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The Impact of Financial Agglomeration on Carbon Emission

Yanan Wu*, Chunlin He

School of Economics, Guangzhou College of Commerce, Guangzhou, Guangdong, 511363, China
**Corresponding author*

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Abstract: Financial agglomeration not only produces economic effects, but also has environmental effects that cannot be ignored. Therefore, this paper adopts the panel data of 30 provinces in China from 2007 to 2018, and use benchmark regression analysis, quantile regression, regional heterogeneity test and robustness test to discuss the impact of financial agglomeration on carbon emissions. It is found that the linear relationship between financial agglomeration and carbon emissions presents an inverted "U" state. Quantile regression shows that with the change of quantile, the inverted "U" shape of financial agglomeration and carbon emission changes. Regional heterogeneity shows that financial agglomeration in the eastern region has an inverted "U" shaped relationship on carbon emission intensity, while financial agglomeration in the central and western regions have no significant effect on carbon emission intensity.

1. Introduction

With the development of economy, the financial industry develops rapidly, and there are more and more branches of banking financial institutions around the country, but they gradually become stable in recent years. According to the data, by the end of 2018, compared with 2008, the number of banking financial institutions in China increased by 24.5% on average. Employment rose by an average of 48.5 percent. In general, the whole financial industry shows a trend of sustainable development. As the foundation of the development of the real economy, the financial sector plays a vital role in the national economy. The 13th Five-Year Plan clearly points out that economic construction and ecological civilization construction should be promoted as a whole. As a "high value-added" service industry, the financial industry has to face environmental problems caused by massive energy consumption while promoting rapid economic development. Today, China follows the five development concepts of "innovation, coordination, green development, opening up and sharing". Relevant policies have shown that China will strive to achieve carbon peaking and carbon neutrality from six aspects. The National Development and Reform Commission said in the deployment of 2021 development and reform work tasks, continue to deepen the construction of national ecological civilization pilot zone, deployment and implementation of carbon peak, carbon neutral related work, improve the dual control degree of energy consumption, continue to promote the whole chain of plastic pollution control. In this context, energy conservation and emission

reduction has become a strategic need for sustainable development under the "new normal" of the economy. What is the impact of financial agglomeration on carbon emissions? It is worth exploring.

From the existing literature, scholars on the research of the relationship between financial agglomeration and carbon emissions, less about the conclusion of the two disputes. Study the effect of financial agglomeration of carbon emissions can promote the development of financial industry, and low carbon environmental protection. The research on this problem has certain policy connotation and practical significance.

Therefore, we use the panel data of 30 provinces in China to study the impact of financial agglomeration on carbon emissions from 2007 to 2018. We use regression model, quantile regression model, regional heterogeneity analysis, robustness, and endogeneity test to study the nonlinear relationship between financial agglomeration and carbon dioxide emissions.

From the perspective of financial agglomeration, this paper tries to analyze whether financial agglomeration can further exert agglomeration effect and realize carbon emission reduction and sustainable economic development on the basis of its own green production.

The innovation of this paper is as follows: First, this paper studies the impact of financial agglomeration on carbon emissions, which can enrich related research. Second, at present, researchers basically analyze the impact of financial agglomeration on the improvement of industrial structure from a qualitative perspective, and demonstrate the impact on carbon emissions. At present, there are few quantitative studies directly studying financial agglomeration and environmental quality. Third, in addition to the financial agglomeration degree as the core variable, this paper also cites the square of financial agglomeration degree as one of the core variables, in order to determine the nonlinear impact of financial agglomeration on carbon emissions and make the conclusion more convincing.

2. Review of Research at Home and Abroad

2.1. Summary of Research on Financial Agglomeration at Home and Abroad

Scholars mainly study financial agglomeration from the perspectives of industrial agglomeration, regional economy, industrial economy and information economy. Krugman (1991) [1] believes that in today's world, the most prominent localization phenomenon is not manufacturing, but actually based on service industry. It is finance, not manufacturing, that is most likely to cluster. With the development of service economy, financial industry plays an increasingly important role in national economy. Governments of various countries pay more and more attention to the development of financial industry, and the research on the development and agglomeration of financial industry has gradually been brought into the field of view of scholars. In China, there are few studies on financial agglomeration, most of which are based on the ideas put forward by foreign experts and lack originality. Among them, Wei Shouhua and Shi Bihua [2] elaborated agglomeration competitive advantages from the perspective of management and summarized four elements: regional marketing advantages, product differentiation advantages, market competitive advantages and production cost advantages.

2.2. Review of Carbon Emission Research at Home and Abroad

The phenomenon of global warming is related to greenhouse gases produced by human activities. As verified, carbon dioxide accounts for the largest proportion of global greenhouse gas emissions. With the emphasis on reducing carbon emissions at home and abroad, there are more and more economic studies on carbon emissions and carbon emission reduction, which is a research hotspot in the field of environment and economics. At home and abroad mainly from: carbon emissions and

financial development between the relationship; Emission reduction effect; Embodied carbon and embodied carbon emissions; LMDI model; Carbon emissions peak; Carbon emission trading; The relationship between carbon emission and industrial structure; Carbon emission efficiency and other aspects of carbon emission research. At present, domestic and foreign scholars believe that technological innovation and technological progress are an important part and fundamental way of emission reduction theory, but the low carbon technology standard is vague, which causes many obstacles in the international technology transfer and diffusion. Second, there is a serious lack of incentives for individuals to own large innovative contributions to low-carbon technologies. At the same time, the current microeconomic research based on the behavior of enterprises and residents has not been deeply explored.

2.3. A Review of the Impact of Financial Agglomeration on Carbon Emissions

Scholars at home and abroad have studied the relationship between financial agglomeration and carbon emissions, mainly from the aspects of industrial agglomeration, industrial agglomeration, manufacturing agglomeration, industrial structure, economic development and so on. First of all, industrial agglomeration and manufacturing agglomeration have caused a certain degree of pollution in this region and surrounding areas [3,4]. By developing high-tech industries, optimizing industrial structure and promoting industrial upgrading, manufacturing agglomeration can become an effective economic growth model, reduce carbon emission intensity and environmental pollution [5]. In addition, financial agglomeration plays a positive role in promoting low-carbon development at the present stage [6]. Economic development, population density, technological progress, industrial structure, foreign direct investment and environmental regulation intensity all have different degrees of influence on per capita carbon dioxide emission [7]. Financial agglomeration can also improve the efficiency of urban green economy and reduce carbon emission intensity through industrial structure upgrading and technological innovation [8,9]. However, it is worth noting that only when the level of science and technology and economic development reach a certain level can financial agglomeration exert a restraining effect on carbon emissions [10]. When the securities industry and insurance industry are underdeveloped, agglomeration has no significant impact on environmental pollutants [11]. The inhibitory effect of financial agglomeration on carbon emission may decrease with the decrease of carbon emission level, showing a three-stage feature of "restrain-promotion-inhibition" [12]. Carbon emission intensity is not only affected by current financial agglomeration, but also affected by the lag of financial agglomeration [13]. In general, most of the theoretical results at the present stage mainly focus on manufacturing and industrial agglomeration, and few studies on the impact of financial agglomeration on environmental pollution. At the same time, a few relevant literatures have not reached a consensus on the effects of financial agglomeration and carbon emissions.

3. Development Status of Financial Agglomeration and Carbon Emission

3.1. The Development of Financial Agglomeration

The production of financial products and services and even the development of new products require the development of specialized supporting service industries, including investment consulting, credit rating, asset appraisal, financial professional and technical training institutions, etc. A large number of financial institutions gather together to form a specialized financial supply network, which is financial agglomeration.

The financial industry, represented by the banking, insurance and securities industries, has developed rapidly. By the end of 2018, China's banking financial institutions had 4,571 legal

entities with 3.902 million employees and 106 securities companies. In 2021, a total of 140 securities companies in the industry achieved operating revenue of 502.4 billion yuan (+12.0% year on year) and net profit of 191.1 billion yuan (+21.3% year on year). By the end of 2021, the total assets of the securities industry were 10.59 trillion yuan (+19.1% year on year), the net assets were 2.57 trillion yuan (+11.3% year on year), the ROE of the securities industry increased to 7.83%(+0.56 PCT compared with last year), and the industry leverage ratio was 3.38(3.13 in 2020)[14]. The insurance industry has also experienced a kind of "comeback" from the trough.

However, the level of financial agglomeration is still considerable only in some developed areas in the east. The possible reason is that even if a certain amount of financial resources are invested in the eastern and central regions, the final result may be that the financial resources from the western and central regions are leaked to the eastern regions. Because only in the developed region, the scale efficiency of capital can be steadily improved. In this situation, the central and local government investment funds can only go to the east, leading to the eastern financial agglomeration effect more and more obvious.

3.2. The Development of Carbon Emissions

Figure 1 shows the variation of carbon emission intensity in 30 provinces (excluding Tibet, Hong Kong, Macao and Taiwan) from 2007 to 2018. Carbon emission intensity is mainly determined by the total carbon emission and the level of economic development. The carbon emission intensity of the eastern, central and western regions is in the order from small to large, which may be because the eastern region is more developed, has a sound industrial structure and is capable of applying green technology for environmental governance. The development of the central and western regions is relatively slow, the industrial structure is single and concentrated, and the ability of green technology innovation and application is worse than that of the eastern regions. But overall, the western Middle East showed a trend of declining carbon intensity over time. This is closely related to the increasingly mature technology of industrial governance and environmental regulation in China. It is worth noting that the carbon emission intensity in the central and eastern regions tends to converge. It is possible that carbon reduction measures have reached a bottleneck in reducing carbon emissions.

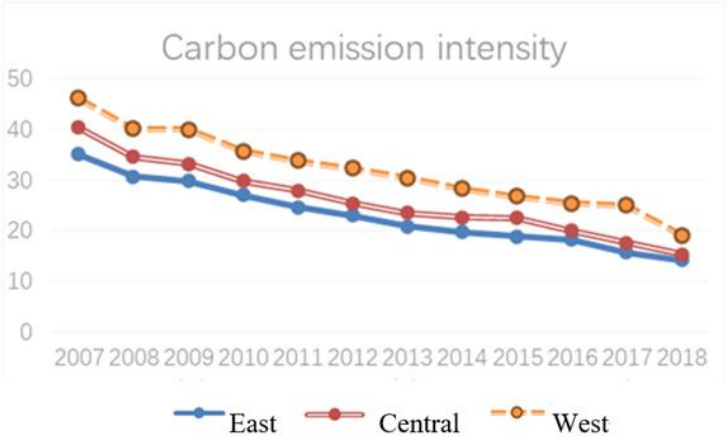

Figure 1: China's regional carbon intensity

4. Financial Agglomeration and Carbon Emission: an Empirical Analysis

4.1. Model Setting and Variable Measurement

4.1.1. Model Specification

To study the impact of financial agglomeration on carbon emissions, the following econometric model is established:

$$C_{it} = \beta_0 + \beta_1 \ln fa_{it} + \beta_2 \ln(fa^2_{it}) + \beta_3 \ln X_{it} + y_i + \varepsilon_t + \mu_{it} \quad (1)$$

Among them, the co2 $_{(i,\,t)}$ said in the I province t in carbon intensity, fait said in the i province t years of financial agglomeration degree, fa^2_{it} said in the i province t year financial agglomeration degree of square, x is a set of control variables, said in the i province t years these control variables of the research, said yi province fixed effects, ε_t said year fixed effects, μ_{it} represents the residual term and β represents the constant term.

4.1.2. A Variable Measure

Core explanatory variables. Financial agglomeration degree FA. In this paper, the commonly used location entropy index is chosen to define the degree of financial agglomeration. The following type:

$$Fa_{it} = (e_i / E_{it}) / (e_t / E_t) \quad (2)$$

Among them, the ratio of eit of financial employees in year t of i province and E_{it} of total employment in year t of i province of each region is taken as the numerator. The denominator is the ratio of the number of financial workers in the country in year t, e_t, to the total number of people employed in the country in year t, E_t.

The explained variable. Carbon emission intensity C_{it}. In this paper, the ratio of the total carbon emission of each region and the sum of GDP_{it} at year t in province i is selected as the carbon emission intensity.

According to the existing literature, the improvement of urbanization level is conducive to the improvement of green development efficiency, that is, to curb carbon emissions; The degree of opening to the outside world shows the size of total factor productivity to some extent. The increase of total factor productivity can improve production technology and reduce energy consumption. Regional economic growth will lead to the expansion of industrial scale, but also may lead to the aggravation of environmental pollution; Different industries have different degrees of carbon emissions, and promoting the upgrading of industrial structure is conducive to reducing carbon emissions [14]. Therefore, the control variables of this paper include: (1) the ratio of urban population to total population in each region, that is, the regional urbanization level, denoted by urban. (2) The proportion of the total import and export volume of foreign investment in each region in the total import and export volume, that is, the regional openness, denoted by open. (3) The proportion of the gross industrial product in the gross domestic product of each region can be called the scale effect, which is denoted by SE. (4) The ratio between the secondary industry and the tertiary output value of each region can objectively reflect the industrial structure, which is represented by IS.

4.2. Analysis of Correlation

Table 1 Correlation analysis shows that urbanization level (Urban) and openness (OPEN) are

negatively correlated with carbon emission intensity. Financial agglomeration (FA), scale effect (SE) and industrial structure (IS) are positively correlated with carbon emission intensity.

Table 1: Analysis of correlation

variable	C	fa	Fa2	urban	open	se	is
C	1						
fa	0.187***	1					
fa2	0.132**	0.982***	1				
urban	-0.358***	0.695***	0.704***	1			
open	-0.123**	0.0340	0.0110	0.104**	1		
se	0.247***	-0.185***	-0.237***	-0.334***	0.0560	1	
is	0.294***	-0.248***	-0.286***	-0.519***	-0.00200	0.921***	1

4.3. The Empirical Analysis

4.3.1. The Benchmark Return

Table 2: The benchmark return

variable	C
fa	6.757***
	(8.989)
fa2	-1.094***
	(-4.176)
urban	-14.678***
	(-13.694)
open	-0.038***
	(-5.420)
se	12.915***
	(5.542)
is	-3.113***
	(-4.596)
Cons	2.517***
	(4.253)
Time	No
N	360
r2_a	0.5472

The benchmark regression results in Table 2 show that the coefficient of the primary term of financial agglomeration is positive and significant at 1% significance level, while the coefficient of the quadratic term of financial agglomeration is negative and significant at 1% significance level. On the one hand, to a certain extent, the improvement of financial agglomeration can improve carbon emission intensity. The possible reason is that financial agglomeration promotes the economy, which leads to economic growth and increases carbon emissions at the same time. On the other hand, if financial agglomeration exceeds a certain range, the positive effect of financial industry agglomeration will drive regional capital flow, ensure the normal operation of industrial clusters of financial capital, improve production efficiency, reduce financing costs and so on, so as to promote the development of regional low-carbon economy. Therefore, the linear relationship between financial agglomeration and carbon emissions shows an inverted "U" state.

In terms of control variables, the urbanization rate (urban) significantly reduce carbon emissions intensity, the improvement of urbanization rate means that more and more people from rural areas

to come out, is not limited to the farm work in the countryside, but more into the second and the third industry, technology of the people in general get higher, accelerates the pace of industrial upgrading, and promotes the development of low carbon, Reduce carbon intensity. Greater openness can reduce carbon emissions. The improvement of foreign openness is reflected in the increased proportion of foreign imports and exports, which means the improvement of foreign technology learning and foreign exchange, which is conducive to China's low-carbon development and reduction of carbon emissions. The scale effect (SE) significantly increases the intensity of carbon emissions, which means that the proportion of gross industrial production increases. The increase of gross industrial production indicates the expansion of industrial scale, and at the same time increases the carbon pollution of industrial output and significantly increases the level of carbon emissions. The improvement of industrial structure (IS) indicates that the growth rate of the secondary industry is greater than that of the tertiary industry, which is the performance of the optimization of industrial structure, which can effectively achieve low-carbon development and reduce carbon emissions.

4.3.2. Quantile Regression

Table 3: Quantile regression

C	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Q=0.25							
fa	3.863	1.149	3.36	0.001	1.603	6.122	***
fa2	-0.642	0.305	-2.1	0.036	-1.241	-0.042	**
urban	-9.175	1.591	-5.77	0	-12.305	-6.046	***
open	-0.011	0.007	-1.44	0.15	-0.025	0.004	
se	3.054	2.476	1.23	0.218	-1.815	7.922	
is	-0.712	0.727	-0.98	0.328	-2.142	0.717	
Constant	3.035	0.838	3.62	0	1.387	4.682	***
Q=0.5							
fa	6.249	0.871	7.17	0	4.535	7.963	***
fa2	-1.134	0.289	-3.93	0	-1.703	-0.566	***
urban	-12.744	0.655	-19.44	0	-14.033	-11.455	***
open	-0.029	0.005	-5.6	0	-0.039	-0.019	***
se	7.048	1.989	3.54	0	3.137	10.959	***
is	-1.519	0.496	-3.06	0.002	-2.494	-0.544	***
Constant	2.779	0.598	4.65	0	1.603	3.955	***
Q=0.75							
fa	10.446	1.829	5.71	0	6.848	14.043	***
fa2	-2.419	0.711	-3.4	0.001	-3.817	-1.022	***
urban	-15.602	1.591	-9.8	0	-18.731	-12.472	***
open	-0.062	0.008	-8.01	0	-0.077	-0.047	***
se	16.139	3.5	4.61	0	9.256	23.021	***
is	-3.713	0.873	-4.25	0	-5.431	-1.995	***
Constant	0.688	0.627	1.1	0.273	-0.545	1.921	
is	0.294***	-0.248***	-0.286***	-0.519***	-0.002	0.921***	1
Mean dependent var		2.752		SD dependent var		1.807	

*** p<.01, ** p<.05, * p<.1

Table 3 shows the quantile test results of financial agglomeration degree on carbon emissions, and the marginal effects at the 25th percentile, 50th percentile and 75th percentile are successively tested. The results show that the regression coefficient of regional financial agglomeration increases

significantly with the change of quantile. First of all, with the gradual increase of carbon emission level from low to high, the promoting effect of financial agglomeration on carbon emission is also gradually enhanced. In addition, when financial agglomeration reaches a certain height, financial agglomeration has a significant inhibitory effect on carbon emission, and this effect will be strengthened with the rise of carbon emission level. At the same time, the scale effect can also significantly promote the regional carbon emission level at the higher carbon emission intensity, while the promoting effect is not significant at the lower carbon emission intensity. Secondly, as the level of urbanization (Urban) and industrial structure (IS) rise, the inhibitory effect becomes more obvious, which can significantly reduce the level of carbon emissions at each percentile. Finally, the marginal effect of openness on carbon emission intensity is relatively stable, which also significantly inhibits carbon emissions.

4.3.3. Regional Heterogeneity Test

The economic development level of different regions in China is different, and there are great differences in many aspects, so there is a certain regional heterogeneity in carbon emission level. Table 4 is the regional heterogeneity analysis based on the eastern, central and western regions. The results show that the impact of financial agglomeration on carbon emission intensity in the eastern region shows an inverted "U" -shaped relationship, while the impact of financial agglomeration in the central and western regions on carbon emission intensity is not significant.

Table 4: Regional heterogeneity tes

	east	middle	west
	C	C	C
fa	2.848***	0.179	2.035
	-4.157	-0.122	-0.809
fa2	-0.419**	-0.098	-1.579
	(-2.081)	(-0.250)	(-1.397)
urban	3.016*	3.274*	-11.922
	-1.748	-1.948	(-0.950)
open	-0.017***	-0.558**	0.087
	(-4.867)	(-2.184)	-0.726
se	-8.399**	-2.338	7.089*
	(-2.508)	(-1.402)	-1.709
is	2.600***	-0.029	-2.017**
	-3.892	(-0.071)	(-2.255)
Cons	-1.668	2.596***	7.678
	(-1.605)	-2.67	-1.302
Time&id	No	No	No
N	144	108	108
r2_a	0.9491	0.98	0.9506

4.3.4. Test for Robustness and Endogeneity

Table 5 is the robustness test done by replacing the core explanatory variable fa. Infa is the location entropy calculated by the number of financial employment and the total population. The regression results showed that lnfa also promoted carbon emissions, and lnfa2 also inhibited carbon emissions, which verified the robustness of the benchmark regression results described above.

Table 5: Test for robustness

variable	C
infa	9.059***
	(7.648)
infa2	-2.044***
	(-5.028)
urban	-14.129***
	(-10.315)
open	-0.048***
	(-6.168)
se	9.146***
	(3.344)
is	-2.567***
	(-3.214)
Cons	2.069***
	(2.890)
N	360
r2_a	0.4224

Table 6 shows the endogeneity test of this model. In this paper, the lag phase of the degree of financial agglomeration (FA) was selected as an instrumental variable to conduct IV-2SLS regression, which passed the unidentifiable test, weak instrumental variable test and overidentification test of instrumental variables. Then, this paper conducts Hausman test on benchmark regression and instrumental variable regression, and the test results are shown in the table below. It can be seen that the P value =0.911>0.1, which rejects the null hypothesis, indicating that the model has no endogeneity.

Table 6: Test for endogeneity

	b iv	B fe	b-B Difference	sqrt(diag(V_b-V_B)) S.E.
fa	8.880349	6.757395	6.757395	0.854161
fa2	-1.946225	-1.093607	-0.8526173	0.3379968
urban	-14.56075	-14.6781	0.1173451	0.3105808
open	-0.0430066	-0.037865	-0.0051416	0.008982
se	12.27823	12.91457	-0.6363392	0.7837855
is	-3.200004	-3.112955	-0.0870484	0.2112259
chi2(8) = 5.61, Prob>chi2 = 0.5861				

5. Conclusions

Based on relevant literature review, this paper selects panel data of 30 provinces in China (excluding Tibet, Hong Kong, Macao and Taiwan) from 2007 to 2018, adopts panel regression model and quantile regression model, and conducts regional heterogeneity, robustness and endogeneity tests to study the nonlinear relationship between financial agglomeration and carbon dioxide emissions. From the perspective of financial agglomeration, this paper tries to analyze whether the financial agglomeration with low energy consumption can further exert agglomeration effect on the basis of its own green production to achieve carbon emission reduction and sustainable economic development. It is found that the linear relationship between financial agglomeration and carbon emissions shows an inverted "U" state. That is, financial agglomeration first promotes the growth of carbon emission intensity, and then inhibits the growth of carbon emission intensity to a

certain extent. Quantile regression shows that with the change of quantile, the regression coefficient of regional financial agglomeration shows a significant upward trend. First of all, with the gradual increase of carbon emission level from low to high, the promoting effect of financial agglomeration on carbon emission is also gradually enhanced. In addition, when financial agglomeration reaches a certain height, financial agglomeration has a significant inhibitory effect on carbon emission, and this effect will be strengthened with the rise of carbon emission level. Regional heterogeneity shows that financial agglomeration in the eastern region has an inverted "U" -shaped relationship on carbon emission intensity, while financial agglomeration in the central and western regions has no significant effect on carbon emission intensity. The conclusion of this study is still valid after a series of robustness tests and has strong credibility.

Based on the empirical results and research conclusions, the following suggestions are put forward:

Rational development of a scientific financial agglomeration model, the conclusion of this paper shows that only when financial agglomeration reaches a critical value, can carbon emissions be effectively reduced. Therefore, the state should vigorously support the economic construction of some central and western regions, reasonably help them through the critical value, to achieve the positive effect of financial agglomeration.

According to the actual situation, China should formulate corresponding policies in different regions and strengthen environmental regulation. At the same time, vigorously develop high-tech industries, promote the opening of different regions to the outside world; Continuously upgrade the industrial structure, increase the proportion of the national economy in the tertiary industry, and effectively curb carbon emissions.

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References

[1] Krugman P R. Development, Geography and Economic Theory. Cambridge: MIT press, 1995.

[2] Wei Shouhua, Shi Bihua. On the Competitive Advantage of Enterprise Clusters. China Industrial Economy, 2002 (1): 11-14.

[3] Shijie Li, Hou Dingxia, Jin Weijian, Shahid Rabia. Impact of industrial agglomeration on environmental pollution from perspective of foreign direct investment-a panel threshold analysis for Chinese provinces. Environmental science and pollution research international, 2021, 28 (41)

[4] Zhonghua Cheng. The spatial correlation and interaction between manufacturing agglomeration and environmental pollution. Ecological Indicators, 2016, 61

[5] Li Hongbiao, Yan Ya, Ding Baogen. The impact of manufacturing agglomeration on carbon emissions—an empirical study based on relevant panel data in central China. Jiangxi Social Sciences, 2013, 33 (12): 66-70.

[6] Hao Liya, Wang Chunxiao. Research on the spillover effect of financial agglomeration and scientific and technological innovation on the development of provincial low-carbon economy. Economic Forum, 2017 (06): 76-82

[7] Sun Jiaxin, Zhang Lihua. Research on the impact of financial agglomeration on carbon emissions. Coal Economic Research, 2021, 41 (01): 30-36

[8] Xu Sheng, Liu Yue. The Impact Path of Financial Industry Clustering on Carbon Emission Intensity -- Empirical Analysis Based on Panel Data of Eastern China. Financial Teaching and Research, 2015 (06): 14-21

[9] Shi Benzhi, Xu Ning, Liu Ming, et al The Impact of Financial Agglomeration on the Efficiency of Urban Green Economy and Its Channels of Action—Based on the Empirical Analysis of 249 Cities above prefecture level in China. Technical Economy, 2018, 37 (8): 87-95

[10] Lu Lingzhu. Spatial spillover and threshold effect of financial agglomeration on carbon emission reduction: an empirical analysis based on panel data in eastern China. Journal of Hubei Institute of Technology (Humanities and

Social Sciences Edition), 2019, 36 (02): 43-50
[11] Li Kaifeng, Wang Jie. Financial Agglomeration, Industrial Structure and Environmental Pollution—Based on China's Provincial Spatial Econometric Analysis. Industrial Technology and Economy, 2017, 36 (3): 3-12
[12] Li Zhiguo, Che Shuai, Wang Jie. "Top to bottom" or "Bottom to bottom": the "local neighbor" emission reduction effect of financial agglomeration. East China Economic Management, 2021, 35 (09): 79-88
[13] Gao Ya. Regional Financial Agglomeration and Low Carbon Development. Ecological Economy, 2021, 37 (07): 28-34
[14] China Securities Regulatory Commission: Annual Report 2021 of China Securities Regulatory Commission.