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Research on the Impact of Financial Agglomeration on Green Investment

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Abstract: With growing global attention on sustainable environmental development, green investment has become an important tool to drive the green transformation of the economy. Financial agglomeration areas, as capital-intensive regions, provide strong support for green technological innovation and eco-environmental projects. Additionally, the policy inclinations and investment preferences of financial agglomeration areas directly influence the flow and efficiency of green funds, further shaping the path of economic green transformation. Based on this, this paper selects panel data from 31 provinces in China (except Hong Kong, Macau, and Taiwan) over 15 years from 2007 to 2021. Using the fixed effects model, the study examines the impact of financial agglomeration on the scale of green investment and conducts a heterogeneous analysis of the effects in different regions of China, as well as proposing related policy suggestions. The results show that an increase in the level of financial agglomeration can significantly enhance the scale of green investment in a region, especially in the central regions. Compared to the eastern and western regions, the promotion effect of financial agglomeration is more pronounced in the central region.

Keywords: Financial Agglomeration, Green Investment, High-Quality Development

1. Introduction

Currently, the challenges of global climate change and environmental degradation are intensifying, making green investment a key driver for achieving sustainable development and high-quality economic growth. In this process, the support of adequate financial funds is a crucial factor. Financial agglomeration refers to the high concentration of financial assets, institutions, and services in a geographic area, playing an important role in the green transformation of regional economies. The study of whether financial agglomeration can effectively enhance the scale of green investment is of great practical significance. This paper empirically analyzes the impact mechanism of financial agglomeration on the scale of green investment using a fixed effects model and explores the heterogeneous effects between different regions, aiming to provide a scientific basis for policy formulation and to promote the green transformation and high-quality development of the economy.

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2. Literature Review

2.1. Research on Financial Agglomeration and High-Quality Development of the Green Economy

Peng Junjie investigated the impact of financial agglomeration and technological innovation on the green development of industry in China and regional differences. The study found that financial agglomeration hinders the green development of industry by inversely adjusting the efficiency of technological outcome transformation, and the positive incentive effect of scientific and technological innovation on industrial green development, industrial technological efficiency, and industrial technological progress is not significant; in different regions, the impact of financial agglomeration and technological innovation on industrial green development shows obvious spatial heterogeneity[1].Ma Luyao analyzed the impact and transmission mechanism of financial agglomeration on high-quality economic development. The study found that financial agglomeration not only has a direct promoting effect on economic high-quality development but also enhances the level of economic high-quality development in the central region, followed by the eastern region, with the weakest effect in the western region[2]. Han Yue, Li Guoqing, Hou Jiaxuan, and Fang Junzhi analyzed the level of financial agglomeration and its mechanism and impact on the development of the real economy in 31 provinces and cities across the country. The study found that financial agglomeration has a significant positive effect on regional economic development[3]. Zhang Xiling, Zhu Zibin, and Li Yue established a PVAR model to analyze the long-term dynamic relationships among financial agglomeration, human capital, and green total factor productivity. The results show that both financial agglomeration and human capital have positive impacts on green total factor productivity[4]. Li Xue investigated the impact mechanism of financial agglomeration on the green economic efficiency of the circulation industry. The study indicates that financial agglomeration has a marginally increasing promotional effect on the green economic efficiency of the circulation industry[5]. Yao Lu and Wang Shuhua constructed panel econometric models and spatial Durbin models to test the impact of financial agglomeration on the efficiency of the green economy in the Yellow River Basin and its spatial spillover effects. The study shows that the overall spatial spillover effect of financial agglomeration on the efficiency of the green economy in the Yellow River Basin presents an "inverted U-shape" characteristic, with heterogeneity in the spatial spillover effects among cities in the upper, middle, and lower reaches[6]. Wang Ren, Duan Yicheng, and Liu Liuqiao selected ten representative city clusters in China and diagnosed the spatial-temporal evolution trajectory and spatial correlation heterogeneity of financial element agglomeration and green technological innovation within them. The study found that financial element agglomeration helps to drive the improvement of the regional green technology innovation level and not only produces a significant local promotion effect on regional green technology innovation but also forms a significant spatial spillover effect[7]. Zhang Jie and Guo Qianru constructed a panel threshold model to analyze the relationship between financial agglomeration and green technological innovation under the constraints of environmental regulation and industrial structure adjustment. The study shows that both financial agglomeration and green technological innovation exhibit a distribution characteristic of being the highest in the eastern region and weaker in the central and western regions[8].

2.2. Research on the Impact of Financial Agglomeration on Investment Efficiency

Yang Yang, Huang Jieyu, and Feng Jue studied the impact of financial agglomeration on the investment efficiency of micro-enterprises. The study shows that financial agglomeration improves the investment efficiency of enterprises, and the positive effect of financial agglomeration on enterprise investment efficiency is more significant in non-state-owned enterprises, high-growth

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enterprises, and small-scale enterprises[9]. Yin Wenting used the Richardson investment expenditure model to empirically analyze the impact of financial agglomeration on corporate investment efficiency and introduced a mediating effect model to discuss whether financing constraints act as a mediating variable. The study finds that an increase in the level of financial agglomeration can significantly reduce the inefficient investment behavior of enterprises, especially effectively improve the problem of insufficient corporate investment, thereby enhancing investment efficiency[10]. Feng Ziyi empirically studied the impact of urban financial agglomeration on the investment efficiency of non-financial enterprises. The study finds that financial agglomeration can improve the investment efficiency of non-financial enterprises by reducing the level of corporate financing constraints, and the increase in the degree of corporate financialization can strengthen the effect of financial agglomeration on improving the investment efficiency of non-financial enterprises[11].Zhang Hao's main research focused on the impact of financial agglomeration on the investment efficiency of Chinese enterprises and its realization mechanism. The study shows that financial agglomeration increases corporate investment efficiency. For companies with insufficient investment, financial agglomeration can reduce the insufficiency, and for companies with overinvestment, financial agglomeration can suppress overinvestment, but both have regional and corporate property heterogeneities[12].

In summary, the current academic research on financial agglomeration mainly focuses on economic high-quality development and regional and industry economy separately, and few scholars have analyzed and studied financial agglomeration in conjunction with regional and industry economy and high-quality development. This paper takes the scale of green investment in green finance as the starting point for studying the high-quality development of the regional economy, analyzes the impact mechanism of financial agglomeration on green investment, thus providing a new research path and perspective for other scholars studying sustainable economic development or high-quality development.

3. Measurement of Financial Agglomeration Level

In the methods used to measure financial agglomeration, academia primarily employs either single-indicator or multi-indicator approaches. However, the multi-indicator method has not shown significant advantages in terms of precision and tends to introduce errors more easily during processing. In contrast, the location quotient method within the single-indicator approach is more widely recognized due to its relative accuracy and ease of operation. Thus, this paper adopts the regional entropy method to calculate the level of financial agglomeration, with the formula being:

$$FI_{it}=\frac{F_{it}/G_{it}}{F_t/G_t}$$

In this context, FI_{it} represents the value added by the financial sector of province i in year t, G_{it} represents the gross regional product of province i in year t, FI_t represents the national value added by the financial sector in year t, and G_{it}represents the national gross domestic product in year t.

4. Empirical Procedure and Results Analysis

4.1. Model Setup and Variable Selection

To study the impact of financial agglomeration on the scale of green investment, this paper employs a fixed effects model that controls for both firm-specific characteristics and time-specific factors. The following model is constructed:

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$$GI_{i,t} = \alpha_0 + \alpha_1 FI_{i,t} + \alpha_2 \sum X_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

In the model, i represents the province, t represents the year, α is the coefficient of the explanatory variable, $GI_{i,t}$ stands for the scale of green investment in province i in year t; $FI_{i,t}$ refers to the level of financial agglomeration in province i in year t; $\sum X_{i,t}$ represents control variables, and $\varepsilon_{i,t}$ is the random error term. To avoid the interference of time and individual effects on the regression results, regional fixed effects γ_i and time fixed effects δ_t are introduced to achieve a two-way fixed effect. Specific variable selection is shown in Table 1:

Table 1: Variable Selection Index

Variable	Primary Indicator	Secondary Indicator
Explanatory Variable	Financial Agglomeration (FI)	Regional Entropy
Explained Variable	Green Investment(GI_1)、(GI_2)	Green Investment Scale (proportion of each province's fiscal expenditure on energy-saving and environmental protection industries to GDP, proportion of government investment in pollution control to GDP)
Control Variable	Economic Development Level (PGDP)	Per Capita GDP
	Technology Level (TL)	Research and Development Investment
	Industrial Structure (IS)	Proportion of Secondary Industry Output Value to GDP
	Financial Market Maturity (MEM)	Proportion of Stock Market Capitalization to GDP

4.2. Data Sources and Descriptive Statistics

4.2.1. Data Sources

Considering the availability of data, this paper selects panel data spanning 15 years from 2007 to 2021 for 31 provinces in China, excluding Hong Kong, Macau, and Taiwan, to empirically study the impact of financial agglomeration on green investment. The related data is sourced from the "China Statistical Yearbook," the "National Bureau of Statistics," the "China Science and Technology Statistical Yearbook," and the statistical yearbooks of various provinces.

4.2.2. Descriptive Statistics

The descriptive statistical results of the main variables are shown in Table 2. According to the statistics in the table, the maximum value of financial agglomeration (FI) is 3.272, the minimum is 0.348, the mean is 3.07, and the standard deviation is 0.984. These figures are basically consistent with the results of existing domestic literature and indicate significant regional differences in the degree of financial agglomeration. The maximum and minimum values for the scale of green investment—fiscal expenditure on energy conservation and environmental protection industries as a percentage of GDP (GI_1)—are 1.103% and 0%, respectively, with a standard deviation of 0.13. The maximum and minimum values for government investment in pollution control as a percentage of GDP (GI_2) are 73% and 0.005%, respectively, with a standard deviation of 12.278. These results highlight the considerable individual differences in the scale of green investment across different

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regions. For control variables, the paper selects the level of economic development (PGDP), technology level (TL), industrial structure (IS), and the maturity of the financial market (MFM) as controls, which are specifically presented in Table 2:

Table 2: Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
FI	465	0.984	0.462	0.348	3.272
GI_1	465	0.128	0.13	0	1.103
GI_2	465	12.708	12.278	0.005	73.289
PGDP	465	10.61	0.573	9.331	11.963
TL	465	14.378	1.603	9.589	17.219
MEM	465	0.64	1.005	0.109	6.411
IS	465	0.418	0.083	0.173	0.587

4.3. Empirical Analysis

4.3.1. Baseline Regression Analysis

As can be seen from Table 3, the regression coefficients for financial agglomeration on the scale of green investment (GI_1) and (GI_2) are 0.0482 and 4.075, respectively, and both are significantly positive at the 5% level. This indicates that financial agglomeration can significantly increase the scale of green investment in a region.

Table 3: Empirical Results of the Regression of Financial Agglomeration on the Scale of Green Investment

	(1) GI_1	(2) GI_2
FI	0.0482**	4.0750**
	(2.37)	(2.16)
MEM	0.0077	0.8369
	(0.85)	(0.99)
PGDP	-0.0317	-3.0436
	(-1.32)	(-1.36)
TL	-0.0259***	-2.3894***
	(-5.03)	(-4.98)
IS	0.7150***	68.1112***
	(7.04)	(7.21)
γ	control	control
δ	control	control
_cons	0.5026***	48.3693***
	(2.68)	(2.77)
N	465	465
adj. R^2	0.291	0.307

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (t-values in parentheses) (same below).

4.3.2. Robustness Check

To conduct the robustness check, this study adopts the following methods:

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(1) Lagging one period. The explanatory variable is processed by lagging one period to generate the variable (L.FI), and the processed data is then subjected to regression analysis.

(2) Shortening the sample interval. The sample period is reduced to the years 2008-2011 for regression analysis again, to test if the regression outcomes are consistent with the primary regression results.

Table 4: Robustness Test Results

	(1) Lag one phase processing		(2) Shorten the sample interval	
L.FI	0.0498**	4.0342**		
	(2.45)	(2.15)		
FI			0.0447**	3.6670*
			(2.17)	(1.92)
MEM	0.0037	0.5042	0.0054	0.6349
	(0.40)	(0.58)	(0.59)	(0.74)
PGDP	-0.0274	-2.5162	-0.0236	-2.2386
	(-1.12)	(-1.11)	(-0.96)	(-0.98)
TL	-0.0259***	-2.3919***	-0.0260***	-2.4008***
	(-4.97)	(-4.96)	(-4.98)	(-4.97)
IS	0.6446***	61.2287***	0.6464***	61.4138***
	(6.20)	(6.36)	(6.18)	(6.34)
γ	control	control	control	control
δ	control	control	control	control
_cons	0.4841**	45.6215**	0.4510**	43.1331**
	(2.48)	(2.52)	(2.32)	(2.40)
N	434	434	434	434
adj. R^2	0.274	0.289	0.271	0.287

4.3.3. Heterogeneity Analysis

As can be seen from the results in Table 5, the impact of financial agglomeration is most significant in the central and western regions. This may be due to the fact that the scale of green investment in the eastern region has already been large and relatively well-developed, leaving little room for improvement. In contrast, the western region has insufficient relative facilities and resources, which means that the short-term effects of financial agglomeration cannot be effectively utilized. Meanwhile, the central region benefits from the demonstration cases and advanced experience of the eastern region, coupled with its nascent systematic resource allocation. This allows the central region to reap greater marginal benefits from financial agglomeration. Therefore, compared to the eastern and western regions, the promotional effect of financial agglomeration is more pronounced in the central region.

Table 5: Results of Heterogeneity Analysis

	GI_1			GI_2		
	East	Central	West	East	Central	West
FI	-0.0096	0.1428***	0.0650	-0.9584	14.6950***	4.4595
	(-0.55)	(2.73)	(1.04)	(-0.55)	(2.82)	(0.83)
MEM	-0.0076	0.3875***	-0.1132***	-0.7603	37.1137***	-10.2619***
	(-1.06)	(5.81)	(-2.62)	(-1.06)	(5.60)	(-2.77)

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Table 5: (continued).

PGDP	-0.0669***	0.2639***	-0.2158***	-6.6898***	26.4525***	-20.9826***
	(-3.02)	(5.57)	(-2.66)	(-3.02)	(5.61)	(-3.01)
TL	0.0206***	-0.0852***	-0.0497***	2.0580***	-8.5362***	-4.5330***
	(2.82)	(-6.61)	(-4.49)	(2.82)	(-6.66)	(-4.76)
IS	-0.0310	0.4037***	2.0090***	-3.1038	39.5996***	190.3965***
	(-0.24)	(3.01)	(6.02)	(-0.24)	(2.97)	(6.64)
γ	control	control	control	control	control	control
δ	control	control	control	control	control	control
_cons	0.6023***	-1.6340***	2.0647***	60.2341***	-1.6e+02***	200.7955***
	(3.34)	(-3.67)	(3.11)	(3.34)	(-3.68)	(3.52)
N	165	135	135	165	135	135
adj. R^2	0.464	0.622	0.379	0.464	0.619	0.425

5. Conclusions and Recommendations

5.1. Conclusions

This paper investigates the impact mechanism of financial agglomeration on the scale of green investment through a fixed effects model and conducts related heterogeneity analysis. The empirical results lead to the following conclusions:

Firstly, the improvement of the level of financial agglomeration can significantly increase the scale of green investment in the region.

Secondly, compared to the eastern and western regions, the central region exhibits a more pronounced effect of financial agglomeration. This may be due to the relatively saturated scale of green investments in some developed cities in the eastern region, where financial agglomeration plays a limited role, while the economic development in the western region is relatively lacking, making it difficult for financial agglomeration to promote green investment in a short time. The central region, combining the developmental advantages of the east and west, gains more marginal benefits from green investment, thus showing a more significant effect.

5.2. Recommendations

Firstly, strengthen the balanced regional development of financial services. Governments should encourage the balanced distribution of financial resources nationwide, especially by increasing financial input in the central region to capitalize on its marginal benefits in green investment. For the eastern region, innovation and technological upgrades in green investment should be promoted, while in the western region, the focus should be on improving infrastructure and financial services to create an environment conducive to green investment.

Secondly, promote financial cooperation and innovative exchange between regions. It is suggested to enhance financial cooperation between different regions, sharing successful experiences and innovative technologies in green investment. Financial and green investment forums and seminars should be organized to focus on the latest technologies in green investment, policy changes, and market dynamics to facilitate the exchange of knowledge and resources, helping regions optimize their green investment strategies according to their own conditions.

Thirdly, establish monitoring and evaluation mechanisms. To ensure that policies are effectively implemented and achieve the intended results, a comprehensive monitoring and evaluation system should be established. Regular checks on the progress of financial agglomeration and green

investment should be conducted, and policies should be timely adjusted to optimize economic and environmental outcomes.

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