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Digital Inclusive Finance Helps Green Industry in Fujian Province Development

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: Digital inclusive finance, as a combination of modern technology and financial services, has developed rapidly in recent years. This new financial model has not only changed the traditional way of providing financial services, but also profoundly affected all aspects of economic and social development. The report of the 18th CPC National Congress made the important decision of "vigorously promoting the construction of ecological civilization " from the strategic height of the sustainable development of the Chinese nation. China's green industry has ushered in a new phase of rapid development. As an important province on the southeast coast of China, Fujian Province, with rich natural resources and vast rural areas, is an important region to promote the development of green industry.

Methodology: In this paper, the green industry index of nine prefecture-level cities in Fujian Province from 2011 to 2021 is selected as the explanatory variable, and the development level of digital inclusive finance is taken as the core explanatory variable to explore the impact of digital inclusive finance on the development of green industry in Fujian Province.

Results: According to the multiple linear regression, it is found that the level of green industry development is positively correlated with the level of digital inclusive finance development at the 1%

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significant level, i.e., digital inclusive finance helps to promote the development of green industry in Fujian Province.

Conclusion: Based on the findings of the study, the paper puts forward the following recommendations: through the provision of low-cost financing, innovative financial products, digitalized payments and settlements, popularisation of financial education, and the promotion of cooperation, digital inclusive finance can effectively support the development of the green industry. This not only helps to achieve the goal of environmentally sustainable development, but also promotes economic growth, creates employment opportunities and enhances social well-being.

Keywords: Digital inclusive finance; green industry; industry development.

1. INTRODUCTION

As the world attaches increasing importance to environmental protection and sustainable development, China has also put forward the "dual-carbon" goal, and in the context of the "dual-carbon", accelerating the development of green industries has become particularly important. At the same time, digital inclusive finance, as an innovative financial tool, has gradually entered the public's field of vision and promoted the development of various industries. Use of digital inclusive finance technology can make investment, monitoring and management of the green industry more efficient and accurate, and at the same time provide more financing channels for enterprises, better help enterprises and the government to make decisions, so that the funds flow to environmentally friendly enterprises, and integrate social responsibility into the financial promotion, so that enterprises can better shoulder their social responsibility [1].

In recent years, the green industry in Fujian Province has achieved a certain degree of development, but it is still insufficient for building a green living environment and achieving sustainable development. Therefore, there is an urgent need to further accelerate the development of green industries in Fujian Province. However, there are relatively few studies on the relationship between digital inclusive finance and green industry in Fujian Province, especially lacking empirical studies based on municipal data. Therefore, this paper takes economic development scale, income level, financial expenditure level and human capital as variables by selecting data from nine prefecture-level cities in Fujian Province. Correlation and regression analyses are used to study the economic level of different municipalities, explore the relationship between digital inclusive finance and green industry, and put forward feasible suggestions in combination with relevant policies, regulations and market demand, so as to explore how digital inclusive finance can help revitalise the green industry in Fujian Province, and to provide a useful theoretical basis and practical suggestions for the formulation and implementation of relevant policies and achieve sustainable development of the economy, society and environment. sustainable development of economy, society and environment.

2. LITERATURE REVIEW

2.1 Study on the Development of Digital Inclusive Finance

People are advancing the continued development of financial inclusion through the widespread adoption of digital technologies that break down the time and space constraints of financial services, as well as lowering their thresholds and speeding up the transfer of information Li, J., & Jia, J [2]. In addition, the concept of digital financial inclusion was also formally proposed at the G20 Hangzhou Summit in 2016, with the core objective of providing financial opportunities by digital means equally to those who do not have full access to financial services Song, X. [3]. Lv Jiajin and other domestic scholars agree that digital financial inclusion is essentially an innovation built on digital standards. Meanwhile, the application of digital technologies such as e-commerce and e-payment also plays a crucial role in promoting financial inclusion Song, X. [4]. To sum up, digital inclusive finance is to provide flexible and efficient financial products and services to low-income groups and micro, small and medium-sized enterprises (MSMEs) through digital technology.

With regard to the metrics aspect of digital financial inclusion, it can be comprehensively assessed in terms of geographic distribution, financial service provision and financial product provision. It is also possible to further deepen the

assessment of financial inclusion in terms of availability, circulation and utility. Guo, T.,& Ding, X. [5] and other domestic scholars also constructed an evaluation system of inclusive finance through population penetration, geographical distribution and bank loan availability.

In terms of measurement methods, Chen, Y., & Tang, G.(2022) [6] innovatively introduced the entropy value method to assess the development of digital inclusive finance in China. With the popularisation of digital technology, digital inclusive finance begins to show its advantages. Therefore, digital inclusive finance is included in the evaluation system of inclusive finance and measured from multiple perspectives. The development level of emerging countries towards digital inclusive finance is also systematically evaluated through multiple aspects such as network penetration rate, smartphone ownership rate, and percentage of registered ID population. In China, the Digital Inclusive Finance Indicator System released by the Financial Research Centre of Peking University has become an important reference in the field. Based on the data of Ant Gold Service and the new situation of digital financial services, the system comprehensively assesses the development of digital inclusive finance in three aspects: the breadth of coverage of digital inclusive finance, the depth of application of digital inclusive finance, and the degree of digitisation of digital inclusive finance.

2.2 Research Related to Green Industry Development

The concept of green industry was first proposed by the Canadian Minister of the Environment in his 1989 government work report. With the increasingly serious problems of resource depletion and environmental pollution brought about by industrial development, scholars and organisations in various countries have begun to pay attention to and study green industry and its related concepts. The United Nations Development Programme (UNDP) gave a definition of green industry in 2003, that is, those related industries that use equipment, services, and technologies that can reduce and prevent pollution, such as wind, solar, geothermal and other renewable energy industries, which help to reduce the dependence on traditional bioenergy.Li, K., Jia, J., & Gai, Y. [7]. In addition, relevant scholars further pointed out in 2009 that green industry is a unity of capital-intensive and environmentally friendly by comparing green industry with traditional industry, for example, wind power and solar power and other related power industries are typical representatives of green industry.

In exploring the development of green industries, foreign scholars have conducted in-depth analyses of green industries in their respective countries. For example, Imran, A. H., Kabir, M. H., Ben, Y. Z., et Al. [8]. Studied the green transformation of Australia's industry and found that the country's industry gained better development through the improvement of production efficiency and the innovation of management mode. Similarly, Ning,Z., jinhua, S., Yu,T., et al [9] after studying a report on the development of green industries in the United States, suggested that the economic gains created by green industries have become an important factor driving the overall progress of the US economy. In order to promote the development of green industry, scholars and organisations in various countries have made suggestions. Studies have shown that the introduction of financial capital is the key to the development of green industry, through capital injection can expand the scale of production and innovation of production technology. Jianfeng, G., Kai, Z., & kecheng, L. [10], on the other hand, believes that in addition to social investment, the government's policy formulation is also crucial, and providing a favourable development environment for the green industry is a guarantee for its long-term development. In addition, from the perspective of raw materials, studies have shown that the use of renewable resources as raw materials for production has a positive impact on the development of green industries. Some scholars have suggested that financial subsidies should be used to accelerate technological research and development in the green industry and enhance its level of innovation.

Focusing on the development of China's green industry, domestic scholars have also conducted relevant research and made suggestions. Zhao, X. [11] Specifically studied the municipal waste treatment industry, pointing out that it also belongs to the category of green industry and is closely related to life. Li X., Zhang, Y., & Jiang, F. [12] on the other hand, suggested that green industry can form an industrial chain to provide green products and green services, and

suggested the use of policy tools to break through sustainability technical difficulties and coordinate green diversified development. Xing X., Ye,A.,&Lu, F et al. [13] focuses on regional development differences and emphasises the use of digital inclusive financial tools in the development of green industries and the importance of green transformation of industries in the western region. Chen, L., Zhou, R., et al. [14] analyses the impact of green industry policies on the transformation of heavily polluting industries, and argues that transformed green industries still need to strive to meet high-quality production standards.

2.3 Digital Inclusive Finance and Green Industry Development

As an emerging financial model, digital financial inclusion provides strong support for the green food industry with unique advantages; the impact of digital financial inclusion on the revitalisation of the green industry has become a hot topic in the academic world. Many studies re-exploring digital financial inclusion on the green industry have been explored from the following two aspects. On the one hand, the innovation research of digital inclusive finance and green industry is mainly explored. Qiao, B., Zhao, G., & Shen, S. [15] took A- share listed enterprises as a sample and explored the role of digital inclusive finance in promoting green innovation activities of enterprises. Yu, D., et al. [16] on the other hand, from the perspective of highly polluting enterprises, found that digital inclusive finance effectively alleviated their financing difficulties, thus enhancing their green industry innovation level. Wang, Z., Zhu, W., & Han,C. [17] further study pointed out that the relationship between digital inclusive finance and enterprises' green technology innovation is not completely linear, but presents a non-linear characteristic of increasing marginal effect. On the other hand, there are also scholars who explore the factor production related issues between digital inclusive finance and green industry. Li, W., Chen, Z., et al. [18] combined digital inclusive finance and green total factor productivity and found that digital inclusive finance promotes green total factor productivity growth through the intermediary pathways of technological innovation, industrial structure optimisation and resource mismatch mitigation, and the effect is more significant in the eastern region. However, most of these studies are based on data from a single country or region and do not fully consider the impact of local characteristics and policy environment.

The relationship between digital inclusive finance and green industry has also been widely studied in China. Xing, X., Ye, A.,& Lu, F. (2022) [19] Through the coefficient of variation- hierarchical analysis and spatial statistical methods, it was found that digital inclusive finance has a promoting effect on the overall and east-central green industry, but has an inhibiting effect on the west. Xue,S. (2018) [20] found that digital inclusive finance can help the green industry to access capital, improve efficiency and reduce risk by providing convenient and low-cost financial services. Wu, Y., & Zheng, T. (2021) [21] Using provincial-level data in China, found that digital inclusive finance can significantly increase the output value and employment of green industries. However, most of these studies focus on national-level analyses, and relatively few studies have been conducted on the situation and policies of specific provinces. For Fujian Province, although some studies have focused on the development of digital inclusive finance and green industries Wang, X., Zhang, Y., & Hu, D. (2021) [22], but most of them are qualitative analyses and lack empirical studies based on municipal data. In addition, most of these studies do not take into account the context and needs of Fujian Province in achieving the "dual-carbon" goal. In terms of policy, research on the impact of digital inclusive finance on green industries has not yet formed a complete theoretical framework. Some scholars, Chen, J.,& Fang, G. (2022) [23] have begun to pay attention to this issue and put forward some preliminary policy recommendations, such as increasing the penetration rate of digital inclusive finance and optimising the supply structure of financial services.

3. LITERATURE REVIEW

In summary, with the increasing global emphasis on sustainable development and environmental protection, green industry has received widespread attention as a key force in promoting the green transformation of the economy. Countless scholars and researchers have invested in this research direction, and due to the differences between provinces in China and the different measurement methods and selection of indicators, the results of the research have not formed a unified conclusion. For digital inclusive finance to help the development of the green industry a number of scholars from different perspectives to explore the reasons for

this. There are also scholars who have studied the transformation of the green industry as well as the scope of the green industry.In February 2019, in order to clarify the focus of the development of the green industry, the National Development and Reform Commission, together with the relevant departments, issued the "Guidance Catalogue for the Green Industry (2019 Edition)", which clearly defines the categories and connotations of the green industry, and exerts a positive and positive influence on the promotion of the green transformation of the economic and social development.2024 The new version of the Catalogue is specific in four aspects First, the name of the catalogue has been adjusted to fully implement the "dual-carbon" strategy. The name of the catalogue has been adjusted from "Green Industry Guidance Catalogue" to "Green and Low Carbon Transformation Industry Guidance Catalogue", incorporating industries related to low-carbon transformation, better connecting with green finance and transformation finance, and fully reflecting the "dual- carbon" work orientation. "orientated" work.

Meanwhile, digital inclusive finance, as an emerging financial model, provides strong support for the development of green industry with its unique advantages. In recent years, academics have conducted in-depth studies on the relationship between digital inclusive finance and green industry, and have achieved a series of important results. However, most of these studies are based on data from the whole country or big cities, and relatively few studies have been conducted on the policy needs and impacts of provinces with special geographic and economic characteristics, such as Fujian. The economic level of Fujian Province has maintained steady growth, but there is still a big gap compared with the economic development level of the regional provinces of the Yangtze River Delta, such as Shanghai and Hangzhou, and the Pearl River Delta, such as Guangzhou Province, as well as Hong Kong, Macao and Taiwan. The development of green industries will become an important direction to accelerate the transformation of the mode of economic development in Fujian Province, and to achieve scientific, leapfrog and green development. In addition, although there are some studies focusing on the development of green industry and digital inclusive finance in Fujian Province, comparing the changing trends of green industry development and its influencing factors in various regions of Fujian Province, and proposing corresponding development ideas. However, most of them do not study the relationship between them in depth, nor do they take into account the background and needs of Fujian Province in realising the goal of "dual-carbon". Therefore, this paper attempts to empirically analyse the municipal data of Fujian Province, to explore how digital inclusive finance can help the development of green industry, and to provide useful theoretical basis and practical suggestions for policy formulation and implementation in Fujian Province.

4. RESULTS AND DISCUSSION

4.1 Data Sources and Sample Selection

In February 2019, the National Development and Reform Commission (NDRC), together with relevant departments, clarified the categories and connotations of green industries, which provided a strong basis for localities to formulate and improve green industry support policies.2024 The new version of the Green Industry Guidance Catalogue further enhances the guiding and practicality. This paper is based on Zhu Bin, Hu Zhiqin et al. [23] 's research method to construct the green development index of Fujian Province. This green industry development evaluation index system follows the index system construction principle of green industry, through the sustainable development of economy, efficient recycling of resource utilisation, greening of industrial manufacturing, pollution control and emission reduction in accordance with the standards, and green industrial management from multiple perspectives, the index system can be divided into five modules with a total of 30 indicators (as shown in the appendix). According to the statistical data of Fujian Statistical Yearbook, Fujian Economic and Social Statistical Yearbook, China Urban Statistical Yearbook, China Statistical Yearbook, etc. from 2011 to 2021, the integration data will multiply the 30 level 3 indicators by the corresponding combination of weights to get the green industry index of 9 cities in Fujian Province in each year as shown in Table 1.

The core explanatory variables of this paper are derived from the total digital inclusive finance index in the Peking University Digital Inclusive Finance Index (2011-2021) compiled by the Peking University Digital Inclusive Finance Research Centre as the core explanatory variables.

Table 1. Green industry index of prefecture-level cities in fujian province, 2011-2021

Vintages	Fuzhou prefecture level city and capital of Fujian province in east China	Xiamen, Subpr ovincial city in Fujian	Putian prefecture level city in Fujian	Sanming prefecture level city in Fujian	Quan zhou prefecture level city in Fujian	Zhang zhou prefecture level city in Fujian	Nanping prefecture level city in Fujian	Longy an prefecture level city in Fujian	Ningde Prefecture Level city in Fujian
2011	0.345	0.379	0.361	0.407	0.373	0.418	0.423	0.396	0.418
2012	0.340	0.323	0.368	0.365	0.405	0.419	0.408	0.412	0.468
2013	0.329	0.366	0.361	0.363	0.411	0.381	0.393	0.448	0.451
2014	0.350	0.365	0.374	0.343	0.386	0.375	0.399	0.420	0.438
2015	0.326	0.323	0.374	0.343	0.370	0.360	0.409	0.385	0.450
2016	0.363	0.362	0.334	0.350	0.412	0.396	0.442	0.420	0.449
2017	0.330	0.339	0.355	0.346	0.400	0.393	0.386	0.423	0.401
2018	0.349	0.347	0.396	0.367	0.419	0.388	0.384	0.382	0.451
2019	0.321	0.320	0.364	0.363	0.363	0.377	0.423	0.416	0.430
2020	0.345	0.379	0.361	0.407	0.373	0.418	0.423	0.396	0.418
2021	*0.340*	*0.323*	*0.368*	*0.365*	*0.405*	*0.419*	*0.408*	*0.412*	*0.468*

Digital inclusive finance, as a combination of modern technology and financial services, has developed rapidly in recent years. This new financial model has not only changed the way traditional financial services are provided, but has also profoundly affected all aspects of economic and social development. By reducing transaction costs and improving the efficiency of financial services, digital inclusive finance has provided more convenient and efficient financial services for micro and small enterprises and individuals, effectively promoting economic growth. At the same time, the development of digital inclusive finance has also promoted the digital transformation of traditional industries, fostered the development of new industries, optimised the industrial structure and improved the overall competitiveness of the economy.

At the social level, the development of digital inclusive finance not only improves the living standards of residents, but also promotes social equity. Relying on big data technology and other means, digital inclusive finance has solved the challenges of geographical and time constraints, enabling the scope of financial services to cover a wider range of people, especially for groups that are difficult to cover with traditional financial services. This increased financial inclusion allows more people to enjoy the convenience and opportunities brought by financial services, thus promoting social equity and justice.

In addition, the development of digital HPF also provides the government with more accurate and efficient data support to improve social governance. Through technical means such as big data analysis and cloud computing, the government is able to obtain real-time information on the dynamics of the financial market and make better policy formulation and decision- making. This data-based decision-making approach not only improves the relevance and effectiveness of policies, but also helps the government's governance capacity and efficiency.

3.2 Explained Variables

This paper selects the development level of green industry as an explanatory variable, and there are several reasons why we choose the development level of green industry as an explanatory variable: as an emerging industry, the development of green industry is of great significance in promoting the optimisation and upgrading of economic structure and promoting sustainable development. In addition, the development level of green industry directly reflects the effectiveness of the region in environmental protection, energy saving, circular economy, etc., and is an important indicator of the quality of the regional economy and the ability of sustainable development. The green industry index can comprehensively assess the development status of green industry in multiple dimensions, thus revealing the development level of green industry and its influencing factors in a more comprehensive way.

3.3 Explanatory Variables

In this paper, the level of digital financial development is selected as an explanatory variable, and the digital financial inclusion index compiled by Peking University is used to measure it. The level of digital financial development is chosen as an explanatory variable because, on the one hand, digital finance, as an important part of financial technology, provides new channels and impetus for the financing and development of green industries. On the other hand, the development of digital finance helps to reduce the financing cost of green industry, improve the financing efficiency, and promote the rapid development of green industry. In addition, the digital financial inclusion index has high authority and representativeness, which can better reflect the development level of digital finance in various provinces and regions, and provides reliable data support for the research of this paper.

3.4 Control Variables

In this paper, several control variables are selected, and their control variables are the scale of economic development, the level of income, the level of fiscal expenditure, and human capital. The scale of economic development is measured by the GDP of each city in Fujian Province, which can reflect the overall scale and strength of the regional economy. Income level reflects the consumption ability and living standard of regional residents. The level of fiscal expenditure reflects the government's investment and support in promoting the development of green industries. Human capital, as an important resource, is measured by the number of employees, which can reflect the region's advantages and potential in terms of talent. By controlling these variables, the effect of the level of digital financial development on the level of green industry development can be revealed more accurately.

3.5 Descriptive Statistics

When visualised for key variables such as the Green Industry Index, the NU Inclusion Index, the size of the economy, the level of income, the level of fiscal spending, and human capital, histograms provide insight into the distribution of these variables in the dataset.

The histogram of the Green Industry Index (GII) may reveal regional differences in environmental awareness, reflecting the efforts and effectiveness of different regions in environmental sustainability and green development. The distribution of the BYU Inclusion Index, on the other hand, reveals the degree of financial services access and inclusiveness, which is crucial for understanding financial development and regional balance.

The histogram of the scale of economic development (LnGDP), on the other hand, reflects the differences in the economic strength of regions, providing clues to the geographic distribution of economic activities and the relative size of the economy. The distribution of income levels, on the other hand, provides a visual representation of the wealth gap between regions, which is important for assessing social equity and welfare policies.

Table 2. Variable names and descriptions

Variable type	Variable name	notation	Instructions
Explanatory variable	Green industry	GID	Measured using the method of Zhu, B., Hu,Z., & Yao, Q.(2014)
	Level of development		
Core explanatory variables	Digital Inclusive Finance	DFD	Measured using the Digital Financial Inclusion Index developed by Peking University
	level of development		
	Scale of economic development	LnGDP	Measured using the Gross Domestic Product (GDP) of each municipality in Fujian Province and taking logarithms
control variable	Income level	RIL	Measured using per capita disposable income of urban residents in cities in Fujian Province.
	Level of fiscal expenditure	lnFEL	Using a measure of fiscal expenditures of municipalities in Fujian Province and taking logarithmic
	human capital	HC	Measured using the number of employees in each city in Fujian Province

Table 3. Descriptive statistics for each variable

	GID	*DFD*	*LnGDP*	*RIL*	*lnFEL*	*HC*
maximum values	0.480	343.344	18.545	6.720	16.176	515
average value	0.394	206.545	17.133	3.480	15.018	87.410
norm	0.041	75.123	0.650	0.986	0.584	83.122
minimum value	0.320	58.470	16.006	1.931	13.769	17.680
reckoning	99	99	99	99	99	99

Table 4. Correlation analysis

	DID	DFD	LnGDP	RIL	lnFEL	HC
Green Industry Index (DID)	1	0.851950053	0.446771776	0.65045083	0.463278782	0.311554377

Table 5. Stepwise regression results

	Model 1	Model 2	Model 3	Model 4	Model 5
DFD	0.852***	0.884***	0.977***	0.980***	1.007***
	(16.025)	(13.656)	(10.207)	(10.387)	(10.112)
LnGDP		-0.057	0.030	0.221	0.162
		(-0.873)	(0.329)	(1.645)	(1.065)
RIL			-0.174	-0.093	-0.138
			(-1.310)	(-0.681)	(-0.938)
lnFEL				-0.281*	-0.256*
				(-1.932)	(-1.723)
HC					0.075
					(0.849)
F(1,97)=256.785 F(2,96)=128.45 F(3,95)=86.849 F(4,94)=67.943 F(5,93)=54.338					
F-value	p=0.000	p=0.000	p=0.000	p=0.000	p=0.000
R2	0.726	0.728	0.733	0.743	0.745
Adjustment R2	0.723	0.722	0.724	0.732	0.731
sample size	99	99	99	99	99

*Notes:*** , ** and * indicate 1%, 5% and 10% significance levels, respectively, with t-values in parentheses.*

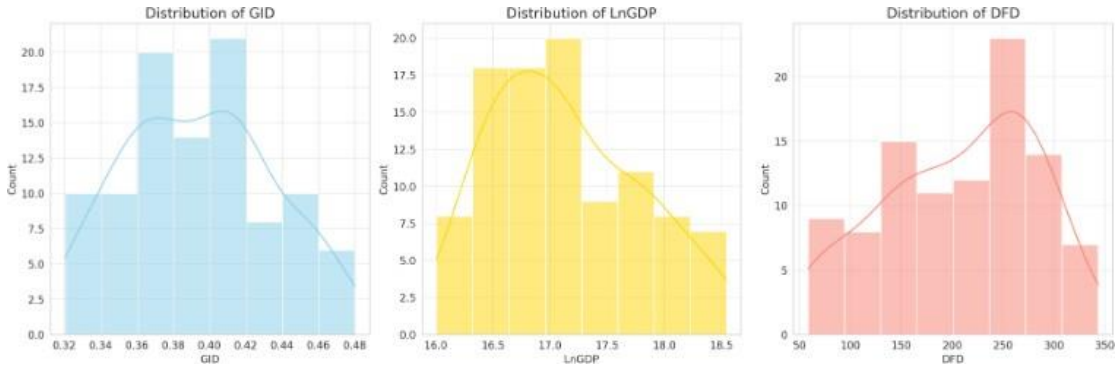

Fig. 1. Histogram of GID Figure Fig.2. Histogram of LnGDP Fig.3. Histogram of DFD

Histograms of the level of fiscal spending reveal patterns and differences in the distribution of government resources across regions, which is critical to understanding the fiscal strategies and service delivery capacity of local governments. The distribution of human capital, on the other hand, reflects the geographical distribution of education and skill levels, reflecting the talent pool and potential for future development between regions. This can be seen in the Fig. 1.

As seen in Fig. 1 GID Distribution: shows some degree of normal distribution, indicating that the indicator varies around a common centroid value in the dataset. The spread indicates the diversity of this economic indicator or index across cities or over time. LnGDP distribution as seen in Fig. 2: This distribution is slightly skewed to the right, indicating that although many cities have similar economic sizes, a few cities have significantly higher GDP values given the natural logarithm of GDP. The DFD distribution can be seen in Fig. 3: the distribution of DFD is skewed to the right, which suggests that while most entries have lower values, a large number of entries also have higher values. This skewness indicates the variability of any DFD measure across the dataset, with certain cities or years showing particularly high values.

which can be seen in Table 3, Year: the data span from 2011 to 2021, with 99 entries, i.e., entries for cities from 2011-2021; GID: the indicator varies between 0.320 and 0.480, with a mean value of about 0.394, suggesting that there is a certain degree of variability from city to city or from time to time; DFD: the range of values is wide, from 58.47 to 343.34, with a mean of 206.54, suggesting that the indicator varies significantly across anything measured in the dataset; LnGDP: the natural logarithm of GDP ranges from about 16.01 to 18.55, with a mean close to 17.13, highlighting differences in the size of the economy; RIL: the ratio or index has a wide range, from 1.9314 to 6.7197, with a mean of 3.4801, indicating the variability of this financial or investment-related indicator; lnFEL: the natural logarithm of the level of the foreign economy ranges from 13.77 to 16.18, with a mean of 15.02, indicating varying degrees of participation in the foreign economy; and HC: the range of the human capital or healthcare- related indicator ranges from 17.68 to 515, with a mean of 87.41, suggesting significant differences.

The maximum value of GID is 0.48, the minimum value is 0.32, the mean value is 0.39, and the standard deviation is 0.04. This indicates that there is a relatively small difference in the level of green industry development between different prefectures in Fujian Province. However, the standard deviation value is not large, which indicates that most of the data are close to the mean and relatively stable. The maximum value of DFD is 343.34, the minimum value is 58.47, the mean value is 206.54, and the standard deviation is 75.12, which shows that the level of digital finance development in different prefectures and cities in Fujian Province is unbalanced and volatile.The maximum value of LnGDP is 18.55, the minimum value is 16.01.The mean value is The maximum value of RIL is 6.72, the minimum value is 1.93, the mean value is 3.48, and the standard deviation is 0.9859, which indicates that the income levels of different prefectures in Fujian Province are uneven and different. lnFEL has a maximum value of 16.18, a minimum value of 13.77, and a mean value of 0.9859, which indicates that the development level of digital finance in different prefectures in Fujian Province is unbalanced and volatile. The

maximum value of lnFEL is 16.18, the minimum value is 13.77, and the mean value is 15.02, which indicates that the level of financial expenditures between different prefectures in Fujian Province does not differ much. lnHC has the maximum value of 515.00, the minimum value of 17.68, the mean value of 87.41, and the standard deviation of 83.12, which indicates that there is a large gap in the human capital of the different prefectures in Fujian Province, which is very unbalanced.

3.6 Correlation Analysis

Pearson's correlation coefficient is a measure of the correlation of continuous variables, parametric testing of hypotheses on data with high test efficacy, which is calculated by the following formula:

$$\sigma_{x,y} = \frac{cov\,(X,Y)}{\sigma_x \cdot \sigma_y} = \frac{E\,[(X - \mu_x)(Y - \mu_{yy})]}{\sigma_x \cdot \sigma_y}$$

Where and are the mean of variables X,Y, respectively, and the standard deviation of variables X,Y, respectively. Its value range [-1,1], the larger the absolute value the stronger the correlation.

The correlation analysis of each variable is shown in Table 4. The green industry index has a positive correlation with several variables, i.e. the relationship between the level of green industry development and the level of digital HP financial development, the scale of economic development, the level of income, the level of fiscal expenditure and human capital in each prefecture-level city in Fujian Province from 2011 to 2021 is a mutually reinforcing relationship.

The value of correlation coefficient between green industry index and digital financial inclusion index is 0.852, thus indicating that there is a significant positive relationship between green industry index and digital financial inclusion index. The value of correlation coefficient between green industry index and economic development scale (LnGDP) is 0.447, thus indicating that there is a significant positive relationship between green industry index and economic development scale (LnGDP). The correlation coefficient value between green industry index and income level is 0.650, which indicates that there is a significant positive relationship between green industry index and income level. The correlation coefficient between the green industry index and the level of financial expenditure is 0.463, which indicates that there is a significant positive relationship between the green industry index and the level of financial expenditure. The correlation coefficient between the green industry index and human capital is 0.312, thus indicating a significant positive relationship between the green industry index and human capital.

3.7 Model Construction

The level of green industry development (GID) as an explanatory variable, the level of digital financial inclusion development (DFD) as a core explanatory variable, human capital (HC), the level of fiscal expenditure (lnFEL), the scale of economic development (LnGDP), and the level of income (RIL) as a control variable, and the multiple linear regression model was adopted as the measurement of the study because all variables are continuous variables Model. The expression of the multiple linear regression model is as follows:

$$GID = \beta_0 + \beta_1 DFD + \beta_2 HC + \beta_3 InFEL + \beta_4 LnGDP + \beta_5 RIL + \varepsilon$$

In the above model, theβ_0 is a constant term, and β_1, β_2, β_3, β_4, and β_5 are the regression coefficients of each indicator variable, respectively, and ε is the random error of the regression model. In this paper, SPSS software is used to regression analysis of the model.

3.8 Gradual Return

Table 5 shows the results of the stepwise regressions, which are the results of regressions after adding the DFD, LnGDP, RIL, lnFEL, and HC variables in turn. The coefficients of DFD are positively correlated and significant (significant level of 1%) in all five models, indicating that DFD has a significant positive effect on GID regardless of controlling for other variables.The standardised coefficients of DFD do not vary much across models, from 0.852 to 1.007, which suggests that the effect of DFD on GID is still statistically robust after controlling for other variables.R^2 increases from model 1 of 0.726 to 0.745 in Model 5, indicating that the model fit improves with the addition of other control variables. For the accuracy of the experimental results, the regression of model 5 is analysed in detail below.

Table 6. Regression results

	Standardised coefficient				Covariance Diagnostics	
	B	standard error	t	p	VIF	tolerance level
A constant (math.)	-0.000	0.052	-0.000	1.000	-	-
DFD	1.007	0.100	10.112	0.000***	3.614	0.277
LnGDP	0.162	0.152	1.065	0.290	8.396	0.119
RIL	-0.138	0.147	-0.938	0.351	7.881	0.127
lnFEL	-0.256	0.148	-1.723	0.088*	8.031	0.125
HC	0.075	0.088	0.849	0.398	2.835	0.353
R2	0.745					
Adjustment R2	0.731					
F	F (5,93)=54.338, p=0.000					
D-W value	2.037					

Dependent variable: GID

Table 7. Results of KS test analysis

Name (of a thing)	Sample size	Average value	(Statistics) standard deviation	Skewness	Kurtosis	Statistic D-value	p
Residual	99	0.000	0.507	0.056	-1.174	0.089	0.053

3.9 Regression results Analysis

Because of the different magnitudes and orders of magnitude of each variable, the sample data were standardised before regression to reduce the instability of numerical calculations and improve the stability of model estimation, and the results of regression analysis were obtained as shown in Table 6.

The section uses the level of green industry development (GID) as the explanatory variable, the level of digital financial inclusion development (DFD) as the core explanatory variable, human capital (HC), the level of fiscal expenditure (lnFEL), the scale of economic development (LnGDP), and the level of income (RIL) as the control variables. The decidable coefficient of the model, R^2, is 0.745, indicating that the model accounts for 74.5 per cent of the variance in the explained variables. The adjusted R^2 was 0.731. The significance level of the F-test was 0.000 indicating that the model as a whole was statistically significant in predicting GID.

From the table, it can be seen that digital financial inclusion (DFD) is positively correlated with the level of green industry development (GID) at a significant level of 1%, with a standardised regression coefficient of 1.007, indicating that the level of green industry development can be increased by 1.007 units for every unit increase in digital financial inclusion on average. The level of financial expenditure (lnFEL) is negatively correlated with the level of green industrydevelopment (GID) at the 10% significant level. In this case, the standardised regression coefficient is 0.256, indicating that for every 1 unit increase in the level of fiscal expenditure on average, the level of green industry development will decrease by 0.256 units. The reason for this could be that digital financial inclusion facilitates access to capital for green industries by providing a wider range of financial services, including loans, savings and insurance. This helps businesses and individuals to invest in renewable energy, clean technology and environmentally friendly projects, enhancing the level of green industry development.

Covariance diagnosis of the variables revealed that the variance inflation factor (VIF) of all independent variables was less than 10 and the tolerance (1/VIF) was greater than 0.1, indicating that there is no serious covariance problem in the model. The model Durbin- Watson (D-W) value of 2.037 is close to 2, indicating that there is no significant autocorrelation between the residuals of the model.

3.10 Residual Test

In order to ensure that the statistical inference of the resulting model is valid and that the model interprets the data reasonably, the model is subjected to a residual test. In this paper, the KS test was used,and the results are shown in Table 7:

The D-value of the residuals is 0.089, which corresponds to a p-value of 0.053. Specifically, the skewness (Skewness) value of the residuals is 0.056, indicating that the distribution of the data is slightly skewed, while the kurtosis (Kurtosis) value is -1.174, indicating that the data distribution is flatter than the normal distribution. The data, although not absolutely normal, is basically acceptable as a normal distribution, further indicating that the regression model developed in this paper is valid.

4. CONCLUSION

Today, digital inclusive finance has begun to rise steadily as a new industry, and the digital economy is on fire, which is an important driving force for the development of science and technology and the discovery of new directions in the coming period. The orderly promotion of the development of digital inclusive finance can better meet the diversified financial needs of the people and the real economy. Moreover, with the improvement of people's living standards, the awareness of environmental protection is gradually increasing, thus the proportion of consumption for environmental protection is also gradually increasing. Therefore, this paper takes the green industry index of nine prefecture-level cities in Fujian Province from 2011 to 2021 as the research object, and deeply explores the impact of digital inclusive finance on the development of green industry. Starting from the intrinsic connection between digital inclusive finance and green industry, this paper adopts methods such as correlation analysis and multiple linear regression to analyse the actual situation in Fujian Province. It is found that the increase in the level of digital inclusive finance development can significantly promote the development of green industry. In addition, the level of financial expenditure also significantly affects the level of green industry development.

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At the end of the article, I put down my pen and suddenly realised that the years are short. Completion of this thesis also means that my student years have come to an end, and even though I know that life has to move forward, I can't help but feel a little bit sad about the loss of the name "classmate".

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DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Indicator system			Weighting factor		
First class	**Category B**	**Three-tier**	**Hierar chical weighting**	**Portfolio weighting**	**Combined weights**
Green ind ustry index	Greenbenefits	Energy consumption per unit of GDP in industry (tonnes of standard coal per million yuan)	0.0534	0.0122	0.2289
		water consumption per unit of GDP in industry (cubic metresper million yuan)	0.0565	0.0129	
		Electricity consumption per unit of GDP in industry(kwh/million yuan)	0.0984	0.0225	
		industry GDP per unit of land area (million yuan/square kilometre)	0.5134	0.1175	
		growth rate of tertiary value added (per cent)	0.1245	0.0285	
		growth rate of output value of high-tech industries (per cent)	0.1273	0.0291	
		Growth rate of value added of agriculture, forestry,livestock and fisheries output(%)	0.0266	0.0061	
	Greenutilisation	Comprehensive industrial solid waste utilisation rate (%)	0.2058	0.0175	0.0851
		Industrial hazardous waste disposal utilisation rate (%)	0.1007	0.0086	
		centralised treatment rate of urban sewage treatment plants	0.1997	0.0170	
		LPG consumption per capita (kg/person)	0.3643	0.0310	
		gas penetration rate (per cent)	0.1295	0.0110	
	Green Manufacturin	Greenness of industry (per cent)	0.1309	0.0336	0.2565
		degree of green innovation in industry (per cent)	.1841	0.0472	
		reduction rate of energy consumption of 10,000 yuan of added value in industries above designated size (per cent)	0.0650	0.0167	
		Electricity consumption per unit of industrial added value (kwh/million yuan)	0.1591	0.0408	
		share of cleaner production audits implemented in industries above designated size (%)	0.3405	0.0873	
		share of polluting enterprises in industry above designated size (%)	0.1204	0.0309	

Indicator system			Weighting factor		
First class	**Category B**	**Three-tier**	**Hierar chical weighting**	**Portfolio weighting**	**Combined weights**
	greencontrol	Industrial wastewater effluent intensity(tonnes/million)	0.0457	0.0075	0.1632
		Industrial sulphur dioxide emission intensity (kg/millionyuan)	0.0569	0.0093	
		Investment in industrial pollution control as a share ofgdp (%)	0.3279	0.0535	
		ammonia nitrogen emissions per unit of gdp (kg/million yuan)	0.0868	0.0142	
		cod emissions per unit of GDP (kg/million yuan)	0.1525	0.0249	
		fertiliser application per unit of arable area (kg/ha)	0.0918	0.0150	
		pesticide application per unit of arable land area (kg/ha)	0.2385	0.0389	
	greenmanagement	Financial environmental support (%)	0.1772	0.0472	0.2662
		financial support for science and technology (per cent)	0.0839	0.0223	
		R&D expenditure as a percentage of gdp (%)	0.1347	0.0359	
		Industry green patent potential (pieces per 10,000people)	0.2922	0.0778	
		Industry green talent	0.3120	0.0831	
		Potential (Persons Per 10,000)			

Note: The above is from zhu bin, hu et al. (2014) green industrymeasurement methodolo'gy

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