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Study on the Coupling Coordination and Spatial Correlation Effect of Green Finance and High-Quality Economic Development—Evidence from China

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Abstract: The article aims to study the coupling coordination and spatial correlation effects of green finance (GF) and high-quality economic development (HQED) in 30 Chinese provinces. The index system of GF and HQED is constructed by selecting relevant index data from 2007 to 2017. The index of GF and HQED is measured by the entropy value method. Next, the coupling coordination degree (CCD) and spatial association strength are calculated based on the index using the coupling coordination degree model and the gravity model. Then the driving factors of the CCD between GF and HQED are analyzed by using geographic detectors. Finally, the spatial association network is constructed and its robustness is studied. The research results show that the coupling coordination degree between GF and HQED in each province is generally low, with strong regional heterogeneity, and the coupling coordination degree shows a trend of decay from the eastern region to the western region, but the western region has more room for development. Green credit, green, coordination, and sharing are the strong driving factors of the CCD between GF and HQED. The network of spatial association between GF and HQED in each province is gradually tightened, making the western peripheral provinces more closely connected with the eastern provinces through the intermediate node provinces. The network robustness of GF and HQED is more influenced by provinces with higher node degree values. Accordingly, the article proposes that China should continuously improve relevant GF policies, environmental disclosure systems, enhance green innovation technology and guide private capital to enter the GF market.

Keywords: green finance; high-quality economic development; coupling coordination; spatial correlation; network robustness

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1. Introduction

Since the 1980s, China's economic development has experienced a stage of rapid growth, but this rapid growth is following the old development path of "pollution first, treatment later", with many environmental problems companies, such as frequent extreme weather, water pollution, air pollution, and soil pollution, etc. According to data released by China's Ministry of Ecology and Environment, the average concentration of PM2.5 in China from 2015 to 2017 was 46.7 μg/m^3, much higher than the World Health Organization's standard of 10 μg/m^3, and the national surface water IV, V and poor V category accounted for 32% (https://www.mee.gov.cn/hjzl/sthjzk/zghjzkgb/ (accessed on 2 February 2022)). The emergence of these problems for the global economic development of countries sounded the alarm, so many countries began to vigorously pursue a "less pollution" lean development approach. Regarding the economic development of China, it is no longer in the pursuit of speed. Developing traditional industry cities have also shifted their focus to the development of high-end productive services [1], and it is the development of productive services that has brought cities closer together [2], making them play a more important role in the global economy [3]. If this competitive advantage is to be maintained, there should be a gradual shift towards HQED [4], and toward the development of an HQED path. This kind of HQED path is guided by the new development concept of eco-friendly growth models, which shows that HQED cannot be separated from the promotion of a green economy.

GF is a new financial model that pays attention to both environmental protection and economic development. Its development is related to the sustainable development of the economy and environment, so GF is an important factor to promote HQED [5]. GF can promote the upgrading of the industrial structure by allocating financial resources and then comprehensively promote HQED by optimizing economic structure [6,7]. Therefore, studies on GF and HQED have attracted progressively more attention from scholars. Some scholars believe that green credit has a negative impact on macroeconomic development [8] but can promote the development of a green economy [9]. At the same time, the green credit policy will restrain the investment in high energy consumption industries in the long term [10]. Another part of scholars selected green credit, green securities, green investment, and carbon finance to construct GF development indicators system to study the impact on economic development, but got the opposite result, GF will have a positive impact on China's overall economic development [11]. Green bonds are mainly used for financing environment-friendly projects, but their development mainly exists in some developed countries and emerging economies [12]. As a representative of emerging economies, China's green bond issuance scale is significantly larger than that of other countries, which has a good space for development [13]. It is to maintain this healthy growth space that the Chinese government has required all companies to assume environmental responsibilities [14]. Because of the existence of profit-driven capital, there will be a conflict between the economic interests of enterprises and environmental protection, so the Chinese government adopts the principle of combining voluntary and legislative restrictions [15]. If companies fulfill their environmental responsibility while focusing on R&D, it will have a positive impact on their financial performance [16], showing that fulfilling corporate environmental responsibility has a dual role of improving business performance and protecting the ecology. At present, the relevant research on HQED mainly focuses on the ecological environment, governance quality, digital economy, technological innovation, green innovation, industrial structure, and environmental regulation on the impact of HQED [17–21]. However, this article is more than previous studies that explore the relationship between GF and HQED rather than just discussing the impact on the variables. Next, the article will draw some new conclusions, namely, the coupling and coordination relationship between these two aspects, the spatial association relationship between regions, and the network stability. These findings not only have important practical implications for the layout of both but also enrich the literature on coupled coordination and spatial association studies between GF and HQED.

In order to obtain the above research conclusions, the overall research framework of the article is conceived as shown in Figure 1: first, to put forward relevant hypotheses based on previous studies; second, to construct a GF and HQED index system and measure relevant indices; third, to measure the CCD of GF and HQED in each province; fourth, to study the spatial and temporal research of coupling coordination degree in each province; fifth, to construct a spatial correlation network of GF and HQED, and finally, to test the robustness of the correlation network.

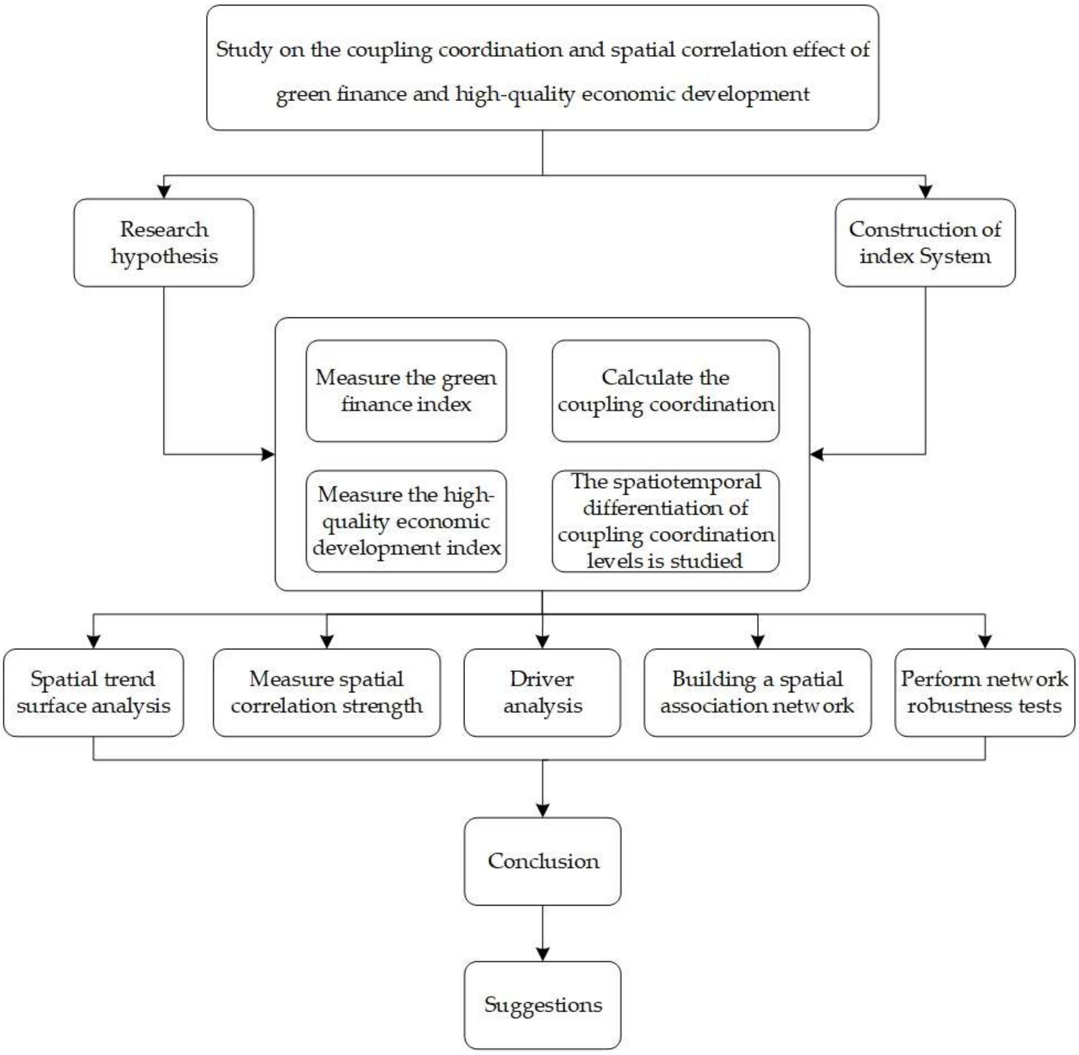

Figure 1. Research framework.

2. Literature Review and Research Hypothesis

Due to the late start of GF in China, there are few studies on the coupling relationship between GF and other economic factors, the existing studies were mainly concentrating on the coupling coordination between GF and green technological innovation, industrial structure, and green economy. Just as Liu et al. hold that the development of a green economy is the basis of the development of GF. However, the relationship between the two is complex, and the coupling coordination degree shows an upward trend, while there are regional differences [22]. Yin and Xu found that the CCD between GF and economic growth in China is not high. GF not only lags behind in economic growth, but also has an insignificant supporting role through analysis [23]. Gan and Bufound that the coupling coordination level of GF and ecological environment in the Yangtze River Basin developed from uncoordinated stage to well-coordinated stage [24]. Dong et al. believe that there is a coupling and coordination relationship between GF and green urbanization, but GF lags behind the development of green urbanization [25]. Soundarrajan and Vivek found that GF development in India can not only protect the ecology but also achieve low-carbon green economic growth, indicating that there is a relationship between GF and HQED [26]. Based on existing relevant studies this paper puts forward Hypothesis 1.

Hypothesis 1. *There is a coupling and coordination relationship between GF and HQED.*

The economic development environment and ecological environment of each province in China are significantly different. Is there existing spatial heterogeneity in the coupling coordination degree between GF and HQED in different regions? Many scholars have conducted regional heterogeneity analysis on similar objects. For example, Shi et al. found the coupling coordination between the economic development and ecological environment of tropical and sub-tropical areas in China, and the high-value areas concentrated in the east and the low-value areas concentrated in the central and western regions [27]. Geng and Tan believe that the spatial distribution of the financial system and atmospheric environment is similar, the development of coupling coordination degree in different regions is different, and the spatial distribution is high in the east and low in the west [28]. The study of Cheng et al. found that the coupling coordination degree of regional green competitiveness system formed a high-value agglomeration area centered on Shanghai and then expanded southward and a low-value agglomeration area centered on Qinghai and expanded eastward respectively, and the two agglomeration areas had different dynamic trends [29]. Wei and Yang studied the coupling coordination degree between GF and industrial institutions in northwest China and found that the overall coupling coordination degree was low and there were significant differences among provinces. Xinjiang and Gansu were at the forefront of coupling coordination [30]. Based on the above analysis, this paper puts forward Hypothesis 2.

Hypothesis 2. *The coupling coordination degree between GF and HQED has regional heterogeneity*.

From the perspective of economic development, the eastern region of China has always been at the forefront, and the level of economic development shows a declining trend from east to west. Although the gap has narrowed in recent years, it still maintains this trend. Therefore, does the spatial correlation intensity between GF and HQED decline from east to west? Does it change over time? In order to prove the existence of such an attenuation trend, some scholars select some research objects to analyze it. Such as Li et al. studied the current situation of haze emission control in China, it is found that inter-provincial haze emission presents a "center-edge" spatial network structure, with the Beijing-Tianjin-Hebei region and Yangtze River Delta as the network center area [31]. Sun and Hou found that Zhoushan and other cities in the Yangtze River Delta have a high centrality of tourism ecological efficiency network, which occupies the core position of the network [32]. In addition, Xu et al. analyzed the spatial network pattern of urban function and regional innovation in the Yangtze River Economic Belt, showing that the urban agglomeration of the Yangtze River Delta led to the development of the middle and upper reaches, and gradually spread to the other areas [33]. Based on the above analysis, this paper puts forward Hypothesis 3.

Hypothesis 3. *The spatial correlation strength of GF and the economic high-quality system shows a trend of regional attenuation.*

Since the spatial correlation strength of GF and high-quality economic system has a trend of regional attenuation, is the spatial correlation network robust? Can it resist the impact of other relevant factors? The study of spatial network robustness is of great significance for GF and high-quality economic systems. Acemoglu, et al. study found that when the impact on financial institutions is relatively small, the closely connected financial network will have stronger financial stability. When a certain degree value is breached, the more closely connected financial network will spread risks more easily. This makes the network more vulnerable [34]. König et al. studied the network stability and efficiency by constructing the R&D network and found that the high-efficiency network has stability for the small-scale industry, while the large-scale industry has the opposite [35]. Thomas found that the network topology of the financial market would be affected by the financial environment and the network stability would be reduced when the financial market fluctuated [36]. Bian et al. established an investment network and derivative model for simulation analysis and found that different attack strategies have different robustness characteristics [37]. Based on the above analysis, this paper puts forward Hypothesis 4.

Hypothesis 4. *There are differences in the robustness of the spatial association network between GF and HQED systems under different circumstances.*

3. Research Methodology

3.1. The Construction of Index System

GF is a new financial model combining economic development with environmental protection [5]. It refers to financial services that invest and finance green industries in response to environmental problems. This article uses the GF index to measure the level of GF development in China, and a larger index indicates a higher level of GF development.

HQED refers to maintaining long-term, sustainable and healthy economic development and obtaining the core competitiveness of sustainable growth mainly by relying on technological innovation and quality improvement [38]. It is a development model from high pollution and high energy consumption extensive to green, sustainable, and efficient intensive development mode [39]. This development model emphasizes the unity of quality and quantity and has more distinctive characteristics of The Times [40]. The HQED index is used to measure the level of high or low, and the larger the index indicates a higher level of HQED.

The article's approach to constructing the index system of GF and HQED is based on Liu et al. [41], which express green credit in GF as the percentage of interest expenditure in six high-energy-consuming industries, and green investment as the percentage of government expenditure on environmental protection and the percentage of investment in environmental protection projects. The proportion of investment in environmental governance is mainly used to evaluate the investment in environmental governance in the process of social and economic development. As for green insurance, because environmental liability insurance has only been implemented in China since 2013, considering data availability and agricultural insurance is the insurance most closely related to natural environment protection, agricultural insurance was used for characterization [42]. As for carbon finance, previous studies have mostly used the proportion of CDM project transactions for positive characterization [41]. The article considers that carbon finance is mainly a financial trading activity with carbon emissions as the underlying, and its purpose is to reduce carbon emissions in the process of economic development, so it draws on Sun and Wang to characterize carbon finance in terms of carbon emissions intensity [43]. The input-output methods and indicator system construction methods were used to measure the level of HQED [44–46], Hua and Hu, Ou et al. constructed an HQED index system based on "Five development concepts" [47,48]. Data of all indicators come from China Industrial Statistical Yearbook, China Insurance Yearbook, China Environmental Statistical Yearbook, China Statistical Yearbook, provincial statistical yearbook, and EPS data platform. As China Industrial Statistical Yearbook has not released the data for 2018 and 2019, and the statistical yearbook of some provinces has not counted the wastewater discharge in 2018 and 2019, the data utilized in this paper is up to 2017. Specific indicators are shown in Table 1.

Table 1. Green Finance and a high-quality economic development index system.

First-Level Index	Second-Level Index	Third-Level Index	Calculation Method	Index Attribute	Reference
Green finance (GF)	Green credit	Interest expense of energy-consuming industries (GC)	Interest expense of six energy-consuming industries/interest expense of industrial industries	negative	[41]
	Green investment	Proportion of investment in environmental governance (GI1)	Environmental management investment/GDP	positive	
		Proportion of government spending on environmental protection (GI2)	Fiscal expenditure on environmental protection/general budgetary expenditure	positive	[41]
		Proportion of investment in environmental projects (GI3)	Investment in environmental protection projects/GDP	positive	[41]
	Green insurance	Proportion of agricultural insurance (GI4)	Agricultural insurance income/total agricultural output value	positive	[42]
	Carbon finance	Carbon intensity (CF)	Total carbon dioxide emissions per GDP	negative	[43]
Economic High-quality development (HQED)	Innovation	Human input (I1)	Number of R&D researchers	positive	[47]
		Financial investment (I2)	R&D expenditure	positive	[47]
		Number of patents granted (I3)	Ownership of regional invention patents	positive	[47]
		Proportion of technology market turnover (I4)	Technology market turnover/GDP	positive	[47]
	Coordinate	Regional coordination (C1)	Regional GDP/national GDP	positive	[48]
		Rationalization of industrial structure (C2)	1/Industrial structure rationalization Theil index	positive	[49]
		Advanced industrial structure (C3)	Tertiary industry GDP/secondary industry GDP	positive	[47]
		Urban-rural income gap (C4)	Thiel index of the urban-rural income gap	negative	[50]
	Green	Afforestation coverage rate of built-up area (G1)		positive	[48]
		Wastewater discharge per unit output value (G2)	Total wastewater discharge/GDP	negative	[48]
		Exhaust emissions per unit output value (G3)	Sulfur dioxide emissions per GDP	negative	[48]
		Solid waste emission per unit of output value (G4)	Solid waste production/GDP	negative	[47]
	Open	Openness to foreign trade (O1)	Total import and export trade/GDP	positive	[48]
		Openness to foreign investment (O2)	FDI/GDP	positive	[47]
	Shared	Per capita expenditure on education (S1)	Education expenditure/year-end total population	positive	[48]
		Per capita expenditure on health care (S2)	Health expenditure/year-end total population	positive	
		Per capita social security expenditure (S3)	Social security subsidy expenditure/year-end total population	positive	[47]
		Grade road density (S4)	Grade road mileage/total area	positive	

The total carbon dioxide emissions are calculated from the consumption of eight fossil energy sources, including raw coal, crude oil, and coke. The Theil index of rationalization of industrial institutions refers to the research method of Gan [49], selects the employment number and GDP of the three major industries, and takes the reciprocal of them as the positive representation variable. The Theil Index of the urban-rural income gap refers to the research methods of Wang and Ouyang [50] and selects the disposable income of rural households, disposable income of urban households, total population, and urbanization rate as the negative representation variables. Per capita expenditure on health care measures whether people get effective medical and health protection, and grade road density measures whether transportation is shared with people. A larger value means that it is more convenient for residents to travel in a region.

3.2. Entropy Method

With the construction of the index system, the comprehensive index of GF and HQED is calculated. In order to eliminate the dimensional difference of each index, the range method is used to standardize the original data. In this article, for the sake of completeness of observations and meaningful logarithmic taking, the following standardization formula is used based on the standardization treatment of He et al. and Zhang et al. [51,52].

$$X_{ij}{}^{*} = \begin{cases} \frac{(X_{ij}-minX_{ij})}{(maxX_{ij}-minX_{ij})} + 0.0001, \textit{Positive indicators} \\ \frac{(maxX_{ij}-X_{ij})}{(maxX_{ij}-minX_{ij})} + 0.0001, \textit{Negative indicators}, \end{cases} \tag{1}$$

X_{ij} represents the original data of the ith index in place j, $maxX_{ij}$ and $minX_{ij}$ represent the maximum and minimum value of the ith index in place j respectively, and $X_{ij}{}^{*}$ represents the normalized data.

After standardizing the original data, the proportion of indicators in each region is determined, and the calculation method is as follows:

$$Q_{ij} = \frac{X_{ij}}{\sum_{j=1}^{m} X_{ij}}, \tag{2}$$

here, P_{ij} represents the proportion of index i in j to the sum of regional indexes in the current year, and then calculates the entropy, redundancy, and weight of index i. The calculation method is as follows:

$$e_i = (-k) \times \sum_{j=1}^{m} Q_{ij} \times ln(Q_{ij}), \tag{3}$$

where $k = \frac{1}{ln(m)}$, m is the sample size.

Then the information entropy redundancy is calculated as follows:

$$r_i = 1 - e_i, \tag{4}$$

with r_i represents information entropy redundancy, and then the weight of each indicator is calculated as follows:

$$w_i = \frac{r_i}{\sum_{i=1}^{n} r_i}, \tag{5}$$

where w_i represents the weight of index i. Finally, the score of the comprehensive index of high-quality GF and economy in each region can be obtained as follows:

$$Y_{ij} = \sum_{i}^{n} w_i \times X_{ij}{}^{*} \tag{6}$$

Y_{ij} represents the comprehensive index of GF and HQED.

3.3. Coupling Coordination Degree Model

This paper builds a coupling coordination degree model of GF and HQED by referring to the research methods of Tang and Hui et al. [53,54]. Therefore, the coupling degree model is firstly constructed, and its calculation method is as follows:

$$C = \sqrt[2]{Y_1 \times Y_2} / \frac{(Y_1 + Y_2)}{2}. \tag{7}$$

here C represents the coupling degree, Y_1 and Y_2 represent the comprehensive index of GF and HQED, respectively. Because the coupling degree model cannot accurately reflect the development environment of the system, it is easy to appear that the coordination degree and the coupling degree develop in opposite directions. Therefore, the coupling coordination degree model is introduced, and its calculation method is as follows:

$$D = \sqrt{C \times T}. \tag{8}$$

D represents the coupling coordination degree (CCD) value, C stands for the coupling degree, T represents coordination degree value, $T = \alpha Y_1 + \beta Y_2$. α and β denote the weight ratios of the two systems respectively. Considering that GF and HQED have the same influence, $\alpha = 0.5$ and $\beta = 0.5$ are selected.

3.4. Spatial Trend Surface Analysis

In order to explore the spatial distribution of the coupled and coordinated development of GF and high-quality economic development, this paper used the spatial trend surface analysis method to analyze the overall spatial differentiation trend by referring to the research results of Oliveira [55]. The spatial trend surface analysis function is as follows:

$$D_i(x_i, y_i) = S_i(x_i, y_i) + \varepsilon_i, \tag{9}$$

$$S_i(x_i, y_i) = \alpha_0 + \alpha_1 x + \alpha_2 y + \alpha_3 x^2 + \alpha_4 y^2 + \alpha_5 xy. \tag{10}$$

here $D_i(x_i, y_i)$ is the coupling coordination degree of province i, (x_i, y_i) is the coordinate of plane space, $S_i(x_i, y_i)$ is the trend function, ε_i is the interference term, α_0 is the constant term, α_1–α_5 is the correlation coefficient.

3.5. Geographic Detector

Coupling coordination degree is a comprehensive measure of GF and HQED, and indicators at all levels are also of great significance to the driving analysis of coupling coordination degree between GF and HQED. Therefore, this paper refers to the research results of Wang et al. [56]. Factor detection in a geographical detector is used to analyze the driving effect of three indicators on the coupling coordination degree of GF and HQED. The calculation method is as follows:

$$q = 1 - \frac{1}{N\sigma^2} \sum_{h=1}^{L} N_h {\sigma_h}^2 \tag{11}$$

where q represents the explanatory power of three-level indicators, $h = 1 \ldots L$ represents the classification of coupling coordination degree and index, N and N_h represent all samples and classified sample size, σ^2 and ${\sigma_h}^2$ represent the variance of all samples and classified samples, respectively.

3.6. Spatial Association Network Model

By referring to the research methods of Bai et al. [57], Su and Yu [58], and Song et al. [59], the Gravity model is used to measure the spatial correlation strength of GF and high-quality economic system among provinces, and then the spatial correlation network is constructed, to explore the connection between GF and HQED in various provinces from the spatial perspective. The calculation method is as follows:

$$GFHQED_{mn} = K_{mn} \times (\sqrt[3]{GF_m \times HQED_m \times P_m} \times \sqrt[3]{GF_n \times HQED_n \times P_n})/(d_{mn})^2, \tag{12}$$

$$K_{mn} = \frac{D_m}{D_m + D_n}. \tag{13}$$

here, $GFHQED_{mn}$ represents the spatial correlation strength of GF in the m region and n region on $HQED$, K_{mn} is the correction coefficient. GF, $HQED$, and P represent the GF index, HQED index, and the total population at the end of the year, respectively. d_{mn} is the geographical distance between the m region and n region, calculated by the longitude and latitude of each provincial capital city.

3.7. Spatial Network Robustness

Djauhari and Gan proposed that specific risks or events would have serious impacts on the financial network, so we should pay more attention to the vulnerable and important nodes in the network and establish risk response strategies for them [60]. GF and high-quality economic systems are affected by many related factors, such as the outbreak of the financial crisis, regional GF policy changes, and domestic and foreign economic fluctuations that will lead to changes in network stability. Therefore, this paper refers to the research methods of Ding et al. and Ding et al. [61,62], and according to the definition of complex network, the network robustness is defined as follows:

$$R(e) = \sum DV_e / \sum DV_{e,0} \quad (14)$$

here $R(e)$ represents the network robustness, $R(e)$ is between 0 and 1, $\sum DV_e$ represents the initial total network degree, $\sum DV_{e,0}$ represents the total network degree after disturbance, it is used to measure the ability of continuous and stable operation of spatial association network disturbed by related factors.

4. Empirical Analysis

4.1. Comprehensive Index Measurement of GF and HQED

In order to obtain the comprehensive index of GF and HQED, the entropy method is used to calculate the data from 2007 to 2017, where the weight of each indicator and the comprehensive index are shown in Tables 1 and 2, respectively.

Table 2. Indicator weights at each level.

Second-Level Index	Weighting	Third-Level Index	Weighting
Green Credit	7.28%	GC	7.28%
Green Investment	51.64%	GI1 GI2 GI3	24.10% 9.69% 17.85%
Green Insurance	38.65%	GI4	38.65%
Carbon Finance	2.43%	CF	2.43%
Innovation	54.72%	I1 I2 I3 I4	13.96% 15.13% 11.21% 14.42%
Coordination	14.18%	C1 C2 C3 C4	4.25% 3.82% 5.21% 0.90%
Green	1.30%	G1 G2 G3 G4	0.71% 0.19% 0.19% 0.21%
Open	16.73%	O1 O2	7.92% 8.81%

As can be seen from Table 2, among the GF subsystem, green investment and green insurance account for 51.64% and 38.65%, respectively, indicating that green investment and green insurance have the greatest impact on GF. Wang et al. found that new energy, green transportation, and new energy vehicles in green credit had a great impact on the GF composite index because he only chose green credit as a representation when constructing the indicator system of GF [63]. In the green investment, the percentage of environmental governance investment (GI1) is 24.1%, which has the greatest impact on green investment. Innovation accounts for more than 50% of the subsystem of HQED, indicating that innovation has an extremely important impact on HQED. The four third-level indexes of innovation account for relatively small differences in weight, among which financial investment (I2) and the share of technology market turnover (I4) occupy the top two places, indicating that the current stage of innovation enhancement focuses on financial investment and financial support for it. The other impact indicators on HQED are openness, coordination, and sharing, which account for 16.73%, 14.18%, and 13.09%, respectively. However, the impact of green on the HQED during the study period is relatively small, accounting for only 1.30%.

As can be seen from Table 3, the GF index showed an upward trend from 2007 to 2017. In terms of regions, Chongqing, Sichuan, Shaanxi, and other western provinces have higher GF indexes. The development of GF varies greatly in the eastern region. Shanghai and Beijing play the leading role, and the GF development speed is at the forefront of the country. While Tianjin, Jiangsu, and Guangdong have a lower level of GF development. The overall development level of GF in the central area of China is relatively high, and the development speed is also quite fast.

Table 3. GF and HQED Index in 2007, 2010, 2013, and 2017.

Province	GF Index				HQED Index			
	2007	**2010**	**2013**	**2017**	**2007**	**2010**	**2013**	**2017**
Beijing	0.174	0.285	0.370	0.582	0.311	0.344	0.434	0.483
Tianjin	0.152	0.145	0.200	0.305	0.145	0.145	0.181	0.224
Hebei	0.148	0.158	0.210	0.275	0.062	0.078	0.092	0.123
Shanxi	0.296	0.250	0.287	0.296	0.048	0.059	0.080	0.104
Inner Mongolia	0.252	0.288	0.386	0.355	0.038	0.055	0.074	0.103
Liaoning	0.126	0.127	0.176	0.193	0.100	0.106	0.127	0.162
Jilin	0.244	0.244	0.224	0.272	0.053	0.060	0.076	0.102
Heilongjiang	0.159	0.228	0.254	0.227	0.052	0.067	0.096	0.124
Shanghai	0.210	0.220	0.356	0.520	0.250	0.273	0.300	0.366
Jiangsu	0.166	0.163	0.208	0.184	0.180	0.260	0.329	0.383
Zhejiang	0.166	0.193	0.206	0.186	0.143	0.187	0.246	0.314
Anhui	0.163	0.189	0.277	0.255	0.061	0.076	0.110	0.154
Fujian	0.129	0.143	0.183	0.148	0.097	0.113	0.143	0.183
Jiangxi	0.122	0.146	0.168	0.185	0.053	0.069	0.091	0.130
Shandong	0.158	0.157	0.193	0.211	0.117	0.144	0.195	0.237
Henan	0.170	0.120	0.159	0.204	0.062	0.077	0.106	0.149
Hubei	0.127	0.172	0.151	0.146	0.069	0.086	0.129	0.182
Hunan	0.160	0.169	0.177	0.208	0.056	0.074	0.096	0.140
Guangdong	0.113	0.160	0.182	0.175	0.268	0.353	0.451	0.610
Guangxi	0.143	0.150	0.146	0.131	0.037	0.049	0.066	0.099
Hainan	0.116	0.140	0.183	0.163	0.137	0.091	0.114	0.149
Chongqing	0.213	0.178	0.178	0.176	0.056	0.078	0.122	0.154
Sichuan	0.205	0.157	0.204	0.173	0.064	0.085	0.117	0.171
Guizhou	0.139	0.128	0.148	0.175	0.026	0.044	0.068	0.107
Yunnan	0.144	0.170	0.237	0.138	0.035	0.050	0.071	0.099
Shaanxi	0.203	0.203	0.197	0.172	0.055	0.080	0.128	0.169
Gansu	0.262	0.190	0.254	0.177	0.033	0.049	0.073	0.107
Qinghai	0.201	0.163	0.243	0.302	0.036	0.069	0.084	0.133
Ningxia	0.272	0.230	0.378	0.339	0.035	0.046	0.067	0.108
Xinjiang	0.212	0.219	0.318	0.279	0.040	0.051	0.071	0.092

Overall, the HQED index shows a rising trend. Including Beijing, Tianjin, Shandong, Shanghai, Jiangsu, and Zhejiang, their HQED level is higher and on the top. However, the HQED of western provinces is in the lower level of the whole country, and the development speed of HQED is relatively slow. Combining these two indexes, it can be seen that GF and HQED in Beijing and Shanghai are relatively synchronized and have the expected trend of coordinated development.

4.2. The Measurement of the Coupling Coordination Degree between GF and HQED

Through the preliminary analysis of the GF and HQED indexes, it is concluded whether GF and HQED in some provinces are coupled and coordinated. In order to further accurately obtain the CCD value of these two subjects, the coupling coordination degree model is further applied, and the results are shown in Table 4.

Table 4. CCD of GF and HQED from 2007 to 2017.

	Province	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Eastern region	Beijing	0.796	0.888	0.952	0.989	0.935	0.986	0.975	0.930	0.941	0.967	0.940
	Tianjin	0.610	0.575	0.586	0.551	0.572	0.516	0.578	0.577	0.569	0.588	0.619
	Hebei	0.491	0.520	0.525	0.497	0.500	0.453	0.484	0.492	0.489	0.464	0.495
	Shanghai	0.827	0.815	0.850	0.836	0.924	0.881	0.870	0.887	0.897	0.910	0.843
	Jiangsu	0.679	0.692	0.714	0.702	0.699	0.703	0.698	0.630	0.663	0.645	0.594
	Zhejiang	0.642	0.746	0.634	0.709	0.601	0.644	0.642	0.626	0.615	0.640	0.565
	Fujian	0.491	0.501	0.535	0.509	0.502	0.508	0.509	0.429	0.464	0.468	0.430
	Shandong	0.594	0.626	0.592	0.585	0.560	0.590	0.577	0.550	0.535	0.584	0.550
	Guangdong	0.542	0.598	0.551	0.751	0.693	0.673	0.696	0.629	0.624	0.650	0.658
	Hainan	0.478	0.448	0.523	0.472	0.518	0.523	0.475	0.478	0.388	0.418	0.426
Central region	Shanxi	0.641	0.621	0.614	0.582	0.502	0.506	0.537	0.465	0.456	0.555	0.477
	Anhui	0.519	0.543	0.562	0.550	0.531	0.551	0.588	0.503	0.503	0.545	0.518
	Jiangxi	0.406	0.409	0.433	0.451	0.450	0.414	0.412	0.386	0.408	0.455	0.432
	Henan	0.535	0.489	0.479	0.374	0.415	0.374	0.413	0.393	0.416	0.488	0.471
	Hubei	0.446	0.492	0.581	0.540	0.461	0.438	0.416	0.402	0.406	0.463	0.426
	Hunan	0.506	0.518	0.552	0.510	0.453	0.464	0.437	0.419	0.513	0.451	0.465
Western region	Inner Mongolia	0.574	0.576	0.618	0.602	0.559	0.558	0.586	0.553	0.510	0.517	0.507
	Guangxi	0.427	0.433	0.435	0.415	0.328	0.333	0.316	0.319	0.373	0.336	0.326
	Chongqing	0.584	0.553	0.538	0.535	0.495	0.500	0.475	0.441	0.440	0.453	0.446
	Sichuan	0.590	0.543	0.552	0.506	0.498	0.511	0.514	0.479	0.455	0.465	0.457
	Guizhou	0.389	0.422	0.407	0.345	0.366	0.316	0.325	0.389	0.327	0.320	0.392
	Yunnan	0.424	0.448	0.485	0.457	0.455	0.458	0.472	0.394	0.375	0.373	0.337
	Shaanxi	0.567	0.514	0.577	0.578	0.504	0.483	0.518	0.477	0.478	0.498	0.453
	Gansu	0.566	0.488	0.499	0.484	0.430	0.485	0.493	0.434	0.374	0.424	0.395
	Qinghai	0.513	0.502	0.538	0.490	0.524	0.483	0.506	0.481	0.518	0.587	0.525
	Ningxia	0.579	0.593	0.569	0.519	0.528	0.539	0.561	0.572	0.507	0.558	0.507
	Xinjiang	0.539	0.563	0.604	0.524	0.467	0.494	0.536	0.538	0.475	0.489	0.446
Northeastern region	Liaoning	0.484	0.500	0.563	0.443	0.472	0.580	0.477	0.458	0.470	0.470	0.471
	Jilin	0.611	0.558	0.553	0.579	0.510	0.501	0.469	0.428	0.405	0.449	0.460
	Heilongjiang	0.494	0.555	0.559	0.582	0.537	0.521	0.542	0.470	0.472	0.482	0.462

As can be seen from Table 4, generally, the CCD value between GF and HQED shows a significant "inverse U" relation. From the perspective of the four regions of eastern, central, western, and northeastern, the CCD value of provinces in the eastern region has the highest value, followed by the central region, and then the western region is better than the northeastern region. Among the eastern regions, Beijing and Shanghai have the highest CCD value, showings that the coupling and coordination between GF and HQED in these two areas are the best, and the effect of system interaction and interaction is the best. It can be seen that the GF promotes HQED, at the same time HQED drives the development of GF, they promote each other and realize the optimization of the two systems. The CCD value of the central region, western region, and northeastern region decreased slightly in 2017 compared with 2007, which may be because the HQED level of these three regions lags behind the development of GF, owing to the acceptance of industrial transfer from the eastern region, so their CCD value decreased. Among the four regions, Guizhou province has the lowest CCD value, which may be attributable to its lagging level of economic development. Although the economic development speed of Guizhou province is at the forefront of the country, the overall quality and quantity of economic development are relatively lower, so its HQED seriously lags behind the development of GF.

4.3. Analysis of Coupling Coordination Results between GF and HQED

Through the above measurement of the coupling coordination level of GF and HQED in 30 provinces, it is found that there are significant differences in the coupling coordination level of the two systems in each region. To judge the coupling coordination level of each region, the article therefore based on Li et al. for subsequent analysis of the degree of coupling and coordination into 10 levels [64] is shown in Table 5.

Table 5. Classification standard of coupling coordination degree.

D Value Interval of Coupling Coordination Degree	Coordination Level	Coupling Coordination Stage
(0.0~0.1)	1	Extreme imbalance
[0.1~0.2)	2	Serious imbalance
[0.2~0.3)	3	Moderate disorder
[0.3~0.4)	4	Mild disorder
[0.4~0.5)	5	Nearly disorder
[0.5~0.6)	6	Barely coordination
[0.6~0.7)	7	Primary coordination
[0.7~0.8)	8	Intermediate coordinate
[0.8~0.9)	9	Good coordination
[0.9~1.0)	10	Well coordination

In order to intuitively analyze the evolution of the coupling coordination level of each region, the CCD values of 2007, 2010, 2013, and 2017 of 30 provinces will be selected, and the spatial evolution map will be drawn by ArcGIS 10.7, as shown in Figure 2.

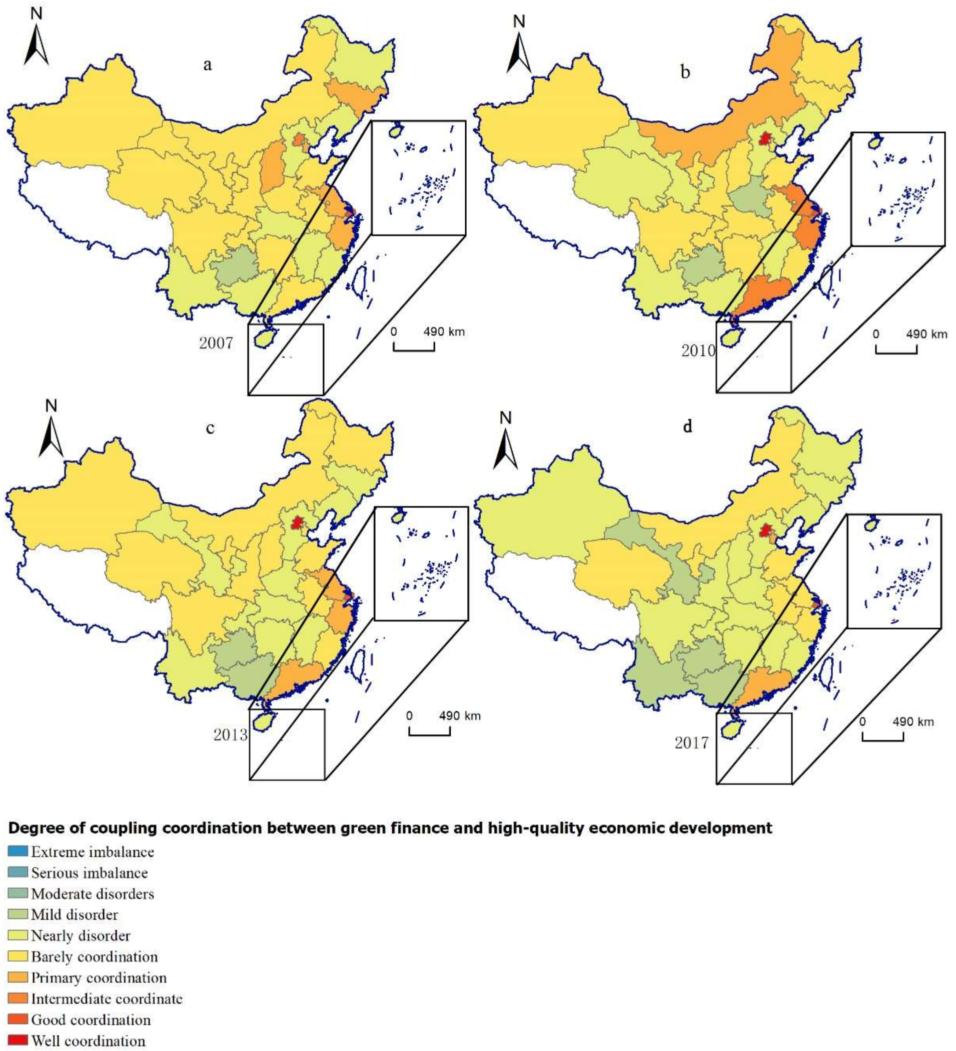

Figure 2. Space-time evolution of coupling coordination degree between GF and HQED, (**a**) represents the spatial distribution of CCD between GF and HQED in 2007, (**b**) represents the spatial distribution of CCD between GF and HQED in 2010, (**c**) represents the spatial distribution of CCD between GF and HQED in 2013, (**d**) represents the spatial distribution of CCD between GF and HQED in 2017.

As can be seen from Figure 2, from 2007 to 2017, the coupling coordination degree between GF and HQED in most provinces was at the level of Barely coordination, this is more consistent with the conclusions obtained by Liu et al. studying the coupling and coordination of GF and green economy, mainly in that the green economy can be part of the HQED [52]. The CCD values in the eastern region were higher than those in other regions. Mostly, the changing trend of the CCD values shows a significant "inverse U" relation and exists volatility in the development trend. The coupling coordination degree of Beijing is in the stage of high-quality coordination, indicating that the two systems of GF and HQED in Beijing have significant positive effects and promote and influence each other. In 2013 and 2017, the CCD values of most provinces in central and western China were in the stage of the mild disorder and barely coordination. Among them, the CCD values of GF and HQED in Guizhou were always in the stage of mild disorder, which was partly due to the lag of HQED in central and western zones. The lagging development of the central and western regions lies in the excessive pursuit of economic development speed and neglect of the quality of economic development, accepting the transfer of high energy consumption and high pollution industries from the eastern regions. During the study period, the CCD values of GF and HQED in Beijing and Shanghai have always been ahead of other areas, which is related to the economic and financial development level of Beijing and Shanghai and is gradually advancing in the direction of improving the quality of economic development.

4.4. Spatial Trend Surface Analysis of the Coupling Coordination Degree between GF and HQED

In order to explore the spatial trend change of the coupling coordination degree between GF and HQED in various provinces, ArcGIS was used to select the CCD values of four different years for spatial trend surface analysis, as shown in Figure 3:

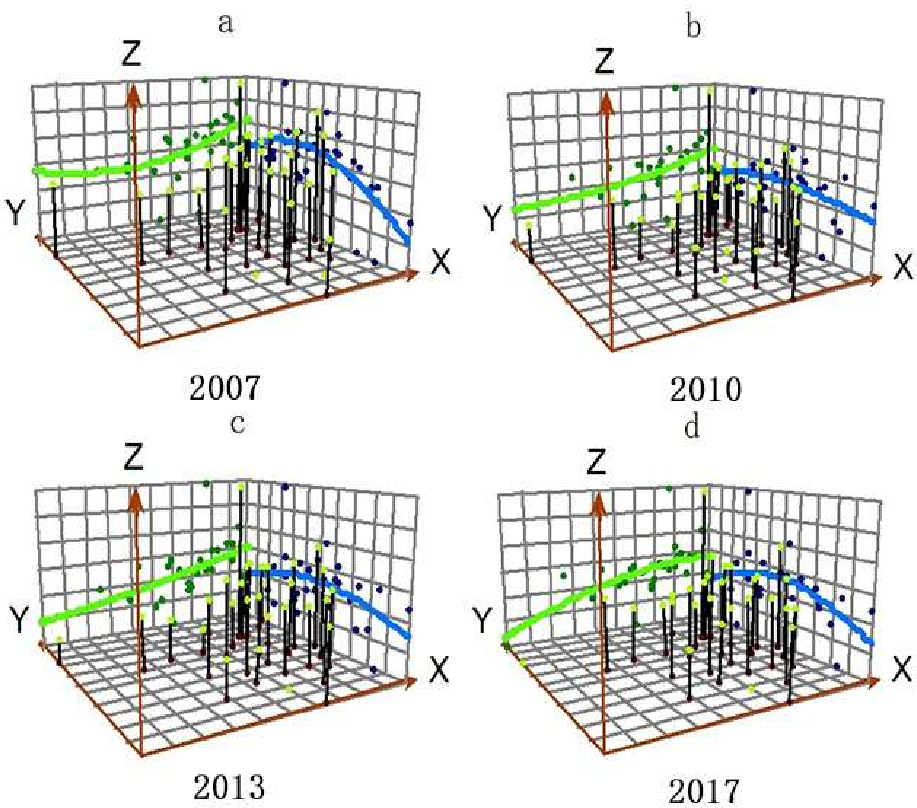

Figure 3. Trend surface analysis of coupling coordination degree, (**a**) represents the spatial trend surface of the CCD between GF and HQED in 2007, (**b**) represents the spatial trend surface of the CCD between GF and HQED in 2010, (**c**) represents the spatial trend surface of the CCD between GF and HQED in 2013, (**d**) represents the spatial trend surface of the CCD between GF and HQED in 2017. The

X-axis and Y-axis represent due east and due north, respectively, and the Z-axis represents the degree of coupling and coordination between China's green finance and high-quality economic development. the green and blue lines represent the spatial trend change of the degree of coupling and coordination between green finance and high-quality economic development. The green line represents the east-west trend, and the blue line represents the north-south trend.

As can be seen from Figure 3, from 2007 to 2017, the CCD of GF and HQED presented an overall spatial trend of "high in the east and low in the west". From east to west, the "U-shaped" structure was high in the east and low in the west from 2007 to 2013, but with continuous development, the "U-shaped" radian became smaller. Until 2017, the spatial structure showed an inverted "U-shaped" structure, indicating that the coupling coordination degree between GF and HQED in central China was higher than that in western China, and its coupling coordination degree improved faster than that in eastern China. During this period, relying on its own advantages in financial development and industry, the eastern region has led the country in the coupling coordination between GF and HQED, and has formed a good systematic interactive connection. From north to south, the spatial trend of coupling coordination degree between GF and HQED presents an inverted "U-shaped" shape, the CCD values between the north and south are low, while the CCD values in the middle of the north-south direction are always high.

4.5. Driving Factors Analysis of Coupling Coordination Degree between GF and HQED

By analyzing the driving factors of GF and HQED, the paper selects the top five explanatory factors in 2007, 2010, 2013, and 2017 for analysis, as shown in Table 6:

Table 6. Detection results of coupling coordination factor between GF and HQED.

2007		2010		2013		2017	
Detectability Factor	**q-Value**	**Detectability Factor**	**q-Value**	**Detectability Factor**	**q-Value**	**Detectability Factor**	**q-Value**
C4	0.386 ***	C1	0.572 ***	GC	0.702 ***	GC	0.737 ***
GC	0.385 ***	G4	0.560 ***	G1	0.643 ***	S3	0.586 ***
G4	0.382 ***	G3	0.458 ***	C1	0.514 ***	S1	0.539 ***
S4	0.379 **	G1	0.427 ***	G2	0.489 ***	S4	0.524 ***
GI2	0.374 ***	C2	0.394 ***	G3	0.487 ***	G1	0.448 ***

Note: "***" and "**" mean passing the significance level test of 1%, 5%, and 10% respectively.

In 2007, the explanatory power of the three-level indicators to the spatial differentiation of the coupling coordination degree between GF and HQED was all less than 50%, indicating that the contribution gap between the three-level indicators to the coupling coordination degree was small. Regional coordination (C1) and 2010 (G4) solid waste emissions per unit of output of high-quality GF and economic growth in the CCD of spatial differentiation explanatory power for more than 50%, of which green development has three tertiary indexes that are the explanatory power of the top five, which suggests that the current focus is on green development gradually, with green as the leading green financial and HQED. In 2013, the interest expense (GC) of energy-intensive industries accounted for 70% of the coupling coordination degree. Meanwhile, three third-level indicators of green development were selected, indicating that China still pays attention to green and sustainable development at this time. In 2017, green credit still ranked first in the explanatory power of coupling coordination degree, but at this time, three three-level indicators in the sharing subsystem were selected, indicating that at the present stage, China has implemented the sharing of development achievements with the people and played an important role in promoting high-quality coupling coordination and sharing of GF and economy. Overall, green credit, green, coordination, and sharing have more explanatory power to the spatial differentiation of CCD, and the driving effect also changes partly over time, and the driving effect is more significant on the whole. The explanatory power of the innovation system on the spatial differentiation of coupling coordination does not reach the top five, indicating that the contribution of innovation to coupling coordination is still insufficient, and innovation investment should be increased to take innovation as the first driving force of HQED.

4.6. Spatial Correlation Analysis of GF and HQED System

This study selects relevant data from 2007 to 2017, uses Python and ArcGIS, applied the modified gravity model of Equations (9) and (10) to calculate the spatial association strength from 2007 to 2017, and selects the 4-year spatial association strength matrix to analyze the spatial-temporal evolution, as shown in Figure 4:

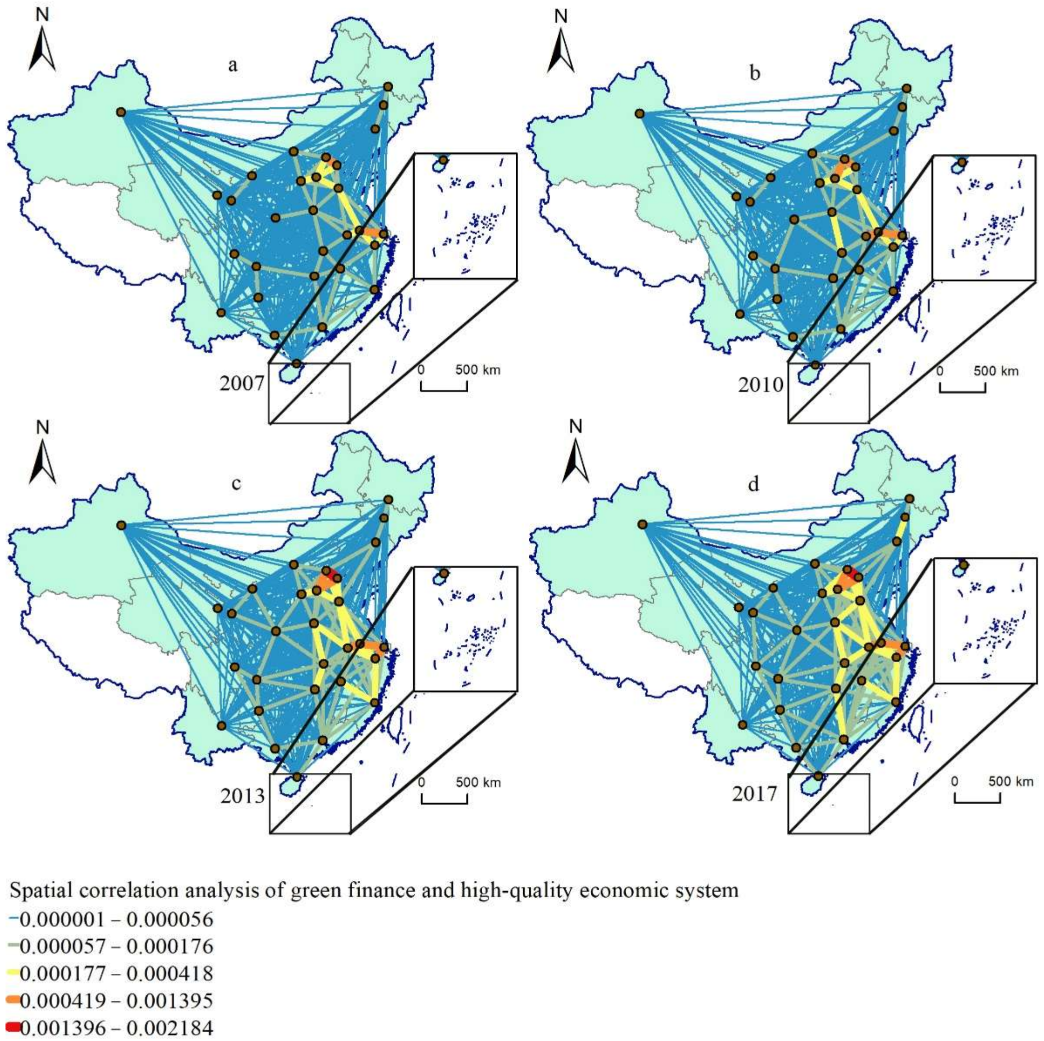

Figure 4. Spatial correlation analysis of GF and high-quality economic system, (**a**) represents the spatial association network of GF and economic high-quality systems in 2007, (**b**) represents the spatial association network of GF and economic high-quality systems in 2010, (**c**) represents the spatial association network of GF and economic high-quality systems in 2013, (**d**) represents the spatial association network of GF and economic high-quality systems in 2017. The location of each point represents the geographic location of each provincial capital in China.

As can be seen from Figure 4, the spatial pattern of the network correlation with GF and HQED has changed in different periods. In the spatial pattern of 2007, the Beijing-Tianjin-Hebei region and the Yangtze River Delta area showed a bipolar attraction pattern, represented by Beijing and Shanghai, while the central and western regions showed weak spatial correlation. In the spatial pattern of 2010, the intensity of spatial correlation in some regions was significantly strengthened. Among them, Hubei and Henan, Jiangsu and Anhui, Beijing and Hebei are the most obvious cities. The spatial correlation intensity of the central and western regions also gradually strengthened, but the spatial correlation of Xinjiang, Qinghai, and Yunnan regions did not change substantially. In 2013, the spatial correlation between eastern China and central China was further enhanced, and the bipolar attraction pattern of the Beijing-Tianjin-Hebei and Yangtze River Delta area was more significant, gradually extending to the central region. Hu and Lian also found that the spatial correlation network between GF and industrial structure change also roughly shows an eastern-central core emitting shape, and both of our studies came to a similar conclusion that industrial structure change is an integral part of HQED [65]. In 2017, the spatial correlation of all regions reached the highest level in the study period, the spatial correlation intensity of eastern and central regions was meaningfully improved, and the density of the spatial correlation network was significantly improved compared with 2007. At this time, a radial network was formed in the western region with Shaanxi and Chongqing as the center, indicating that the development gradually deepened to the inland areas of China. Generally, the spatial correlation intensity showed a decreasing trend from east to central to west, and the spatial radiation effect also showed the same trend.

4.7. Test of Spatial Network Robustness of GF and HQED System

Based on the above analysis, the spatial association network pattern of GF and a high-quality economic system is obtained. But can its spatial association network withstand the impact of other related factors? Is it stable? Based on these questions, the robustness test of the spatial network of GF and high-quality economic system will be carried out, and the test results are shown in Figure 5 below.

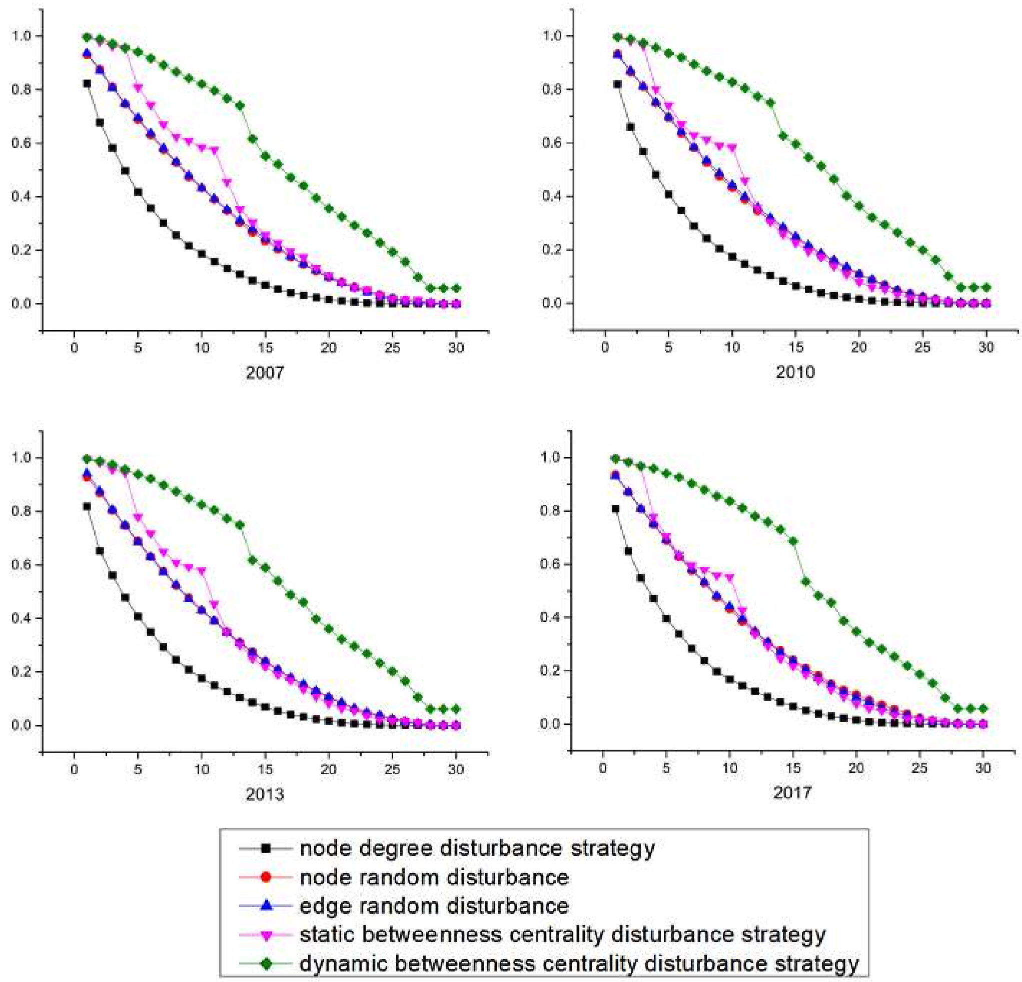

Figure 5. Analysis of network disturbance strategies at different levels.

In order to prevent the disturbance caused by related factors such as macroeconomic changes to green financial and high-quality economic system spatial network, five different strategies such as the node degree disturbance strategy, node random disturbance, edge random disturbance, static betweenness centrality disturbance strategy, and dynamic betweenness centrality disturbance strategy were proposed, and the spatial network robustness of GF and the economic high-quality system is quantitatively analyzed. Based on the above five disturbance strategies, the random disturbance strategy was repeated 100 times, and the disturbance strategies of different levels in four different years in 2007, 2010, 2013, and 2017 were selected for analysis. It can be seen from Figure 4 that in the tests of spatial network robustness of high-quality GF and economic systems in 2007, 2010, 2013, and 2017, the effect of disturbance based on node degree disturbance strategy is the most obvious. When 8% nodes are removed, the network robustness decreases to about 68%. The two random disturbance strategies are relatively stable to the network ability. When 8% nodes are removed, the network robustness decreases to about 88%. The disturbance strategy based on static betweenness centrality has larger fluctuations in green financial and high-quality economic system spatial network. In 2007, when the node removed around 16%, network robustness drops to about 97%. When the number of removed nodes is increasing, the change speed of the robustness influence is speeded up. When nodes are removed around 30%, the influence of the network robustness is growing. When 43% of nodes are removed, its effect on network robustness is roughly similar to that of the two random disturbance strategies but larger than that of the dynamic betweenness centrality disturbance strategy. In 2017, when 14–25% of nodes are removed, the effect of the two random disturbance strategies is roughly similar to the static betweenness centrality disturbance strategy, while in the rest of the years, the effects of static betweenness centrality disturbance strategy are similar to that of 2007. Based on the dynamic betweenness centrality disturbance strategy, its influence on the network is relatively stable, but when 50% of nodes are removed, the network robustness decreases to less than 60% in 2017. Through the test of the robustness of GF and economic high-quality system, it is concluded that the network robustness is most strongly affected by the node degree disturbance strategy. Dynamic betweenness centrality disturbance strategy has the least effect on the network robustness and shows strong stability, while the other three disturbance strategies have the effect between dynamic betweenness centrality disturbance and node degree disturbance. Therefore, provinces with high node degrees should be fully protected, which is of great significance for improving the robustness of GF and economic high-quality systems.

5. Conclusions and Suggestion

This study selects the relevant indexes of 30 provinces in China from 2007 to 2017, to analyze the coupling coordination and spatial correlation between GF and HQED, and the coupling coordination degree model, gravity model, and robustness test were applied. The main conclusions are as follows:

(1) During the study period from 2007 to 2017, most of China's GF index showed an upward trend, and the economic high-quality development index also showed an upward trend in general, with great differences in regional development. Green insurance has a great impact on the GF composite index, and innovation driving factors play a huge role in the process of HQED, among which innovation financial input and technology market transaction volume are important factors affecting the HQED.

(2) The CCD values between GF and HQED in all provinces of China is generally low, and it has volatility in terms of time, showing a fluctuant trend of rising first and then declining. From the perspective of space, it has strong regional heterogeneity and gradually attenuates from the eastern region to the western inland region. Fan et al. also presented a trend of "high in the east and low in the west" for the overall spatial pattern of CCD between socio-economic development and eco-environmental

development [66]. The CCD values of Beijing, Guangdong, and Yangtze River Delta region in the east ranks the top in China, indicating that the higher GF level in these three regions company with the higher HQED level. The level of coupling and coordination between GF and the level of HQED in the central and western regions is relatively low, it may be that the acceptance of industrial transfer in eastern China leads to the lag of HQED behind the development of GF. Given this, The State Council has explicitly designated Guizhou, Jiangxi, and Xinjiang in the central and western regions, as well as Zhejiang and Guangdong in the eastern regions, as GF reform pilot zones to guide capital to high-quality development industries to improve the quality of economic development. The decay of coupling coordination from the east to the west is roughly similar to the spatial divergence of China's overall development, to a large extent due to the concentration of more high-quality resources in the east.

(3) Among the driving factors for the spatial differentiation of high-quality coupling coordination between GF and the economy, the explanatory power of green credit, green, coordination, and sharing occupy the first place. China's green shared development plays an important role in the coupling coordination system. However, the driving effect of the innovation system is still insufficient, and it is necessary to further strengthen the driving effect of innovation on high-quality economic development.

(4) There are spatial linkage channels between GF and HQED among Chinese provinces, and the linkage is closer, there are no isolated provinces, the provinces have the spatial role of receiving and exporting in the network, and there are both direct and intermediate node links, which makes the linkage between the western peripheral provinces and the east closer. The Yangtze River Delta area and Beijing-Tianjin-Hebei region are advantageous areas for the coupling and coordinated development of GF and a high-quality economy system. Due to their strong attraction and closer spatial connection, they are developing towards the direction of "urban agglomeration" and "metropolitan circle". Overall, a cobweb structure of multi-polar development has been formed, with the Yangtze River Delta area and The Beijing-Tianjin-Hebei region as the "first rung", Henan, Hubei, and Hunan as the "second rung", and Shaanxi, Sichuan, and Chongqing as the "third rung".

(5) The robustness test of the spatial correlation network shows that there are significant differences in the robustness of the spatial network of GF and economic high-quality system in China under different disturbances. The key is to pay attention to provinces with high node degrees, which makes them less susceptible to GF policies and macroeconomic fluctuations, thus enhancing network robustness.

HQED is an important strategic goal for the development of GF. However, China is facing difficulties such as credit system laws and regulations and environmental information disclosure system that need to be improved, while green credit policy can improve the problem of "difficult financing" for green enterprises to a certain extent [67]. Therefore, GF policies should be continuously improved. In promoting the development of GF, the government and the market should play a role in promoting GF, China proposed to establish a green financial system in the "Outline of the 13th Five-Year Plan" and "Guidance on Building a Green Financial System" in 2016. Tu et al. also mentioned that Vietnam plays the role of domestic and foreign enterprises in the green bond market by improving market regulations [13]. China should also encourage qualified private capital to set up green banks and green funds to support green credit and GF lease projects [68]. The steady development of GF should be promoted through policy guidance and market regulation considering its development. Altogether, the GF and HQED of each region are coordinated, and the spatial layout is optimized, in which highly coupled and coordinated areas, such as major cities like Beijing and Shanghai, vigorously promote "green travel" and build intelligent transportation systems [69], vigorously promote green technology innovation, and reduce the end pollution treatment technology innovation. Low-coupling coordination regions should further show their regional advantages, accelerate the upgrading and transformation of industrial structures, strengthen environmental law enforcement and supervision, and pay attention to the quality of economic development, rather than blindly pursuing the speed of economic development. From the perspective of spatial association network, Sichuan, Shaanxi, and Chongqing, as a key link connecting the central and eastern regions, should give full play to their leading role, thus promoting the coupling and coordinated development of GF and economy with high quality in the whole western region and even the whole country. In addition, the protection of provinces with higher node degrees is emphasized to reduce the disturbance of domestic and foreign macroeconomic factors on network robustness.

Although China has encountered many problems in GF and HQED, its experience in this area is worthwhile for other countries and regions around the world to "take the best" and "remove the worst" to vigorously develop a green economy and achieve the goal of sustainable development.

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References

1. Derudder, B.; Cao, Z.; Liu, X.J.; Shen, W.; Dai, L.; Zhang, W.Y.; Caset, F.; Witlox, F.; Taylor, P.J. Changing connectivities of Chinese cities in the world city network, 2010–2016. *Chin. Geogr. Sci.* **2018**, *28*, 183–201. [CrossRef]
2. Taylor, P.J.; Ni, P.; Derudder, B.; Hoyler, M.; Huang, J.; Lu, F.; Pain, K.; Witlox, F.; Yang, X.; Bassens, D.; et al. Measuring the world city network: New results and developments. *GaWC Res. Bull.* **2009**, *300*. Available online: https://biblio.ugent.be/publication/2051151/file/2051156 (accessed on 29 January 2022).
3. Raźniak, P.; Csomós, G.; Dorocki, S.; Winiarczyk-Raźniak, A. Exploring the shifting geographical pattern of the global command-and-control function of cities. *Sustainability* **2021**, *13*, 12798. [CrossRef]
4. Yan, B.R.; Dong, Q.L.; Li, Q.; Amin, F.U.; Wu, J.N. A Study on the Coupling and Coordination between Logistics Industry and Economy in the Background of High-Quality Development. *Sustainability* **2021**, *13*, 10360. [CrossRef]
5. Wang, Y.; Zhi, Q. The Role of Green Finance in Environmental Protection: Two Aspects of Market Mechanism and Policies. *Energy Procedia* **2016**, *104*, 311–316. [CrossRef]
6. Gu, B.B.; Chen, F.; Zhang, K. The policy effect of green finance in promoting industrial transformation and upgrading efficiency in China: Analysis from the perspective of government regulation and public environmental demands. *Environ. Sci. Pollut. Res.* **2021**, *28*, 47474–47491. [CrossRef]
7. Yang, Y.X.; Su, X.; Yao, S.L. Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China. *Resour. Policy* **2021**, *74*, 102445. [CrossRef]
8. Ning, W.; She, J.H. An empirical study on the dynamic relationship between green finance and macroeconomic growth. *Seeker* **2014**, *8*, 62–66. (In Chinese)
9. Mengze, H.; Wei, L.; Bi, Z. Analysis of China's Green Credit Policy Towards Green Economic Growth. In Proceedings of the 2011 Asia-Pacific Power and Energy Engineering Conference, Wuhan, China, 25–28 March 2011.
10. Liu, J.Y.; Xia, Y.; Fan, Y.; Lin, S.M.; Wu, J. Assessment of a green credit policy aimed at energy-intensive industries in China based on a financial CGE model. *J. Clean. Prod.* **2017**, *163*, 293–302. [CrossRef]
11. Zhou, X.G.; Tang, X.M.; Zhang, R. Impact of green finance on economic development and environmental quality: A study based on provincial panel data from China. *Environ. Sci. Pollut. Res.* **2020**, *27*, 19915–19932. [CrossRef]

12. Banga, J. The green bond market: A potential source of climate finance for developing countries. *J. Sustain. Financ. Invest.* **2019**, *9*, 17–32. [CrossRef]
13. Tu, C.A.; Rasoulinezhad, E.; Sarker, T. Investigating solutions for the development of a green bond market: Evidence from analytic hierarchy process. *Financ. Res. Lett.* **2020**, *34*, 101457. [CrossRef]
14. Qin, Y.; Harrison, J.; Chen, L. A framework for the practice of corporate environmental responsibility in China. *J. Clean. Prod.* **2019**, *235*, 426–452. [CrossRef]
15. Tan-Mullins, M.; Mohan, G. The potential of corporate environmental responsibility of Chinese state-owned enterprises in Africa. *Environ. Dev. Sustain.* **2013**, *15*, 265–284. [CrossRef]
16. Lioui, A.; Sharma, Z. Environmental corporate social responsibility and financial performance: Disentangling direct and indirect effects. *Ecol. Econ.* **2012**, *78*, 100–111. [CrossRef]
17. Liu, K.; Qiao, Y.R.; Shi, T.; Zhou, Q. Study on coupling coordination and spatiotemporal heterogeneity between economic development and ecological environment of cities along the Yellow River Basin. *Environ. Sci. Pollut. Res.* **2021**, *28*, 6898–6912. [CrossRef] [PubMed]
18. Liu, J.D.; Tang, J.; Zhou, B.; Liang, Z.J. The effect of governance quality on economic growth: Based on China's provincial panel data. *Economies* **2018**, *6*, 56. [CrossRef]
19. Ding, C.H.; Liu, C.; Zheng, C.Y.; Li, F. Digital Economy, Technological Innovation and High-Quality Economic Development: Based on Spatial Effect and Mediation Effect. *Sustainability* **2022**, *14*, 216. [CrossRef]
20. Li, C.G.; Wan, J.; Xu, Z.C.; Lin, T. Impacts of Green Innovation, Institutional Constraints and Their Interactions on High-Quality Economic Development across China. *Sustainability* **2021**, *13*, 5277. [CrossRef]
21. Chen, L.M.; Ye, W.Z.; Huo, C.J.; James, K. Environmental regulations, the industrial structure, and high-quality regional economic development: Evidence from China. *Land* **2020**, *9*, 517. [CrossRef]
22. Liu, N.; Liu, C.Z.; Xia, Y.F.; Ren, Y.; Liang, J.Z. Examining the coordination between green finance and green economy aiming for sustainable development: A case study of China. *Sustainability* **2020**, *12*, 3717. [CrossRef]
23. Yin, X.L.; Xu, Z.R. An empirical analysis of the coupling and coordinative development of China's green finance and economic growth. *Resour. Policy* **2022**, *75*, 102476. [CrossRef]
24. Gan, Y.; Bu, Y.C. A Coordinated Assessment between Green Finance and Ecological Environment along the Yangtze River Basin. *E3S Web Conf.* **2020**, *194*, 05038; EDP Sciences. [CrossRef]
25. Dong, G.L.; Ge, Y.B.; Zhu, W.Y.; Qu, Y.B.; Zhang, W.X. Coupling Coordination and Spatiotemporal Dynamic Evolution Between Green Urbaniza-tion and Green Finance: A Case Study in China. *Front. Environ. Sci.* **2021**, *8*, 621846. [CrossRef]
26. Soundarrajan, P.; Vivek, N. Green finance for sustainable green economic growth in India. *Agric. Econ.* **2016**, *62*, 35–44. [CrossRef]
27. Shi, T.; Yang, S.Y.; Zhang, W.; Zhou, Q. Coupling coordination degree measurement and spatiotemporal heterogeneity between economic development and ecological environment—Empirical evidence from tropical and subtropical regions of China. *J. Clean. Prod.* **2020**, *244*, 118739. [CrossRef]
28. Geng, Y.Q.; Tan, Y.Q. Measurement and prediction: Coupling coordination of finance and air environment. *Discret. Dyn. Nat. Soc.* **2020**, *2020*, 8673965. [CrossRef]
29. Cheng, X.; Long, R.Y.; Chen, H.; Li, Q.W. Coupling coordination degree and spatial dynamic evolution of a regional green competitiveness system–A case study from China. *Ecol. Indic.* **2019**, *104*, 489–500. [CrossRef]
30. Wei, L.L.; Yang, Y. Historical Evolution of the Coupled and Coordinated Development of Green Finance and Industrial Structure in Northwestern China from the Perspective of New Structural Economics. *J. Lanzhou Univ. (Soc. Sci.)* **2019**, *47*, 24–35. (In Chinese)
31. Li, H.; Zhang, M.; Li, C.; Li, M. Study on the spatial correlation structure and synergistic governance development of the haze emission in China. *Environ. Sci. Pollut. Res.* **2019**, *26*, 12136–12149. [CrossRef]
32. Sun, Y.Y.; Hou, G.L. Analysis on the spatial-temporal evolution characteristics and spatial network structure of tourism eco-efficiency in the Yangtze River Delta urban agglomeration. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2577. [CrossRef] [PubMed]
33. Xu, W.X.; Zhang, L.Y.; Liu, C.G.; Yang, L.; Huang, M.J. The Coupling Coordination of Urban Function and Regional Innovation: The Coupling Coordination of Urban Function and Regional Innovation: A Case Study of 107 Cities in the Yangtze River Economic Belt. *Sci. Geogr. Sin.* **2017**, *37*, 1659–1667. (In Chinese)
34. Acemoglu, D.; Ozdaglar, A.; Tahbaz-Salehi, A. Systemic risk and stability in financial networks. *Am. Econ. Rev.* **2015**, *105*, 564–608. [CrossRef]
35. König, M.D.; Battiston, S.; Napoletano, M.; Schweitzer, F. The efficiency and stability of R&D networks. *Games Econ. Behav.* **2012**, *75*, 694–713.
36. Thomas, K.; Costa, L.F.; Rodrigues, F.A. The structure and resilience of financial market networks. *Chaos Interdis-Ciplinary J. Nonlinear Sci.* **2012**, *22*, 193.
37. Bian, Y.T.; He, J.M.; Zhuang, Y.M. A Network Model of Investment and Its Robustness Based on the Intrinsic Characteristics of Subjects in Stock Market. *J. Ind. Eng. Eng. Manag. Ment* **2013**, *27*, 108–113. (In Chinese)
38. Tong, L. Public Policy Research to Promote High-quality Economic Development. *Sci. J. Econ. Manag. Res.* **2021**, *3*, 316–320.
39. Gan, W.H.; Yao, W.P.; Huang, S.Y. Evaluation of Green Logistics Efficiency in Jiangxi Province Based on Three-Stage DEA from the Perspective of High-Quality Development. *Sustainability* **2022**, *14*, 797. [CrossRef]

40. Du, J.G.; Zhang, J.; Li, X.W. What is the mechanism of resource dependence and high-quality economic development? An empirical test from China. *Sustainability* **2020**, *12*, 8144. [CrossRef]
41. Liu, R.; Wang, D.; Zhang, L.; Zhang, L. Can green financial development promote regional ecological efficiency? A case study of China. *Nat. Hazards* **2019**, *95*, 325–341. [CrossRef]
42. Ren, X.D.; Shao, Q.L.; Zhong, R.Y. Nexus between green finance, non-fossil energy use, and carbon intensity: Empirical evidence from China based on a vector error correction model. *J. Clean. Prod.* **2020**, *277*, 122844. [CrossRef]
43. Sun, C.; Wang, Z.; Liu, J.Q. Research on the coupling of green technology innovation and green financial system development. *Financ. Theory Pract.* **2021**, *10*, 22–33. (In Chinese)
44. Jahanger, A. Influence of FDI characteristics on high-quality development of China's economy. *Environ. Sci. Pollut. Res.* **2021**, *28*, 18977–18988. [CrossRef] [PubMed]
45. Liu, Y.; Liu, M.; Wang, G.G.; Zhao, L.L.; An, P. Effect of Environmental Regulation on High-quality Economic Development in China—An Empirical Analysis Based on Dynamic Spatial Durbin Model. *Environ. Sci. Pollut. Res.* **2021**, *28*, 54661–54678. [CrossRef] [PubMed]
46. Sun, X.; Fang, S.; Zhang, S. High-Quality Economic Development in Huaihe Economic Zone Level Measurement and Evaluation. *J. Math.* **2021**, *2021*, 6615884. [CrossRef]
47. Feng, M.; Guo, H.X. Research on the Evaluation of High-Quality Economic Development Based on Factor Analysis. *NIScPR Online Period. Repos.* **2019**, *78*, 827–830.
48. Li, X.S.; Lu, Y.L.; Huang, R.T. Whether foreign direct investment can promote high-quality economic development under environmental regulation: Evidence from the Yangtze River Economic Belt, China. *Environ. Sci. Pollut. Res.* **2021**, *28*, 21674–21683. [CrossRef]
49. Gan, C.H.; Zheng, R.G.; Yu, S.F. An Empirical Study on the Effects of Industrial Structure on Economic Growth and Fluctuations in China. *Econ. Res. J.* **2011**, *46*, 4–16, 31. (In Chinese)
50. Wang, S.P.; Ouyang, Z.G. The Rural-urban Income Disparity and Its Effects to Economic Growth in the Case of China. *Econ. Res. J.* **2007**, *42*, 44–55. (In Chinese)
51. He, Y.X.; Jiao, Z.; Yang, J. Comprehensive evaluation of global clean energy development index based on the improved entropy method. *Ecol. Indic.* **2018**, *88*, 305–321. [CrossRef]
52. Zhang, X.Q.; Wang, C.B.; Li, E.K.; Xu, C.D. Assessment model of ecoenvironmental vulnerability based on improved entropy weight method. *Sci. World J.* **2014**, *2014*, 797814. [CrossRef] [PubMed]
53. Tang, Z. An integrated approach to evaluating the coupling coordination between tourism and the environment. *Tour. Manag.* **2015**, *46*, 11–19. [CrossRef]
54. Hui, E.C.; Wu, Y.Z.; Deng, L.J.; Zheng, B.B. Analysis on coupling relationship of urban scale and intensive use of land in China. *Cities* **2015**, *42*, 63–69. [CrossRef]
55. Oliveira, J.M.S. Trend-surface analysis in geochemical prospecting data, Arouca-Castro Daire region, northern Portugal. *Chem. Geol.* **1979**, *24*, 271–291. [CrossRef]
56. Wang, J.F.; Li, X.H.; Christakos, G.; Liao, Y.L.; Zhang, T.; Gu, X.; Zheng, X.Y. Geographical detectors—Based health risk assessment and its application in the neural tube defects study of the Heshun Region, China. *Int. J. Geogr. Inf. Sci.* **2010**, *24*, 107–127. [CrossRef]
57. Bai, C.Q.; Zhou, L.; Xia, M.L.; Feng, C. Analysis of the spatial association network structure of China's transportation carbon emissions and its driving factors. *J. Environ. Manag.* **2020**, *253*, 109765. [CrossRef]
58. Su, Y.; Yu, Y.Q. Spatial association effect of regional pollution control. *J. Clean. Prod.* **2019**, *213*, 540–552. [CrossRef]
59. Song, J.Z.; Feng, Q.; Wang, X.P.; Fu, H.L.; Jiang, W.; Chen, B.Y. Spatial association and effect evaluation of CO_2 emission in the Chengdu-Chongqing urban agglomeration: Quantitative evidence from social network analysis. *Sustainability* **2019**, *11*, 1. [CrossRef]
60. Djauhari, M.A.; Gan, S.L. Optimality problem of network topology in stocks markets analysis. *Phys. A Stat. Mech. Its Appl.* **2015**, *419*, 108114. [CrossRef]
61. Ding, R.; Zhang, T.; Zhou, T.; Zhang, Y.L.; Li, T.F.; Wu, J.J. Topologic characteristics and sustainable growth of worldwide urban rail networks. *Int. J. Mod. Phys. B* **2021**, *35*, 2150151. [CrossRef]
62. Ding, R.; Zhang, T.; Yin, J.; Zhang, Y.L.; Li, T.F. Structural characteristics and resilience of city network in the new Western Land-Sea Corridor. *J. Beijing Norm. Univ. (Nat. Sci.)* **2021**, *57*, 794–802.
63. Wang, X.Y.; Zhao, H.K.; Bi, K.X. The measurement of green finance index and the development forecast of green finance in China. *Environ. Ecol. Stat.* **2021**, *28*, 263–285. [CrossRef]
64. Li, C.; Gao, X.; He, B.J.; Wu, J.; Wu, K. Coupling coordination relationships between urban-industrial land use efficiency and accessibility of highway networks: Evidence from Beijing-Tianjin-Hebei urban agglomeration, China. *Sustainability* **2019**, *11*, 1446. [CrossRef]
65. Hu, H.M.; Lian, S.H. Green Finance development and Industrial Structure change in China: Based on the multi-dimensional perspective of grey, coupling and spatial connection network. *Financ. Econ.* **2021**, *9*, 51–59. (In Chinese)
66. Fan, Y.; Fang, C.; Zhang, Q. Coupling coordinated development between social economy and ecological environment in Chinese provincial capital cities-assessment and policy implications. *J. Clean. Prod.* **2019**, *229*, 289–298. [CrossRef]

67. Niu, H.P.; Zhang, X.Y.; Zhang, P.D. Institutional Change and Effect Evaluation of Green Finance Policy in China: Evidence from Green Credit Policy. *Manag. Rev.* **2020**, *32*, 3–12. (In Chinese)
68. An, G.J. Discussion on the innovation path of green finance under the goal of carbon neutrality. *South China Financ.* **2021**, *2*, 3–12. (In Chinese)
69. Yao, L.; Li, X.; Li, Q.; Wang, J. Temporal and spatial changes in coupling and coordinating degree of new urbanization and ecological-environmental stress in China. *Sustainability* **2019**, *11*, 1171. [CrossRef]