purchase willingness

Dimension		MEM				AME			
		dy/dx	Std. Err	z	P> z	dy/dx	Std. Err	z	P> z
Demand side	PS	0.159	0.084	1.88	0.060	0.153	0.080	1.91	0.056
	TD	0.127	0.078	1.63	0.104	0.123	0.075	1.64	0.102
	PR	0.123	0.062	1.98	0.048	0.118	0.059	2.01	0.044
Supply	IN	0.108	0.061	1.78	0.075	0.104	0.058	1.80	0.071

side	FS	0.043	0.062	0.69	0.487	0.041	0.06	0.70	0.487
	RI	0.017	0.067	0.25	0.802	0.016	0.064	0.25	0.802

(1) Potential consumers' policy cognition of the supply and demand sides have a significant impact on purchase willingness. The "demand side" policy cognition is more sensitive to purchase willingness than the "supply side" policy cognition. The data in Table 7 show that consumers' cognitive sensitivity of the "demand side" policy is 40.90%, which is significantly higher than that of the "supply side" policy cognition (16.80%). The dual policy of supply and demand is an important factor affecting the purchasing intention of potential consumers. The "supply side" policy is mainly for public resources, thus its impact on potential consumers is relatively indirect. By contrast, the "demand side" policy directly aims at potential consumers. Therefore, this policy is sensitive to potential consumers.

(2) In the "demand side" policy, potential consumers are the most sensitive to PS policy and are quite sensitive to PR policy. TR policy sensitivity is insignificant. The data in Table 7 indicate that in terms of the "demand side" policy, the marginal effect values of PS, PR, and TR are 0.159, 0.123, and 0.127, respectively. These policy cognitions increase by one unit, and consumers' purchase willingness increases by 15.90%, 12.30%, and 12.70%. The three types of policy cognition in the "demand side" have evident stimulating effects on purchase willingness. Relatively speaking, PS is the most sensitive, PR is the second, and TR is relatively low. Given that China's new energy vehicles are still in the commercial demonstration stage, the "subsidy dependence" of potential consumers is evident. At the same time, due to the heavy traffic pressure in certain cities in China, the increasing cost of licenses has caused consumers' anxiety on the cards. The "priority power" of new energy vehicles is attractive to consumers.

(3) In terms of the "supply side" policy, potential consumers are the most sensitive to IN policy cognition, less sensitive to FS policy cognition, and less sensitive to RI policy cognition. The data in Table 7 reveal that in terms of the "supply side," the marginal effect values of IN, FS, and RI are respectively 0.108, 0.043, and 0.017, indicating that these policy cognitions increase by one unit. Thus, consumers' purchase willingness increases by 10.80%, 4.30%, and 1.70%. The "supply side" policy cognition has different stimulating effects on purchasing willingness. IN is the most irritating effect on potential consumers, and the impact of FS is low, whereas that of RI is the lowest. The IN construction-related policies remain the focus of potential consumers. Moreover, the inconvenience of charging and replacing electricity is still one of the obstacles to the promotion of new energy vehicles.

D. Matching analysis of the actual level and sensitivity of policy cognition

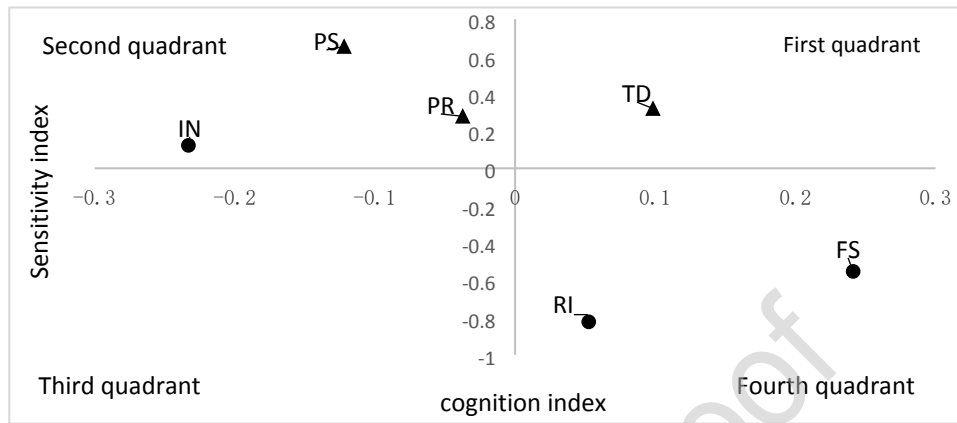
To further clarify the optimization focus of the marketing policies on new energy vehicles, this study draws on relevant research (Zhao, 2017) and standardizes consumers' policy cognition and sensitivity. First, the average of each policy sensitivity and cognitive level is calculated. These mean values are then used as denominators. Second, the difference between each policy sensitivity and cognitive level and its corresponding mean is calculated, and these differences are taken as numerators. The standardized processing results are presented in Table 8.

Table 8 Standardized sensitivity coefficient and policy cognitive index

Dimension	Demand side			Supply side		
	PD	TD	PR	IN	FS	PR

Sensitivity index	0.653	0.321	0.279	0.123	-0.552	-0.823
cognition index	-0.122	0.098	-0.037	-0.233	0.241	0.053

Let the consumers' policy cognition index be the abscissa and the consumers' sensitivity index to each policy as the ordinate. This study shows all the policies in the four quadrants for matching analysis. The results are illustrated in Figure 1.



Note: In the figure, "●" represents the "supply side" policy, and "▲" represents the "demand side" policy.

Figure 1 Analysis of potential consumers' policy sensitivity and cognition

(1) The policy cognitions of PS and PR in the "demand side" do not match the policy sensitivity and should be the "focus" of policy cognition improvement. Figure 1 displays that PS and PR policies are in the second quadrant and belong to the "low cognition, high sensitivity" area, indicating that these two policy cognitions are sensitive to purchase willingness. However, potential consumers' policy cognition at present is low. The TD policy is in the first quadrant and belongs to the "high-cognitive, high-sensitivity" zone, suggesting that the policy cognition is highly sensitive to purchase willingness, and consumers' policy cognition is relatively high. PS and PR are important policy variables that affect potential consumers' purchase willingness. At present, potential consumers' cognitions of these two types of policies do not match the status of policy sensitivity. The "subsidy retreat" has accelerated in recent years. The core purpose is to promote the manufacturers of new energy vehicles for building "hematopoietic" functions on the basis of R&D innovation to provide consumers with many cost-effective products. The one-sidedness in the publicity process has affected the policy cognition of potential consumers on PS to a certain extent because of the "subsidy retreat" policy. Certain consumers in restricted-limit cities have high policy awareness of the PR policy for new energy vehicles. New energy vehicles in non-restricted cities often have a corresponding PR. Given the lack of policy propaganda, potential consumers in non-limited restricted cities are not fully aware of this policy.

(2) The policy cognition of IN in the "supply side" does not match the policy sensitivity and should be the "focus" of policy cognition improvement. Figure 1 shows that the IN policy is in the second quadrant and belongs to the "low-cognitive, high-sensitivity" region, indicating that the policy cognition is more sensitive to purchase willingness, but potential consumers currently do not recognize the policy. The RI and FS policies are in the fourth quadrant and belong to the "high-cognitive, low-sensitivity" zone, suggesting that the policy cognition is less sensitive to purchase willingness, and consumers are relatively aware of the policy. Infrastructure is an important policy tool to influence the purchasing intention of potential consumers. At present, the degree of

potential consumers' policy cognition does not match the status of policy sensitivity. In recent years, China has intensively introduced a series of incentive policies for the construction and optimization of the "infrastructure" of new energy vehicles' charging piles. However, due to insufficient policy propaganda, that is, adding charging piles' necessary construction period, the "infrastructure" policy dividend has not been effectively released.

IV. Main conclusions and policy implications

A. Research summary

This study uses a combination of questionnaire survey and experimental research to divide the consumption promotion policies on new energy vehicles into two categories: "supply" and "demand" sides. An analysis model of the sensitivity of policy cognition to purchase willingness is also constructed. This model helps analyze the policy cognition of potential consumers of new energy vehicles and its sensitivity to purchase willingness. The exploratory and practical values of the study have two main aspects. First, the consumption promotion policies on new energy vehicles are divided into "supply" and "demand" sides to explore the differences in consumers' perceptions of such policies, making up for the lack of analysis on the differences in consumer cognition levels of the "supply" and "demand" side policies on new energy vehicles among few scholars in existing research. Second, the sensitivity of policy cognition to the influence of potential consumers' purchase willingness is analyzed. On the basis of the matching of potential consumers' policy cognition and policy sensitivity, the study proposes relevant policy implications, which have certain uniqueness from the research perspective. A basic improvement direction is provided for further promoting the "landing" of the consumption promotion policies on new energy vehicles.

B. Main conclusions

(1) The implementation effect of the policies on new energy vehicles is based on the high policy cognition of potential consumers. The policy cognition and purchase willingness of potential consumers of new energy vehicles are currently at a low level. The difference in policy awareness between the "supply" and "demand" sides of potential consumers is not evident. Policy propaganda and training can help increase consumer policy cognition and purchase willingness. The specific policy cognitions in both sides of the potential consumers of new energy vehicles are different. Among them, PR and PS in the "demand side" have low policy cognitions. The policy cognition of TR is relatively high. The IN and RI policies in the "supply side" are less recognized, whereas the FS policy cognition is relatively high.

(2) The sensitivity of the dual-side policy cognition of the supply and demand of new energy vehicles to purchase willingness is significant. Moreover, the sensitivity of the "demand side" policy cognition is greater than that of the "supply side" policy cognition. In the "demand side," the PS policy has the highest sensitivity, whereas the TR policy has the lowest sensitivity. In the "supply side," the IN policy has the highest sensitivity, whereas the FS and RI policies are less sensitive.

(3) The policy cognitions of PS and PR in the "demand side" and that of IN in the "supply side" do not match the policy sensitivity. The one-sidedness and incompleteness of the "subsidy retreat" policy propaganda process have negatively affected the cognition of potential consumers in the PS policy to a certain extent. New energy vehicles in non-limited restricted cities have

corresponding PR. However, due to the lack of policy announcements, the policy cognition of potential consumers in non-limited restricted cities is low. In recent years, China has intensively introduced a series of encouragement policies in the construction and optimization of the “infrastructure” of new energy vehicles’ charging piles. However, due to insufficient policy propaganda and the necessary construction cycle of “infrastructures” such as charging piles, the benefits of the IN policy have not been effectively released.

C. Policy implications

(1) The propaganda of the marketing policies on new energy vehicles must be further increased. The policy cognition of potential consumers should also be comprehensively improved. The current situation in which the number of marketing policies is promulgated, the policy cognition is low, and the policy is “hanging” should be practically changed. Moreover, the “last mile” of the marketing policies on new energy vehicles must be opened. Furthermore, the policy dividend should be effectively and fully released during the promotion of new energy vehicles.

(2) Consumers should be guided to correctly understand the core essence of the “subsidy retreat” policy for changing the one-sidedness and incompleteness of the current propaganda process. The core purpose of “subsidy retreat” is to promote new energy vehicle manufacturers to build “hematopoietic” functions on the basis of R&D innovation, thereby providing additional cost-effective products for consumers. The implementation of the “subsidy retreat” policy can well promote the development of the new energy automobile industry and increase consumers’ “sense of acquisition” of new energy vehicles at a high level. Guiding potential consumers to properly understand the core goals of the “subsidy retreat” policy is necessary.

(3) PR and IN must be considered the key points of policy propaganda to change the unmatched situation between policy cognition and policy sensitivity. On the one hand, the focus is to improve the policy cognition of the PR of potential consumers in certain non-restricted cities, where a corresponding PR exists. However, due to the lack of policy propaganda, the policy cognition of potential consumers is low. On the other hand, increasing the incentives for the construction and optimization of the “infrastructures” of new energy vehicles, such as charging piles, is necessary. Thus, policies can effectively motivate potential consumers to purchase.

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Declaration of interests

✓ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: None

None

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