Pol. J. Environ. Stud. Vol. 34, No. 1 (2025), 397-414
DOI: *10.15244/pjoes/185702* ONLINE PUBLICATION DATE: 2024-05-20

Original Research

Research on the Related Allocation of Green Financial Assets among Enterprises in The Insurance Shareholding Network

Wencheng Yu[1], Yikang Zhang[1], Kun Du[1]*

[1] School of Economics and Management, Qingdao Agricultural University, Qingdao 266109, P. R. China

Received: 20 November 2023
Accepted: 05 March 2024

Abstract

Based on social network theory and the viewpoint of Economic Man, this paper chooses listed enterprises in Shanghai and Shenzhen A-share markets from 2015 to 2017 as samples to empirically study the relationship between green financial asset allocation behavior among the companies in the insurance shareholding network. It is found that after distinguishing the risk heterogeneity of green financial assets, the insurance shareholding network will produce two different effects among enterprises. That is, the existence and quantitative strength of the insurance equity network will significantly promote the convergence of the low-risk asset allocation level of green finance, the "reservoir contagion effect" among enterprises, and significantly promote the differentiation of the high-risk asset allocation level of green finance among enterprises, and trigger the "crowding out dispersion effect". At the same time, with the increase in the holding time of the same insurance institution, the deviation of the level of low-risk asset allocation in green finance among enterprises will show a "U"-shaped change, while the deviation of the level of high-risk asset allocation in green finance among enterprises will expand. In addition, due to the dominant influence of state-owned shareholders, the insurance equity network plays a small role among state-owned enterprises and only has a significant impact on the difference in green financial investment among non-state-owned enterprises.

Keywords: Insurance Shareholding Network, Green Financial Assets, Related Association, Heterogeneous Risk

Introduction

In recent years, with the continuous popularity of China's insurance products and the continuous growth of premium income, the scale of insurance funds held by insurance institutions has been rising, and the influence on the capital market has become increasingly prominent. According to the 2021 mid-year report of the WIND database, the total market value of shares held by insurance institutions in the A-share market is as high as 1.27 trillion yuan, second only to the top-ranked public funds, and the scale of shareholding has grown from 3.6% of the proportion of A-share market value in circulation in 2016 to about 4.5% in mid-2021, with an obvious development trend of continuous high-speed growth. In February 2021, the State Council issued the Guiding Opinions on Accelerating the Establishment and Improvement of a Green, Low-carbon, and Circular Economic Development System, emphasizing the vigorous development of green finance, the development of green credit, and green direct financing. By the end of December 2021, the scale and growth rate of China Ping An's green investment had increased rapidly, with the scale of green investment and financing reaching 224.58 billion yuan and the total

* e-mail: dukun@qau.edu.cn

scale of responsible investment exceeding 1.22 trillion yuan. The scale of green banking business reached 89.813 billion yuan, the balance of green credit reached 72.974 billion yuan, and the premium income of environmental sustainable insurance reached 44.569 billion yuan. China's green finance system is developing rapidly and leading the world's scale, and RMB assets are expected to take the lead in the field of green finance. By the end of 2020, the outstanding green loans of 21 major Chinese banks exceeded 12 trillion yuan, ranking first in the world and significantly ahead of other countries. The total amount of green and ESG credit in major European countries was about 700 billion yuan. Meanwhile, China's stock of green bonds reached 813.2 billion yuan, ranking second in the world. China's green bonds account for about 20% of total global bond issuance (2019), with double-digit issuance growth. The number of insurance institutions entering the top ten shareholders of listed companies has also risen rapidly. For example, China Life Insurance Co., Ltd. has appeared among the top ten shareholders of 70 listed companies. The phenomenon of multiple listed companies being held by the same insurance institution is common, and more and more listed companies are included in the influence of the insurance shareholding network. However, the governance effect of insurance institutions on listed companies has not been well matched with their rapidly growing shareholdings in a very timely manner. For example, in the wave of insurance capital placards in 2015, Zhongrong Life Insurance held three listed companies in one year, ranking among the top ten shareholders of 17 listed companies in the same year, which doubled the number of eight in 2014. However, in the first quarter of 2016, the listed companies listed by Zhongrong Life had a floating loss of nearly 100 million yuan, and the operating profits of the rest of the listed companies had also declined, so Zhongrong Life faced a regulatory dilemma. So many listed companies have seen declining profits or even losses that it is hard not to think that they are related to each other because of the same property owner, Zhongrong Life, and thus have an impact on their respective operations. However, judging from the actual needs of current economic development, insurance institutions with the natural advantages of long-term investment and robustness are indispensable 'escorts' in promoting the high-quality development of the real economy. Guo Shuqing, chairman of the China Banking and Insurance Regulatory Commission, pointed out in October 2018 that it is necessary to give full play to the long-term stable investment advantages of insurance funds and increase the financial and strategic investment of insurance funds in high-quality listed companies '. This makes it increasingly important to study and promote the mechanisms and effects of insurance institutions to stabilize the market and promote the development of enterprises.

Insurance shareholding networks cannot function among listed companies without the transmission of information. Social network theory holds that the relationship network can form a bridge of information transmission between individuals, and this kind of information transmission will make the behavior of individuals in the network have a certain relevance. For the insurance shareholding network, this information may be concentrated in financial investment, which has a greater impact on the green financial asset allocation of real enterprises. This is because insurance companies themselves, as financial institutions, have a professional financial foundation, can obtain more advantageous financial investment information and resources, and may have more 'voice' in the decision-making of financial investment behavior of listed companies. At the same time, according to the 2019 mid-year report of the WIND database, insurance institutions prefer to hold financial enterprises, followed by real estate enterprises. Therefore, other entities in the insurance shareholding network may have more access to financial and real estate investment information. Taking the "Baoneng dispute" that attracted social attention in 2015 as an example, Baoneng, a subsidiary of Vanke Real Estate, is among the 17 listed companies held in the same period. At the end of 2016, there were 9 investment real estate projects that were significantly improved compared to 2014, of which Shandong Expressway tripled the scale of investment real estate between 2015 and 2016. Behind the rapid expansion of real estate investment by many companies in the Qianhai Life Insurance network over the same period, the source of its decision-making information may be difficult to disengage from the common shareholder of Qianhai Life Insurance, which intends to dominate Wanke. In addition, from the policy objective of the CBRC on insurance investment, i.e., "to leverage insurance funds in the form of equity to help the real economy", financialization is the issue that we are currently focusing on in relation to the quality of development of the real economy, especially the study on the impact factors of financialization. This is because the financialization of real enterprises has a two-sided effect, and different corporate motivations have different effects. Enterprises may use a 'reservoir effect' for the purpose of preventing reserve. For example, in 2014, Jilin Aodong gained rich investment income through financial investment and fed it back to the industry, transforming capital advantages into real economic advantages. However, the motive of profit-chasing may have a 'crowding out effect'. In 2012, Sanpu Pharmaceutical did not avoid risks, but engaged in financial speculation for the purpose of making windfall profits, resulting in huge losses and putting the main business of the enterprise into operational difficulties. Therefore, the study of the influencing factors of financialization is closely related to the 'enhancement of the ability of financial services to the real economy' as clearly pointed out in the report of the 19th National Congress of the Communist Party of China. Only by clarifying the factors that affect the financialization of enterprises can we control the financialization problem in a targeted manner to achieve the purpose of improving the quality of real economic development. However, the current research on corporate financialization mainly

focuses on the macro level [1], and the micro level mainly focuses on factors such as corporate performance and the internal and external environment [2]. In addition to Li Xinzi et al. [3], who studied the phenomenon of contagion in financialization decision-making within the enterprise group network, few scholars connect the financialization decision-making of enterprises with the social network. However, the social network theory holds that the business decision-making of enterprises is closely related to the relationship network, and the interaction between enterprises may be the key factor affecting the financial decision-making of enterprises. Therefore, we study the green financialization behavior among enterprises from the perspective of the insurance equity network. It is conducive to formulating more targeted and realistic financial supervision and incentive programs, maximizing the positive role of corporate governance in insurance institutions, promoting insurance investment to help the real economy, and grasping the level of financialization.

In summary, this paper selects the current focus on the financialization of real enterprises as the entry point to study the impact of the insurance shareholding network on the correlation of inter-enterprise behavior and takes into account the impact of heterogeneous effects of corporate financialization. Combined with previous studies, from the perspective of risk heterogeneity of green financial assets, based on social network theory and rational economic man's point of view, this paper further explores the influence of the quantity intensity and time intensity of the insurance shareholding network connection on the correlation of green financial asset allocation among enterprises. The contributions of this paper are mainly in the following three aspects: (1) Starting from the financialization of enterprises in the network, the quality and information function of the insurance shareholding network are measured from the dimensions of network existence: connection strength and time strength. The difference degree of financialization behavior among enterprises in the insurance shareholding network is tested. The social network theory and the view of rational economic man are comprehensively applied to the governance of the insurance shareholding network. It is an important supplement to the existing literature on the governance of the listed companies in insurance institutions. (2) In the study of the interaction between insurance shareholding networks and financialization among listed companies, the different effects of the number of insurance shareholding networks on the correlation of green financial asset allocation among enterprises are tested from the perspective of high and low risks. At the same time, the long-term insurance shareholding linkage between enterprises can promote the differentiation of high-risk green financial assets among enterprises, while the difference in low-risk green financial assets shows a U-shaped development trend, which enriches the current research results on the impact of corporations. (3) Through the further excavation of the situational conditions of the difference in financialization behavior between enterprises by the nature of enterprises, it is found that due to government control and agency conflict in the context of heterogeneous multi-tasking, the insurance shareholding network is difficult to play a role in the correlation of green financial asset allocation behavior between enterprises, but it is reflected and highlighted in private enterprises. The findings of this paper not only explore the mechanism and prevention path of inter-firm green financial asset allocation correlation from the perspective of insurance shareholding networks, but also provide a basis for government regulators to formulate policies to better guide insurance institutions to play an active governance role in shareholding enterprises.

The following structure of this paper is organized as follows: The second part is a literature review; the third part is a theoretical analysis and research hypothesis; the fourth part is the research design, including the selection of the sample, the definition of variables, and the design of the model; the fifth part is the empirical analysis; the sixth part is further testing; and finally, the research conclusion and implications.

Literature Review

Insurance Agencies

With the gradual liberalization of regulatory restrictions on insurance institutions' investment in listed companies [4], the shareholding volume of insurance institutions has gradually increased, and their influence on listed companies has also increased strongly. First, the existing research mainly focuses on the investment behavior of fund institutional investors [5-6]. There are few studies on insurance shareholding behavior alone, mainly focusing on two aspects: (1) Research on the shareholding preferences of insurance institutions. Current research shows that because insurance funds are not self-owned funds, regulatory requirements are more stringent, and insurance institutions prefer stocks with low risk and strong liquidity [7], following the principle of long-term value investment, have the role of stabilizing the market [4], which is different from general shareholders and institutional investors. (2) The corporate governance role of insurance institutions for individual enterprises. Previous studies have shown that insurance institutions participating in listed companies can use their advantages in terms of specialty and scale to improve the earnings quality of enterprises [8], improve the operating performance of enterprises [7], ease the financing constraints of enterprises [9], enable enterprises to have a higher level of investment, and improve the investment efficiency of listed companies under economic tension [10]. Second, the impact of insurance institutions on listed companies may be different from that of other institutional investors and shareholders [4, 8], and cannot be generally covered. Coupled with the current strong increase in the investment influence of insurance institutions, it is necessary to conduct in-depth research on the governance role of insurance institutions

in listed companies. However, such research is still relatively lacking, and it is basically carried out from the perspective of a single enterprise [8-10], without considering the correlation between enterprises in the insurance shareholding network. From the perspective of a rational economic man, shareholders with diversified investment portfolios will focus on joint investment portfolios rather than individual enterprises [11].

Shareholder Ownership Network

A social network is a collection of organizations or individuals and a series of relationships. It is precisely because of the existence of this strong informal system that Chinese enterprises can develop rapidly. Currently, more and more scholars have begun to focus on the role of social networks on firm development, but mainly on inter-firm network linkages such as the same region, the same industry, having common directors or executives, and the same corporate group [3, 12-16]. Less research has been conducted on shareholding network relationships. However, shareholders can be involved in the internal decision-making of the enterprise, and its effect on the development of the enterprise may be more direct than that of the network of directors, who are mostly independent directors and have a limited number and role [17, 18]. The existing research on the effect of shareholders' shareholding networks on enterprises mainly has two perspectives: individual enterprises and behavior correlations between multiple enterprises. From the perspective of individual enterprises, the study finds that the 'information advantage' brought by the shareholding network of shareholders has significantly promoted the operating performance of listed companies [18] and M&A performance. The network position of non-controlling shareholders has a restraining effect on the private interests of controlling shareholders [19]. The fund network has a certain impact on the inefficient investment of enterprises [20, 21]. However, in fact, some studies believe that the behavioral differences between multiple enterprises are the best perspective to test the social network of enterprises [22], which can directly examine the impact of information and experience transmission within the network on the behavioral relevance between enterprises. The study found that the shareholder network can cause stock price linkage between enterprises [23] and inhibit the contagion of financial restatements [4]. After distinguishing the heterogeneity of shareholders, it is found that executive compensation is contagious in venture capital networks [24], and financial restatement contagion occurs between enterprises in venture capital networks.

Corporate Green Financial Asset Allocation

Under the current situation of the sluggish real economy and the rapid development of the financial market, the rate of return on financial investment is far greater than the rate of return on real capital. Green financial asset allocation has increasingly become an important way for enterprises to pursue profit growth points. Therefore, the profit-seeking color of corporate financialization is increasing, and the financialization of real enterprises has become a hot issue for many scholars in recent years. At present, scholars' research on corporate green financial asset allocation mainly focuses on two aspects: (1) The motivation and consequences of corporate green financial asset allocation. The financial investment of enterprises for different motives will have different effects on their development. Sheng Mingquan et al. and Huang Xianhuan et al. [1, 25] believed that, in general, enterprises allocate green financial assets with different maturities, because of their different liquidity and risk, which reflect the different financial motives of enterprises and will have different effects. The research shows that the short-term green financial asset allocation of enterprises is more based on prevention motivation, which plays a 'reservoir effect', while the profit-seeking motivation of configuring long-term green financial assets is stronger, which will produce a crowding-out effect, increase financial risk, and inhibit the R&D investment of enterprises. Other studies also show that, on the one hand, the 'reservoir effect' of corporate green financial asset allocation can broaden the financing channels of enterprises and reduce the adverse effects of capital shortages on business operations [26]. On the other hand, the asset allocation of real enterprises will also have a 'crowding out effect', creating short-term excess profits [27]; at the same time, it will also increase the risk of stock price crashes [28], reduce total factor productivity [25], and damage the value of enterprises [29]. (2) The factors affecting the allocation of green financial assets by enterprises. First, the asset allocation of green finance will affect the economic performance of enterprises; green credit will affect the investment behavior of enterprises [30, 31]; the risk of green enterprises will increase [32]; and the uncertainty of green financial policy will inhibit the green financialization of enterprises [28]. The second is the influencing factors of the enterprises themselves. The research in this field has recently attracted the attention of scholars, mainly studying the impact on enterprise environmental social responsibility [33] from the aspects of enterprise, enterprise environmental investment [34], green economic efficiency [35], and enterprise production efficiency [36].

Research Review

Through a literature review, we find that: firstly, there are relatively few studies on the role of insurance institutions in the governance of listed companies, and they are basically from the perspective of individual enterprises, and few scholars have considered the correlation between the influence of insurance institutions in multiple enterprises. At the same time, considering that insurance institutions are different from other institutional investors and shareholders in terms of operating characteristics and regulatory requirements, and with the increasing depth and breadth of the influence of the insurance shareholding network, it is of practical

significance to conduct network research on investors with professional characteristics such as insurance. Second, the current research on the influencing factors of corporate green financial asset allocation level rarely distinguishes the differences between corporate green financial asset liquidity and risk. However, the behavior of enterprises investing in financial heterogeneous risk assets may reflect the different motives of corporate financialization, which will have different effects on enterprises. Therefore, it is necessary to consider the heterogeneity of corporate financial investment when exploring the factors affecting the level of green financial asset allocation. Mixed research makes the conclusion contradictory. Third, few scholars have linked corporate green financial asset allocation decisions to social networks, while the influence of the relationship network in which a firm is located is crucial to its decisions [15]. Based on the advantages of insurance institutions with professional financial and risk management knowledge and long-term investment funds. It may have greater influence than general shareholders in the allocation of corporate green financial assets, and insurance institutions pay special attention to the liquidity and safety of investment due to the need for operation and supervision. It may also make the impact of the insurance shareholding network relationship on the correlation of inter-enterprise green financial asset allocation different from the risk heterogeneity of green financial assets.

Therefore, this paper first defines the insurance shareholding network relationship as the relationship between listed companies held by the same insurance institutions. Then, based on this, from the perspective of the network, the influence of the insurance shareholding network relationship on the related allocation of financial heterogeneous risk assets among enterprises is studied, and the factors affecting the decision-making of green financial asset allocation are explored more accurately. It is helpful to formulate and implement the financial supervision policy of enterprises, further promote the healthy development of the economy, enhance the ability of financial services to benefit the real economy, and enrich the current research on the influencing factors of corporate green financial asset allocation.

Theoretical Analysis and Research Hypothesis

The Influence of Insurance Shareholding Network Relationships on the Correlation of Green Financial and Low-Risk Asset Allocation among Enterprises: "Reservoir Contagion Effect"

Relevant research shows that when enterprises invest in low-risk financial products, such as transactional green financial assets, and when the main business operation and development needs capital replenishment or urgently needs to repay due debts, enterprises can quickly realize their low-risk green financial assets, thus supplementing the required liquidity and alleviating the 'reservoir effect' of financing constraints and financial risks [1]. For the insurance institutions of shareholding enterprises, this undoubtedly increases their shareholding income, security, and liquidity. Then, on the one hand, based on the view of rational economic man, shareholders with diversified portfolios will focus on the profits of joint portfolios [11]. Therefore, in order to obtain the total maximum shareholding income, insurance institutions have the motivation to transfer information and experience about financial low-risk asset investment that can play a positive 'reservoir effect' among listed companies. On the other hand, based on social network theory, networks build bridges for information transfer between individuals, and the behavior of individuals is influenced by other individuals within the network [24]. Therefore, the insurance shareholding network can establish information transmission channels among listed companies, and the investment behavior of listed companies' financial low-risk assets will also be affected by this information. Therefore, the management of listed companies in the insurance shareholding network is affected by this information, and their green financial and low-risk asset allocation behavior may tend to be consistent. The difference in the level of low-risk assets in green finance among enterprises is reduced, forming the "reservoir contagion effect" of the insurance shareholding network.

In addition, many listed companies in the same insurance shareholding network received similar market information, funds, and other resources. Therefore, the development planning, financing, and other decision-making environments of these enterprises are more consistent. This makes them more likely to take similar green finance low-risk asset allocation action [26, 37], which leads to the convergence of the low-risk asset allocation level of green finance among enterprises under the insurance shareholding network, forming a "reservoir contagion effect".

Further, multiple insurance institutions can simultaneously invest in a listed company. Therefore, the same amount of insurance investment between the two listed companies may not be unique. Previous studies have shown that the more joint directors of two listed companies, the more similar the investment efficiency level [16, 38]; the more common analysts, the easier the same group is to adopt the same financing decision [39]. Therefore, the greater the number of insurance institutions linking the two companies, the stronger the channel of information between them, and the more similar the level of low-risk assets in green finance is, leading to a "reservoir contagion effect".

Therefore, the following hypothesis is proposed in this paper:

Hypothesis 1 (H1a). The difference in the allocation level of green financial low-risk assets between enterprises invested by the same insurance institution is small. That is, the network relationship of insurance equity between enterprises will form a "reservoir contagion effect".

Hypothesis 1 (H1b). The quantitative intensity of the insurance shareholding network relationship has a

positive impact on the direction of green financial and low-risk asset allocation among enterprises. That is, the greater the number of insurance institutions affiliated with enterprises, the smaller the difference in the low-risk asset allocation level of green finance.

The Impact of Insurance Shareholding Network Relationships on the Correlation of High-Risk Asset Allocation in Green Finance among Enterprises: "Crowding Out Dispersion Effect"

Unlike the motivation to invest in low-risk green financial assets as a 'reservoir' strategy, a company's allocation of investments in high-risk green financial assets, such as investment properties, is more of a profit-seeking behavior that substitutes for investment in tangible assets. This behavior has a dual impact on shareholders' interests. While it brings short-term excess profits [27] and increases shareholder returns, it also causes a 'crowding-out effect' on the company due to weak asset liquidity and poor asset liquidation ability, which is unfavorable to the company's development. This in turn increases the investment risk for shareholders. Therefore, for insurance institutions that place a high value on investment liquidity and safety, it is undoubtedly necessary to balance the insurance investment profits and risks brought about by the allocation of high-risk green financial assets to listed companies. Based on the rational economic agent perspective, when the same shareholder holds multiple listed companies, they will focus on the comprehensive returns and risks of their overall investment portfolio rather than individual investment enterprises. This is consistent with the current research focus on the behavior of firms under common institutional ownership abroad [11, 40, 41]. Therefore, insurance institutions will pay more attention to the total returns and risks of all enterprises within the network and balance profits and risks from a holistic perspective rather than at the individual enterprise level.

As a result, on the one hand, insurance institutions with professional expertise in finance and risk control may provide information and resource support to the financial high-risk asset investments of listed companies, thus gaining greater stockholding profits. On the other hand, in order to stabilize the risk of insurance investment at a controllable level, insurance institutions may use the financial high-risk asset levels of other companies in the network as a reference point and influence the financial high-risk asset allocation behavior of individual companies from the perspective of balancing the overall network risk. Therefore, based on the dual impact of the financial high-risk asset levels of listed companies on the investment interests of insurance institutions and the particularity of insurance operation and investment, insurance institutions may have a "crowding-out diversification effect" on multiple companies held simultaneously within the network.

Furthermore, if more insurance institutions connect the two companies, the aggregation of their green financial high-risk asset allocation behavior will lead to greater investment risk for various insurance institutions, thus increasing the possibility of differential strategies between listed companies. At the same time, as insurance institutions face similar interests and regulatory requirements, their risk diversification decisions are often consistent in listed companies, leading to a difference in high-risk asset allocation levels and the "crowding out dispersion effect".

Therefore, this article proposes the following hypotheses:

Hypothesis 2 (H2a). The degree of difference in the allocation level of high-risk assets in green finance between the companies invested by the same insurance institution is relatively high; that is, the relationship of the insurance holding network among the companies will form a "crowding out dispersion effect".

Hypothesis 2 (H2b). The strength of the holding network relationship of insurance has a positive impact on the differentiation trend of high-risk asset allocation in green finance among enterprises. In other words, the more insurance institutions that connect companies, the greater the difference in their level of green financial risky asset allocation.

The Impact of the Time Intensity of Insurance Shareholding Networks on the Interconnectedness of Green Financial Asset Allocation between Enterprises.

The linkage between two companies in an insurance shareholding network not only differs in terms of quantity but also in terms of time intensity. Some recent theoretical and empirical studies have shown that the motivation and effect of shareholders in exercising governance may also be influenced to some extent by their holding period [42-44]. Therefore, the duration of investment by insurance institutions in listed companies in the network varies, leading to differences in the time intensity of the network linkage between them. This may result in variations in the correlation of green financial asset allocation among the companies.

Regarding the correlation of green financial low-risk asset allocation behavior between companies, at the beginning of the formation of the insurance equity network between the two listed companies, the insurance institutions lacked time to collect and deal with information from companies with short holding times. They do not fully understand the managers and operations of listed companies. According to the resource dependence theory and learning effect [45, 46], insurance institutions can transfer their governance experience and valuable information obtained from the equity network to the company, so as to effectively play the role of insurance institutions in listed companies and obtain certain controlling benefits in a short time. Therefore, for insurance institutions, the green financial low-risk asset allocation of listed companies can realize the "reservoir effect", which increases the income of insurance shareholding while considering investment safety and liquidity. Therefore, in the initial stage, insurance institutions can provide assistance to listed companies in

the investment decision of green financial low-risk assets according to their experience, which may lead to the convergence of green financial low-risk asset allocation among listed companies in the network with the increase of the connection time of the insurance shareholding network, and the level gap may decrease.

However, for the green financial high-risk asset allocation behavior of listed enterprises in the network, insurance institutions adopt the strategy of differentiation among enterprises according to the investment level of all listed enterprises holding their shares, so as to obtain a certain investment return and diversify the comprehensive equity risks. This is objectively determined by the particularity and regulatory requirements of insurance investment funds and is not affected by the subjective cognition of insurance institutions between listed enterprises. Therefore, with the increase in the connection time intensity of the insurance shareholding network, the differences in the allocation level of financial green and financial risky assets among listed enterprises gradually accumulate and increase.

Therefore, this article proposes the following hypotheses:

Hypothesis 3 (H3a). There is a "U-shaped" relationship between the time intensity of the insurance shareholding network relationship and the green financial low-risk asset allocation level between enterprises; that is, with the increase in connection time between two listed enterprises in the insurance shareholding network, the financial green and low-risk asset allocation level between them first converges and then diverges.

Hypothesis 3 (H3b). There is a positive correlation between the time intensity of the insurance shareholding network relationship and the difference in the allocation level of high-risk green finance among enterprises.

Study Design

Sample Selection and Data Sources

This article selects Shanghai and Shenzhen-listed companies with insurance institutions among the top ten shareholders in the annual report from 2015 to 2019 as the initial sample. 2015 is chosen as the starting year because in 2014, the "Decision of the China Insurance Regulatory Commission on Amending the Interim Measures for the Administration of Insurance Funds Utilization" was released, which further relaxed the proportion of insurance institutions' investment in equity assets. This had a significant impact on the number and share of listed companies held by insurance institutions. In 2015, insurance institutions were very active in the secondary market, and frequent incidents of shareholding occurred. At the same time, with the implementation of the "compensation scheme II" in 2015, the risk constraints on insurance investment were stronger, directly affecting the liquidity and risk requirements of insurance institutions for listed companies.

This article processed the sample as follows: (1) Exclude listed companies in the financial and real estate sectors; (2) Exclude listed companies in the ST category; (3) Exclude samples with missing key data. Furthermore, this article refers to the research of Chen Shihua et al. and Chen Yunsen [15, 16]. By combining each of the above-mentioned listed companies into pairs each year, each company will form a combination with all listed companies except itself, and duplicate combinations will be removed. A total of 189,681 enterprise combination samples were obtained. The data for listed companies is from the WIND database and the Guotai An database. To avoid the influence of extreme values, this article performs a 1% trimming on continuous variables other than the quantity intensity and time intensity of insurance shareholding network relationships.

Variable Setting and Measurement Model

Dependent Variable - Differences in the Level of Green Financial Asset Allocation among Firms

This article refers to the measurement method used by Demir and Du Yong et al. [29, 39] to measure the degree of green financial asset allocation of enterprises using the ratio of green financial assets to total assets. Based on the balance sheet of listed companies, this article includes trading green financial assets, derivative green financial assets, net loans and advances, net available-for-sale green financial assets, net held-to-maturity investments, and net investment properties in the category of green financial assets. It should be noted that in recent years, with the rapid development of the real estate industry, more and more enterprises have changed their investment purpose for investment properties to pursue profits. Therefore, green financial assets also include investment properties, which is consistent with the definition of green financial assets in this article and is also consistent with the actual situation. This paper also draws on the research of Sheng Mingquan et al., Huang Xianhuan et al., and Peng Yuchao et al. [1, 25, 28] to distinguish different risky green financial assets based on the liquidity of assets, conversion costs, and holding period. Based on the order of the items in the balance sheet, trading green financial assets are current assets with shorter holding periods, stronger liquidity, and good tradability, belonging to low-risk green financial assets; while derivative green financial assets, loans and advances, available-for-sale green financial assets, held-to-maturity investments, and investment properties belong to high-risk green financial assets with longer holding periods, weaker tradability, and poorer liquidity. Among them: (1) the difference in the allocation level of low-risk green financial assets between enterprises: the absolute value of the difference in the level of low-risk green financial assets between enterprise combinations; (2) the difference in the allocation level of high-risk green financial assets between enterprises: the absolute value of the difference in the level of high-risk green financial assets between enterprise combinations. The smaller the above values, the smaller the difference in the level of low (high) risk green financial assets between enterprise combinations.

Independent Variable – Insurance Holding Network Relationship

The insurance shareholding network relationship is measured by dummy variables and continuous variables in three dimensions: existence, quantity, and time.

(1) Existence of an insurance shareholding network relationship: Following the studies of Chen Shihua et al. and Chen Yunsen et al. [15, 16], a dummy variable is set based on whether the same insurance institution holds shares in the enterprise combination in the current year. If the same insurance enterprise is among the top ten shareholders in the annual report, the dummy variable takes the value of 1, otherwise it takes 0.

(2) Quantity strength of insurance shareholding network relationship: Following the research of Chen Yunsen et al. [16], the number of the same insurance institutions in the top ten shareholders of the annual reports of the enterprise combination is taken.

(3) Time intensity of the insurance shareholding network relationship: Based on the holding age concept and the method of measuring the holding period of institutional investors by Xinhengzhan [44], the time intensity of the insurance shareholding network relationship is defined as the number of consecutive quarters that the insurance institution holds shares in two listed companies in the portfolio at the end of the current year, with the earliest being January 2010. In addition, when there are multiple identical insurance institutions investing in the enterprise portfolio, the time intensity of the insurance holding network relationship is the sum of the common holding time of each insurance institution for the enterprise portfolio. This paper believes that each insurance institution may affect the behavior correlation of enterprises in the network to a certain extent within a certain period of time. Therefore, comprehensive consideration of the time intensity of each insurance institution can reflect the strength of the network connection between enterprise portfolios more accurately.

In order to effectively test the green financial asset allocation association among companies in the insurance shareholding network, to alleviate the possible endogeneity problem, and considering the lag effect of the insurance shareholding network relationship, this paper lagged the independent variables by one period. In addition, according to the requirements of the Chen Yunsen et al. [16] model, it is necessary to take the logarithm of the continuous variables.

Model Building

In order to test the impact of the insurance shareholding network on the allocation of green financial assets in enterprises and the relationship between the allocation of green financial assets in the insurance equity network, the following model to be tested is constructed as:

$$DLFIN_{i,t} = \alpha_0 + \alpha_1 IN_{i,t-1} + \alpha CVs_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$$DLFIN_{i,t} = \alpha_0 + \alpha_1 IN1_{i,t-1} + \alpha CVs_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$DLFIN_{i,t} = \beta_0 + \beta_1 IN2_{i,t-1} + \beta_2 IN2_{i,t-1}^2 + \beta CVs_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$$DLFIN_{i,t} = \gamma_0 + \gamma_1 IN2_{i,t-1} + \gamma CVs_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

In the above model, $DLFIN_{i,t}$ denotes It represents the difference in the low-risk asset allocation level of green finance among the enterprise portfolios in t, $DHFIN_{i,t}$ denotes the difference in the level of high-risk asset allocation of green finance among enterprise portfolios in t, $IN_{i,t-1}$ denotes the existence of insurance holding network relationships among enterprise portfolios in t–1, $IN1_{i,t-1}$ denotes the quantitative strength of insurance holding network relationships among enterprise portfolios in t–1, $IN2_{i,t-1}$ denotes the temporal strength of insurance holding network relationships among enterprise portfolios in t–1, and $CVs_{i,t-1}$ is the control variable of this paper. The lagged one-period treatment is applied to the following variables: difference in profitability between firms (*DROA*), difference in total asset turnover between firms (*DTURNOVER*), difference in operating income margin between firms (*DE*), difference in growth capacity between firms (*DTOBITQ*), difference in equity concentration between firms *(DTOP3* and *DTOP5*), whether there is a director network relationship between firms (*DBC*), whether firms have the same property rights (DSTATA), and whether they belong to the same industry (*DIndustryfe*). $\varepsilon_{i,t}$ are random error terms. The definitions and measures of the above variables are shown in Table 1. This paper also controls the double fixed effect of time and enterprise, respectively.

Model (1) is the relationship between the insurance shareholding network and the difference in the level of low-risk asset allocation in green finance among enterprises. If α_1 is negative, it shows that the relationship of the insurance shareholding network significantly reduces the difference in the level of low-risk assets of green finance among enterprises, makes the asset allocation behavior converge, and verifies *H1*. When examining the relationship between the insurance shareholding network and the difference in the allocation level of high-risk assets of green finance among enterprises, i.e., testing *H2*, we regress with $DHFIN_{i,t}$ replacing $DLFIN_{i,t}$ in models (1) and (2) .If the β_1 in model (3) is positive, it indicates that the existence of an insurance shareholding network relationship will significantly increase the degree of difference in the level of high-risk asset allocation in green finance among enterprises. To validate the H3 proposed in the previous paper, we constructed a model of model (4). If γ_0 is positive in the model (4), it indicates that the increase in the connection time intensity of the insurance shareholding network between enterprise portfolios will gradually widen the difference in the low-risk asset allocation level of green finance among enterprises.

Table 1. Definition and measurement of variables

Variable Name	*Definition and measurement of variables*
DLFIN	The difference in the allocation level of low-risk assets of green finance among enterprises, the logarithm of the absolute value of the difference in the level of low-risk assets of green finance among t-year enterprise portfolios: ln (1+DLFIN)
DHFIN	The difference in the allocation level of high-risk assets of green finance among enterprises, the logarithm of the absolute value of the difference in the level of high-risk assets of green finance among t-year enterprise portfolios: ln (1+DHFIN)
IN	Existence of insurance holding network relationship, whether the same insurance institution exists among the top ten shareholders of the enterprise portfolio in year t-1, the existence is taken as 1, otherwise it is taken as 0
IN1	Quantitative intensity of insurance holding network relationships, logarithm of the number of top ten shareholders of the firm's portfolio in year t-1 that have the same insurance institution: ln(1+IN1)
IN2	Temporal intensity of the insurance holding network relationship, the logarithm of the sum of the number of consecutive quarters in which the firm portfolio is simultaneously held by the same insurance institution at the end of year t-1: ln(1+IN2)
DROA	Difference in profitability between firms, the log of the absolute value of the difference in return on assets between portfolios of firms in year t-1: ln(1+DROA)
DTURNOVER	Difference in total asset turnover between firms, the logarithm of the absolute value of the difference in total asset turnover between firm combinations in year t-1: ln(1+DTURNOVER)
DE	Difference in operating income margin between enterprises, the logarithm of the absolute value of the difference in operating income margin between combinations of enterprises in year t - 1: ln (1+ DE)
DTOBITQ	Difference in growth between firms, log of the absolute value of the difference in TobinQ between firm portfolios in year t-1: ln (1+ DTobinQ)
DTOP3	Difference in equity concentration between firms, the logarithm of the absolute value of the difference in the shareholdings of the top three shareholders between the firm portfolios in year t-1: ln (1+D TOP3)
DTOP5	Difference in equity concentration between firms, the logarithm of the absolute value of the difference in the shareholdings of the top five shareholders between the firm portfolios in year t-1: ln (1+D TOP5)
DBC	Whether there is a director network relationship, whether there is a common director among the firm portfolio in year t-1, take 1 for existence, otherwise take 0
DSTATA	Year t-1 Enterprise Portfolio Is the ownership the same, yes take 1, otherwise take 0
DIndustryfe	Whether the industry of the enterprise portfolio in year t-1 is the same, yes take 1, otherwise take 0 (according to the SEC's 2012 classification standards, manufacturing is subdivided into secondary classification)

Empirical Analysis

Descriptive Statistics

Table 2 reports the descriptive statistical results of the variables. The data shows that: (1) The mean value of the main explanatory variable insurance shareholding network relationship (*IN*) is 0.115, the mean value of the number intensity (*IN1*) of the insurance shareholding network relationship is 0.116, and the mean value of the time intensity (*IN2*) of the insurance shareholding network relationship is 0.232. These all indicate that in the listed companies invested by insurance institutions, the phenomenon of insurance shareholding network relationships between enterprises is relatively common, which is consistent with China's real environment and also highlights the reality and necessity of the current research on the impact of insurance shareholding networks on the correlation of inter-enterprise behavior. In addition, the standard deviation of the time intensity (*IN2*) of the insurance shareholding network relationship is 0.858, the minimum value is 0, and the maximum value is 23, indicating that there are great differences in the time intensity of the insurance shareholding network relationship among the enterprise portfolios. It is of great significance to explore the influence of network relationships on the behavior correlation between enterprises from the time dimension to its maximum value. 23 also shows that the investment of insurance institutions has certain long-term stability. (2) The difference in the level of financial low-risk asset allocation between enterprises (*DLFIN*) has a minimum value of 0, a maximum value of 0.24, and a mean value of 0.008, and the difference in the level of financial high-risk asset allocation between enterprises (*DHFIN*) has a minimum value of 0, a maximum value of 0.392, and a mean value of 0.048, all of which indicate a large difference in the allocation of green financial assets between enterprises.

Analysis of the Regression Result

The model in this paper rejects the random effect model through the Hausman test, so the individual

Table 2. Descriptive statistics

VARIABLES	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*min*	*max*
IN	189681	0.115	0.319	0.000	0.000	0.000	0.000	1.000
IN1	189681	0.116	0.325	0.000	0.000	0.000	0.000	3.000
IN2	189681	0.232	0.858	0.000	0.000	0.000	0.000	23.000
DLFIN	189681	0.008	0.032	0.000	0.000	0.001	0.000	0.240
DHFIN	189681	0.048	0.075	0.006	0.021	0.055	0.000	0.392
DROA	189681	0.053	0.050	0.018	0.040	0.072	0.001	0.277
DTURNOVER	189681	0.462	0.447	0.150	0.329	0.615	0.006	2.287
DE	189681	0.154	0.204	0.041	0.092	0.183	0.002	1.326
DTOBITQ	189681	1.913	2.123	0.554	1.268	2.497	0.021	13.373
DTOP3	189681	33.848	19.790	17.440	33.995	48.628	0.670	81.417
DTOP5	189681	17.257	12.535	7.070	14.860	25.110	0.280	53.170
DSTATE	189681	0.502	0.500	0.000	1.000	1.000	0.000	1.000
DBC	189681	0.002	0.048	0.000	0.000	0.000	0.000	1.000
DIndustryfe	189681	0.050	0.217	0.000	0.000	0.000	0.000	1.000

Table 3. Association between insurance holding network relationships and low-risk asset allocation of green finance among companies

	A		*B*	
	(1)	**(2)**	**(1)**	**(2)**
	DLFIN	***DLFIN***	***DLFIN***	***DLFIN***
IN	-0.056***		-0.051***	
	(-4.24)		(-3.84)	
IN1		-0.018***		-0.017***
		(-4.36)		(-3.96)
DBC			0.180	0.180
			(1.13)	(1.13)
DSTATE			-0.024	-0.024
			(-0.75)	(-0.75)
DIndustryfe			-0.041	-0.041
			(-1.40)	(-1.41)
DROA			-0.097***	-0.097***
			(-12.15)	(-12.15)
DTURNOVER			-0.071***	-0.071***
			(-6.50)	(-6.50)
DE			0.052***	0.052***
			(3.99)	(3.99)
DTOBITQ			-0.023***	-0.023***
			(-3.55)	(-3.56)
DTOP3			0.009**	0.009**
			(2.10)	(2.10)
DTOP5			-0.017***	-0.017***
			(-3.02)	(-3.02)
Year	Control	Control	Control	Control
Company	Control	Control	Control	Control
_cons	-0.096***	-0.103***	-0.088***	-0.093***
	(-22.24)	(-25.55)	(-5.34)	(-5.76)
Obs.	189681	189681	189681	189681
R-squared	0.018	0.018	0.035	0.035

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively.

fixed effect model is adopted. In order to eliminate the interference of other factors on the results, this paper controls other variables that reflect the differences in business performance, ownership structure, property rights, industries, etc., and controls the annual effect.

Test Results of the Influence of the Insurance Shareholding Network Relationship on the Correlation of Low-Risk Asset Allocation in Green Finance among Enterprises

Table 3 reports the existence and quantity of insurance shareholding network relationship strength and the difference in green financial low-risk asset levels between enterprises. Column A shows the regression results without control variables, showing that the estimated coefficients for *IN* and *IN1* are both significantly negative at the 1% confidence level. After controlling for the other variables, the regression results are shown in column B. The coefficients for *IN* and *IN1* were still significantly negative at the 1% confidence level. This shows that in order to increase the shareholding income, insurance institutions share and transmit their information and experience about the investment of green finance from the network, so as to significantly reduce the difference in the level of low-risk assets of green finance among enterprises in the insurance shareholding network and make the asset allocation behavior converge. At the same time, the greater the number of insurance institutions with the same enterprise portfolio, the stronger the information reference and transmission effect of the network. Therefore, the quantitative intensity of the insurance shareholding network relationship will significantly reduce the difference in the low-risk asset allocation level of green finance among enterprises. All the above results support the previously proposed "reservoir infectious effect" of *H1a* and *H1b*.

Test Results of the Impact of the Insurance Shareholding Network Relationship on the Correlation of Green Financial High-Risk Asset Allocation among Enterprises

Table 4 reports the connection between the existence and quantitative strength of the insurance shareholding network relationship and the difference in the allocation level of high-risk assets in green finance among enterprises. The explained variable is the difference in the allocation level of high-risk assets in green finance among enterprises (*DHFIN*). Column A shows the regression results without control variables, showing that the estimated coefficients of *IN* and *IN1* are both significantly positive at the 5% confidence level. In column B of the regression results containing the control variables, the coefficients for *IN* and *IN1* were still significantly negative at the 5% confidence level. This shows that the existence of an insurance shareholding network relationship and the number of strengths will significantly increase the green financial high-risk asset allocation level differences between enterprises and insurance institutions from the perspective of their overall holdings. At the same time, it will control the liquidity of insurance investments and increase security, while differentiating the listed companies with green financial high-risk assets. At the same time, the greater the number of insurance institutions with the same enterprise portfolio, each insurance institution will make similar risk diversification decisions, which also increases the difference in the level of high-risk asset allocation in green finance among enterprises. All the above results support the "extrusion dispersion effect" in *H2a* and *H2b*.

Table 4. Association between insurance holding network relationships and high-risk asset allocation of green finance among companies

	A		***B***	
	(1)	**(2)**	**(1)**	**(2)**
	DHFIN	***DHFIN***	***DHFIN***	***DHFIN***
IN	0.020**		0.019**	
	(2.33)		(2.22)	
IN1		0.006**		0.006**
		(2.31)		(2.21)
DBC			-0.050	-0.050
			(-0.63)	(-0.63)
DSTATE			-0.041*	-0.041*
			(-1.85)	(-1.85)
DIndustryfe			0.005	0.005
			(0.13)	(0.14)
DROA			0.024***	0.024***
			(5.53)	(5.53)
DTURNOVER			0.007	0.007
			(0.88)	(0.88)
DE			0.000	0.000
			(0.04)	(0.04)
DTOBITQ			0.016***	0.016***
			(4.73)	(4.73)
DTOP3			-0.007***	-0.007***
			(-2.72)	(-2.72)
DTOP5			0.002	0.002
			(0.68)	(0.68)
Year	Control	Control	Control	Control
Company	Control	Control	Control	Control
_cons	0.015***	0.017***	0.038***	0.040***
	(4.39)	(5.36)	(3.23)	(3.43)
Obs.	189681	189681	189681	189681
R-squared	0.041	0.041	0.043	0.043

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively.

Table 5. Temporal intensity of insurance holding networks and inter-firm green financial asset allocation correlations

	A		***B***		
	(1)	**(2)**	**(1)**	**(2)**	**(3)**
	DLFIN	***DHFIN***	***DLFIN***	***DHFIN***	***DHFIN***
IN2	-0.049***	0.005**	-0.045***	0.005**	0.006
	(-5.71)	(2.12)	(-5.22)	(2.08)	(0.97)
IN2^2	0.012***		0.011***		-0.000
	(5.78)		(5.36)		(-0.03)
DBC			0.167	-0.051	-0.051
			(1.04)	(-0.65)	(-0.64)
DSTATE			-0.024	-0.041*	-0.041*
			(-0.76)	(-1.86)	(-1.86)
DIndustryfe			-0.043	0.005	0.005
			(-1.49)	(0.12)	(0.12)
DROA			-0.097***	0.024***	0.024***
			(-12.13)	(5.54)	(5.54)
DTURNOVER			-0.071***	0.007	0.007
			(-6.52)	(0.90)	(0.89)
DE			0.052***	0.000	0.000
			(3.99)	(0.03)	(0.03)
DTOBITQ			-0.023***	0.016***	0.016***
			(-3.59)	(4.73)	(4.73)
DTOP3			0.009**	-0.007***	-0.007***
			(2.11)	(-2.71)	(-2.71)
DTOP5			-0.017***	0.002	0.002
			(-3.03)	(0.67)	(0.67)
Year	Control	Control	Control	Control	Control
Company	Control	Control	Control	Control	Control
_cons	-0.111***	0.018***	-0.101***	0.041***	0.041***
	(-26.00)	(5.51)	(-6.23)	(3.48)	(3.47)
Obs.	189681	189681	189681	189681	189681
R-squared	0.019	0.041	0.036	0.043	0.043

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively.

Test Results of the Effect of the Temporal Intensity of Insurance Holding Networks on the Correlation between Inter-Firm Green Financial Asset Allocation

Table 5 reports the time strength between the insurance shareholding network relationship and the green financial heterogeneous risk asset allocation level differences between enterprises. Column A is the regression results without control variables, where the estimated coefficients of *IN2* and *IN2* in column (1) are significant at the opposite sign, namely, the primary term coefficient is negative and the quadratic term coefficient is positive; *IN2* is significantly positive at the 5% confidence level. With the addition of control variables such as enterprise performance and equity concentration degree. The results are shown in column B: the quadratic term estimation coefficients of *IN2* and *IN2* in column (1) are still opposite and are significant at the confidence level of 1%. The inflection point was approximately 1.98. Bushee (2001) divides the transient type and the other two types of institutional investors (quasi-exponential and focused) based on institutional investor turnover, with a turnover rate of 2 [47]. It shows that the influence of the time intensity of the insurance shareholding network relationship on the difference in low-risk asset allocation level in green finance among enterprises is "U"-shaped, That is, when the enterprise portfolio is jointly held by the same insurance institution for a short time, insurance institutions lack the motivation and time to know the business. In order to improve its governance efficiency and increase its shareholding gains, it will apply the experience and advantage information gained in the network to enterprise decision-making. Thus, the low-risk asset allocation behavior of green finance tends to be similar among enterprises. As the same insurance institutions jointly hold more than 1.98 quarters, the heterogeneity between the network enterprises is gradually exposed through experience and information sharing applications, thus making green financial low-risk asset allocation behavior differentiation between enterprises, namely the combination of insurance shareholding network coupling time strength, which will gradually widen the green financial low-risk asset allocation level difference between enterprises.

The estimated coefficient of *IN2* in column (2) of Group B, with significant positive values at the 5% confidence level, This shows that the time intensity of the insurance shareholding network relationship has a significant positive impact on the difference in green financial high-risk asset allocation level among enterprises, Neither the quadratic term estimation coefficient for *IN2* nor *IN2* in column (3) is significant. It shows that there is no nonlinear relationship between the difference in green finance high-risk asset allocation levels between enterprises and the time intensity of the insurance shareholding network relationship. The strategy of insurance institutions to adopt the allocation level of listed enterprises in the network due to their own operational needs and regulatory requirements does not change with time. All the above results support *H3a* and *H3b*.

Endogeneity Test

Although the financial investment decision-making of listed companies as internal information provides a relatively 'clean' environment for testing the correlation of inter-enterprise behavior in the insurance shareholding network [16], the dependent variables of this paper are also processed in a lag phase, which alleviates the endogenous problems that insurance institutions may have when holding listed companies. However, in order

Table 6. Endogeneity test - regression results after PSM matching

	(1)	(2)	(3)	(4)	(5)	(6)
	DLFIN	***DHFIN***	***DLFIN***	***DHFIN***	***DLFIN***	***DHFIN***
IN	-0.053**	0.034**				
	(-2.368)	(2.308)				
IN1			-0.017**	0.010**		
			(-2.378)	(2.249)		
IN2					-0.044***	0.008**
					(-3.552)	(2.025)
IN2^2					0.012***	
					(4.630)	
CVs	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control
Company	Control	Control	Control	Control	Control	Control
_cons	-0.098***	0.013	-0.104***	0.017	-0.096***	0.023
	(-5.385)	(0.519)	(-6.040)	(0.699)	(-5.745)	(0.955)
Obs.	74112	74112	74112	74112	74112	74112
R-squared	0.053	0.047	0.053	0.047	0.056	0.047

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively.

to make the research conclusions more robust, this paper adopts the *PSM* sample propensity score matching method and refers to the research of Wang Yuanyuan et al. [7] on the factors of shareholding preference of insurance companies. The differences in return on assets (*ROA*), asset-liability ratio, ownership concentration (the sum of the shareholding ratios of the top three shareholders), whether the industry is the same, and the year are selected as covariates. According to the ratio of 1:3, 21838 groups of enterprise portfolio samples with insurance shareholding network relationships are taken as the control group, and the matched paired portfolio sample observations are taken as the control group. Then regression is performed on models (1) - (4). The regression results are shown in Table 6. All explanatory variables are still significant, and the coefficient symbols are also consistent with the previous text. Therefore, after considering the endogenous problem, the results of this paper are still robust.

Further Analysis

The previous analysis shows that the insurance shareholding network relationship and its quantity and time intensity will have a certain impact on the correlation of green financial asset allocation behavior among enterprises. However, there are two types of enterprises with different property rights in China, namely state-owned enterprises and non-state-owned enterprises. These two types of enterprises have great differences in overall business objectives, resource acquisition capabilities, and internal decision-making [18, 19]. Therefore, the impact of the insurance shareholding network relationship on the correlation of inter-enterprise green financial asset allocation behavior may be different between state-owned enterprises and non-state-owned enterprises. This paper divides the enterprise portfolio samples into two groups: state-owned enterprises and non-state-owned enterprises, and conducts regression analysis, respectively, to

Table 7. Sample of the same SOE portfolio

	(1)	(2)	(3)	(4)	(5)	(6)
	DLFIN	***DLFIN***	***DHFIN***	***DHFIN***	***DLFIN***	***DHFIN***
IN	-0.009		-0.056			
	(-0.15)		(-0.99)			
IN1		-0.002		-0.020		
		(-0.08)		(-1.05)		
IN2					-0.022	-0.038*
					(-0.52)	(-1.88)
IN2^2					0.013	
					(0.73)	
DBC	-0.138	-0.137	0.129*	0.128*	-0.141	0.128**
	(-1.06)	(-1.05)	(1.95)	(1.94)	(-1.08)	(1.97)
DROA	-0.152***	-0.152***	0.155***	0.155***	-0.152***	0.156***
	(-3.31)	(-3.31)	(5.32)	(5.32)	(-3.32)	(5.34)
DTURNOVER	-0.074	-0.074	0.084	0.085	-0.075	0.085
	(-1.33)	(-1.33)	(1.60)	(1.60)	(-1.34)	(1.62)
DE	0.068	0.068	-0.030	-0.030	0.070	-0.031
	(1.59)	(1.59)	(-0.96)	(-0.97)	(1.62)	(-1.00)
DTOBITQ	-0.017	-0.017	0.003	0.003	-0.013	0.001
	(-0.40)	(-0.39)	(0.11)	(0.10)	(-0.30)	(0.02)
DTOP3	-0.086**	-0.086**	0.030	0.030	-0.085**	0.030
	(-2.07)	(-2.07)	(0.94)	(0.95)	(-2.06)	(0.94)
DTOP5	-0.004	-0.004	0.011	0.011	-0.003	0.010
	(-0.13)	(-0.13)	(0.46)	(0.46)	(-0.10)	(0.43)
Year	Control	Control	Control	Control	Control	Control
Company	Control	Control	Control	Control	Control	Control
_cons	-0.006	-0.007	-0.062**	-0.069***	-0.014	-0.072***
	(-0.27)	(-0.34)	(-2.48)	(-2.80)	(-0.61)	(-2.91)
Obs.	2747	2747	2747	2747	2747	2747
R-squared	0.143	0.143	0.126	0.126	0.145	0.129

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively.

Table 8. Sample portfolio with non-state enterprises

	(1)	(2)	(3)	(4)	(5)	(6)
	DLFIN	***DLFIN***	***DHFIN***	***DHFIN***	***DLFIN***	***DHFIN***
IN	-0.064***		0.023*			
	(-3.13)		(1.91)			
IN1		-0.021***		0.008**		
		(-3.25)		(2.00)		
IN2					-0.040***	0.007*
					(-3.12)	(1.86)
IN2^2					0.009***	
					(2.85)	
DBC	0.344	0.344	-0.138	-0.138	0.337	-0.139
	(1.31)	(1.31)	(-0.90)	(-0.90)	(1.28)	(-0.91)
DIndustryfe	-0.057	-0.058	-0.016	-0.016	-0.058	-0.016
	(-0.80)	(-0.81)	(-0.30)	(-0.29)	(-0.82)	(-0.30)
DROA	0.170***	0.170***	-0.024*	-0.024*	0.170***	-0.024*
	(7.87)	(7.87)	(-1.88)	(-1.88)	(7.87)	(-1.88)
DTURNOVER	-0.058***	-0.058***	-0.002	-0.002	-0.058***	-0.002
	(-3.78)	(-3.78)	(-0.16)	(-0.17)	(-3.80)	(-0.15)
DE	-0.540***	-0.540***	0.113***	0.113***	-0.540***	0.113***
	(-13.17)	(-13.17)	(5.29)	(5.30)	(-13.16)	(5.30)
DTOBITQ	0.063***	0.063***	-0.014**	-0.014**	0.063***	-0.014**
	(6.07)	(6.07)	(-2.14)	(-2.14)	(6.09)	(-2.13)
DTOP3	0.016**	0.016**	0.026***	0.026***	0.016**	0.026***
	(2.04)	(2.04)	(4.97)	(4.97)	(2.02)	(4.96)
DTOP5	0.036***	0.036***	-0.027***	-0.027***	0.036***	-0.027***
	(3.43)	(3.43)	(-3.88)	(-3.88)	(3.44)	(-3.89)
Year	Control	Control	Control	Control	Control	Control
Company	Control	Control	Control	Control	Control	Control
_cons	-0.122***	-0.130***	0.045***	0.048***	-0.137***	0.049***
	(-11.69)	(-12.77)	(6.01)	(6.51)	(-13.19)	(6.59)
Obs.	92478	92478	92478	92478	92478	92478
R-squared	0.134	0.134	0.062	0.062	0.134	0.062

Note: *, **, *** represent significant at 10%, 5%, 1% confidence level, respectively

explore the impact of inter-enterprise property rights heterogeneity on the role of the insurance shareholding network in information transmission.

Table 7 and Table 8 report the test results of the impact of the insurance shareholding network relationship on the correlation of green financial asset allocation behavior between enterprises in the combined samples of state-owned enterprises and non-state-owned enterprises. The impact of the three measurement dimensions of the insurance shareholding network relationship in Table 7 on the difference in the levels of green financial asset allocation between enterprises is mostly not significant. Among them, only column (6) in the insurance shareholding network relationship time intensity (*IN2*) of green financial risk asset allocation levels difference between state-owned enterprises of the estimated coefficient at 10% confidence level is significantly negative, that between state-owned enterprises, with the growth of the insurance shareholding network connection time, the green financial high risk asset allocation behavior gradually tends to be similar. This may be because, although insurance institutions should implement the differentiation strategy of green finance and high-risk asset allocation level among state-owned enterprises based on the motivation of dispersing the total investment risk, their willingness cannot be well reflected due to their low voice in state-owned enterprises. On the contrary, due to the stronger application of information sharing channels among state-owned enterprises, with the increasing time of the same insurance institutions, the opportunities for independent communication and understanding among the enterprises increase. In order to pursue more excess profits, state-owned enterprises may actively share and exchange the investment experience and advantage information of high-risk assets of green finance, so as to gradually be similar in the allocation behavior of high-

risk assets of green finance. In Table 8 with a sample of non-state-owned enterprises, the existence of insurance shareholding network relationship (*IN*) and quantity intensity (*IN1*) of green finance low-risk asset allocation difference among enterprises is significantly negative at 1%, the estimated coefficient of green finance high-risk asset allocation difference is significantly positive at 5%, and the coefficient is greater than the regression results in Table 3 and Table 4. Between non-state-owned enterprises, insurance shareholding network relationship time intensity (*IN2*) and green financial low risk asset allocation level difference between enterprises "U" type relationship is still significant in 1% confidence level, and inflection point delay to 2.34 quarters, the estimate of green financial high risk asset allocation level difference in 10% of the confidence level is positive.

According to the regression results of Table 7 and Table 8, the influence of the insurance shareholding network relationship on the correlation of green financial asset allocation behavior among non-state-owned enterprises is more obvious, but not obvious among state-owned enterprises. The reasons can be understood from three aspects: the 'political view', 'resource curse', and 'manager view' of state-owned enterprises [18]. First, from the perspective of 'political view', state-owned enterprises bear social responsibilities such as solving employment, so state-owned enterprises need to cater to policies and are more vulnerable to government intervention [48]. Moreover, the development decisions of state-owned enterprises are not only related to the enterprises themselves, so they have stricter requirements on the scientificity and rationality of corporate investment behavior [1]. Suggestions made by insurance institutions to state-owned enterprises based on experience and information in the network may not be easily adopted. Secondly, from the perspective of the 'resource curse', state-owned enterprises have a natural connection with the government, and their internal financing constraints are generally smaller than those of non-state-owned enterprises. Therefore, their financialization behavior is mainly driven by capital profit-seeking factors [49], preferring to allocate high-risk green financial assets, which may themselves have a small tendency to invest in low-risk green financial assets mainly used to alleviate financing constraints. More importantly, the attractiveness of insurance investment funds to state-owned enterprises with a better financing environment may also be limited. Compared with non-state-owned enterprises that choose to 'comply' in order to retain the long-term funds of insurance institutions, state-owned enterprises may choose to violate the wishes of insurance institutions for the excess profits brought by financial markets, so that insurance institutions have little effect among state-owned enterprises. Finally, from the perspective of 'manager's view', the agency problem in state-owned enterprises is prominent, and management is more likely to make decisions contrary to the wishes of insurance institutions because of self-interest motivation, resulting in the information and resources transmitted by the insurance shareholding network not being well affected by management within the enterprise [18, 19], so that the 'extrusion dispersion effect' is not obvious. Therefore, although the application of information sharing among state-owned enterprises is strong, due to the low motivation of state-owned enterprises to obtain investment information on low-risk assets of green finance, and the limited influence of insurance institutions in state-owned enterprises, the correlation of green financial asset allocation behavior among state-owned enterprises is not obviously affected by the insurance shareholding network, while the ' reservoir contagion effect ' and ' crowding out dispersion effect ' of the insurance shareholding network among non-state-owned enterprises are more obvious, which also shows that the conclusion of this paper is robust to a certain extent.

Conclusion and Insights

With the vigorous development of China's insurance industry, the influence of insurance institutions on the market has also increased strongly. In-depth exploration of the impact of insurance institutions on all aspects of corporate governance has attracted more and more attention from all walks of life. From the perspective of the network, this paper explores the related allocation behavior of green financial assets among enterprises in the insurance shareholding network. The results show that after distinguishing the risk heterogeneity of green financial assets, the insurance shareholding network relationship has two distinct effects on the correlation of inter-enterprise green financial asset allocation, that is, the existence and quantity intensity of the insurance shareholding network will significantly promote the allocation of low-risk assets of green finance among enterprises. This level tends to be similar, leading to the "reservoir contagion effect" and simultaneously promoting the differentiation of the level of high-risk asset allocation in green finance among enterprises, triggering the "crowding out dispersion effect". In addition, from the perspective of the time intensity of the insurance shareholding network, the same insurance institutions jointly hold time and the difference between the "U" relationship, namely the insurance shareholding network relationship, the increase of time strength, first promote green financial low-risk asset allocation between enterprises, and then gradually increase the difference. The inflection point is 1.98 quarters. The time intensity of the insurance shareholding network relationship will linearly promote the differentiation of financial high-risk asset allocation levels among enterprises. Further empirical evidence also shows that the impact of the insurance shareholding network on the correlation of inter-enterprise green financial asset allocation behavior is not obvious among state-owned enterprises, but larger among non-state-owned enterprises.

The management practices and policy implications of the paper's findings are as follows:

(1) For insurance institutions, looking at the Chinese and the world, they should be good at playing the role of their shareholding network and actively participating in the decision-making and governance of listed companies. First of all, insurance institutions should focus on the green financial asset allocation behavior that has a dual effect on the development of listed companies, pay attention to balancing the total risk and total income of all enterprises in the network, and take appropriate risk diversification strategies among the holding listed companies in a timely manner. In the pursuit of investment income while maintaining a certain degree of liquidity and security to meet their own policy management needs and regulatory requirements. Second, by collecting relevant information on the financial investment decisions of listed companies, insurance institutions should form decision-making experiences in a timely manner and transmit information within the network on the premise of conforming to relevant rules, so as to save the management costs of listed companies and improve investment returns. Third, insurance institutions should pay attention to the heterogeneous information of listed companies and carry out effective targeted recommendations and governance after gradually understanding their characteristics. Fourth, insurance companies can pay more attention to some non-state-owned enterprises with better performance when choosing listed companies to invest in and help the development of small and medium-sized enterprises.

(2) For listed companies in the shareholding network, both Chinese enterprises and enterprises from all over the world should pay attention to the role of information transmission and risk balance played by the insurance shareholding network. When making green financial asset allocation decisions, the management can appropriately refer to and analyze the financial investment information of other enterprises in the insurance shareholding network, so as to enhance the marginal contribution of this information to the enterprise value. At the same time, due to the double-sided effect of financialization on the development of enterprises, enterprises should also pay attention to the control suggestions of insurance institutions on the allocation level of high-risk green financial assets of enterprises, so as to effectively prevent agency risks and form differentiated development with other enterprises, so as to make investment decisions that are more suitable for the future development of enterprises rather than only obtaining short-term benefits.

(3) For government regulators, according to the development of countries in the world, we should pay attention to the supervision and guidance of insurance institutions in the insurance shareholding network. Promote the improvement of green finance policies, participate in the formulation of internationally unified and mutually recognized standards and definitions of green industries and green assets, and promote the integration of domestic and international green finance allocation standards. With the 'loosening' of insurance investment restrictions, there will be more large-scale insurance funds entering the market in the future, and the scale and quantity of the existing insurance shareholding network will be further expanded. The regulatory authorities should pay more attention to the 'source' of the insurance shareholding network-insurance companies' investment quality and risk monitoring, strengthen the rigid constraints on insurance funds, guide the correct and reasonable investment of insurance funds, and prevent radical insurance institutions from exploiting policy gaps. This will also have an indirect regulatory effect on a number of listed companies invested by insurance institutions, which is conducive to improving the quality of economic development efficiently. At the same time, the government regulatory authorities must properly supervise the relevant communication between the insurance institutions and the management of the enterprise under the insurance shareholding network and avoid the relevant insurance institutions from using the relevant information, especially the private information that is not easily perceived by market participants, to conduct improper transactions with the management.

Acknowledgements

National Statistical Science Research Project(2022LY088); Natural Science Foundation of Shandong Province (ZR2020QG019); Soft Science Key Project of Shandong Province(2021RZB03011); Youth Innovation Science and Technology Support Program of Shandong higher Education Institution(2021RW027); Special Research Project of the Ministry of Agriculture and Rural Affairs PRC (ZONG 20220457, ZONG 20210475).

Conflict of Interest

The authors declare no conflict of interest.

References

1. HUANG X.H., WU Q.S., WANG Y. Green Financial Asset Allocation and Corporate Financial Risk: 'take precautions' or 'give up the bottom'. Financial Research, **44**, 100, **2018**.
2. LIU Y.M, LUO Y.F. External Profit Pressure, Diversified Equity Investment and Financialization of Enterprises. Financial Research, **45**, 73, **2019**.
3. LI X. Z., NIU Y.H., ZHANG X.P. Will the Company's Financial Investment Behavior Infect other Companies? - Empirical Evidence from Enterprise Groups. China Soft Science, **07**, 102, **2019**.
4. LIU L., WANG X.N., ZHANG W.X. The Impact of Insurance Institutions 'Shareholding Behavior on Stock Price Volatility of Listed Companies. Insurance Research, **02**, 28, **2019**.

5. CHEN X., HARGORD J. Monitoring: Which Institutions Matter? Journal of Financial Economics, **86**, 279, **2007**.
6. KIM J.B., LI Y., ZHANG L. Corporate Tax Avoidance and Stock Price Crash Risk: Firm-level Analysis. Journal of Financial Economics, **99**, 639, **2011**.
7. WANG Y.Y., GE H.Y. Research on the Impact of Insurance Companies ' shareholding Preference and Shareholding on the Operating Performance of Listed Companies-Empirical Evidence from China's A-share market. Insurance Research, **08**, 89, **2017**.
8. FU C.R., XIE H.B. Research on the Relationship Between Insurance Companies ' Equity Participation and Earnings Quality - An Empirical Study Based on Listed Companies in China. Insurance Research, **03**, 44, **2014**.
9. KHANNA T., YAFEH Y. Business Groups in Emerging Markets: Paragons or Parasites? Journal of Economic Literature, **45**, 331, **2007**.
10. WANG X.L., JIA J.M., LI S.J. Insurance Participation, Economic Cycle Fluctuation and Capital Investment. Economic Issues, **04**, 6, **2017**.
11. AZAR J., SCHMALZ M.C. Anticompetitive Effects of Common Ownership. Journal of Finance, **73**, 1513, **2018**.
12. GAO W., NG L.K., WANG Q. Does Corporate Headquarters Location Matter for Firm Capital Structure? Financial Management, **40**, 113, **2011**.
13. FRACASSI C., TATE G. External Networking and Internal Firm Governance. The Journal of Finance, **67**, 153, **2012**.
14. LEARY M.T., MICHAEL R.R. Do Peer Firms Affect Corporate Financial Policy? The Journal of Finance, **69**, 139, **2014**.
15. CHEN S.H., MA C. Consistency between Inter-firm Top Management Ties and Charitable Behavior - An Empirical Study Based on Donations of Chinese Listed Companies after the Wenchuan Earthquake. Management World, **12**, 87, **2011**.
16. CHEN Y.S, ZHENG D.J. Director Network Relationship, Information Bridge and Investment Convergence. Nankai Management Review, **20**, 159, **2017**.
17. LIU J., LIU C.L., YIN F. Research on the Contagion Mechanism of the Associated Shareholder Network in Financial Restatements. Financial Review, **04**, 53, **2015**.
18. HUANG C., LI S.M. Shareholder Relationship Network, Information Advantage and Firm Performance. Nankai Management Review, **22**, 75, **2019**.
19. MA L.F., DU B. Research on the Impact of Shareholder Network on the Private Interest Behavior of Controlling Shareholders. Journal of Management, **16**, 665, **2019**.
20. LI W.A., QI L.J., DING Z.S. The Information Effect of Fund Network on Corporate Investment Efficiency. Economic Management, **39**, 44, **2017**.
21. QI H.D., QIAO L., CAO W. Fund Network Relationship Strength and Corporate Inefficient Investment. Financial Economics, **40**, 66, **2019**.
22. BADERTSCHER B.N., SHROFF H.W. Externalities of Public Firms: Evidence from Private Firms' Investment Decisions. Journal of Financial Economics, **109**, 682, **2013**.
23. DONG D.Y., LIU H.B., HU Y., ZHANG W. Does the Shareholder Network Affect the Stock Price Linkage? Journal of Management Engineering, **27**, 20, **2013**.
24. CAI N., DENG X.L., CHENG Y.Q. Does the Venture Capital Network have a 'Contagion' effect - A Study Based on the Over-compensation of Listed Companies. Nankai Management Review, **20**, 17, **2017**.
25. SHENG M.Q., WANG S., SHANG Y.P. Green Financial Asset Allocation and Total Factor Productivity of Real Enterprises: 'industry and finance complement each other' or 'off the real to the virtual'. Finance and Trade Research, **29**, 87, **2018**.
26. THEURILLAT T., CORPATAUX J., CREVOISIER O. Property Sector Financialization: The Case of Swiss Pension Funds (1992-2005). European Planning Studies, **18**, 189, **2010**.
27. HU Y.M., WANG X.T., ZHANG J. Green Financial Asset Allocation Motivation: 'reservoir' or 'alternative'? - Evidence from Chinese Listed Companies, Economic Research, **52**, 181, **2017**.
28. PENG Y.C., NI X.R., SHEN J. Firm's 'de-reality' and Financial Market Stability - from the Perspective of Stock Price Crash Risk. Economic Research, **53**, 50, **2018**.
29. DU Y., ZHANG H., CHEN J.Y. The Impact of Financialization on the Future Development of the Main Business of Real Enterprises: Promoting or Inhibiting. China's Industrial Economy, 113, **2017**.
30. LIU L., XIA Y., FAN Y., LIN S., WU J. Assessment of a Green Credit Policy Aimedat Energy-Industries in China Based on a Financial CGE Model. Journal of Cleaner Production, **163**, 293, **2017**.
31. FAN H., PENG Y., WANG H., XU Z. Greening Through Finance? Journal of Development Economics, **152**, 102683, **2021**
32. LI J.,PENG Y., WANG W. Can the Green Credit Policy Promote the Development of Green Enterprises? Based on the Risk-Taking Perspective. Financial Research, **03**, 112, **2023**.
33. SI L., CAO H., Can Green Credit Policy Improve Corporate Environmental Social Responsibility— Based on the Perspective of External Constraints and Internal Concerns. Industrial Economy of China, **04**, 137, **2022**.
34. GUO J., FANG Y., Green Credit, Financing Structure and Enterprise Environment Investment . The World Economy, **08**, 57, **2022**.
35. ZHAO Y., WANG X., LIU J. Evaluation of the Effect of the Green Finance Reform and Innovation Pilot Zone- Based on the Perspective of Green Economy Efficiency [J]. Economic Review, **02**, 122, **2023**.
36. WANG X., LIU J., ZHAO Y. Effectiveness Measurement of the Green Finance Reform and Innovation Pilot Zone. Quantitative Economy, Technical and Economic Research, **10**, 107, **2021**.
37. JIN J., HAN L. Assessment of Chinese Green Funds: Performance and Industry Allocation. Journal of Cleaner Production, **171**, 1084, **2018**.
38. HE L., Liu R., Zhong Z. Can Green Financial Development Promote Renewable Energy Investment Efficiency? A Consideration of Bank Credit. Renewable Energy, **143**, 974, **2019**.
39. XU R.J., YUAN T.R., LONG Z.W., ZHAO Q. Will the Analyst Follow-up Network Cause the Peer Effect of Financing Decisions of Listed Companies? A New Interpretation of the Analyst Role Perspective. Economic Management, **40**, 156, **2018**.
40. GORANOVA M., DHARWADKAR R., P. Brandes. Owners on Both Sides of The Deal: Mergers and Acquisitions and Overlapping Institutional Ownership. Strategic Management Journal, **31**, 1114, **2010**.
41. CONNELLY B.L., LEE K.B., TIHANYI L., CERTO S.T., JONSON J.L. Something in Common: Competitive Dissimilarity and Performance of Rivals with Common Shareholders. Academy of Management Journal, **62**, 1, **2019**.
42. GASPAR J.M., MASSA M.P. Shareholder Investment Horizons and The Market for Corporate Control. Journal of Financial Economics, **76**, 135, **2005**.

43. ELYASIANI E., JIA J. Distribution of Institutional Ownership and Corporate Firm Performance. Journal of Banking & Finance, **34**, 606, **2010**.
44. XIN H.Z. Institutional Investor Heterogeneity, Shareholding Duration and Corporate Performance. Journal of Shanxi University of Finance and Economics, **39**, 112, **2017**.
45. HILLMAN A.J., WITHERS M.C., COLLINS B.J. Resource Dependence Theory: A Review. Journal of Management, **35**, 1404, **2009**.
46. YU W, JACOBS M.A., SALISBURY W.D. The Effects of Supply Chain Integration on Customer Satisfaction and Financial Performance: An Organizational Learning Perspective. International Journal of Production Economics, **146**, 346, **2013**.
47. BUSHEE B.J. Do Institutional Investors Prefer Near-term Earnings Over Long-run Value? Contemporary Accounting Research, **18**, 207, **2001**.
48. LI W.J., LI M.M. 'Entity + Finance': Financing Constraints, Policy Catering or Market Competition? An Empirical Study from the Perspective of Different Nature of Property Rights. Financial Research, **08**, 100, **2017**.
49. ZHANG C.S., ZHENG N. Research on the Influence Mechanism of Financial Investment Behavior of Non-financial Enterprises in China. World Economy, **41**, 3, **2018**.