

Consumers' Responses to Low-carbon Behaviors in Corporate on SPSS 23.0

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Abstract—Green development and environmental protection have become global trends. Taking low-carbon actions in corporate can not only produce ecological benefits, but also benefit their own sustainable development. This study adopts experimental method to study the influence of corporates' low-carbon behavior on purchase intention and the mediating effect of brand affect from the perspective of consumers. A total of 156 valid questionnaires were collected. SPSS 23.0 was used for regression analysis and process V2.16.3 for mediation effect analysis. The results show that both hard and soft low-carbon behaviors have a positive impact on purchase intention through influencing brand affect. In addition, the positive effect of hard low-carbon behavior is more significant than that of soft low-carbon behavior. Therefore, we suggest that corporates increase R&D investment and consumer promotion related to low-carbon technologies to enhance brand value and generate economic benefits.

Keywords-low-carbon; corporate; brand affect; purchase intention

1 INTRODUCTION

Global warming is a major challenge faced by human beings. Its harms include sea level rise and frequent occurrence of extreme weather, which will lead to a series of political, economic and military conflicts. Greenhouse gas emissions are an important cause of climate warming. Due to the enhancement of global awareness, environmental issues have become mainstream issues, and the promotion of energy conservation and carbon emission reduction has been widely advocated around the world. Reducing GHG emissions is critical to achieving the climate change mitigation goals of the Paris 2015 Agreement. As the world's largest developing country, China has also contributed to global carbon reduction. According to a white paper titled "Chinese Policies and Actions to Address Climate Change" published on October 27, 2021, Chinese carbon emission intensity has declined significantly while its economy and society have maintained sound development. In 2020, China's carbon emission intensity dropped 48.4 percent from 2005, exceeding China's commitment to the international community of a 40-45 percent reduction by 2020, reducing carbon dioxide emissions by about 5.8 billion tons and basically reversing the situation of rapid growth of carbon dioxide

emissions. At the same time, China has pledged to peak its carbon dioxide emissions by 2030 and strive for carbon neutrality by 2060.

According to the World Bank Report (2019) [1], it is mainly corporate that emit greenhouse gases during production and distribution. As major contributors to climate change and beneficiaries of external environmental costs, corporates are not only the market players of carbon emission reduction and carbon trading, but also an important driving force for the formation of a low-carbon economic society. Therefore, they must assume more moral responsibility to achieve carbon reduction. As governments, consumers and financial market participants pay more and more attention to global warming, climate change mitigation and adaptation receive more and more attention, and more and more companies express their desire to take advantage of green opportunities [2], Integrate environmental and social issues into corporate strategies to achieve sustainability and create social value. Previous studies have shown that corporates are the unity of value creation and social responsibility fulfillment, and corporate low-carbon practices can promote the realization of value creation goals.

As for the value that can be created by corporate low-carbon behavior, previous scholars mostly studied it from the perspective of finance and market. Scholars have drawn contradictory conclusions about the relationship between corporate carbon emissions and financial performance. Kuo et al. [3] found a positive relationship between GHGS and firm value from a financial perspective and attributed this to eco-efficiency. Eco-efficiency means that companies can improve their operating efficiency by using fewer materials, improving manufacturing processes and increasing productivity through waste use. When GHG abatement investments require large upfront investments, the costs may exceed the investment returns, thus weakening the financial performance of the firm. In addition, corporate low-carbon behavior not only has financial implications, but also improves efficiency through emission reduction and the use of by-products and wastes, which both reduces costs and leads to more innovation and improves the competitive advantage and market position of corporate. Low-carbon competitiveness is an effective way for companies to stay on the global green economic agenda.

Few studies have explored the value and long-term benefits of corporate low-carbon behavior to brands from a consumer perspective. Existing studies mainly focus on consumers' purchase intention of low-carbon products from the perspective of carbon labeling. Some scholars find the determinants of consumers' willingness to purchase carbon-labelled products. However, current research does not take into account the long-term benefits of companies taking low-carbon actions. The core question raised by this study is whether the low-carbon actions taken by enterprises can make consumers have positive emotions towards brands and thus promote their purchase intentions. Therefore, the main purpose of this study is to analyze the effect of enterprises' low-carbon behavior on consumers' brand emotion and purchase intention, and further explore the boundary conditions of this effect. At the same time, the effects of low-carbon behaviors of different types of enterprises will be compared.

2 HYPOTHESIS DEVELOPMENT

2.1 Low-carbon behaviors and purchase intention

According to the characteristics of low-carbon economy, Low Carbon Behavior (LCB) is considered to be the Corporate Behavior related to Low energy consumption, Low pollution and Low emissions, and is the Corporate Environmental Management (LCB). CEM) is an important part of the environmental management behavior of corporate in controlling carbon emissions. From the perspective of the implementation of environmental management standards, [Jiang et al. \[4\]](#) classified corporate low-carbon behaviors into substantive low-carbon and symbolic low-carbon according to [Christmann and Taylor's \[5\]](#) classification of corporate environmental protection behaviors. The substantial low-carbon category mainly reflects the energy, technology and input related to low-carbon in the production process of corporate, such as the proportion of the input of low-carbon production equipment and the proportion of clean energy use of the company; Symbolic low-carbon refers to the concept, publicity and operation related to low-carbon, such as the company's emphasis on low-carbon concept and daily office energy consumption. Literature on environmental management identifies two types of activities adopted by corporate in dealing with environmental problems -- soft environmental behavior and hard environmental behavior. Low-carbon behavior is a subset of environmental behavior. [Zhou et al. \[6\]](#) divided corporate low-carbon behavior into hard low-carbon behavior and soft low-carbon behavior. Hard low-carbon behavior refers to the substantial efforts made by corporates to modify their production processes or redesign their products to reduce carbon emissions. Soft low-carbon behavior refers to the efforts made by corporate to improve its organizational structure or management system and is not always related to substantive actions, including a set of policies or announcements on how to reduce carbon emissions.

Social exchange Theory (SET) is based on the premise that the relationship between organizations and customers is a kind of social exchange, and a series of interactions between organizations and customers generate obligations, which in turn may generate high-quality relationships. Based on social exchange theory, beneficial community consequences occur when a company cares for the community, for example by improving the community environment, making donations to charities, and complying with the law. Customers who receive such benefits as part of the community may respond to such organizations in the form of positive behavior (citizenship). Corporate low-carbon behavior is a sustainable behavior of corporate environmental responsibility, which can produce beneficial social consequences. Therefore, from the perspective of social exchange theory (SET), customers who have a good understanding of corporate low-carbon behaviors may be more intrinsically motivated to return the corporate with constructive feedback by spreading positive word of mouth. In addition, if a firm's low-carbon behavior is an important source of customer identification with the firm, then personal identification with the firm leads to cooperative and altruistic actions towards others. Therefore, customers with a positive view of corporate low-carbon behavior may be more willing to think altruistically and generate purchase intention.

Hard low-carbon behaviors may enhance the core competitive advantage of corporate because they are not easy to be imitated. By enhancing company-related outcomes, such as creating competitive advantages and improving corporate performance, customers can generate

purchase intention. According to the study of [Nasr et al. \[7\]](#), CSR initiatives increase the occurrence of positive customer feedback. The customer-firm psychological attachment that arises from CSR initiatives drives customers to voluntarily participate in corporate initiatives. Therefore, by responding to low-carbon policies, issuing low-carbon initiatives and other soft low-carbon behaviors, corporate can promote customers to actively contribute to the corporate, such as buying behavior. Hence, we hypothesize:

Hypothesis 1a (H1a). Hard low-carbon behaviors are positively related to purchase intention.

Hypothesis 1b (H1b). Soft low-carbon behaviors are positively related to purchase intention.

2.2 Mediating role of brand affect

Double-layer structure based on the Chinese emotion, as well as consumer sentiment comes from human basic emotion research tradition, [He Jiaxun \[8\]](#) put forward the Chinese consumers' brand emotion in addition to consider similar to western consumers of spontaneous, internal brand emotion, you should also consider for China "renqing norms" of some kind of obligation even bound feelings. Referring to the concepts of true affection and due affection proposed by Hu Xianjin, [He Jiaxun \[9\]](#) used the constructs of "natural affect and obliged affect" to reflect the emotional relationship between Chinese consumers and brands, including two dimensions of "natural affect" and "obliged affect". Natural affect refers to the uncontrollable positive emotional reactions generated by consumers' brand love during brand use, such as attraction, joy, pleasure and fun, etc. Obligated affect refers to feelings of obligation that are influenced by cultural norms such as patriotism, family and tradition, occasion and etiquette.

Previous studies have found that consumers' CSR perception stimulates their identification with corporate, which satisfies consumers' need to play the role of identity, helps them construct themselves, expresses their moral value demands, and provides symbolic value, thus generating positive feelings for brands [10]. Thus, it is speculated that when corporates show their support and support for low-carbon policies and even implement low-carbon concepts in the design of products and services, consumers will have a real affection for the brand. Consumers believe that CSR companies are doing good to their own social groups. Therefore, the association of altruistic quality of corporate generated by corporate low-carbon behavior can stimulate consumers' gratitude and reciprocation for corporates and their brands based on the obligation nature of "courtesy", that is, "obliged affect" for brands.

Based on the theory of emotional priming, positive emotions lead people to perceive stimuli from a positive perspective and hope to be more attractive to others. Corporate social responsibility behaviors can promote the establishment of customer positive emotions, thus promoting the establishment of customer organizational citizenship behaviors, including buying, feedback and other behaviors. Accordingly, we propose:

Hypothesis 2a (H2a). The positive relationship between hard low-carbon behaviors and purchase intention is mediated by brand affect.

Hypothesis 2b (H2b). The positive relationship between soft low-carbon behaviors and purchase intention is mediated by brand affect.

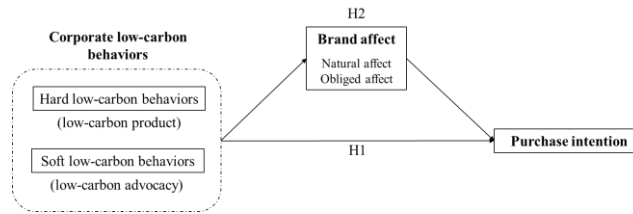


Figure 1. The main framework of the study

3 METHODOLOGY

3.1 Experimental design

In order to study the influence of enterprises' low-carbon behavior on consumers' purchase intention, we take clothing products as the research object and conduct empirical research through experimental method. Our study design consisted of two experimental groups (hard low-carbon behavior and soft low-carbon behavior) and a control group. Three groups were given reading materials and then answered the same questions. The reading material is designed with real information about the brand in the real world and includes a brand profile and an introduction to low-carbon behavior. The control group only provided the brand profile, so as to control the influence of other potential variables in this material and ensure the reliability of research results. The stimulus material design is as follows:

(1) Brand introduction: Brand A is a multi-brand comprehensive clothing business group, mainly specializing in down jackets. Its main products include men's wear, women's wear and casual wear. In recent years, brand A continues to carry out business reform and management innovation to improve the overall quality of the enterprise. At the same time, it also pays close attention to the low-carbon development of the industry.

(2) Hard low-carbon behavior: Brand A constantly improves product energy efficiency through technological innovation and reduces carbon emissions during production, manufacturing and use of products. The products of brand A have obtained the carbon label evaluation certificate, which indicates that the products of brand A meet the industry low-carbon standards and belong to low-carbon products.

(3) Soft low-carbon behavior: Brand A advocates environmental protection, pollution control, green energy saving, and mobilizes partners of the whole value chain to participate in strengthening energy conservation, low-carbon management and circular economy, practicing corporate social responsibility and participating in carbon neutrality initiatives. We will further improve the green procurement mechanism, promote the joint actions of upstream and downstream partners, and promote the deep integration of industrial chain development and carbon neutral path expansion.

3.2 Samples

In this study, questionnaires were issued and data were collected through multiple platforms (Qenstar, Wechat, Tecent, etc.). Participants were randomly assigned to one of three groups: hard low-carbon behavior group, soft low-carbon behavior group, or control group. A total of 187 questionnaires were recovered, 31 invalid questionnaires were deleted, and 156 valid questionnaires were obtained, including 48 in the soft low-carbon behavior group, 53 in the hard low-carbon behavior group and 55 in the control group. The effective rate was 83.42%. The experimental group usually has significant effects in 40 participants [11]. The sample size collected in this study meets the above requirements. In the samples collected this time, there are more women in terms of gender; In terms of age, the group is mainly 18-24 years old and the youngest age is 17 years old. In terms of academic qualifications, they are mainly undergraduates and postgraduates. On the whole, the subjects of this survey are relatively young and highly educated, which meets the research requirements.

Table 1 Descriptive statistical analysis

Demographic variables	Type	Percent
Gender	Female	71.15%
	Male	28.85%
Age	<= 18	3.21%
	18 -24	65.38%
	24 -30	23.08%
	>=30	7.69%
Education	High school degree	3.21%
	Junior college	9.62%
	Bachelor's degree	67.31%
	postgraduate degree	19.87%

3.3 Measurements and manipulation checks

In all three sets of experiments, manipulative checks were performed after the stimulus material was provided to ensure that subjects fully understood the information provided in the reading material. After reading the material, subjects were asked to recall whether the material contained information about hard or soft low carbon corporate behavior. According to the answers to this question, the invalid questionnaires in the sample questionnaire were screened. A total of 31 did not pass the maneuverability inspection, with a pass rate of 83.42%. Verify that the manipulation is basically successful. Following this question, participants were asked to answer a series of questions to demonstrate their environmental knowledge and attitude towards the brand. The measurement items as follows (Table 2) were adapted from mature scale and modified moderately according to the study scenario. According to the Cronbach's Alpha and KMO (KMO=0.919), the reliability and validity of related variables are good, which can be further analyzed.

Table 2 Measurements

Variable	Items	Resource	Cronbach's Alpha
Brand affect	This brand appeals to me	He (2008)	0.904
	I will pay attention to the new situation of this brand		
	I have an affinity for the brand		
	I'm willing to make small sacrifices to use this brand		
	I think I should use this brand		
	It's a brand that suits me and caters to how others see me		
Purchase intention	It is highly likely that I will buy the products of brand A	<u>Lee and Shin (2010) [12]</u>	0.847
	I want to buy the products of brand A		
	When buying electronic products, brand A will be my first choice		

4 RESULTS

Regression analysis was conducted with the low-carbon behavior of enterprises as the independent variable, the purchase intention of consumers as the dependent variable, and demographic variables such as gender, age and education level as the control variables. According to the analysis results, both hard and soft low-carbon behaviors have a significant impact on consumers' purchase intention. Soft low-carbon behavior has a significant impact on purchase intention ($\beta=0.276$, $P=0.001$), hard low-carbon behavior has a significant impact on purchase intention ($\beta=0.575$, $P=0.000$), H1a and H1b can be verified. As can be seen from the data in the Table 3, hard low-carbon behavior has a more obvious effect on purchase intention.

Table 3 Main effects

Variables	Purchase intention	
	β - value	p
X1: Soft low-carbon behaviors	0.276	0.001
Gender	0.008	0.915
Age	0.106	0.196
Education background	-0.102	0.202
X2: Hard low-carbon behaviors	0.575	0.000
Gender	0.105	0.649
Age	0.285	0.810
Education background	-0.171	0.080

SPSS 23.0 was used to test the mediation effect, and process V2.16.3 plug-in was downloaded and installed to test the mediation effect. After standardizing brand emotion and purchase intention, enterprises' low-carbon behavior was taken as the independent variable, anger as the intermediary variable, negative word of mouth as the dependent variable, and demographic variables such as gender, age and educational background were used as control variables (choice model 4). The results show that brand emotion has a significant mediating effect between hard low-carbon behavior and purchase intention (LLCI=0.7875, ULCI=1.3603, not including 0), with a mediating effect of 0.0639.

Table 4 Mediating effects of brand affect

X	Effect		t	p	LLCI	ULCI
Hard low-carbon behaviors	Direct effect	1.0100	7.1330	0.0000	0.7303	1.2897
	Indirect effect	0.0639		0.0000	0.7875	1.3603

Note: LLCI= Lower level confidence interval; ULCI= Upper level confidence interval;

Subsequently, the mediating effect of brand emotion on soft low-carbon behavior and consumer response was tested using the same method. The results showed that brand emotion had a significant mediating effect between soft low-carbon behavior and purchase intention (LLCI=0.3516, ULCI=1.0044, not including 0), and the mediating effect was 0.0596, which was proved by H2a and H2b.

Table 5 Mediating effects of brand affect between soft low-carbon behaviors and purchase intention

X	Effect		t	p	LLCI	ULCI
Soft low-carbon behaviors	Direct effect	0.6184	3.8580	0.0002	0.3017	0.9350
	Indirect effect	0.0596		0.0000	0.3516	1.0044

5 CONCLUSIONS

This study finds that enterprises taking low-carbon actions or low-carbon initiatives can have a positive impact on consumers' purchase intention through promoting consumers' brand emotion. More importantly, taking substantial low-carbon actions such as low-carbon product design and low-carbon technology research and development has a more positive effect on purchase intention. The theoretical significance of this study is to discuss the value of corporate low-carbon behavior to brands from the perspective of consumers, and to supplement the relevant research results of corporate low-carbon behavior. At the same time, it also provides a theoretical basis for enterprises to formulate low-carbon strategy by exploring the differential influence of hard low-carbon behavior and soft low-carbon behavior.

The management significance is that under the background of carbon peak and carbon neutrality, the whole society is actively seeking an effective way for the common development of economy and ecology. As important economic entities, enterprises should also actively

assume their social responsibilities and incorporate carbon emission reduction into the implementation of their development strategies. There have been many discussions on whether reducing carbon emissions can improve financial performance, and the conclusions are often contradictory. The starting point of this study is to help companies realize that the long-term benefits of taking low-carbon actions are significant. The low-carbon behavior of enterprises is not only conducive to the sustainable development of the environment and society, but also conducive to the improvement of the brand value of enterprises, thus contributing to the sustainable development of enterprises. In addition, Zhou et al. (2020) found in their study that enterprises' low-carbon awareness has a more significant impact on soft low-carbon behavior. Because hard low-carbon behavior needs to pay more costs, and need to develop strategies to adapt to it. But from the result of formation, the benefits of hard low-carbon behavior are more significant. Therefore, enterprises should appropriately increase hard low-carbon behaviors, and provide information available to consumers, such as carbon labels or publicity of low-carbon technological innovation, so that consumers can perceive the efforts made by enterprises for energy conservation and emission reduction, thus creating value for the development of enterprises.

However, there are still some limitations to this study. First of all, this study mainly adopts experimental method to study the results of enterprises' low-carbon behaviors. The research object in the experiment is the clothing industry, so the conclusions may not be applicable to other industries. Future research can select other industries as research objects to verify the conclusions of this study. In addition, can choose real brand should be measured to consumers, can reflect the true choice of consumers. Secondly, the outcome variable selected in this study is purchase intention. Future studies can consider other valuable variables, such as brand support and word of mouth, to enrich relevant theoretical results. Finally, the boundary conditions of this effect can be considered and verified in future studies.

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