Abstract: The scientific promotion of rural revitalization is an important issue in the context of global poverty reduction and sustainable development. For China, the largest developing country in the world, the construction of rural revitalization model villages has become an important measure to achieve agricultural and rural modernization and the coordinated development of urban and rural areas. Research on the rural revitalization model villages in China can provide guidance for the rural transformation development in other developing countries. In this paper, the Yangtze River Delta (YRD) was used as the study area, and the spatial differentiation characteristics and driving factors of 1621 rural revitalization model villages were analyzed using ArcGIS software and the geographical detector method. The results are as follows: (1) The multiscale spatial distributions of rural revitalization model villages in the YRD showed a weak agglomeration and disequilibrium characteristic. Anhui Province has the highest imbalanced distribution of model villages among different provinces in the YRD. (2) The model villages are the most densely distributed along the Yangtze River. Extending to the north and south from areas along the Yangtze River, the distribution of the model villages is first sparse then dense. Model villages agglomerate mainly along rivers and lakes, areas close to traffic arteries and the middle areas of suburban. (3) The spatial differentiation of rural revitalization model villages is the result of the combined effect of multiple factors, and the driving factors also showed significant spatial heterogeneity. The most important driving factors of the spatial differentiation of the model villages of the YRD, Jiangsu, Zhejiang, and Anhui are social development and government intervention, transportation accessibility and economic development, resource endowment and natural conditions, and transportation accessibility and government intervention, respectively. This study has practical significance for optimizing the spatial pattern of rural revitalization model villages in the YRD and facilitating high-quality rural revitalization.

Keywords: rural revitalization model village; spatial differentiation; driving factors; geographical detector; the Yangtze River Delta

1. Introduction

Rural areas are indispensable units of the urban–rural system, which have important functions, such as agricultural production, ecological maintenance, and cultural inheritance [1]. However, under the impact of long-term industrialization and urbanization, rural decline has become a global challenge [2]. Problems in rural areas, such as population loss, economic recession, and the widening of the urban–rural gap, have become increasingly prominent, severely constraining regional sustainable development [3]. Both developed and developing countries around the world are actively exploring measures that suit local conditions to promote rural revitalization [4], such as the construction of central villages in England and the Rural Revitalization Plan in France in the 1960s, and the Saemaul Undong (New Village Movement) of South Korea and the One Village One Product movement of Japan in the 1970s [5–7]. These programs have promoted the construction of rural infrastructure, revitalized rural land resources, and improved rural production and living
conditions. The implementation of these programs has reversed the decline of rural areas effectively by attracting people back to the rural and promoted urban–rural coordination and high-quality development [8].

Under the guidance of the macro policy of “Economic Construction as the Center of Socioeconomic Development” since the reform and opening up, China’s local governments have implemented a series of urban-biased development measures to promote rapid economic growth. While creating a “growth miracle” for China’s economy, the implementation has also brought about rural decline, characterized by environmental pollution, population migration, and agricultural decline [9]. Since the beginning of the 21st century, due to the tremendous negative impact of rural decline on regional sustainable development and the real demand for China’s economy to shift to high-quality development, macroeconomic policies have gradually shifted from urban bias to urban–rural balance. Accelerating the promotion of rural revitalization has become the focus of the Chinese government and academia. In this context, the government has successively implemented macro strategies with Chinese characteristics, such as urban–rural coordination, new rural construction, urban–rural integration, new urbanization, and rural revitalization. The construction of model villages in particular has become an important path for local governments to implement the macro strategies of rural revitalization [10]. The local governments select a number of villages with a good development foundation and support them to improve their living environment and develop special industries through financial investment and land supply security. Through these measures, local governments try to create realistic model villages of rural revitalization. By summarizing and promoting the construction experience of these model villages, the construction of model villages can be extended from one locality to a larger area to realize territory-wide rural revitalization. The spatial distribution of model villages has become an important means of understanding the rural revitalization strategies and construction effects of various regions and has received extensive attention from all sectors of society.

In China, the number of villages is large while their spatial heterogeneity and development disparity are strong; therefore, a direct copy of the developed countries’ path of rural revitalization that relies on a strong financial supply and the transfer of surplus rural labor is impractical [8]. Moreover, it is difficult to succeed by relying solely on the macro guidance of the central government; only through exploring and promoting localized experiences in different regions can China’s rural revitalization be fully realized. The Yangtze River Delta (YRD) is one of the most dynamic economic regions in China while it has typical heterogeneity in rural development. The realization of rural revitalization becomes the main focus and challenge for the YRD to take the lead in realizing modernization and high-quality development on the basis of “integration”. The study of the spatial distribution pattern and driving factors of rural revitalization model villages in the YRD can not only clarify the actual situation and experience of rural revitalization in China’s economically developed areas but also help develop rural revitalization strategies in accordance with local conditions in the YRD. Using the rural revitalization model villages in three provinces (Jiangsu, Zhejiang, and Anhui) and one city (Shanghai) in the YRD as the research object, this paper analyzed the spatial distribution characteristics and evaluated the separate effects and interaction effects of different factors on the spatial differentiation of model villages to identify the main driving factors. Furthermore, this paper discussed how to build a collaborative governance path among multiple entities such as community and government in China to promote the sustainable development of the model villages. This study addressed the following questions: (1) What are the spatial distribution characteristics of the rural revitalization model villages in the YRD? (2) What are the driving factors of the spatial differentiation of the rural revitalization model villages in the YRD, including the composition of the driving factors and the magnitude of separate effects and interaction effects of different factors? (3) How do the main driving factors affect the distribution of model villages? This research can not only enrich the theoretical
system of rural revitalization in China but also provide an example of rural revitalization for other developing countries and regions.

2. Literature Review

2.1. Studies on the Spatial Distribution Pattern of Model Villages

As model villages are typical geographical units of rural development, scholars have carried out much research on them with rich results. These studies have focused on the development process of demonstration villages [11], the location and spatial pattern [12], influencing factors and formation mechanism [13], and spatial agglomeration and diffusion [14]. In terms of the spatial distribution pattern, the academic community has carried out rich research on relevant issues from multiple angles, mainly describing the spatial distribution types, the spatial equilibrium situation, aggregation characteristics, and spatiotemporal evolution characteristics of different types of demonstration villages [15,16]. Some studies also use case villages to explore the spatial structure of a village and its reconstruction characteristics during the rural transformation development at a micro scale [17]. The objects of these studies include demonstration villages of protection of traditional culture and characteristic development. The former comprises traditional villages [18], while the latter includes rural tourism destinations [15], agricultural characteristic villages [19], and specialized villages [20]. Study areas mainly focus on the national level [19,21]. The research methods are based mainly on geographic information technology and statistical analysis methods, including the average nearest neighbor index (NNI), geographic concentration index, disequilibrium index, kernel density-estimation (KDE) method, fractal grid dimension analysis, and spatial autocorrelation analysis [18–21]. Research on the characteristic development demonstration villages, such as key rural tourism villages and “One Village One Product (OVOP)” demonstration villages, provides a reference for exploring the spatial differentiation characteristics of rural revitalization model villages.

The results of theoretical analysis and empirical research show that the construction of demonstration villages can significantly improve the living conditions of villagers, promote economic growth of the villages, and stimulate the development of surrounding rural areas. However, due to the constraints of the natural environment, resource endowments, and macroeconomic policies, the spatial distribution of the demonstration villages is disequilibrium, showing significant spatial agglomeration characteristics [22]. The demonstration villages are concentrated mainly in economically developed, densely populated, and resource-rich areas; besides, they tend to locate around large or medium-sized cities and the main road network [15]. For example, studies of demonstration villages in China show that economically developed areas, such as the YRD and the Beijing–Tianjin–Hebei region, are the agglomeration areas of key rural tourism villages and OVOP demonstration villages. However, the agglomeration characteristics of different types of model villages are starkly different and are closely related to the resource endowment and industrial development [21]. The spatial pattern of agricultural development demonstration villages is highly consistent with the regional agricultural strategic pattern [19]; tourism development demonstration villages mainly surround large and medium-sized cities, are distributed near scenic areas and agglomerated in areas with unique cultural, natural, and social resources [15]; model villages for industrial development are concentrated mainly in areas with a flat terrain and convenient transportation which afford convenient distribution of materials and products. Although the range of the spatial distribution of model villages spreads over time, the degree of spatial agglomeration increases gradually [21].

2.2. Studies on the Driving Factors of the Spatial Distribution of Model Villages

In terms of research methods, previous studies mainly focus on qualitative descriptions; that is, by summarizing the characteristics of industrial development, policy environment, population agglomeration, and culture of the model village agglomeration areas, the effects of the above factors on the distribution of model villages are analyzed [23]. With the rapid development of information technology, methods such as ArcGIS software-based
overlay analysis and buffer analysis have been widely used to explore the spatial relationships between the model villages and geographic elements, such as the terrain and rivers, and human elements, such as roads, cities and scenic spots [18,22]. In addition, some studies have used the geographic connection rate to analyze the spatial consistency between the distribution of demonstration villages and gross domestic product (GDP), residents’ consumption, scenic spots and historic villages [15,24]. In recent years, with gradual improvements in spatial measurement and other methods, the geographical detector analysis method has been widely used to identify the driving factors of the spatial distribution pattern of various geographical phenomena, quantitatively detecting the explanatory power of factors such as elevation, river network density, per capita GDP, highway density, and population density on the spatial distribution of model villages [20,22].

The results show that the spatial distribution of different kinds of demonstration villages is affected mainly by factors such as natural conditions, resource endowments, economic development, social development, the policy environment, location, and transportation, but the main driving factors of different types of model villages are different. Among them, the driving factors for specialized villages include mainly elite farmers, geographical factors, resource characteristics, government behavior, socioeconomic environment, and technology [20]. The spatial distribution of characteristic agricultural villages is closely related to factors including rural population, land and industrial development level [19]. The spatial distribution of tourism model villages is affected mainly by factors such as topography, resource endowment, location, transportation conditions, tourist source market, economic development, policy and innovation environment, and other factors, such as climate, population and education, cannot be ignored [15,22]. The pilot villages in the Beautiful Village Initiative are affected mainly by factors such as the locations, traffic conditions, resource distribution, economic development, and policy environment [21]. In addition, as a background constraint factor in economic and social development, natural conditions, such as the topography and landforms, affect the location and development of rural settlements, thereby affecting the spatial distribution of model villages [25].

2.3. Studies on Rural Revitalization and Sustainable Development Paths

Around the world, the paths to rural revitalization are diverse and controversial and have transformed from exogenous development into endogenous development and then into new endogenous development [26]. In the 1960s and 1970s, rural revitalization in Europe and some other countries in the Northern Hemisphere mainly followed an exogenous development path, i.e., hollowed out and depleted rural areas were developed with extensive involvement and stimulation of urban capital, technology, and talent [27]. However, driven by the profit-seeking nature of capital, many foreign entities turned to plundering rural resources, which exacerbated rural decline and limited autonomous local development [28]. In response to this predicament, the endogenous development path began to receive attention and was widely used to reverse the decline in rural areas [29]. In the 1990s, the Links between Actions of Rural Development (LEADER) of the European Union (EU) and its subsequent projects advocated the full use of the creativity of rural communities and emphasized the right of local community to decide on development options, to control the development process, and to enjoy the benefits of development [30]. Due to the imbalanced participation capacity of local communities, this type of practice, which emphasizes the internal strength of the village, has been criticized. “It is unrealistic to rely solely on local actors to implement ‘pure’ endogenous development without the help of external forces” [31]. On this basis, a new endogenous development path has emerged, which advocates that based on a “bottom-up” approach of community leadership, a collaborative governance network with external actors should be established to rationally and effectively use external actors and resources to enhance endogenous development capacity [32].

Through long-term practical exploration, rural revitalization in developed countries has gradually formed a practical path of “policy support-technical support-social
participation-comprehensive evaluation”, which emphasizes farmers’ entrepreneurial spirit and building community networks as the keys to rural revitalization [33,34], adopts the “government support for agriculture” approach, and uses both legislative and enterprise cooperation paths [35]. The government and rural communities are widely considered to play important roles in rural revitalization [36]. In the past, rural construction in China was led mostly by the government or enterprises. Although the short-term development performance is outstanding, it is difficult for this approach to benefit all villages and stimulate villagers’ enthusiasm to participate, which is not conducive to the sustainable development of rural areas. Studies generally indicate that the current rural revitalization in China should further enhance the bottom–up initiative of the villagers and establish a new endogenous development path with the participation of both villagers and foreign entities. However, studies on community participation have suggested that there is very little actual community participation in developing countries [37]. The participation of rural communities in China is mainly symbolic and passive, and the main constraints are the lack of effective participation channels, villagers’ low level of knowledge, and lack of awareness and effective ability to participate [38]. Given these issues, to construct a new endogenous rural revitalization path in developing countries such as China, a collaboration governance network between internal and external entities (i.e., rural community and the government) should be established, and the level of rural community participation should be improved.

2.4. Summary of Literature Review

Although existing studies have focused on the spatial differentiation of various demonstration villages and have achieved some results, there are still some limitations in terms of research objects, research scales, and methods of identifying driving factors. In terms of research objects, the existing research mainly focuses on a single dimension of rural development, such as economic growth or improvement of human settlements. In fact, the construction of rural revitalization model villages emphasizes the comprehensive development of the rural system, spanning multiple dimensions, such as the human settlements, economy, culture, and governance, which is different from living environmental improvement model villages and characteristic development demonstration villages. The research shows that there are significant differences in the agglomeration characteristics of various demonstration villages, and it is necessary to explore the spatial distribution pattern of rural revitalization model villages.

In terms of research scales, previous studies have been mainly conducted at the national scale. However, at different spatial scales, the generation mechanisms of geographic phenomena are quite different [24]. Moreover, the types of regions in China are diverse and complex. Existing research cannot meet the needs of understanding the spatial differentiation characteristics of demonstration villages in different types of regions, nor can they provide a scientific basis for adopting differentiated rural revitalization strategies based on their respective regional characteristics. The YRD is a developed region with high-density population and rich natural resources. Besides, it is a pioneer of institutional reform and policy innovation in China, which offers a favorable opportunity for the construction of various demonstration villages. The YRD is the high-density area of various model villages while it is also a region with significant heterogeneity of urban–rural integration. However, the spatial differentiation characteristics of model villages within this type of region have received little attention. Therefore, it is necessary to identify the spatial distribution characteristics and driving factors of the rural revitalization model villages in the YRD to deepen the understanding of the distribution rules of rural revitalization model villages in different types of regions and at different spatial scales.

In terms of identifying methods of driving factors, a few studies have used the factor detection method of geographical detector to analyze the individual effects of different factors on the spatial differentiation of model villages, and combine the influence of different factors according to the principle of maximum value. However, the effect of multiple
factors acting together may be greater or less than the effect of a single factor; therefore, it is necessary to improve the methods adopted to analyze the interaction effect of different factors on the spatial differentiation of model villages. By using the factor detection module and interaction detection module of the geographical detector, this study not only can quantitatively measure the individual influence of different factors, but also can measure the interaction influence of different factors more precisely, which helps to identify the main drivers of spatial differentiation in model villages more accurately.

3. Study Area and Methods

3.1. Study Area

The study area is the YRD. According to the Outline for the Yangtze River Delta Regional Integration Development Plan issued by the Central Committee of the Communist Party of China and the State Council in 2019, the YRD covers the entire region of Shanghai, Jiangsu, Zhejiang, and Anhui. This document provides an important basis for selecting this region for study (Figure 1). YRD region has a long history of agricultural cultivation and is a pioneer in exploring rural transformation development paths. In 2021, the total GDP of the YRD region was 24.47 trillion yuan, accounting for approximately 1/4 of China’s GDP; the total population was approximately 235.21 million, and the urbanization rate exceeded 70%.

![Figure 1. Study area.](image)

Since the reform and opening up, the globalization, industrialization, and urbanization in the YRD have been accelerating, and rural areas have undergone multiple rounds of reconstruction. In the 1980s, the Southern Jiangsu model, characterized by the emergence of township enterprises, promoted the rapid development of rural urbanization; since 2005, with a new understanding of rural values and the transformation of the consumption structure, the rapid development of characteristic towns and villages as a link between urban and rural areas has radiated and driven the development of the surrounding rural areas. With the proposal of the rural revitalization strategy by the central government in 2017, local governments in the YRD have formulated corresponding implementation plans and have actively constructed various rural revitalization model villages.
However, with the expansion of the planning scope of the YRD region and the regional rise and fall caused by the free flow of resource elements, the heterogeneity of rural development within the YRD is significant. In the region from Hefei to Nanjing and to Shanghai and the megaregion along the coast of Hangzhou Bay, the high level of urban development has prompted the flow of resources from the city to the surrounding villages which stimulate the rapid development of rural areas. In contrast, driven by rapid urbanization, the urban–rural development gap in northern Jiangsu, Anhui, and inland Zhejiang continues to widen. In the context of integration, when pursuing region-wide rural revitalization, the YRD still faces the challenge of a wide gap in rural development within the region.

3.2. Research Samples and Data

In this study, the sample rural revitalization model villages in the YRD were selected according to the following criteria. First, the sample model villages were selected from rural revitalization projects of the same kind, grade, and level created in various places within the same period of time after the rural revitalization strategy implementation. Second, the project must focus on the systemic nature of rural revitalization, and the content should cover different aspects, such as improvement of living environment and development of the economy and society. Based on these criteria, this study selected the provincial model village projects recognized by the local governments in the YRD since 2017, i.e., the featured countryside in Jiangsu, the beautiful and livable model village in Zhejiang, the key model village of the beautiful villages project in Anhui, and Shanghai’s rural revitalization model village (Table 1).

Jiangsu began to promote the construction of featured countryside in 2017 and assessed and identified pilot villages in 2019. By the end of 2021, 446 provincial featured countryside pilot villages had been identified. Since 2018, as an upgraded version of the beautiful villages, the standard for beautiful villages in Zhejiang has shifted from the comprehensive improvement of the village environment to rural revitalization led by green development. By the end of 2021, 551 provincial-level beautiful and livable model villages had been created. The construction of key model villages of the beautiful villages project in Anhui started in 2018 and began to be assessed and recognized in 2019. By the end of 2021, Anhui had identified 544 provincial-level key model villages. Since 2018, Shanghai has selected rural revitalization model villages, and a total of 80 villages were created by the end of 2021. The final samples selected in this study were the 1621 model villages identified starting from the implementation of the rural revitalization strategy to the end of 2021 (Figure 2). The model villages in Shanghai, Jiangsu, Zhejiang, and Anhui account for 4.94%, 27.51%, 33.99%, and 33.56% of the total number of model villages in the YRD, respectively.

Based on the official websites of relevant government departments of Jiangsu, Zhejiang, Anhui, and Shanghai, this study obtained a list of model villages and used the Baidu Map coordinate selection system to obtain the location coordinates of each model village. The data coordinates were imported into ArcGIS 10.8, and after alignment and projection, a database of spatial attributes of the rural revitalization model villages in the YRD was established. The basic geographic data were from the database of the National Geomatics Centre of China; the road traffic data were from amap.com; and the socio-economic development data were from the official websites of the National Bureau of Statistics, the Bureau of Statistics of various provinces and cities and the Ministry of Housing and Urban–Rural Development.
Table 1. The sample rural revitalization model villages in the YRD.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Construction Requirements</th>
<th>Target Number</th>
<th>Existing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Revitalization Model Village in Shanghai</td>
<td>Optimizing village layout, improving rural landscape, improving living environment, increasing efficiency of agricultural development, and promoting rural governance</td>
<td>90 150 80</td>
<td></td>
</tr>
<tr>
<td>Featured Countryside in Jiangsu</td>
<td>Highlighting rural culture, protecting the ecological environment, cultivating industrial development, and enhancing rural vitality</td>
<td>500 1000 446</td>
<td></td>
</tr>
<tr>
<td>Beautiful and Livable Model Village in Zhejiang</td>
<td>Promoting the prosperity of rural industries, livability of living environment, the moral and ethical standards of the rural, efficiency of governance and the prosperity of life to a new level, and improving the quality of beautiful rural areas overall</td>
<td>500 1000 551</td>
<td></td>
</tr>
<tr>
<td>Key Model Villages of the Beautiful Village Project in Anhui</td>
<td>Promoting village infrastructure, improving the living environment, improving rural public services, strengthening the construction of rural civilization, developing the industry according to local conditions, strengthening the collective economy, and strengthening the leadership of grassroots party organizations</td>
<td>- 1000 544</td>
<td></td>
</tr>
</tbody>
</table>

1 Source: Collated from policy and planning documents of Jiangsu, Zhejiang, Anhui, and Shanghai, namely, The Rural Revitalization Strategic Plan (2018–2022), Opinions on the Implementation/Promotion of Rural Revitalization Strategy, The 14th Five-Year Plan for the Modernization of Agriculture and Rural Areas, and The 14th Five-Year Plan for Rural Revitalization, respectively.

3.3. Research Methods

3.3.1. Nearest Neighbor Index (NNI)

Model villages are represented as point-like elements on a macroscopic scale, and the spatial distribution type of point-like elements can be determined by the NNI [19]. The calculation formula is as follows:

$$R = \frac{r_1}{r_E} = 2\sqrt{D}$$

(1)

where \(r_1\) is the actual nearest neighbor distance; \(r_E\) is the theoretical nearest-neighbor distance; and \(D\) is the point density. When \(R = 1\), the spatial distribution of the model villages shows a random pattern; when \(R > 1\), the model villages tend to be evenly distributed; when \(R < 1\), the model villages tend to be agglomerated.
Table 1. The sample rural revitalization model villages in the YRD

<table>
<thead>
<tr>
<th>Sample Construction Requirements</th>
<th>Target Number</th>
<th>Existing Number in 2021</th>
<th>Existing Number in 2022</th>
<th>Existing Number in 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Revitalization Model Village in Shanghai</td>
<td>Optimizing village layout, improving rural landscape, improving living environment, increasing efficiency of agricultural development, and promoting rural governance</td>
<td>90</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>Featured Countryside in Jiangsu</td>
<td>Highlighting rural culture, protecting the ecological environment, cultivating industrial development, and enhancing rural vitality</td>
<td>500</td>
<td>1000</td>
<td>446</td>
</tr>
<tr>
<td>Beautiful and Livable Model Village in Zhejiang</td>
<td>Promoting the prosperity of rural industries, livability of living environment, the moral and ethical standards of the rural, efficiency of governance and the prosperity of life to a new level, and improving the quality of beautiful rural areas overall</td>
<td>500</td>
<td>1000</td>
<td>551</td>
</tr>
<tr>
<td>Key Model Villages of the Beautiful Village Project in Anhui</td>
<td>Promoting village infrastructure, improving the living environment, improving rural public services, strengthening the construction of rural civilization, developing the industry according to local conditions, strengthening the collective economy, and strengthening the leadership of grassroots party organizations</td>
<td>-</td>
<td>1000</td>
<td>544</td>
</tr>
</tbody>
</table>


Figure 2. Distribution map of rural revitalization model villages in the YRD.

3.3.2. Disequilibrium Index

The disequilibrium index analyses the balance of the distribution of model villages at the urban scale [18], and the calculation formula is:

\[
S = \frac{\sum_{i=1}^{n} Y_i - 50(n + 1)}{100 \times n - 50(n + 1)}
\]

where \(n\) is the number of regional units and \(Y_i\) is the \(i\)th cumulative percentage when the proportion of model villages in the designated area to the total model villages in the study area is ranked in descending order. \(S\) is usually between 0 and 1. \(S = 0\) indicates that the model villages are evenly distributed in each regional unit, and \(S = 1\) indicates that the model villages are concentrated in a certain regional unit.

When calculating the disequilibrium index of the model villages in the YRD, Jiangsu, Anhui, and Zhejiang, \(n\) is the total number of prefecture-level cities and municipalities; when calculating the disequilibrium index of the model villages in Shanghai, \(n\) is the total number of prefecture-level urban districts.

3.3.3. Kernel Density Estimation (KDE)

KDE can intuitively reflect the agglomeration degree and areas of the model villages [22]. This study used the KDE to measure the spatial agglomeration characteristics of the model villages. The calculation formula [34] is:

\[
f_n(x) = \frac{1}{n h} \sum_{i=1}^{n} k \left[ \frac{1}{n} (x - x_i) \right]
\]

where \(k(x)\) is the kernel function; \((x - x_i)\) is the estimated distance from model village \(x\) to sample model village \(x_i\); \(n\) is the number of all model villages; and \(h > 0\) is the bandwidth. The larger \(f_n(x)\) is, the denser the distribution of model villages is.
3.3.4. Geographical Detector

Geographical detector is a new statistical method for detecting spatial heterogeneity and revealing the underlying driving factors and can detect both numerical data and qualitative data without linear assumptions [39]. In this paper, a geographical detector was used to detect the driving factors of the spatial differentiation of the model villages. The $q$ statistic can measure spatial heterogeneity, detect explanatory factors, and analyze the interaction of variables. The calculation formula is:

$$q = 1 - \frac{1}{N\sigma^2} \sum_{n=1}^{L} N_h \sigma_h^2 = 1 - \frac{SSW}{SST}$$ (4)

where $L$ is the number of categories of influencing factors; $N_h$ and $N$ are the number of units in class $h$ and the study area, respectively; $\sigma_h^2$ and $\sigma^2$ are the variance in class $h$ and the $Y$ value of the study area, respectively. $SSW$ and $SST$ are the sum of the intraclass variance and the total variance in the study area, respectively. The value of $q$ is $[0, 1]$; a larger $q$ means a higher explanatory power of the index regarding the spatial distribution of the model villages.

4. Results

4.1. Spatial Distribution Characteristics

4.1.1. Spatial Distribution Balance

The NNI analysis of the rural revitalization model villages in the YRD showed that the actual average nearest-neighbor distance was 6.89 km, the theoretically expected nearest-neighbor distance was 8.85 km, and the value of $R$ was 0.78, indicating that the model villages in the YRD showed a weak agglomeration distribution. Based on Equation (2), the value of the disequilibrium index was 0.27, indicating that the distribution of the model villages in the YRD was not even at the urban scale, but the degree of imbalance was relatively low. Each city has a certain number of model villages, which indicates that the spatial development of model villages in the YRD is relatively good.

The difference in spatial equilibrium characteristics of the model villages in different provinces is relatively small. The NNI of the model villages in each province was basically between 0.7 and 0.8, and the disequilibrium indexes were all greater than 0 but were small, indicating that the model villages of all provinces had a weak agglomeration and disequilibrium distribution (Table 2). Among them, the spatial disequilibrium of model villages in Anhui was slightly higher than that in Shanghai, Jiangsu, and Zhejiang. For Jiangsu, Zhejiang, and Shanghai, first, there is a solid foundation for rural development, and the establishment of model villages has good material conditions and industrial foundations. Second, local governments have accumulated rich experience in rural transformation development, which helps quickly create more model villages. Finally, the economy is relatively developed, and the local government’s annual budget is high. Therefore, local governments can invest more funds and resources in rural areas, which would strongly support the simultaneous construction of model villages in the region. For Anhui, first, the rural development level is relatively low; second, limited by the economic development level and the local government’s annual budget, local governments provide less funding for the construction of model villages than in Jiangsu, Zhejiang, and Shanghai; therefore, it is difficult for Anhui to support the intensive construction of model villages in various places simultaneously.
Table 2. The NNI and disequilibrium index of rural revitalization model villages in three provinces and one city in the YRD.

<table>
<thead>
<tr>
<th>Province</th>
<th>Jiangsu</th>
<th>Zhejiang</th>
<th>Anhui</th>
<th>Shanghai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of prefectures</td>
<td>13</td>
<td>11</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Distribution density (number/10,000 km²)</td>
<td>43.38</td>
<td>52.38</td>
<td>38.56</td>
<td>99.30</td>
</tr>
<tr>
<td>NNI</td>
<td>0.71</td>
<td>0.79</td>
<td>0.80</td>
<td>0.81</td>
</tr>
<tr>
<td>Disequilibrium index</td>
<td>0.22</td>
<td>0.24</td>
<td>0.28</td>
<td>0.22</td>
</tr>
</tbody>
</table>

4.1.2. Spatial Distribution Density

KDE analysis reveals the spatial differentiation pattern of the rural revitalization model villages in the YRD. The results showed that the high-density areas of the model villages were independent and obvious, and three high-density areas and six secondary high-density areas were formed (Figure 3). The three high-density areas are as follows: (1) the adjacent areas of Shanghai, Suzhou, and Jiaxing included Shanghai suburbs, main urban area of Suzhou, Kunshan, and Jiashan County; (2) the Nanjing–Wuxi–Changzhou joint area in Jiangsu Province, which takes the national pilot area for urban–rural integrated development (Nanjing–Wuxi–Changzhou joint area in Jiangsu Province) as the main body while covering Jurong County, Langxi County, and Bowang District; and (3) Fenghua District of Ningbo in the eastern part of Zhejiang. The six secondary high-density areas can be summarized as “one district, one belt and four cores”: the southern Jiangsu secondary high-density agglomeration district includes the southern Jiangsu area and its adjacent areas, namely the suburban areas of Shanghai, the southwestern part of the central Jiangsu area and the eastern part of the southern Anhui area; the secondary high-density agglomeration belt in central Zhejiang includes the four cities of Ningbo, Taizhou, Jinhua, and Quzhou; the secondary high-density agglomeration core in central Jiangsu includes the contiguous area of Taizhou and Yancheng; the secondary high-density agglomeration core in northern Anhui includes the contiguous area of Fuyang and Bozhou; the secondary high-density agglomeration core of southwest Anhui includes mainly Anqing; and the secondary high-density aggregation core in Wanjiang city belt includes the contiguous areas of Tongling, Wuhu, and Chizhou.

In general, model villages are most densely distributed along the Yangtze River. Extending from the Yangtze River to the north and south, the distribution is initially sparse and then dense. The region along the Yangtze River has superior geography and transportation conditions, a relatively dense population and significantly higher levels of economic and rural development than other regions, providing strong material, manpower, financial, and market support for the establishment of model villages. This region is also a pioneer in institutional innovation, providing a favorable opportunity for the creation of model villages, and the distribution of model villages is the densest. The northern part of the YRD is dominated by plains, and Fuyang, Bozhou, Yancheng, and Taizhou are the main agricultural production areas. The agricultural development foundation is good, and the rural resident population is large, which provide a good industrial and social development foundation for the construction of model villages. In recent years, improved traffic accessibility in these regions has provided external conditions for the construction of model villages, and the distribution of model villages is relatively dense. The southern part of the YRD has a superior ecological environment and historical and cultural resources. The central area of Zhejiang has comparative advantages in terms of rural resident population and rural financial expenditure, providing resources and labor advantages for the construction of model villages. The distribution of model villages in this region is also relatively dense.
4.1.2. Spatial Distribution Density

KDE analysis reveals the spatial differentiation pattern of the rural revitalization model villages in the YRD. The results showed that the high-density areas of the model villages were independent and obvious, and three high-density areas and six secondary high-density areas were formed (Figure 3). The three high-density areas are as follows:

1. The adjacent areas of Shanghai, Suzhou, and Jiaxing included Shanghai suburbs, the main urban area of Suzhou, Kunshan, and Jiashan County.
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3. Fenghua District of Ningbo in the eastern part of Zhejiang.

The six secondary high-density areas can be summarized as “one district, one belt and four cores”:

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- Secondary high-density agglomeration core in northern Anhui includes the contiguous area of Fuyang and Bozhou.
- Secondary high-density agglomeration core of southwest Anhui includes mainly Anqing.
- Secondary high-density aggregation core in Wanjiang City Belt includes the contiguous areas of Tongling, Wuhu, and Chizhou.

Figure 3. Kernel density map of rural revitalization model villages in the YRD.

4.1.3. Spatial Distribution Location

From the perspective of location preference, the distribution of rural revitalization model villages in the YRD has the following characteristics: (1) The model villages are characterized by their “proximity to major traffic arteries”. The buffer analysis showed that the closer the areas were to the highway and the main road, the greater the number of model villages was; conversely, the greater the distance were, the lower the number of model villages was (Figure 4). Seventy percent of the model villages are distributed within 5 km of the main road network.

(2) The model villages are less distributed in the suburbs and outer suburbs of the city and more distributed in the central suburbs. As the distance from the city increases, the number of model villages first increases and then decreases (Figure 5), and the number of model villages within 30–40 km of the city is the largest. In areas that are too close to cities, the possibility of rural urbanization is relatively high, and the total number of villages is small; in areas that are too far from cities, it is difficult for the villages to experience the driving force of urban development, which is not conducive to the establishment of model villages. More than 65% of the model villages are distributed within 50 km of the city, which has good traffic accessibility and can benefit from the functional radiation of the city. Approximately 32% of the model villages are located 50 km away from the city, mainly in areas with rich ecological or cultural resources and unique rural features.

(3) The model villages tend to be distributed along rivers and lakes (Figure 6). Analysis by direct superposition of the distributions of the river network and the model villages showed that 40% and 65% of the model villages were within 5 km and 10 km of the river system, respectively. For example, the adjacent areas of Shanghai, Suzhou, and Jiaxing are located in the Taihu Lake Basin and the estuary of the Yangtze River, the secondary high-density agglomeration cores of southwest Anhui and Wanjiang City Belt are located along the Yangtze River, and the secondary high-density agglomeration core of northern Anhui is close to the Huaihe River and its tributaries.
Figure 4. Major roads buffer zone and rural revitalization model villages in the YRD.

Figure 5. Curves of the number of rural revitalization model villages and the distance to central city in the YRD.
4.2. Driving Factors of Spatial Differentiation of Model Villages

4.2.1. Construction of the Index System of Driving Factors

Based on relevant research and the actual situation of rural revitalization model villages, the availability of data, and the scientific method, this study focused on six types of factors, namely natural conditions, resource endowment, transportation accessibility, economic development, social development, and government intervention. Twelve highly representative indicators were used to identify the driving factors of the spatial distribution of the model villages (Table 3).

Table 3. The index system of the driving factors.

<table>
<thead>
<tr>
<th>Driving Factors</th>
<th>Selected Index</th>
<th>Interpretation of the Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural conditions</td>
<td>Elevation (X1)</td>
<td>Vertical height to the reference plane (m)</td>
</tr>
<tr>
<td></td>
<td>River network density (X2)</td>
<td>River network area/km²</td>
</tr>
<tr>
<td>Resource endowment</td>
<td>Distance to level 5A scenic area (X3)</td>
<td>Distance between the model village and level 5A scenic area (km)</td>
</tr>
<tr>
<td></td>
<td>Number of traditional villages (X4)</td>
<td>Number of traditional villages in each city (number)</td>
</tr>
<tr>
<td>Transportation accessibility</td>
<td>Distance to surrounding cities (X5)</td>
<td>Distance between the model village and the urban area (km)</td>
</tr>
<tr>
<td></td>
<td>Road network density (X6)</td>
<td>Length of highways and urban arterial roads/km²</td>
</tr>
<tr>
<td>Economic development</td>
<td>GDP per capita (X7)</td>
<td>Per capita GDP of each city (yuan)</td>
</tr>
<tr>
<td></td>
<td>Disposable income of farmers (X8)</td>
<td>Disposable income of farmers in each city (yuan)</td>
</tr>
<tr>
<td>Social development</td>
<td>Population density (X9)</td>
<td>Number of permanent residents in each city/km²</td>
</tr>
<tr>
<td></td>
<td>Rural resident population (X10)</td>
<td>Rural resident population in each city (10,000 people)</td>
</tr>
<tr>
<td>Government intervention</td>
<td>Rural fiscal expenditure (X11)</td>
<td>Sum of general public expenditure of each county within the scope of the city (100 million yuan)</td>
</tr>
<tr>
<td></td>
<td>Public road mileage (X12)</td>
<td>Total public road mileage at the end of the year in each city (km)</td>
</tr>
</tbody>
</table>
4.2.2. Driving Factors of the Spatial Differentiation of Model Villages in the YRD

The geographical detector analysis showed that, except for elevation, the remaining 11 factors all had a significant impact on the spatial differentiation of the rural revitalization model villages in the YRD, but the influences of different factors were different (Table 4). From the perspective of a single factor, factors such as road network density, farmers’ disposable income, per capita GDP, and population density have the greatest impact on the spatial differentiation of the model villages; the effects of factors such as river network density, public road mileage, distance to level 5A scenic area, the number of traditional villages, and rural fiscal expenditures are relatively large; the explanatory power of factors such as rural resident population and distance from surrounding cities is small; and the effect of elevation is not significant. The interaction effect detection results of factors X1 and X2, X3 and X4, X5 and X6, X7 and X8, X9 and X10, and X11 and X12 were analyzed to obtain the explanatory power of the six types of factors on the spatial differentiation of model villages in the YRD, as shown in Table 5. Social development and government intervention are the most important driving factors in the spatial differentiation of model villages in the YRD. Economic development and transportation accessibility are the important driving factors, while resource endowment and natural conditions are normal driving factors.

Table 4. The explanatory power of various factors on the spatial differentiation of the model villages in the YRD.

<table>
<thead>
<tr>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
<th>X7</th>
<th>X8</th>
<th>X9</th>
<th>X10</th>
<th>X11</th>
<th>X12</th>
</tr>
</thead>
<tbody>
<tr>
<td>q value</td>
<td>0.003</td>
<td>0.216 *</td>
<td>0.183 *</td>
<td>0.180 *</td>
<td>0.096 *</td>
<td>0.331 *</td>
<td>0.299 *</td>
<td>0.304 *</td>
<td>0.288 *</td>
<td>0.109 *</td>
<td>0.144 *</td>
</tr>
</tbody>
</table>

* Indicates significance at the 1% level.

Table 5. Interaction effect detection results of different driving factors in the YRD.

<table>
<thead>
<tr>
<th>Driving Factors</th>
<th>Natural Conditions</th>
<th>Resource Endowment</th>
<th>Transportation Accessibility</th>
<th>Economic Development</th>
<th>Social Development</th>
<th>Government Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction factors</td>
<td>X1 ∩ X2</td>
<td>X3 ∩ X4</td>
<td>X5 ∩ X6</td>
<td>X7 ∩ X8</td>
<td>X9 ∩ X10</td>
<td>X11 ∩ X12</td>
</tr>
<tr>
<td>q value</td>
<td>0.31</td>
<td>0.37</td>
<td>0.43</td>
<td>0.44</td>
<td>0.55</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Overall, the spatial differentiation of the rural revitalization model villages in the YRD is the result of the combined effect of multiple factors. Because the construction of model villages has strong political significance, local government intervention plays a key role in guiding and promoting the construction of model villages and has the most important impact on the spatial differentiation of model villages. In the context of the continuous strengthening of the concept of “people-oriented governance” by the Chinese central government, people-related social development factors are also decisive driving factors in the spatial differentiation of model villages. The level of economic development and transportation accessibility affect the distribution of the model villages by affecting the factor input, rural accessibility, and the level of urban–rural factor flow and market connectivity. Although the natural conditions and resource endowments, which are the objective environmental factors, are the basic conditions for the formation and development of villages, they have little impact on the spatial differentiation of rural revitalization model villages in the YRD, which may be related to the low variation in the natural environment among cities in the study area.

4.2.3. Heterogeneity of the Driving Factors in Each Province

The explanatory power of each factor regarding the spatial differentiation characteristics of the model villages in different provinces is different (Table 6). Additionally, the main driving factors of the spatial distribution characteristics of the model villages in different provinces are also different. The main driving factors in Jiangsu are the disposable income...
of farmers, public road mileage, rural fiscal expenditure, population density, river network density, road network density, per capita GDP, and rural resident population. The main driving factors in Zhejiang are rural fiscal expenditure, rural resident population, river network density, rural disposable income, population density, per capita GDP, number of traditional villages, and public road mileage. The main driving factors in Anhui are the road network density, per capita GDP, and river network density, and factors such as rural resident population, public road mileage, farmers’ disposable income, and rural fiscal expenditure also have a certain explanatory power. Based on the explanatory power of interactions of factors (Table 7), the dominant factors in the spatial differentiation of the model villages in Jiangsu, Zhejiang and Anhui are as follows: transportation accessibility and economic development, resource endowment and natural conditions, transportation accessibility, and government intervention, respectively.

Table 6. The explanatory power of various factors on the spatial differentiation of the model villages in each province of the YRD.

<table>
<thead>
<tr>
<th>Province</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
<th>X7</th>
<th>X8</th>
<th>X9</th>
<th>X10</th>
<th>X11</th>
<th>X12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jiangsu</td>
<td>0.006</td>
<td>0.358 *</td>
<td>0.156 *</td>
<td>0.234 *</td>
<td>0.160 *</td>
<td>0.355 *</td>
<td>0.354 *</td>
<td>0.450 *</td>
<td>0.365 *</td>
<td>0.334 *</td>
<td>0.381 *</td>
<td>0.441 *</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>0.010 *</td>
<td>0.275 *</td>
<td>0.020 *</td>
<td>0.232 *</td>
<td>0.026 *</td>
<td>0.173 *</td>
<td>0.237 *</td>
<td>0.266 *</td>
<td>0.261 *</td>
<td>0.309 *</td>
<td>0.324 *</td>
<td>0.209 *</td>
</tr>
<tr>
<td>Anhui</td>
<td>0.012 *</td>
<td>0.258 *</td>
<td>0.041 *</td>
<td>0.136 *</td>
<td>0.042 *</td>
<td>0.304 *</td>
<td>0.280 *</td>
<td>0.185 *</td>
<td>0.095 *</td>
<td>0.194 *</td>
<td>0.164 *</td>
<td>0.188 *</td>
</tr>
</tbody>
</table>

* Indicates significance at the 1% level.

Table 7. Interaction effect detection results of different driving factors in each province of the YRD.

<table>
<thead>
<tr>
<th>Driving Factors</th>
<th>Natural Conditions</th>
<th>Resource Endowment</th>
<th>Transportation Accessibility</th>
<th>Economic Development</th>
<th>Social Development</th>
<th>Government Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jiangsu</td>
<td>0.435</td>
<td>0.364</td>
<td>0.544</td>
<td>0.475</td>
<td>0.471</td>
<td>0.466</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>0.339</td>
<td>0.421</td>
<td>0.333</td>
<td>0.276</td>
<td>0.324</td>
<td>0.324</td>
</tr>
<tr>
<td>Anhui</td>
<td>0.331</td>
<td>0.291</td>
<td>0.400</td>
<td>0.328</td>
<td>0.227</td>
<td>0.370</td>
</tr>
</tbody>
</table>

The comparison of the influence of different driving factors on the spatial differentiation of the model villages in each province shows that transportation accessibility is the most important driving factor in Jiangsu and Anhui, and it also has relatively strong explanatory power for the spatial differentiation of model villages in Zhejiang; the dominant factor is road density. Resource endowment is the most important driving factor in Zhejiang, however, it has little influence on the spatial differentiation of model villages in Jiangsu and Anhui, and the dominant factor is traditional villages. Economic development level is the comparatively important driving factor in Jiangsu and Anhui while it has relatively weak explanatory power for the spatial differentiation of the model villages in Zhejiang; the dominant factors are per capita GDP and farmers’ disposable income. Social development level is the comparatively important driving factor in Jiangsu and Zhejiang while it has relatively weak explanatory power in Anhui; the dominant factors are regional population density and rural resident population size. Government intervention and natural conditions have relatively strong explanatory power for the spatial differentiation of the model villages in each province, and the dominant factors are rural fiscal expenditure, public road mileage, and river network density.

4.2.4. Influencing Mechanism of the Main Factors on the Spatial Distribution of Model Villages

The factors that exert a strong influence on the spatial differentiation of model villages in the YRD and each province are river network density, per capita GDP, and farmers’ disposable income. For areas with a dense river network, the water resources are abundant, and the transportation is convenient, so they are suitable for agricultural planting and
villagers’ lives. Such areas tend to have large numbers of villages and also offer conditions for the development of characteristic agriculture and rural tourism, which is conducive to constructing more model villages. Areas with high GDP per capita tend to have relatively high levels of economic development, which can provide more sufficient and stable funding for the construction of model villages. Residents in these areas have a greater demand for high-value-added rural products, such as ecological agricultural products, tourism, and cultural and creative products, providing a broader market space for industry development of the model villages. For areas where farmers have high disposable income, rural construction often starts early, and the foundation for rural development is solid. The villages in such areas not only are closer to the standards of the model villages but also have richer experience in rural construction, which is conducive to the rapid development of model villages.

Factors that have a strong impact on the spatial differentiation of model villages in the YRD and most provinces are road network density, population density, public road mileage, and number of traditional villages. Convenient transportation is an important condition for rural revitalization. The denser the road network is, the more convenient the transportation in the area is, and the more likely the villages in the area are to become model villages. Road construction is an important measure to improve traffic accessibility and is also a key project funded by local governments. Regional public road mileage reflects the investment and effectiveness of the local government in the construction of roads and has a significant impact on the spatial differentiation of model villages. In areas with high population density, the overall consumption capacity is strong, and the human capital stock is high, which is conducive to expanding the market for rural products and training of rural talent. Areas with many traditional villages have a long history of rural development and a profound cultural heritage. In the context of local rural revitalization policies that require the preservation and development of rural customs and culture, the distribution of traditional villages has a strong influence on the development of model village and its spatial differentiation.

The factors that have a strong impact on the spatial differentiation of the model villages in each province are the rural resident population and rural fiscal expenditure. Rural residents are the key subject of rural revitalization. For model villages distributed in areas with large rural population, the labor force is sufficient, and the rural revitalization can benefit more villagers. The government is another important stakeholder and primary driving force in promoting the construction of model villages and assists the construction of model villages through financial support and projects targeting the countryside. Therefore, the local government’s financial support for the rural can largely affect the distribution of model villages. Factors such as topography, distances to level A scenic spots, and surrounding cities have weak explanatory power regarding the spatial differentiation of model villages in the YRD and various provinces.

5. Discussion

Amidst China’s active promotion of rural revitalization and high-quality development, this paper took the YRD region, which has developed economy and significant regional heterogeneity, as an example and explored the geographic spatial differentiation characteristics of rural revitalization model villages in this region from multiple perspectives. Based on scientific analysis, this study offers a discussion on how to better promote the equilibrium distribution and sustainable development of rural revitalization model villages in China.

5.1. Implementing Rural Revitalization According to Local Conditions

At present, the rural revitalization model villages in the YRD exhibit disequilibrium and agglomeration spatial distribution, which is in line with the macro strategic requirement; that is, in the early implementation stage of the rural revitalization strategy, available resources should be concentrated to rapidly build templates for rural revitalization. After
achieving the effective construction of model villages in typical regions, extending the experience of model village construction from one locality to a larger area has become an important goal for China as it seeks to accelerate rural revitalization and achieve common prosperity. However, it must be emphasized that, as a large country with a vast territory, in replicating and promoting the successful experience of model village construction in a larger area, China should deeply understand the differences in the rural development basis, resource conditions, and regional strategic orientation of different regions. Comparison of the driving factors regarding the spatial differentiation of rural revitalization model villages in the three provinces of Jiangsu, Zhejiang, and Anhui also shows this argument. Therefore, in the formulation and implementation of China’s rural revitalization strategy in the future, it is necessary to not only take advantage of the spatial agglomeration characteristics of the model villages to strengthen their demonstration effect but also implement differentiated strategies based on different rural development realities, thus supporting the full realization of China’s rural revitalization strategy by maximizing the resource utilization efficiency.

For the YRD region, there is a strong urgency to implement differentiated development orientation between the areas with densely distributed model villages and other regions. For areas with densely distributed model villages, i.e., areas along the Yangtze River, in central Zhejiang, in central Jiangsu, and in northern Anhui, it should focus on improving the overall quality of rural revitalization. On the one hand, relying on further improving the road networks, it is important to enhancing the interaction between the model villages with small geographical distances and similar development conditions to form rural revitalization demonstration zones which are spatially contiguous and have obvious overall demonstration effects. On the other hand, the demonstration zones should fully tap the supporting role of relevant policies, pay attention to innovating the ways of village environmental improvement and facility construction, and explore the path to integrate the primary, secondary, and tertiary industries to achieve balanced and high-quality development of the model villages. For areas with a relatively small number of model villages and relatively sparse distribution, the main task is to accelerate the process of rural revitalization. Resources such as funds, projects, and policies should be integrated to focus on supporting rural areas with high population density, suitable location, and transportation accessibility. Besides, it is necessary to promote rural development in a sequential manner from the construction of living environment, followed by industrial development and eventual rural revitalization. It is crucial to cultivate new business forms by taking full advantage of local resource endowment and historical and cultural connotations in these villages.

5.2. Multi-Subject Collaboration to Promote High-Quality Rural Development

In the socialist market economy with Chinese characteristics, the government plays an important role in promoting economic and social development and regulating the pattern of regional development. Many theoretical studies have shown that local government intervention not only has a significant impact on the creation of model villages and their spatial differentiation but also contributes to physical environmental improvement and socioeconomic regeneration of the rural areas. However, with the rigid constraints of limited financial resources, local government-led rural revitalization measures can only benefit a few villages directly; besides, they have the disadvantages of emphasizing the short-term construction and neglecting long-term operations and management [40]. For promoting both the sustainable development of established model villages and the construction of model villages from one locality to a larger area, the issue of cultivating endogenous development capacity of rural areas should be considered, which is a key objective of rural revitalization model village construction in China. The development of a cooperative governance model with community participation is the only way to transform from government-led model to farmers becoming practitioners and active promoters of rural revitalization.
Cooperative governance features the participation and collaborative governance of multiple stakeholders, which is underpinned by people-oriented governance concept, empowerment pathway, and win–win cooperation mechanism. To form a cooperative governance mode, all stakeholders should play their proper roles. The government should play its role as the guide of rural governance through macro policy formulation and the supply of basic resources, which includes mobilizing other actors to participate in rural development and supporting the reasonable demands of farmers while discouraging individual demands that affect the public interest of the countryside. Enterprises should play their role as supporters of rural governance including investing in rural construction and supporting industrial development to achieve mutual benefits with farmers through enhancing social responsibility and focusing on the long term benefits. Social elites should play the role of helpers, guides, and educators in rural governance, providing technical support for rural development and enhancing rural human capital. Villagers should become the key subject of rural construction and development, holding the responsibility of “building their own homes” and participating in rural public affairs actively. They need to realize self-empowerment with the support of government, enterprises, social elites, and other external forces and strive to improve their own skills and collective action, which will finally improve the endogenous development momentum of the village.

Promoting the development of collaborative governance in rural area is of great significance to improve the quality of rural revitalization. First, it helps to build a good communication framework and negotiation mechanism which can make the most of each stakeholder’s role. Cooperative governance makes sure that different stakeholders participate in the decision-making process and make extensive consultation to obtain consensus on development. It enables rural governance to play the leading role of the government and obtain support from external forces, such as enterprises and social elites to achieve farmers’ benefits. Second, it is beneficial to balance development among rural economy, society, and ecology. As the key subject of cooperative governance, villagers enhance their own awareness and abilities to participate through the educational and institutional empowerment by government and other entities. The empowerment also helps villagers to form a stronger sense of responsibility than foreign entities. Besides, the enhancement of human capital allows the emergence of farmer elites and their knowledge spillover is passed on, shared, and learned through rural social networks, which works in the long run to promote the overall labor productivity of villages [41]. The deep involvement of local villagers in the exploitation of local resources, socio-economic activities, and ecological conservation is beneficial to promote the sustainability of rural revitalization.

5.3. Supporting Rural Revitalization Strategy with Macro Policies Optimization

As China is a developing country, problems that arise in its development should be resolved in the course of development. Since the reform and opening up, actively playing the role of government has been a successful strategy in achieving the “growth miracle” of China’s economy. However, in this process, the GDP-oriented political promotion championship has led the local government to formulate and implement a series of urban-biased development strategies, which have become the important factors in the accelerated decline in China’s rural areas and the unbalanced development between urban and rural areas. It also has triggered the phenomenon that some rural areas copy the practices of urban development directly which exacerbates the pollution in the rural and affects the conservation of natural resources and the environment. As China’s development shifts from high-speed growth to high-quality, there is a consensus that a certain economic growth rate should be sacrificed for the sake of development quality. In this context, promoting the reform of political performance evaluation at the institutional level and improving the institutional mechanism for urban and rural integrated development have become the foundations for accelerating rural revitalization. Meanwhile, exploring the path of rural ecological transformation to achieve the simultaneous growth of natural and
economic “dual wealth” through policy guidance is the key to improving the quality of rural revitalization in the context of ecological civilization construction.

The central government, as the maker of China’s macro policies, should firstly optimize the performance evaluation system to guide local governments to shift from focusing on the short-term performance of economic growth to long-term performance and from focusing on the growth rate to the development quality. By increasing the weight of coordinated urban and rural development in the performance appraisal, local governments must be forced to abandon the urban-biased strategy, curb the impulse to invest excessively in urban areas, and increase the proportion of fiscal support to the rural. It is also necessary to guide local governments to consider the resource endowment in the rural and villagers’ initiative sufficiently, formulate goals and measures in line with long-term development, and avoid short-term and inefficient local economic growth. Secondly, the central government should improve institutional mechanisms and policy systems for the integrated development of urban and rural areas to promote the two-way flow of urban and rural elements. These include building an institutional framework for the free flow and equal exchange of urban and rural production factors, strengthening infrastructure construction for urban–rural coordination, establishing an integrated urban–rural public service system, completing the mechanism for linking and interest-sharing between enterprises and farmers, and strengthening policy support and financial subsidies.

In the process of ecological civilization construction, rural revitalization needs to fully consider the relationship among rural socioeconomic development, resource conservation, and environmental protection. The central government should encourage rural revitalization demonstration villages to explore the paths of ecological transformation, which will help to formulate goals and measures in line with rural resource protection and low environmental impact orientation. To promote rural ecological transformation, it is a prerequisite to strengthen awareness of ecological protection. Protecting and improving the ecological environment is the foundation while the formation of green production and eco-friendly way of life and the realization of the value of ecological products is the key. Therefore, the first thing to do is create a stronger awareness of sustainability in the policy, economic, and public spheres by publicity and education. Secondly, to play the key role of technology and knowledge in the ecological transformation, the government should increase support for the development of key technology of rural resource utilization and environment protection by policy support, financial subsidies, and establishing major research and development projects. In addition, the governments should help to build up a new production and consumption network between urban and rural areas to promote the rural ecological transformation by measures such as formulating subsidy policies for the development of ecological agriculture, accelerating the construction of a traceable quality certification system for ecological agricultural products, improving the pricing and market supervision mechanisms for ecological products, and guaranteeing the market outlets for ecological products.

5.4. Research Limitations

The results of this study are of great significance to the construction and sustainable development of rural revitalization model villages, but there is room for further in-depth research. First, due to the relatively short period for establishing model villages, this paper focused on the issue of spatial heterogeneity at specific time nodes and thus does not provide a comprehensive comparison of temporal and spatial heterogeneity. In the future, based on continuous attention to China’s rural revitalization strategy and extensive collection of scientific data, more systematic quantitative indexes can be calculated, and conducting comparative analysis from multiple temporal and spatial perspectives will have great practical guiding significance. Second, rural revitalization involves multiple stakeholders, but given the limited availability of data and research scope, this paper focused mainly on the distribution pattern of model villages from the perspective of spatial heterogeneity, and the discussion about different interest groups related to model villages.
is insufficient. In the future, using a combination of qualitative and quantitative methods, under the premise of field investigation and comprehensive analysis of the interests of all parties and from the perspective of stakeholder interaction mechanisms, how to cultivate the endogenous dynamics of the rural areas to achieve rural revitalization and sustainable development can be studied, which represents an important research direction.

6. Conclusions

This study used the NNI, disequilibrium index, and KDE to analyze the spatial differentiation characteristics of rural revitalization model villages in the YRD and used the geographical detector method to reveal the driving factors. The main research conclusions are as follows: (1) The spatial distributions of rural revitalization model villages in the YRD and provinces all exhibited weak agglomeration characteristics and were imbalanced. Among the four regions of Shanghai, Jiangsu, Zhejiang, and Anhui, the imbalance in the spatial distribution of model villages in Anhui was the highest. (2) The distribution of rural revitalization model villages in the YRD was densest in areas along the Yangtze River and extending from the areas along the river to the northern and southern directions, the distribution was initially sparse and then dense. Model villages tend to agglomerate in places along rivers and lakes, close to traffic arteries and middle areas of the suburbs. (3) The spatial differentiation of rural revitalization model villages is the result of the combined effect of multiple factors, and the main driving factors are different under different spatial scales and in different regions. The most important driving factors for the spatial differentiation of the model villages in the YRD, Jiangsu, Zhejiang, and Anhui were the social development level and government intervention, transportation accessibility and economic development, resource endowment and natural conditions, transportation accessibility, and government intervention, respectively.

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Note
\(^1\) Since some indexes are not available at the district level or are difficult to obtain, Shanghai is not included in the analysis of the influencing factors of each province.

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