

Study on the Motivation of Using Personal Carbon Credit Accounts

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Abstract

Since 2022, "personal carbon accounts" promoted by major enterprises and platforms have sprung up like mushrooms after rain, such as Taobao's "88 carbon account" and Ant Forest's "green energy", all of which are active attempts by enterprises in carbon inclusion. Currently, establishing a "personal carbon account" is of great necessity and importance. For individuals, a "carbon account" can assign carbon credits to form carbon assets, and then monetize the value of carbon credits through application scenarios to promote personal low-carbon consumption; For enterprises, the carbon credits accumulated in the "corporate carbon account" and the declared carbon reduction emissions can not only benefit from transactions, but can also be used as collateral financing. Therefore, personal carbon accounts are of great significance for the green transformation path of enterprises. This project aims to analyze the motivation for opening personal carbon accounts from four aspects: social orientation, personal orientation, economic orientation, and public welfare orientation. Data will be collected through large-scale questionnaire surveys, and factor analysis and confirmatory factor analysis will be used to test the dimensions of motivation for opening personal carbon accounts. To provide specific ideas for enterprises to develop personal carbon account promotion strategies and clarify the value appeal points of personal carbon accounts.

Keywords

Carbon Credit; Opening a Personal Carbon Account; Motive; Enterprise Carbon Account.

1. Introduction

Currently, most of the carbon emission accounting and carbon market attention both domestically and internationally focuses on carbon reduction and trading in the front-end production stage, with little attention paid to individual level carbon emissions. According to data, the energy consumption of residents in China accounts for about 45% -50% of the total energy consumption. Therefore, in order to achieve the "dual carbon" goal, the emission reduction of residents' consumption must be taken seriously. Driven by policies such as the "Implementation Plan for Promoting Green Consumption" issued by seven departments including the National Development and Reform Commission, various provinces have actively opened personal carbon credit accounts. As of the end of 2022, carbon accounts have blossomed throughout the country. The "2022 Green Book of Low Carbon Life" echoes with personal carbon credits. Green Paper conducted market research in writing to nearly 200 cities from the first to fourth tier, and people aged 22-60. This is the first time a domestic banking institution has released a research report on low-carbon lifestyle behavior for consumers (C-end), and its research conclusions provide an important reference for the launch of "carbon accounts". With the proposal of China's "30 · 60" dual carbon goals, the concept of carbon living is being fully integrated into all aspects of public life. A deep understanding of the current

public's attitudes and practices towards low-carbon living will provide important reference value for enterprises to actively participate in low-carbon emission reduction and promote carbon inclusive mechanisms.

A carbon account is a storage account for carbon dioxide emissions under the name of a company or individual. To establish a complete carbon account system, local governments, financial institutions, and enterprises need to take the lead. For individuals, their green lifestyle data such as public transportation, cycling, and waste recycling can be assigned carbon credits through a 'carbon account' to form carbon assets, which can then be monetized through application scenarios to stimulate their low-carbon consumption. For enterprises, the accumulated carbon credits and declared carbon reduction emissions can benefit from transactions, and even mortgage financing. Enterprises can guide the establishment of personal carbon accounts at the employee level, push the concept of carbon credits towards consumers, and enable them to work together to promote supply side transformation with the demand side.

2. Research Status and Issues

2.1. Current Situation in China

In the study of personal carbon accounts in China, Cui Hao (2022) found that the scenarios of personal carbon accounts are becoming increasingly diverse, and the attention paid to individual carbon reduction behavior of residents is constantly increasing. Huang Yong et al. (2022) conducted an in-depth analysis of the practical application of carbon accounts in daily life, and also analyzed the difficulties in popularizing personal carbon credit accounts: the difficulty of individuals entering the carbon market for trading lies in their small emissions reduction and insufficient incentives to stimulate emissions reduction. In terms of corporate carbon accounts, Pi Lei (2022) analyzed the establishment of Alibaba's carbon accounts, and Chao Yingping (2020) studied the marketing strategy of Internet financial products for "Ant Forest" under Alipay.

2.2. Current Situation Abroad

Against the backdrop of the upcoming launch of the Sustainable Development Mechanism (SDM) and the possible imposition of a "Carbon Tariff (CBAM)" by the European Union in 2025, the international carbon exchange is gradually establishing a globalized trading system, leading to the formation of global carbon prices and the interconnection of carbon markets. The development of the EU carbon market has become more mature, with extensive participation from financial institutions, a variety of services and carbon derivatives, and active trading. A stable punishment mechanism and market reserve and deposit mechanism have been established. The carbon quota allocation method in the primary market has transitioned from free allocation to auction.

Taking into account the development of carbon trading both domestically and internationally, it can be found that carbon trading abroad has gradually formed an important part of the region, while the development of domestic carbon accounts is just beginning, and many difficulties need to be solved urgently. This topic is based on previous research, based on the current development status of domestic carbon trading, and combined with successful cases from abroad, analyzes the motivation for opening personal carbon accounts from four aspects: social, personal, economic, and public welfare oriented. This provides specific ideas for enterprises to develop personal carbon account promotion strategies and clarify the value demands of personal carbon accounts.

3. Research Design and Main Content

3.1. Research Objectives

This project aims to conduct a comprehensive and systematic study on the relationship between "carbon credits" and individuals, enterprises, and countries, focusing on the topic of "motivation for the use of personal carbon credit accounts", by fully drawing on and absorbing relevant research results from both domestic and foreign sources, as well as self-learning and research. The main research objectives of this project include two aspects: firstly, to provide a detailed interpretation of the concept of "personal carbon credit account". By conducting in-depth research on users who have already opened "personal carbon accounts" and the current platform operation mechanism of enterprises, and summarizing the results, we can extract and summarize the motivation for using some personal carbon credit accounts, laying a research foundation for subsequent analysis of personal carbon credit account motivation, Clarify research ideas; Secondly, based on the final analysis of the motivation for using personal carbon credit accounts in this project, we will consider how enterprises can stimulate individuals to use their platform accounts through specific paths. We will provide relevant suggestions for enterprises that are preparing and have already opened the "carbon account" platform, promote the green transformation of enterprises in various industries in China, and better advocate the concept of green consumption to promote the vigorous development of China's green industry.

3.2. Research Contents

Firstly, search and sort out literature related to the topic of carbon credits both domestically and internationally. On the basis of learning and understanding the relevant theoretical research achievements at home and abroad, sort out and analyze relevant literature, extract and summarize more comprehensive and systematic conclusions on the motivation for using personal carbon credit accounts.

Secondly, construct a theoretical model and motivation research scale for the use of personal carbon credit accounts. A suitable and appropriate research model is the foundation of good research and research. The model serves as a bridge between theory and application, and is indispensable in many project topics or research projects. The scale assists the model in providing relevant data for this study. By establishing models and scales, it is helpful for our team to smoothly conduct research on the motivation for using personal carbon credit accounts in the future.

Thirdly, conduct market research and questionnaire surveys on the themes studied in this project. On the one hand, it is necessary to conduct research on users who have opened carbon accounts to obtain relevant data, and on the other hand, a questionnaire survey should be conducted on different social identity groups who have not used carbon accounts. To ensure that the subsequent research of this project is more systematic, comprehensive, and objective.

Fourthly, analyze the motivation for using personal carbon credit accounts. Based on the comprehensive research of the first three points, the main research related to this project will be carried out to comprehensively integrate the usage motivations summarized and sorted out after in-depth analysis.

3.3. Technology Roadmap

The first step is to summarize the motivation for using personal carbon point accounts through literature review and interview collection, and construct a theoretical model and motivation scale for the public's use of "personal carbon point accounts"; The second step is to design a questionnaire survey on the motivation of the public to use "personal carbon credit accounts" and distribute it to individuals around the public for filling out and collecting; The third step is

to use factor analysis to analyze the motivation for personal carbon point account usage, and use confirmatory factor analysis to verify the accuracy of personal carbon point usage motivation; The fourth step is to analyze various motivations and propose suggestions for promoting personal carbon accounts.

The technical route of this project is shown in the figure 1:

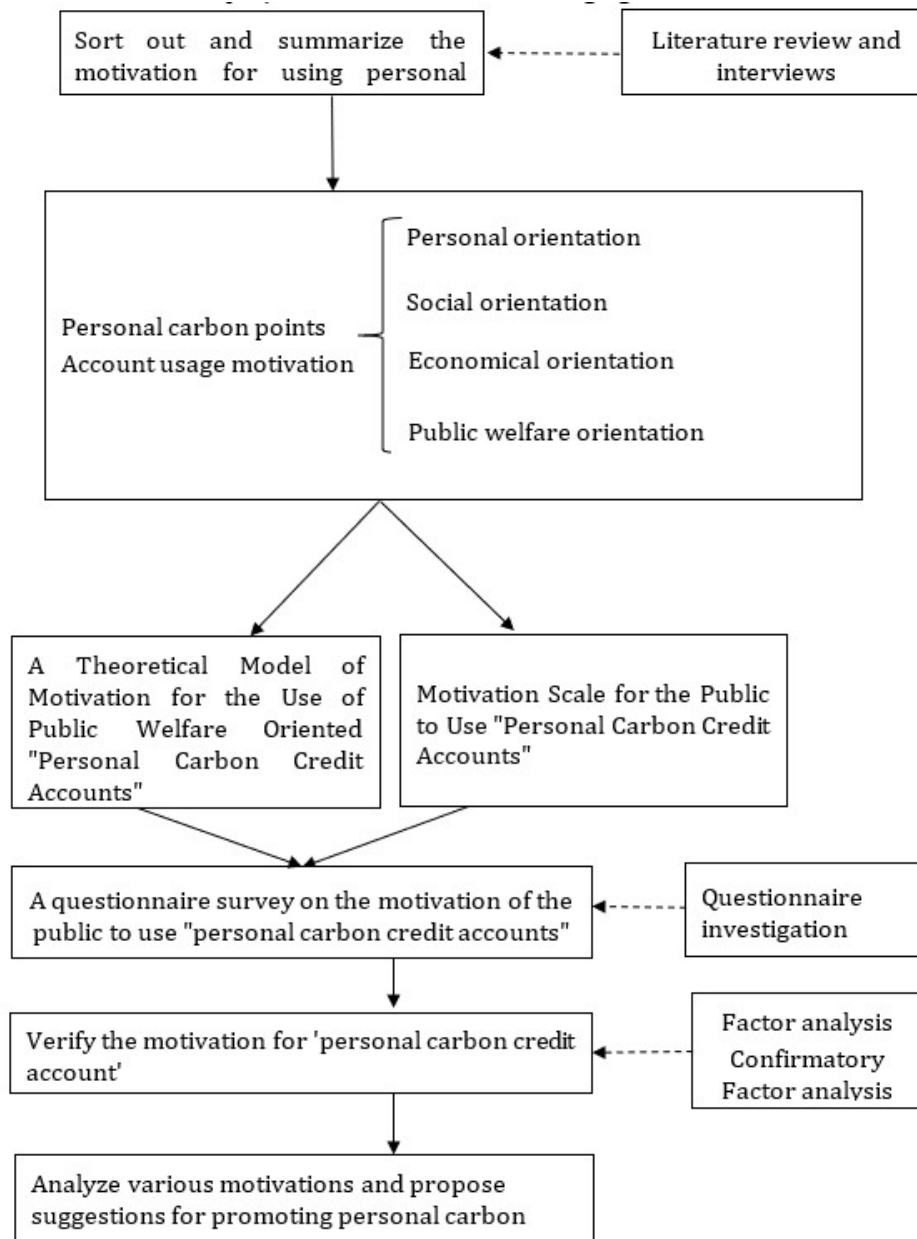


Figure 1. Project Technical Route

3.4. Investigation Process

3.4.1. Data Collection Reliability and Validity Analysis of Data

The questionnaire consists of five parts: the first part is personal basic information, the second part is personal social-economic background, the third part is personal travel habits, the fourth part is respondents' understanding of carbon credits, and the fifth part is a survey that affects the use of carbon credits. A total of 257 formal questionnaires and 252 valid questionnaires were collected in this survey. The gender ratio of the surveyed individuals is basically the same,

with 95.24% under the age of 60, 77.38% with a bachelor's degree or above, and 71.83% with students and permanent workers.

3.4.2. Reliability and Validity Analysis of Data

Using SPSS 24.0 to calculate the questionnaire data, the results of the evaluation scale were obtained (as shown in Table 1 on the following page). Cronbach reliability value α It is $0.836 > 0.8$, indicating that the reliability of the questionnaire meets the requirements. In the validity test, factor analysis is conducted on variables, and comprehensive analysis is conducted through indicators such as KMO value, commonality, variance interpretation rate value, and factor load coefficient value to verify the validity level of the data and set latent variables for factor extraction. The KMO value is 0.874, while the significance p-value of Bartlett's spherical test is less than 0.05, indicating strong correlation between variables and high validity, making it suitable for factor analysis.

Table 1. Reliability and Validity Analysis Results

Cronbach's α coefficient	Standardization Cronbach's α coefficient	Number of items	Number of samples
0.836	0.84	23	252
	KMO value		0.874
	Bartlett sphericity inspection	Approximate chi square	2905.92
		df	171

3.5. Construction of a Green Travel Inducing Factor Model

3.5.1. Structural Equation Model

1) Measurement model. The measurement model describes the relationship between each observation indicator and its corresponding latent variable, and its equation is as follows:

$$x = \Lambda_x \eta + \delta \quad (1)$$

$$y = \Lambda_y \xi + \varepsilon \quad (2)$$

In the formula, x is an external indicator; Y is an endogenous indicator; η and ξ Represent endogenous latent variable vectors and exogenous latent variable vectors respectively; δ is the error term of the external indicator x ; ε is the error term of the endogenous indicator y .

2) Structural model. Use the following equation to represent the intrinsic relationship between each latent variable:

$$\eta = \Lambda_\eta + \Gamma \xi + \zeta \quad (3)$$

In the equation: η and ξ Represent the vectors of endogenous and exogenous latent variables respectively, and represent the coefficient matrices between latent variables, which are residual matrices.

3.5.2. Variable and Model Determination

By exploratory factor analysis, factor loading coefficients and commonality were obtained, and 5 latent variables and their corresponding 19 observation variables were determined. The measurement model and the corresponding relationship between latent and observed

variables of the carbon integral induced green travel structure equation model are determined based on the load coefficient, as shown in Figure 2.

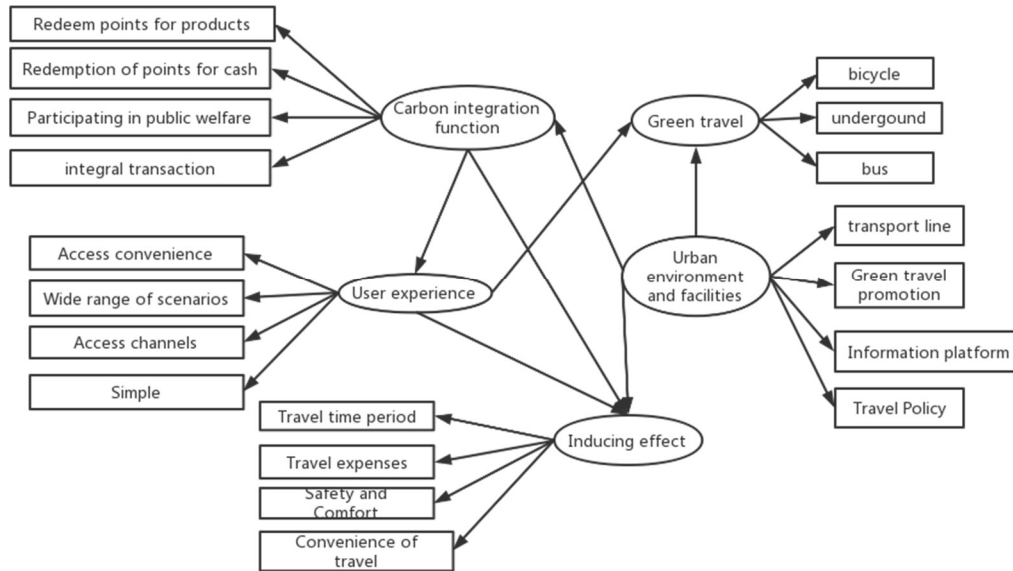


Figure 2. Green Travel Guidance Effect Model for Residents Based on Structural Equation Model

3.6. Model Verification and Result Analysis

3.6.1. Confirmatory Factor Analysis

Conduct CFA confirmatory factor analysis on data for research item screening.

(The results are shown in Table 2 on the following page). In this study, the measured variables in the model passed the significance test ($P < 0.05$), and the standardized load coefficient value was greater than 0.6, indicating that there is sufficient variance interpretation rate to show that each variable can be displayed on the same factor, indicating that the measured variables meet the requirements.

Table 2. Model fitting indicators

Latent Variable	observed variable	Standard load factor	z	S.E.
Urban environmental facilities	Green travel promotion	0.8490	13.774	0.078
	Information platform	0.912	14.8	0.077
	Travel Policy	0.873	14.191	0.082
Carbon integration function	Redeem points for products	0.772	-	-
	Participating in public welfare	0.71	11.013	0.073
	integral transaction	0.753	11.721	0.076
User experience	Access channels	0.942	25.382	0.041
	Wide range of scenarios	0.934	24.801	0.042
	Simple	0.876	21.02	0.046
Inducing effect	Travel expenses	0.541	7.246	0.112
	Convenience of travel	0.762	9.384	0.115
	Safety and Comfort	0.76	9.372	0.117

3.6.2. Model Fitting Analysis

Analyze the overall model fitting situation using model fitting indicators, obtain the results of model fitting indicators (as shown in Table 3), and select some indicators for explanation in this study.

According to the analysis in Table 3, the chi square degree of freedom ratio of $1.65 < 3$ indicates that the model complexity is appropriate, the root mean square error RMSEA is $0.051 < 0.10$, the comparative fitting index CFI is $0.907 > 0.9$, and the non standard fitting coefficient NNFI $0.956 > 0.9$ indicates that the model fitting is very good. From the fitting indicators, it can be seen that all the fitting indicators selected in this study have passed the test, and the model has a good fitting effect.

Table 3. Model fitting indicators

Fit indicators	χ^2	df	χ^2 /df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Recommended standard value	-	-	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
	238.89	144	1.65	0.907	0.051	0.056	0.963	0.918	0.956

Secondly, using AMOS software to analyze all scale residuals in the model, the results were all positive, and the p-values passed the significance test with high reliability, indicating that the path relationship is reasonable. According to the above analysis results, it can be seen that all indicators have reached the expected reference values, and the path coefficients of the green travel guidance effect have passed the significance test. The standardized path coefficients are shown in Figure 3.

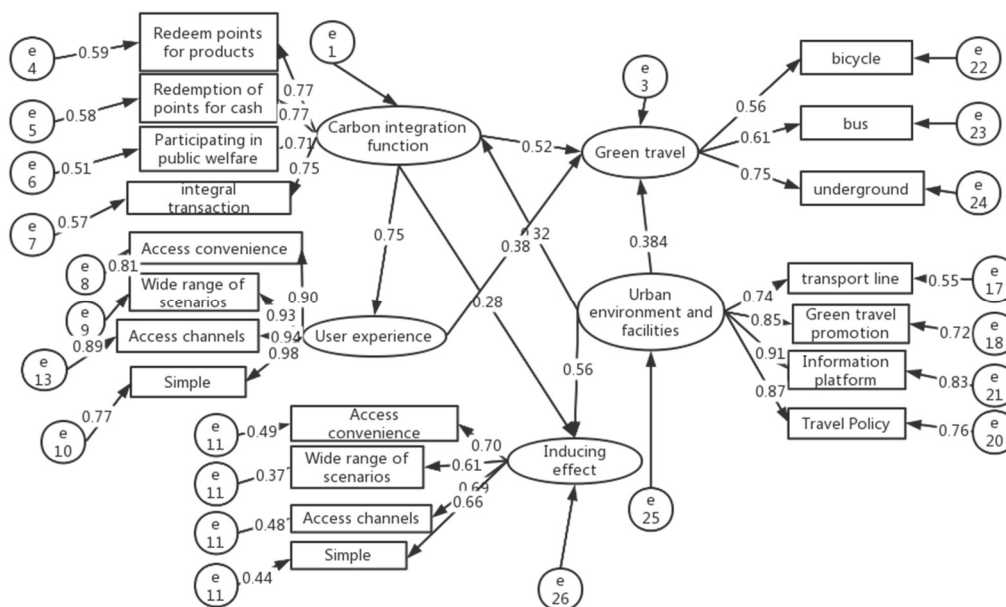


Figure 3. Standardized path coefficient of the green travel guidance effect model for residents

3.6.3. Result Analysis

The standardized path coefficients obtained from the structural equation model test results indicate that the induction effect of carbon credits on green travel is related to the urban

environment and facilities, carbon credits functions, and the experience of using carbon credits mini programs.

(1) The path coefficient between carbon integration function and user experience is 0.75, which is the highest among all explanatory variables. The carbon integration function has a positive impact on the user experience of the mini program and has a significant impact.

(2) The path coefficient between the experience of using carbon credits and the induction effect is 0.69, indicating that the experience of using carbon credits mini programs has a positive and significant impact on the induction effect of carbon credits.

(3) The path coefficient between the carbon integration function and the induction effect is -0.28, indicating that the carbon integration function has a negative impact on the induction effect, but the impact range is relatively small, indicating that the complex functions have raised the threshold for use to some extent, leading to poor induction effect.

(4) The path coefficient between the urban environment and facilities and the guidance effect is 0.56, indicating that the urban environment and facilities have a positive impact on the green travel guidance effect, and the impact is significant.

4. Innovation Points and Project Features

(1) The existing methods for energy conservation and emission reduction in the field of public consumption are relatively single, mainly adopting a combination of spiritual and moral guidance and residents' self-restraint and control, resulting in the energy conservation and carbon reduction potential in the field of public consumption not being effectively explored. As a new emission reduction mechanism focused on the field of public consumption, the "personal carbon account" is an innovation and expansion of the existing carbon emission trading system.

(2) The "personal carbon account" is linked to the green financial economy, which not only promotes green consumption, but also further enriches financial service scenarios, is conducive to business development, achieves Pareto improvement, and promotes green transformation of enterprises.

(3) The establishment of a "personal carbon account" is a substantial social responsibility mechanism for both individuals and businesses, allowing the entire society to participate in green development.

(4) Based on previous literature research on "personal carbon accounts" and analyzing the demand side motivation, this study aims to stimulate individuals in the public to use "carbon accounts" on corporate platforms and explore new ways to solve corporate carbon emissions problems.

(5) The greenhouse gases such as carbon dioxide generated by household consumption in China account for about 50% of the total greenhouse gas emissions. With the continuous improvement of the living standards of the Chinese people, this proportion will continue to rise. This means that consumer change has great potential in the field of carbon neutrality.

5. Conclusion

From a personal perspective, establishing a "personal carbon account" is to convert an individual's daily carbon reduction behavior into "carbon account" points, thereby forming a positive incentive for personal green consumption and carbon emission reduction behavior, enhancing the willingness of the whole people to participate and practice a green lifestyle. Individuals who benefit from carbon point accounts will stimulate their continuous practice of a green lifestyle, and in the long run, form social habits, Realize the continuous use of personal carbon accounts and the continuous expansion of market share. At the same time, some social citizens themselves have green environmental awareness and good green consumption habits.

The motivation for personal use includes environmental influences as well as personal psychological and behavioral habits.

From a social perspective, in October 2021, the "Green and Low Carbon National Action" was listed by the State Council as one of the "Top Ten Actions for Carbon Peak". In order to promote the transformation of personal consumption towards green, in January 2022, the National Development and Reform Commission and seven other departments jointly issued the "Implementation Plan for Promoting Green Consumption", guiding banks and insurance institutions to standardize the development of green consumption financial services and improve the coverage and convenience of financial services; In June 2022, the China Banking and Insurance Regulatory Commission issued the "Guidelines for Green Finance in the Banking and Insurance Industry," requiring banking and insurance institutions to promote green finance from a strategic perspective and increase support for green, low-carbon, and circular economies; In August 2022, the National Development and Reform Commission and other three departments issued the "Implementation Plan for Accelerating the Establishment of a Unified and Standardized Carbon Emission Statistical Accounting System", aiming to provide comprehensive, scientific, and reliable data support for carbon peaking and carbon neutrality work; In October 2022, the report of the 20th National Congress of the Communist Party of China mentioned "improving the carbon emission statistics and accounting system, and improving the carbon emission rights market trading system". Therefore, as a branch of the carbon market, personal carbon accounts are becoming a new trend, and financial institutions and other host institutions have successively stepped in, making useful attempts to implement policies. The continuous introduction of relevant policies and the trial behavior of various banks and enterprises have provided motivation for the use of personal carbon accounts.

From an economic perspective, the use of 'personal carbon accounts' can have the effect of diverting customer resources. As a new scenario for exploring user marketing services, some banking personal carbon account platforms are open to the general public, and non bank customers, tourists, and others can log in and participate. If connected with their own financial services, they may be able to attract more incremental customers; Moreover, an attractive carbon account can increase the frequency of users logging into bank apps, assist in bank marketing, make some existing customers more active, and even awaken some dormant or semi dormant users, which has a positive promoting effect on the economic development of the financial industry. At the same time, for enterprises, the application of personal carbon accounts can motivate more public participation in consumer carbon reduction. The increasing demand for green consumption will, in turn, force more upstream manufacturers to accelerate green transformation by reducing personal consumption of high carbon goods, making carbon reduction in the supply chain industry chain interconnected and mutually reinforcing, further promoting the development and improvement of the green industry chain supply chain.

From the perspective of public welfare orientation, the empowerment of individual carbon accounts can enable the quantification of individual carbon reduction behavior, making it traceable and traceable, effectively enhancing the perception of residents towards their own energy-saving and carbon reduction behavior, and clearly defining relevant rights and responsibilities. Undoubtedly, it will greatly stimulate micro entities to consciously promote green development, practice green and low-carbon lifestyles, and turn consumption potential into green consumption power. In the long run, it can also play a nurturing role in individual participation in carbon emissions trading, guiding individuals to participate in the accumulation of carbon rights value through a model that links carbon emission reduction behavior to the value of individual carbon account balances. This lays a cognitive foundation for individuals to enter the field of carbon rights trading in the future, and plays a key role in improving the carbon market, expanding trading, and enhancing market liquidity in the later stage. At the same time, the development of "personal carbon account" can promote the

progress of "Internet plus" technology, and the carbon management and ESG system of digital transformation industries and enterprises only solve the partial carbon neutrality of the supply side and supply chain, and cannot achieve full coverage of carbon footprint management from production to consumption recovery side of products. Moreover, managing and quantifying carbon data for individuals is far more complex, trivial, and difficult to accurately measure than for enterprises. However, with the support of digital technology, individual fragmented carbon emissions and carbon reduction behaviors have been endowed with quantifiable and cumulative possibilities, and the evaluation of carbon reduction behaviors has become easier to achieve.

6. Research Meaning

6.1. Theoretical Significance

Many financial institutions and enterprises have tried their hand with the support of national policies, but overall, the carbon accounts established by enterprises are not closely connected with individuals and do not form a pathway in carbon trading. This project actively explores the importance of enterprises developing personal carbon account platforms, which can enrich and improve the research on personal carbon credits and corporate carbon account related theories, and further build and popularize carbon inclusive systems, Make the concept of carbon accounts deeply ingrained in people's hearts.

6.2. Practical Significance

The national "dual carbon" policy has been proposed for two years. To further save energy and reduce emissions, it is necessary to start from the perspective of consumer behavior. Clear carbon emission data accounting, opening personal carbon accounts, and connecting enterprises and individuals are important ways to deepen energy conservation and emission reduction. By studying the motivation of individual carbon accounts and finding specific paths to stimulate individuals to use corporate carbon credit platforms, it can help consumers voluntarily make energy conservation and emission reduction a part of their lives, while also enabling enterprises to benefit from carbon reduction and emission reduction. The launch of personal carbon accounts encourages individual consumers to choose low-carbon and environmentally friendly behaviors through positive incentives, and guides the public to form low-carbon lifestyle habits. In the future, personal carbon accounts may achieve application scenarios within easy reach, scientific and effective data monitoring, rich and interesting incentive models, and can also be included in personal bank category III account management. These all require continuous attempts and innovation from regulatory authorities, financial institutions, and major payment platforms. These measures can promote the healthy operation of carbon trading in the entire society, so this topic has strong practical significance.

Acknowledgments

Project: A Study on the Motivation of Using Personal Carbon Credit Accounts.

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