The impact of Digital Economy on Green Consumption

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Abstract. Based on CFPS 2018 data, this study constructs an OLS model and employs principal component analysis to examine the influence of the development level of the digital economy on Chinese residents' level of green consumption. The main findings of the thesis are as follows: the level of development of the digital economy can promote the level of green consumption of residents, and this result still holds after a series of robustness tests. The mediation effect test shows that the digital economy can increase the level of green consumption by expanding the information channels of the residents and reducing information asymmetry. Our study provides practical insights into how to effectively guide and promote green consumption behavior.

Keywords: digital economy; green consumption; CFPS; mediation effect

1 Introduction

With the emergence of new technologies such as artificial intelligence, big data, blockchain and cloud computing, new production methods that use data as the core production factor and digital technology as the driving force have received widespread attention, and the development of the digital economy has brought new opportunities for green innovation in enterprises. This highlights the importance of the development of the digital economy from the top level. A flourishing digital economy can trigger a comprehensive green transformation from production factors to productivity to production relations, and achieve a comprehensive empowerment of green development. At present, the application of new digital technologies in social production and life is expanding, and new economic forms such as digital production and digital consumption are emerging, profoundly changing the production and management modes of enterprises and the lifestyles of the general public[1]. Cultivating green concepts and promoting green consumption are inherent requirements for promoting high-quality economic development in China[2]. The development of the digital economy drives the green transformation of China's economy[3]. In terms of the role of the digital economy on green consumption, the digital economy can drive the development of green consumption[1]. The digital economy promotes consumers' digital literacy and influences green consumption behavior through behaviors such as self-efficacy, outcome expectations,

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anticipated pride and anticipated guilt[4]. However, the research on the relationship between digital economy and green consumption is still lacking. There is also a lack of research on the mechanism of the digital economy's effect on green consumption. Therefore, this paper explores the impact of the digital economy on green consumption, which holds significant implications for igniting vitality in green consumption and achieving high-quality green development.

Digital economy refers to a series of economic activities with the use of digital knowledge and information as key production factors, modern information networks as an important carrier, and the effective use of information and communication technology as an important driving force for improving efficiency and optimizing economic structure. Different from traditional production technology, digital technology itself has the characteristics of high-tech content and low environmental cost. While improving production efficiency, it pays more attention to the coordination between production and the environment, with relatively limited energy consumption and material consumption, and has little impact on the environment (Bao Jianqiang et al., 2008). It can be said that digitalization naturally has a "green" component, which can integrate all aspects of resources and promote the improvement of activity efficiency. Digital technology has greatly changed people's life and mode of production. In the field of consumption, digital technology is reconstructing people's consumption processes, changing people's consumption habits, and expanding people's consumption channels (Shi Hongjing and Chen Lifang, 2023). Relying on the online sales platform, consumers can conduct transactions in real time, avoiding the resources consumed in offline transactions. The development of the digital economy has promoted enterprises to change their production and operation modes and carry out digital and green transformation, thus producing more green products and expanding the targets of green consumption. In addition, the digital economy has also promoted the development of social media, and the concept of "low carbon" and "green" has increasingly become mainstream, which has greatly promoted the improvement of residents' awareness of green consumption. Therefore, this paper puts forward the hypothesis:

H1: The development of the digital economy has promoted the improvement of residents' green consumption level.

2 Empirical Design

2.1 Sample Selection and Data Sources

The data sample of this paper comes from the data of China Family Tracking Survey Database (CFPS) in 2018, which is highly authoritative and representative in academic research and public policy analysis, covering 25 provinces/municipalities/autonomous regions, with a total of 16,000 target households, including all family members in the sample households. The questionnaires used in this survey are classified according to different age groups, including children's questionnaires, adults' questionnaires and family questionnaires. The relevant contents from family questionnaires are used in this study. After the necessary data processing, the final valid sample number is 13,889. The measurement software is Stata16.0.

2.2 Variables Definition

Dependent variables: BDI.

Referring to Cheng [5], the variables of internet penetration rate, relevant employment situations, the total amount of telecommunications-related businesses, mobile phone penetration rate, and China's digital inclusive finance index are standardized by principal component analysis, and then the dimensions zare reduced to calculate the comprehensive development index of the digital economy.

Independent variables: GM.

According to the definition by Liu Li (2020) [9], green consumption refers to the way of consumer behavior that meets the requirements of human health and environmental protection[8]. Referring to Du Xin[6], the total value of own household consumption of agricultural and sideline products, the total value of durable consumer goods, and expenditure items that may be associated with green consumption such as cultural and recreational expenditure, tourism expenditure, heating expenses and education and training expenditure in the CFPS database were taken as the main data of green consumption expenditure (GM). This paper standardizes the above consumption expenditure and takes the natural logarithm.

Control Variables:

Referring to E. Chen[7], the following variables were selected as control variables in this paper, at the demographic level: respondents' gender, age, marital status, and education level; followed by household characteristics variables: household size, level of annual net household income per capita, and household status .

2.3 Empirical Model Design

In order to test the impact of the digital economy on residents' green consumption levels, this paper constructs an Ordinary Least Squares (OLS) model for empirical analysis, with the following model settings:

$$GM_{i,t} = \alpha_0 + \alpha_1 BDI_{i,t} + \alpha_i Controls_{i,t} + \varepsilon_i \quad (1)$$

In models (1), the explanatory variable GM represents the level of households' green consumption, the explanatory variable BDI represents the level of digital economy development, α0 represents the intercept term, and ε represents the residual term.

3 Empirical Results

3.1 Benchmark Regression Result and Robustness Test

The table reports the test results of hypothesis 1. The regression coefficient of BDI in table 1. column (1) is 0.889***, which is statistically significant at the 1% level, indicating that the digital economy can significantly contribute to the increase in total green consumption expenditure of residential households. In terms of economic significance, for every one standard deviation increase in the level of digital economy development,

the level of green consumption of residential households will increase by 0.889 standard deviations. In summary, it can be seen that digital economy development helps to promote residents to engage in green consumption, and this result is both statistically significant and economically significant. Thus, H1 is verified.

Table 1. Empirical results and test results of transmission mechanism.

VARIABLES	(1)	(2)	(3)
BDI	0.889***	0.0265***	0.888***
	(0.0152)	(0.00347)	(0.0156)
oni			0.0384***
			(0.0139)
age	0.000225	-0.000891**	0.000274
	(0.000160)	(0.000418)	(0.000184)
Constant	-0.0746***	-0.286***	-0.0786***
	(0.0232)	(0.0252)	(0.0246)
Controls	YES	YES	YES
Observations	13,889	13,169	13,169
R-squared	0.807	0.326	0.807

This paper conducts robustness tests and addresses endogeneity issues in the following ways:

(1) Instrumental variable approach;

The number of telephones per 100 people in the same province (mobile) is used as the instrumental variable, and the p-value of the one-stage regression results is 0, indicating that the instrumental variable holds, as can be seen from the table, the positive effect of digital economy development on residents' green consumption level still holds after considering possible endogeneity issues.

(2) Dealing with outliers (winsorize);

This paper regresses the main variables after shrinking the tails, as in the Table 2, H1 still holds.

(3) Change the independent variables;

Narrow the scope of green consumer goods, and use the total value of consumption of own agricultural and sideline outcomes and the total value of durable consumer goods as variables to measure the green consumption level of residents, and the regression results are consistent with the previous paper, as shown in Table 2.

(4) Change the dependent variables (DE).

The regression results are consistent with the previous paper, as shown in Table 2.

Table 2. Robustness test results

VARIABLES	(1)	(2)	(3)	(4)
BDI	0.789***	0.990***	8,681***	
	(0.0315)	(0.00826)	(1,348)	
DE				1.733***
				(0.00764)

Constant	-0.0847***	-0.0335*	-31,210***	-0.165***
	(0.0232)	(0.0175)	(3,724)	(0.00947)
Controls	YES	YES	YES	YES
Observations	13,889	13,889	13,889	13,889
R-squared	0.797	0.857	0.076	0.957

3.2 Transmission Mechanism Test

Referring to the practice of E. Chen[7], the decentralized value of the question score of whether or not residents have computer access to the Internet was used as a proxy variable for the information channel (oni). As can be seen from the table 1, the regression coefficient of BDI on oni is significantly positive, indicating that the level of the digital economy can significantly increase the use of online channels. The regression results after adding oni to the original regression model are shown in column (3) of the table1. The coefficient of the effect of the level of digital economy development on the level of green consumption of the population decreases after adding the mediating variable, which proves that the use of online channels plays a mediating role. In terms of economic significance, the digital economy has prompted residents to learn about green-related information and products through the Internet, which has increased their green awareness and thus promoted their green consumption level[8].

4 Conclusions

This paper explores the relationship between the level of digital economy development and the level of green consumption of residents and its transmission mechanism using the 2018 CFPS data. The specific findings are as follows:

The level of development of the digital economy can promote the level of green consumption of residents, and this result still holds after a series of robustness tests. The mediation effect test shows that the digital economy can increase the level of green consumption by expanding the information channels of the residents and reducing information asymmetry.

To foster sustainable innovation, it is essential to promote the digital economy. The government should acknowledge the pivotal role of the digital economy in promoting green consumption among our residents. This can be achieved by improving the construction of digital infrastructure across various regions, increasing accessibility, relevance, and usability of digital services, and further leveraging the potential of digital technologies to boost green consumption.

To broaden residents' knowledge about environmentally friendly practices and products, it is crucial to enhance access to green information channels through internet-based media platforms. Online social media, in particular, can serve as a useful tool for disseminating green-related knowledge and promoting eco-friendly behaviors among the public.

Enterprises have a crucial role to play in driving sustainable consumption patterns. Encouraging businesses to accelerate digital transformation can enable them to offer more green products and services with good quality and affordable prices. Such

measures can increase the likelihood of green consumption from the supply side, thereby creating a virtuous cycle of sustainability [10].

Policy incentives can act as catalysts for promoting green consumption. For instance, offering vouchers or tax incentives for making purchases of environmentally friendly products or services can stimulate demand while also raising awareness about environmental issues.

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