Proceedings of the 2nd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/64/20231466

The Impacts on Purchasing Intension of New Energy Vehicle Based on Big Data Analysis

Chenxi Su[1,a,*]

[1]*School of civil engineering, Tianjin University, Tianjin, China*
a. 3021001030@tju.edu.cn
**corresponding author*

Abstract: As a matter of fact, there is a significant difference between developed and underdeveloped regions in contemporary society. Under the trend of carbon neutrality and carbon peaking in environmental protection in recent years, the use of cars powered by electric, hydrogen or other fuel except oil seems to be fragmented across different regions. With this in mind, this study mainly studies and investiagtes the relationship between economic level and the ownership of the cars powered by electric, hydrogen or other fuel except oil from a perspective of economic data, as well as explores the impact of economic development level and population on the ownership of cars powered by electric, hydrogen or other fuel except oil and environmental protection. According to the analysis, it has provided a positive impact on promoting the development and popularization of cars powered by electric, hydrogen or other fuel except oil, which shed light on guiding further exploration.

Keywords: bigdata analysis, purchasing intension, new energy vehicle

1. Introduction

With the development of human society, people's lifestyles are constantly changing, and the impact of human activities on the environment is becoming increasingly serious. Since the Industrial Revolution, human carbon emissions have sharply increased; On September 8, 2021, at the Green "the Belt and Road" and 2030 Agenda for Sustainable Development theme forum held by the China Council for International Cooperation on Environment and Development, Zhou Wei, the former chief engineer of the Ministry of Transport, pointed out that transport emissions accounted for about 10.4% of China's total carbon emissions, Road transport is the primary source of transport carbon emissions in the country, with it currently accounting for over 85% of the total and focusing on reducing emissions [1-3]. China is committed to promoting the development of global environmental protection, and relying on technological innovation, China's new energy vehicle industry has made significant progress. Unlike Japanese hydrogen energy, China's research direction in cars powered by electric, hydrogen or other fuel except oil is mainly focused on electric vehicles. Compared to traditional gasoline fueled vehicles, the advantage of electric vehicles is that they concentrate their carbon emissions on power plants, avoiding excessive dispersion of carbon emissions due to factors such as different vehicle models and engine levels.

Although research has shown that China's current power supply structure is not sufficient to bring significant benefits to reducing carbon emissions from cars powered by electric, hydrogen or other fuel except oil [1], with the development of non thermal power generation methods such as wind

DOI: 10.54254/2754-1169/64/20231466

power, hydropower, and photovoltaic power generation in China, it is believed that the promotion of cars powered by electric, hydrogen or other fuel except oil will make a huge contribution to reducing carbon emissions.

Cars powered by electric, hydrogen or other fuel except oil provide a solution for China to alleviate the energy crisis, improve air pollution, and reduce greenhouse gas emissions [2]. Cars powered by electric, hydrogen or other fuel except oil refer to vehicles developed by automobile manufacturers that are beneficial for alleviating environmental pollution, mainly composed of hybrid electric vehicles and electric vehicles. The environmental performance of cars powered by electric, hydrogen or other fuel except oil in terms of energy conservation and pollution reduction is seen favorably by many academics. believing that the development and use of cars powered by electric, hydrogen or other fuel except oil will greatly reduce environmental pollution [3].

During the "Eighth Five Year Plan" period, the National Planning Commission's scientific and technological research projects included "Research on Key Technologies of Electric Vehicles". Fuel cell technology was cited as a significant national scientific and technology project during the Ninth Five Year Plan period. In September 2001, the Ministry of Science and Technology's National "863" Plan, which covered the "Tenth Five Year Plan" period, designated the study and development of electric cars as a key special project. Low energy and cars powered by electric, hydrogen or other fuel except oil and hydrogen and fuel cell technology were identified as priority themes and cutting-edge technologies, respectively, in the "Outline of the National Medium and Long Term Science and Technology Development Plan (2006-2010)" published in 2005. During the preparation stage for industrialization (2006-2010) during the 11th Five Year Plan period, the country carried out small-scale demonstration applications of electric vehicles. In November 2008, the first electric vehicle in China was approved for market launch and began mass production. In January 2009, the "Ten Cities and Thousand Vehicles" project for cars powered by electric, hydrogen or other fuel except oil in China was launched. The plan is to provide financial subsidies and develop 10 cities annually for about 3 years, with each city launching 1000 cars powered by electric, hydrogen or other fuel except oil. The "Interim Measures for the Management of Financial Subsidy Funds for Private Purchase of Cars powered by electric, hydrogen or other fuel except oil Pilot Projects" were released by the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Industry and Information Technology, and the National Development and Reform Commission in June 2010. This decision was made to start pilot projects for the private consuming of cars powered by electric, hydrogen or other fuel except oil in some cities.

The 'Energy Conservation and New Energy Vehicle Industry Plan (2012-2020)' was established in April 2012 to establish the objective of industrializing cars powered by electric, hydrogen or other fuel except oil. In 2012, preferential policies for new energy vehicle and vessel taxes were implemented. In 2015, China's production and sales of cars powered by electric, hydrogen or other fuel except oil ranked first in the world. 2.4 Industrialization Development Stage (2016 present) During 2016-2020, China's cars powered by electric, hydrogen or other fuel except oil have entered the industrialization development stage and have initially achieved large-scale application. In December 2016, the Financial Subsidy Policy for Promoting and Applying Cars powered by electric, hydrogen or other fuel except oil was adjusted in the notice that was issued, and since then, subsidies for cars powered by electric, hydrogen or other fuel except oil have continued to decline. In 2017, cars powered by electric, hydrogen or other fuel except oil were established as a breakthrough point in the automotive power strategy. The new energy industry's large-scale production and application was promoted by promulgating the 'double credit' method for passenger cars in 2018.

Researches ten years ago showed that car brand preferences are among the factors that influence consumers' purchase of cars that are powered by electric, hydrogen, or other fuels other than oil, the influence of car buyers surrounded on them, preferential subsidy policies, sales prices, appearance

DOI: 10.54254/2754-1169/64/20231466

and interior preferences, car usage costs, quality reliability, ease of use, safety protection, and after-sales service are all aspects of government-related preferential subsidy policies [4]. The existence of vanity effect and comparison effect will increase consumers' preference for purchasing, and the network external characteristics of new energy vehicle purchasing behavior are significant. Due to the vanity mentality of users, the introduction of environmentally friendly fashion elements can increase the willingness of consumer groups to purchase cars powered by electric, hydrogen or other fuel except oil. Due to the user's comparison mentality. The expansion of market penetration can enhance the preference of potential consumers to purchase cars powered by electric, hydrogen or other fuel except oil [5].

Hence, in the era when China's economy and information level were relatively backward, people paid more attention to practical factors when buying cars, and less attention was paid to higher ideological levels such as the environmental protection attributes and social responsibility of cars powered by electric, hydrogen or other fuel except oil. However, in today's era, in economically developed regions, the purchasing of new energy vehicles is more likely by people because of their corresponding national policies and concern for environmental protection. Firstly, in the context of sustainable and high-quality development policies, consumers' environmental awareness is gradually increasing and they are willing to pay for environmental protection behaviors and green products; Secondly, concern and sympathy for environmental issues can better stimulate Chinese consumers to purchase cars powered by electric, hydrogen or other fuel except oil, rather than simply purchasing cars powered by electric, hydrogen or other fuel except oil out of their obligation to protect the environment. This to some extent reflects that for Chinese consumers, environmental issues and environmental protection responsibilities can directly affect their consumption behavior [6-9].

Through observation of prefecture level city with a comprehensive economic level in the top 25% of China, it is found that there are relatively few cars powered by electric, hydrogen or other fuel except oil in my city, and most of the vehicles driving on the road are gasoline powered vehicles; When traveling across the country, it is found that cars powered by electric, hydrogen or other fuel except oil were almost everywhere on the road, and whether it was walking on the street or taking a taxi, one often encountered cars powered by electric, hydrogen or other fuel except oil. This study would like to conduct this research on the relationship between a city's comprehensive economic level and the number of cars powered by electric, hydrogen or other fuel except oil owned, exploring the relationship between economic development and the number of cars powered by electric, hydrogen or other fuel except oil owned, in order to better understand the development level of cars powered by electric, hydrogen or other fuel except oil and China's environmental protection industry.

2. Data and Method

This study mainly used three data items: new energy vehicle ownership, urban GDP, and per capita GDP. Among them, the new energy vehicle ownership data comes from the WeChat official account "second-hand car circulation", and the urban GDP and per capita GDP data both come from the China Economic Data Website. This set of data is selected from the top 31 Chinese cities (seen from Table 1.) based on the ranking of new energy vehicle ownership, and the sample is relatively comprehensive. Among them, there are "big cities" such as Shanghai and Beijing with high total GDP, high per capita GDP, and high ownership of cars powered by electric, hydrogen or other fuel except oil; There are also cities like Wenzhou and Liuzhou that have relatively low GDP and per capita GDP, but have outstanding performance in the ownership of cars powered by electric, hydrogen or other fuel except oil; There are cities with high total GDP and per capita GDP, but low ownership of cars powered by electric, hydrogen or other fuel except oil, such as Jinan. Chengdu and Hangzhou, on the other hand, are two cities with opposite GDP data: Chengdu has a higher total GDP than Hangzhou but lower per capita GDP, while both have higher levels of new energy vehicle ownership.

DOI: 10.54254/2754-1169/64/20231466

Table 1: The set of the data.

City	New energy vehicle ownership	GDP/100million Yuan	GDP Per Capital/10thousand Yuan
Shanghai	998341	44652	17.99
Shenzhen	771541	32387	18.33
Beijing	712049	41610	19.03
Guangzhou	541960	28839	15.36
Hangzhou	520772	18753	15.26
Chengdu	398049	20817	9.81
Tianjin	374669	16311	11.92
Zhengzhou	316398	12937	10.15
Chongqing	276327	29129	9.07
Suzhou	239195	23958	18.6
Wuhan	231914	18866	13.78
Xi'an	227215	11486	8.88
Changsha	209355	13966	13.63
Nanjing	176587	16907	17.88
Wenzhou	172359	8030	8.31
Ningbo	167312	15704	16.39
Qingdao	165057	14920	14.42
Dongguan	161602	11200	10.68
Hefei	156544	12013	12.58
Foshan	154533	12698	13.29
Liuzhou	147770	3109	7.43
Wuxi	133234	14850	19.84
Haikou	132602	2135	7.34
Nanning	131230	5218	5.91
Jinan	123062	12027	12.88
Xiamen	119559	7802	13.62
Jinhua	112697	5562	7.81
Kunming	108185	7541	8.87
Taizhou	108151	6040	9.06
Taiyuan	107799	5571	10.29
Shijiazhuang	107302	7100	6.34

3. Results and Discussion

According to the linear regression results provided by Minitab, the R square value is 79.15%, indicating that overall, there is a certain linear relationship between the number of new energy vehicle ownership and the total GDP and per capita GDP. However, there are significant errors in the variance and some abnormal observations. The regression equation is new energy vehicle ownership=53469 + 20.87 GDP - 8876 GDP Per Capital. The coefficients are shown in Table 2, the model summary is shown in Table 3, the analysis of variance is shown in Table 4. After removing the abnormal observations in the first regression, the P-value showed a significant weakening trend, at the same time, R square increased. In addition, there is still abnormal observation in this regression (seen from Table 5). The new regression equation is New energy vehicle ownership=156680 + 21.26 GDP -

DOI: 10.54254/2754-1169/64/20231466

18791 GDP Per Capital. The coefficients are shown in Table 6, the model summary is shown in Table 7, the analysis of variance is shown in Table 8.

Table 2: The coefficients.

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	53469	62587	0.85	0.400	
GDP	20.87	2.49	8.37	0.000	1.90
GDP Per Capital	-8876	6389	-1.39	0.176	1.90

Table 3: The model summary.

S	R square	R square(adj)	R square(pred)
104810	79.15%	77.66%	68.99%

Table 4: The analysis of variance.

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1.16769E+12	5.83843E+11	53.15	0.000
GDP	1	7.70108E+11	7.70108E+11	70.10	0.000
GDP Per Capital	1	21205236267	21205236267	1.93	0.176
Error	28	3.07584E+11	10985137914		
Total	30	1.47527E+12			

Table 5: The analysis of adjustment.

Obs	New energy vehicle ownership	Fit	Resid	Std Resid
1	998341	825557	172784	1.97
2	771541	566600	204941	2.09
5	520772	309344	211428	2.07
9	276327	580808	-304481	-3.40

Table 6: The new coefficients.

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	156680	31733	4.94	0.000	
GDP	21.26	1.66	12.78	0.000	2.13
GDP Per Capital	-18791	3523	-5.33	0.000	2.13

Table 7: The new model summary.

S	R square	R square(adj)	R square(pred)
49490.3	89.14%	88.23%	86.18%

DOI: 10.54254/2754-1169/64/20231466

Table 8: The Analysis of Variance.

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	4.82283E+11	2.41141E+11	98.45	0.000
GDP	1	3.99833E+11	3.99833E+11	163.24	0.000
GDP Per Capital	1	69689798979	69689798979	28.45	0.000
Error	24	58782846432	2449285268		
Total	26	5.41065E+11			

In the final regression model, one obtained a very small P-value and a large R square value, indicating a certain linear relationship between the number of new energy vehicle ownership and the total GDP and per capita GDP. It is worth noting that in the final equation (O=143261+10.61TT-8584PC), the coefficient of total GDP is positive, while the coefficient of per capita GDP is negative, which may indicate that population has positive impacts on the number of new energy vehicle ownership. This study only selected two types of data to speculate and evaluate the ownership of cars powered by electric, hydrogen or other fuel except oil, which has certain limitations. Impacts on the ownership of cars powered by electric, hydrogen or other fuel except oil in real life must be multifaceted, such as government policies. The more comprehensive the promotion policy, car purchase policy, and charging policy, the higher the perceived value and lower the perceived risk of potential consumers towards cars powered by electric, hydrogen or other fuel except oil, which in turn can stimulate their willingness to purchase [10]. The promoting effect of fiscal subsidies will continue to decrease with the implementation of policies and the passage of time [11]. In the 2009 economic stimulus plan, $14 billion was invested by the US federal government in helping produce and develop car batteries, key components and other technology related to new energy industry [12].

Looking forward to future researchers using different research models, establishing different economic and mathematical models, incorporating different influencing factors such as policies and consumer psychology, and conducting more comprehensive research on the influencing factors of new energy vehicle ownership, in order to promote the development of environmental protection.

4. Conclusion

To sum up, the two major indicators of economic level, the total GDP and per capita GDP, have a significant impact on the ownership of cars powered by electric, hydrogen or other fuel except oil. The total GDP has a positive impact on the ownership of cars powered by electric, hydrogen or other fuel except oil, while the corresponding per capita GDP has a relatively negative impact, that is, the population also has a positive impact on the ownership of cars powered by electric, hydrogen or other fuel except oil. The amount of data used in this article is small and there are few factors to consider. It is expected that future researchers will adopt more comprehensive models for exploration. It is believed this study can make contribution to the development of the new energy industry and environmental protection, and promote people to have a better living environment.

References

[1] *Li, C., Li, X., Song, D., & Tian, M. (2022). Does a carbon emissions trading scheme spur urban green innovation? Evidence from a quasi-natural experiment in China. Energy & Environment, 33(4), 640-662.*

[2] *Wang, Y., Guo, C. H., Chen, X. J., et al. (2021). Carbon peak and carbon neutrality in China: Goals, implementation path and prospects. China Geology, 4(4), 720-746.*

[3] *Liu, X., Sun, M., Chu, W. (2019). Research on the Development Strategies of Cars powered by electric, hydrogen or other fuel except oil in China: Based on a Questionnaire Survey of China, Germany, Japan, the United States, and South Korea. Power analysis, 17, 25.*

DOI: 10.54254/2754-1169/64/20231466

[4] *Shao, J., Xin, M. (2018). Exploring the factors that affect consumers' purchase of cars powered by electric, hydrogen or other fuel except oil. Energy Consumption, 21, 19-22.*
[5] *Yeh, S. (2007). An empirical analysis on the adoption of alternative fuel vehicles: The case of natural gas vehicles. Energy policy, 35(11), 5865-5875.*
[6] *Zhao, H., Bai, R., Liu, R., & Wang, H. (2022). Exploring purchase intentions of new energy vehicles: Do "mianzi" and green peer influence matter?. Frontiers in Psychology, 13, 951132.*
[7] *Zheng, G. W., Siddik, A. B., Masukujjaman, M., Alam, S. S., & Akter, A. (2020). Perceived environmental responsibilities and green buying behavior: The mediating effect of attitude. Sustainability, 13(1), 35.*
[8] *Mansoor, M., & Wijaksana, T. I. (2023). Predictors of pro-environmental behavior: Moderating role of knowledge sharing and mediatory role of perceived environmental responsibility. Journal of Environmental Planning and Management, 66(5), 1089-1107.*
[9] *Boztepe, A. (2012). Green marketing and its impact on consumer buying behavior. European Journal of Economic & Political Studies, 5(1).*
[10] *Li, C., Ye, L. L., & Wang, L. P. (2021). The influence of new energy vehicle consumption promotion policy on the purchase intention of potential consumers. Chin. J. Manag. Sci, 29, 151-164.*
[11] *Lu, Z. (2015). Research on Fiscal and Tax Policies to Promote the Development of Cars powered by electric, hydrogen or other fuel except oil in China. Tax Policy, 18, 27-33.*
[12] *Shen, J., & Luo, C. (2015). Overall review of renewable energy subsidy policies in China–Contradictions of intentions and effects. Renewable and Sustainable Energy Reviews, 41, 1478-1488.*