Article

Spatial Differentiation and Driving Mechanism of Agricultural Multifunctions in Economically Developed Areas: A Case Study of Jiangsu Province, China

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Abstract: Revealing the spatial patterns of differentiation and the driving mechanism of agricultural multifunctional patterns is an important aspect of coordinating the functional optimisation and coordinated development of different agricultural regions. On the basis of understanding the connotation of agricultural multiple functions, this paper constructed an evaluation index system of agricultural multiple functions. Taking Jiangsu Province as a typical case, the spatial patterns of agricultural multifunctions in Jiangsu since 1978 were analysed by using the entropy weight TOPSIS (technique for order preference by similarity to ideal solution) method and ESDA (exploratory spatial data analysis) model, and the influencing mechanism of agricultural multifunction spatial differentiation was revealed by a geographic detector model. The results showed that (1) the cities with higher agricultural grain production functions were mainly concentrated in Yancheng and Huai'an; cities with higher agricultural economic development functions were mainly distributed in the coastal areas of Jiangsu; cities with higher agricultural social security functions were mainly concentrated in the Suzhou–Wuxi–Changzhou metropolitan area; and cities with higher agricultural ecotourism functions evolved from Nanjing–Zhenjiang to Suzhou–Wuxi–Changzhou. (2) The H–H (high–high) cluster pattern of the agricultural grain production function shifted from southern Jiangsu to northern Jiangsu. The H–H clusters of the agricultural economic development function and social security function were mainly distributed in Suzhou–Wuxi–Changzhou, while the L–L (low–low) cluster was mainly distributed in northern Jiangsu. The H–H cluster of agricultural ecotourism functions was mainly distributed in the areas with rich mountain and hill resources or dense water networks in Jiangsu. (3) The agricultural multifunction pattern differentiation was affected by the natural environment and economic and social comprehensive factors; the level of economic development and population employment structure were the leading factors of agricultural multifunction spatial differentiation; industry structure and people's living conditions were the important driving forces of agricultural multifunction spatial differentiation; and the natural environment and population density were the basic factors underlying agricultural multifunction spatial differentiation.

Keywords: agriculture multifunction; spatial pattern; spatial agglomeration; ESDA; geographical detector; driving mechanism; economically developed areas

1. Introduction

With the continuous acceleration of urbanisation and industrialisation, the area of agricultural land is gradually shrinking, and the proportion of agriculture in GNP continues to decline [1,2]. At the same time, with the development of society and the economy, people's demand for the ecological and cultural functions of agriculture is increasingly urgent, and the function of agriculture is expanding from a single function of production to multiple functions, such as economy, ecology, and culture. Since 1949, this has been greatly influenced by the historical issues of promoting economic development at the expense of agriculture and "emphasizing industry and neglecting agriculture in China" [3].

Agriculture is still a weak industry, farmers are still a weak group, and the gap between urban and rural areas is still large [4]. The hollowing out of rural areas, the ageing of agricultural operators, the degradation of traditional functions, and the lack of industrial transformation are also becoming increasingly prominent.

The revitalisation and development of rural areas are key to improving the overall development of urban and rural areas in China [5]. As the starting point and driving force of rural development, agriculture should focus on promoting rural development. Under the background of the full implementation of rural revitalisation, paying attention to research on the multiple functions of agriculture has become a hot topic [6]. A scientific understanding of agricultural multifunction and its evolution trend has important practical significance for China's food security and rural revitalisation in the new era.

The concept of agricultural multifunction was first introduced in the "rice culture" proposed by Japan in the late 1980s [7]. The basic laws on food, agriculture, and rural areas clearly took food security, multiple functions, the sustainable development of agriculture, and the revitalisation of rural areas as the four basic concepts. The concept of agricultural multifunction was formally put forward in Agenda 21 of the Rio Earth Summit in 1992 [8]. In 1996, the "cork declaration" was the beginning of the practice of the EU (European Union) agricultural multifunction policy and put forward the "EU agricultural model" with agricultural multifunction as the core idea [9]. In 1999, the United Nations Food and Agriculture Organization (FAO) held an international conference on agriculture and land multifunction [10].

To date, agricultural multifunctions have been widely valued and applied worldwide, and extensive theoretical and empirical research has been carried out around agricultural versatility [11,12]. In general, agricultural multifunctional research has roughly gone through three stages: (1) 1994–2004 was the embryonic stage; (2) 2004–2015 was a period of fluctuating growth; (3) 2016 to date showed a trend of bipolar development; China showed a slow decline, while the number of documents produced outside China showed a trend of growth. Developed countries paid more attention to the exploration of modes [13], influences, and driving forces [14] in research into agricultural multifunction, focusing on the impact of the rapid development of agricultural multifunction on land use [15,16], ecosystem services [17,18], biodiversity [19,20], and policies [21,22] from a micro perspective.

China's research on agricultural multifunction mainly focused on the research contents, methods, scales, and regions: (1) In terms of research content, the current research field was increasingly expanding, mainly focusing on agricultural multifunctional regional divisions [23], evaluation systems [24], spatial–temporal evolution [25], driving mechanisms [26] and optimisation paths [27]. (2) In terms of research methods, the comprehensive trend of multidisciplinary research methods was prominent, mainly involving quantitative analysis methods such as the entropy method [28], the AHP method [29], the multidimensional evaluation model [30], and the GIS spatial analysis model [31,32]. (3) In terms of research scale, the current research scale was mainly focused on the macro scale (province [33], urban agglomeration [34]) and mesoscale city [35]), and there were relatively few comparative studies on multiscale agricultural multifunctional characteristics. (4) In terms of the research area, the current empirical research on multifunctional agriculture in China focused on hot areas such as the Bohai Rim [36], central and southern Liaoning [37], and Changsha–Zhuzhou–Xiangtan [38]. In conclusion, the current research on the concept connotation, index construction, and quantitative evaluation of agricultural multiple functions has become increasingly perfected [39,40].

There have been relatively few studies on the characteristics of agricultural multifunctional patterns from different scale perspectives. It is still necessary to explore the spatial–temporal relationship of agricultural multifunction and its influencing mechanisms on the basis of regional types and pattern recognition. In addition, there is a lack of discussion and summary on the developmental characteristics, spatial differentiation rules, and driving mechanisms of multifunctional agriculture in economically developed areas. During the process of rapid urbanisation, it is of great practical significance to reveal

the evolutionary characteristics and driving mechanism of agricultural multifunction in economically developed areas, and it is also helpful to enrich the international theory of agricultural multifunction.

Since the reform and opening up, with the urbanisation and economic and social development of Jiangsu Province in the eastern coastal areas, the regional agricultural function has been undergoing transformation and reconstruction, and the agricultural function has gradually changed from a single economic function in the past to a complex function integrating economic, social, ecological, cultural, and entertainment functions, representing an important epitome of the evolution of agricultural multifunction in economically developed areas. Therefore, this study took Jiangsu as a typical case of economically developed areas from the perspective of different scales, such as cities and counties, and integrated the entropy weight TOPSIS method, the ESDA model, and the geographic detector model to study the spatial–temporal pattern differentiation and the influencing factors of agricultural multiple functions in Jiangsu from 1978 to 2019 to provide useful enlightenment and practical references for the transformation and upgrading of agricultural functions in economically developed areas in China. The analytical framework of the manuscript mainly includes the following parts:

- How can the spatial differentiation pattern of agricultural multiple functions be analysed at the city scale? In this part, four aspects, namely grain production, economic development, social security, and ecological tourism, were used to build the agricultural multifunction ecotourism function evaluation index system through the entropy weight TOPSIS method, which measures the agricultural multifunction level based on the GIS platform and reveals the space–time structure of agricultural multifunctions and the evolutionary characteristics in Jiangsu Province since 1978.
- How can the spatial correlation pattern characteristics of agricultural multifunctions be analysed at the county scale? In this part, the global Moran's I and local Moran's I indices in the ESDA model were used to reveal the spatial agglomeration characteristics of agricultural multifunctions in Jiangsu Province since 1978 from the global and local dimensions, respectively.
- How can the driving mechanism of agricultural multifunctional spatial differentiation be revealed? In this part, based on the theoretical analysis of the influencing factors of agricultural multifunction evolution, specific influencing factor indicators were selected, the leading factors affecting the spatial–temporal differentiation of agricultural multifunction in Jiangsu were detected through the geographical detector model, and the driving mechanism was revealed.

2. Materials and Methods

2.1. The Study Area

Jiangsu Province is located in an eastern coastal area of China, bordering the Yellow Sea to the east and Shanghai, Zhejiang, Anhui, and Shandong (Figure 1). It is an important part of the national strategy for the regional integration of the Yangtze River Delta, with a population of 84.8 million and a land area of 107,200 square kilometres. By the end of 2020, the total output value of agriculture in Jiangsu was 100.2 billion yuan, the total power of agricultural machinery reached 52.1 million kilowatts, and the machine-cultivated area reached 7630.6 thousand hectares. Jiangsu Province is endowed with unique natural resources such as water, soil, sunlight, and heat, superior agricultural production conditions, and a high level of agricultural modernisation. However, at the same time, due to its geographical location, economic basis and history, and other factors, the economic and social development of the province presents a significant gradient difference, and the agricultural and rural modernisation of southern Jiangsu and northern Jiangsu has been differentiated, which represents an important example in miniature of China's agricultural regional function transformation after the reform and opening up. Therefore, Jiangsu Province was selected as a typical case of China's rapid economic development since the reform and opening up, due to its certain representativeness.
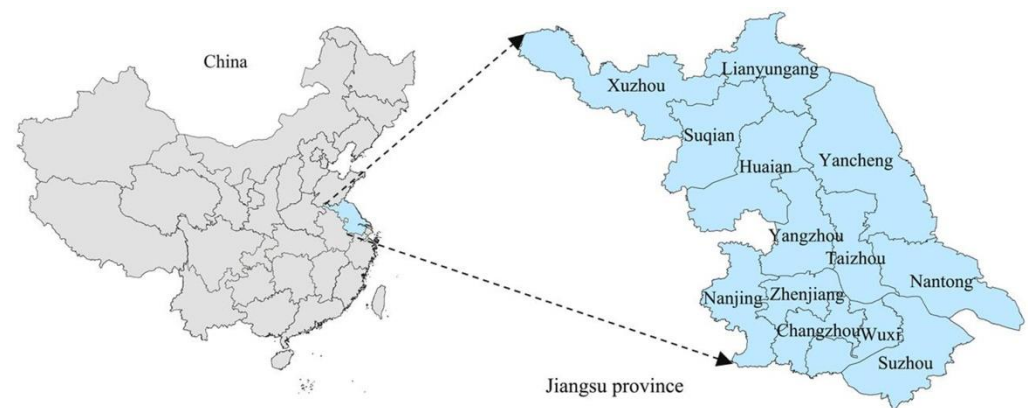
Figure 1. The geographical location of study area.

2.2. Research Methods

2.2.1. Function Evaluation Model

The theory of agricultural multifunction points out that agriculture can not only produce agricultural products but also play the role of derivative functions such as economy, society, ecology, and culture [41–43]. Therefore, in addition to the basic function of grain production, agriculture also has the functions of economic development, social security, and ecological tourism to meet the diversified needs of social development. Combining the actual situation of Jiangsu Province and considering the accessibility of evaluation index data, with reference to the construction results of the agricultural multifunction evaluation index system, an evaluation system was constructed from the four aspects of the agricultural grain production function, the economic development function, the social security function, and the ecotourism function (Table 1) [44,45].

Table 1. Agricultural multifunction evaluation index system.

Function	Index	Index Attribute	Weight
Grain production function	Grain yield per unit area	+	0.0683
	Per capita grain availability	+	0.0624
	Grain sown area	+	0.0892
Economic development function	Total agricultural output value	+	0.1022
	Proportion of total agricultural output value in GDP	+	0.1267
	Per capita net income of farmers	+	0.1129
Social security function	Rural agricultural employment rate	+	0.1183
	Added value of labour per capita primary industry	+	0.0922
	Rural Engel coefficient	-	0.0718
Ecotourism function	Forest coverage rate	+	0.0665
	Agricultural fertiliser consumption	-	0.0568
	Proportion of agricultural tourism income in GDP	+	0.0785

Based on the evaluation index system, the entropy weight TOPSIS method was used to measure the agricultural multifunctional level. The TOPSIS method of entropy weight is an objective weight assignment method that measures the amount of information provided by each indicator from a mathematical perspective and determines the weight of each indicator on this basis, avoiding the interference of human factors to a large extent [46,47]. The TOPSIS method, also known as the superiority and inferiority solution distance method, sorts the superiority and inferiority of multiple targets by determining the Euclidean distance between the positive ideal solution and the negative ideal solution and then by the correlation with the closeness degree. When an evaluation target is closest to the optimal

solution and furthest away from the worst solution, it is the best. Otherwise, it is not optimal. For details, see [38].

2.2.2. ESDA Model

The exploratory spatial data analysis (ESDA) model describes and visualises the spatial distribution pattern of geographical phenomena, discovers the spatial clustering characteristics, and analyses the mechanism. The specific indicators of the model include global Moran's I and local Moran's I indices [48–50], and the theoretical formula is as follows:

① Global Moran's I:

$$I(d) = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} (X_i - \overline{X})(X_j - \overline{X})}{S^2 \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij}}$$

where X_i is the observed value of region i; X_j is the observed value of region j; W_{ij} is the spatial weight matrix; and the spatial adjacency is 1. $I(d) > 0$ is a positive spatial correlation, and there is significant agglomeration in space.

② Local Moran's I:

$$I_i = \frac{Z_i - \overline{Z}}{D^2} \sum_{j=1}^{n} W_{ij}(Z_j - \overline{Z})$$

where Z_i' and Z_j' are the standardisation of observed values on regions i and j. When $I_i > 0$, the agricultural multifunction has a small difference from the surrounding areas. When $I_i < 0$, the agricultural multifunction is significantly different from the surrounding area.

2.2.3. Geographic Detector Model

The geographic detector model is a statistical method combining GIS spatial analysis technology to detect the spatial differentiation of a single variable or the possible causal relationship between two variables [51–53]. The basic principle is that the whole study area is divided into several subareas. If the sum of the variances of the fruit area is less than the total regional variance, there is spatial differentiation; if the spatial distribution of independent variables and dependent variables tends to be consistent, there is a statistical correlation between them [54]. The theoretical formula is:

$$P_{D,\,S} = 1 - \frac{1}{N\sigma_S^2} \sum_{H=1}^{m} n_{D,\,H}\, \sigma_{S_{D,\,H}}^2$$

where $P_{D,\,S}$ is the influence of influence factor D on agricultural multifunctional development level S; $n_{D,\,H}$ represents the number of sublevel regional samples; N is the number of samples in the whole region; m is the number of sublevel region samples; σ_S^2 represents the variance of agricultural multifunctional development level in the whole region; and $\sigma_{S_{D,\,H}}^2$ is the variance of the regional agricultural multifunctional development level. The value range of $P_{D,\,S}$ is [0,1]. If the $P_{D,\,S}$ value is larger, it indicates that the influencing factors have greater effects on the development of the agricultural multiple functions.

2.3. Data Collection

The research data in this paper mainly included statistical data and spatial data. (1) The statistical data, mainly including the indices for the agricultural multifunction evaluation and impact factor analysis of 13 cities and 77 counties in Jiangsu Province, were detailed in the China Statistical Yearbook of Counties (county volume), the Jiangsu Statistical Yearbook, and the Jiangsu Rural Statistical Yearbook from 1979 to 2020, as well as 13 municipal statistical yearbooks and national economic and social development statistical bulletins. The measurement data of tourism development level were from the websites of the Ministry of Agriculture and the National Tourism Administration. (2) The spatial data, mainly including the spatial vector data of Jiangsu city and county, mainly derived

from the administrative zoning map of the Atlas of Jiangsu Province (2020), were obtained by using vectorisation in ArcGIS10.2 software (Environmental Systems Research Institute, Redlands, CA, USA), and the corresponding optimisation and adjustment of the counties (cities) of the administrative zoning adjustment during the study period were carried out to ensure the data consistency.

3. Results

3.1. Overall Pattern Differentiation

Based on the ArcGIS10.2 (Environmental Systems Research Institute, Redlands, USA) analysis platform, the calculated data of the agricultural multifunctional level of urban units with four cross-sections in 1978, 1990, 2005, and 2019 were selected, and the calculated values were divided into three categories using the natural fracture point classification method. The horizontal spatial distribution map of the agricultural multifunctions in Jiangsu Province at the city scale was obtained from 1978 to 2019 (Figures 2–5).
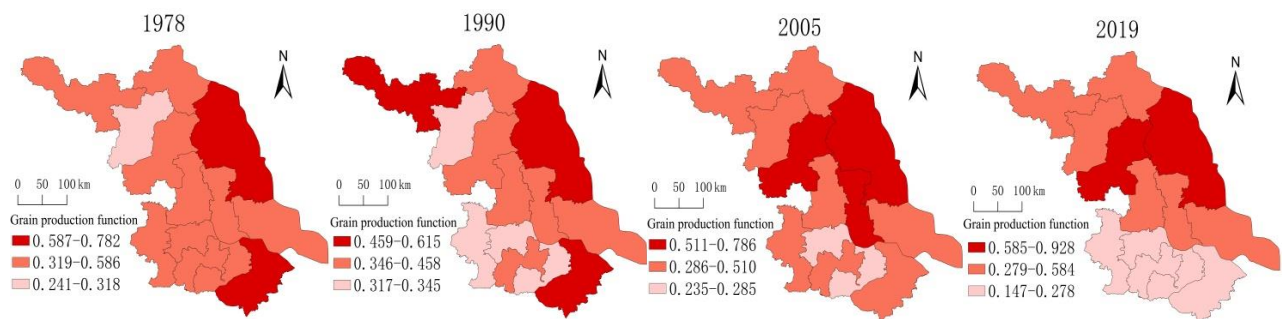

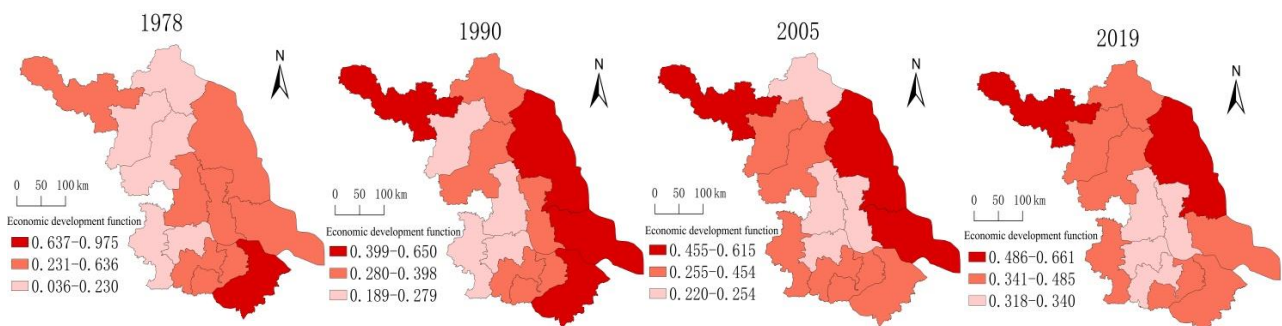**Figure 2.** Spatial evolution of the grain production function in Jiangsu (1978–2019).

Figure 3. Spatial evolution of the economic development function in Jiangsu (1978–2019).
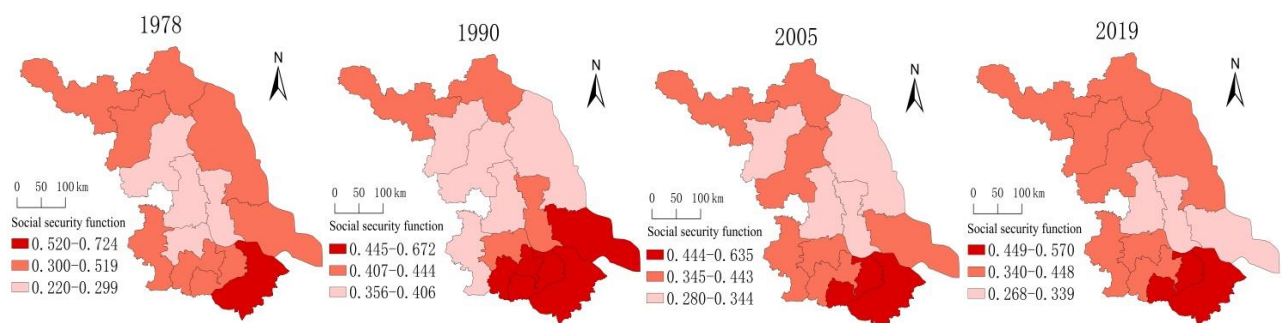

Figure 4. Spatial evolution of the social security function in Jiangsu (1978–2019).
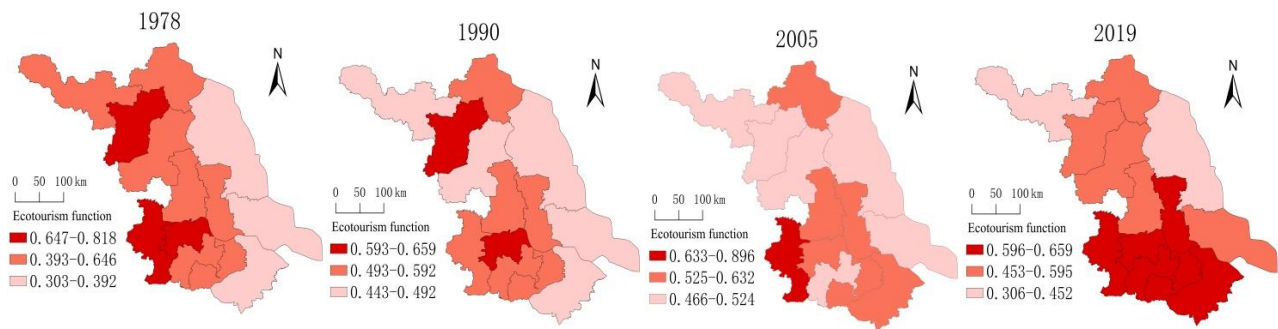
Figure 5. Spatial evolution of the ecotourism function in Jiangsu (1978–2019).

3.1.1. Spatial Differentiation of Grain Production Function

From 1978 to 2019, the spatial pattern of the grain production function of agriculture showed a trend of shifting from south to north. In 1978, the level of the grain production function ranged from 0.241 to 0.782, and the cities with higher values were mainly distributed in southern Jiangsu. In 1990, the level of the grain production function was 0.317–0.615, and the cities with higher values were mainly distributed in southern and northern Jiangsu. The centre of the grain production function began to shift from south to north. In 2005, the value of the functional level of grain production ranged from 0.235 to 0.786, and the higher value was mainly concentrated in central and northern Jiangsu. By 2019, the level of the grain production function was between 0.147 and 0.928, and the cities with higher values were mainly concentrated in the agricultural product planting and production advantage areas in northern Jiangsu. During the process of rapid urbanisation, the cultivated land area decreased, the number of agricultural workers decreased, and the function of grain production gradually weakened. However, the less developed cities in northern Jiangsu, with large-scale grain cultivation, rich cultivated land resources, and continuous improvement of modern agricultural technology, experienced a significant rise in their grain production function.

3.1.2. Spatial Differentiation of the Economic Development Function

The high value of the agricultural economic development function was mainly concentrated in the coastal areas of Jiangsu Province from 1978 to 2019. In 1978, the level of the economic development function was between 0.036 and 0.975, and the cities with higher values were mainly distributed in southern Jiangsu and coastal areas. In 1990, the level of the economic development function was between 0.189 and 0.650, and the high-value cities were mainly distributed in Nantong, Yancheng, and Xuzhou in northern Jiangsu Province. In 2005, the level of the economic development function was 0.220–0.615, and the high-value cities were mainly concentrated in the coastal areas of Nantong, Yancheng, and Xuzhou in northern Jiangsu. By 2019, the level of the economic development function was between 0.318 and 0.661, with the higher cities still mainly concentrated in the coastal areas of Jiangsu and northern Jiangsu. With the development of industrialisation and urbanisation, the focus of development in southern Jiangsu has gradually changed from primary industry to secondary and tertiary industry, and its agricultural economic development function has gradually weakened. Northern Jiangsu is an important strategic area of food security in Jiangsu, and the primary industry plays an important role in Jiangsu Province.

3.1.3. Spatial Differentiation of Social Security Functions

The high value of the agriculture social security function was mainly distributed in the economically developed southern Jiangsu region from 1978 to 2019. In 1978, the level of the social security function was between 0.220 and 0.724, and the cities with high levels were mainly located in Suzhou in southern Jiangsu. In 1990, the level of the agriculture social security function was between 0.356 and 0.672, and the high-value cities were mainly concentrated in the Suzhou–Wuxi–Changzhou metropolitan area. In 2005, the level of

the social security function was between 0.280 and 0.635, and the high-value cities were mainly concentrated in the Suzhou–Wuxi area. By 2019, the high-value pattern of the social security function did not change. Due to the rise in the secondary and tertiary industries, the agricultural labour force in the northern cities of Jiangsu Province has been transferred rapidly, and more farmers have chosen to enter a different occupation. As a result, the absorption of the agricultural labour force has decreased, and its employment and social security functions have been weakened. Due to the rapid economic development in southern Jiangsu province, more jobs have been established for farmers, and they have experienced an increased income, and their employment and social security functions are also higher.

3.1.4. Spatial Differentiation of the Ecotourism Function

From 1978 to 2019, the agricultural ecotourism function pattern shifted from Nanjing–Zhenjiang to Suzhou–Wuxi–Changzhou. In 1978, the level of ecotourism function ranged from 0.303 to 0.818, and the high-value cities were mainly distributed in the Nanjing–Zhenjiang area. In 1990, the level of ecotourism function ranged from 0.443 to 0.659, and the cities with the highest level were distributed in Nanjing–Zhenjiang–Yangzhou and Changzhou–Wuxi. In 2005, the level of ecotourism function ranged from 0.466 to 0.896, and the spatial pattern of cities with higher values was basically stable. By 2019, the level of ecotourism function was between 0.306 and 0.659, and high-value cities were distributed in southern Jiangsu. In recent years, the economic development speed in northern Jiangsu has accelerated, the forest coverage rate has been reduced, and the proportion of pesticides and fertilisers in agricultural investment has also increased, resulting in a weak ecotourism function of agriculture. There are many natural mountains in southern Jiangsu, and the forest coverage rate is higher than that in northern Jiangsu. The ecotourism resources are relatively rich, and its ecotourism functional advantage is relatively significant.

3.2. Agglomeration Pattern Evolution

With the help of the exploratory spatial data analysis software GeoDa095 (Environmental Systems Research Institute, Redlands, CA, USA), the global Moran's I values of agricultural multifunctions in 77 county units in Jiangsu were calculated. As seen from Table 2, the global Moran's I values of the agriculture grain production function, the economic development function, the social security function, and the ecotourism function at the county scale during the study period were all greater than zero, passing the 1% significance level test, indicating that the agriculture multifunction at the county scale presented a positive spatial autocorrelation. Furthermore, the spatial distribution of agricultural multifunctions at the county scale in Jiangsu showed agglomeration. Among them, the global Moran's I values of the social security function and the ecotourism function were higher overall, indicating that their spatial agglomeration effect was significant. The global Moran's I values of the grain production function showed an upwards trend, indicating that its spatial agglomeration gradually strengthened. The global Moran's I values of the economic development function showed a declining trend, indicating that its spatial agglomeration effect gradually weakened.

Table 2. Global Moran's I index values of agricultural multifunction at the county scale in Jiangsu.

Year	Grain Production Function	Economic Development Function	Social Security Function	Ecotourism Function
1978	0.1352	0.4088	0.7390	0.3141
1990	0.1430	0.1340	0.4017	0.1330
2005	0.4772	0.1707	0.7547	0.3295
2019	0.5718	0.2384	0.6042	0.3219

Based on the LISA theory formula, the local Moran's I values of the grain production function, the economic development function, the social security function, and the ecotourism function at the county scale in Jiangsu were calculated. LISA clustering maps (Figures 6–9) were drawn by using the Multivariate LISA module in GeoDa095 software. The LISA agglomeration map can be divided into four types: (1) H–H (high–high) cluster type, indicating that the agricultural function development levels of this county and its neighbouring counties were high; (2) H–L (high–low) cluster type, indicating that the level of agricultural function development in this county was high, while that in neighbouring counties was low; (3) L–H (low–high) cluster type, indicating that the level of agricultural function development in this county was low, while that in neighbouring counties was high; (4) L–L (low–low) cluster type, indicating that the levels of agricultural function development in this county and adjacent counties were low.
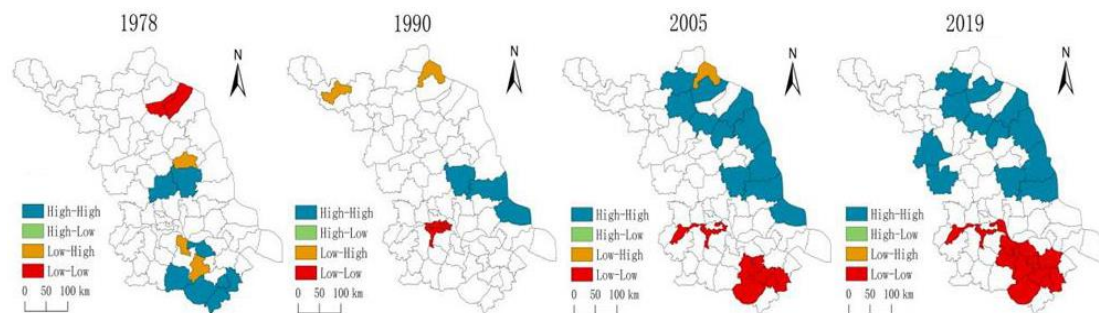

Figure 6. Local agglomeration evolution of the grain production function in Jiangsu (1978–2019).
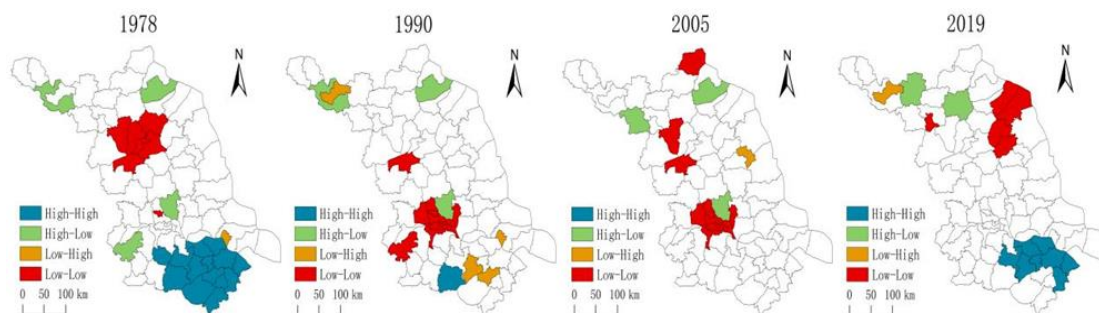

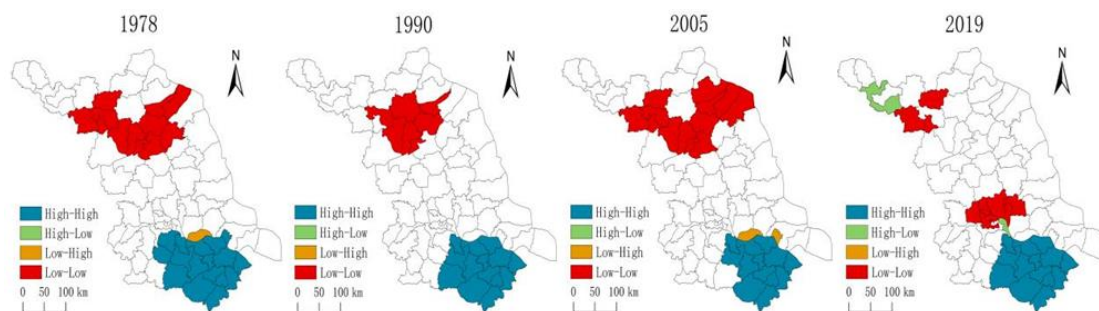**Figure 7.** Local agglomeration evolution of the economic development function in Jiangsu (1978–2019).

Figure 8. Local agglomeration evolution of the social security function in Jiangsu (1978–2019).
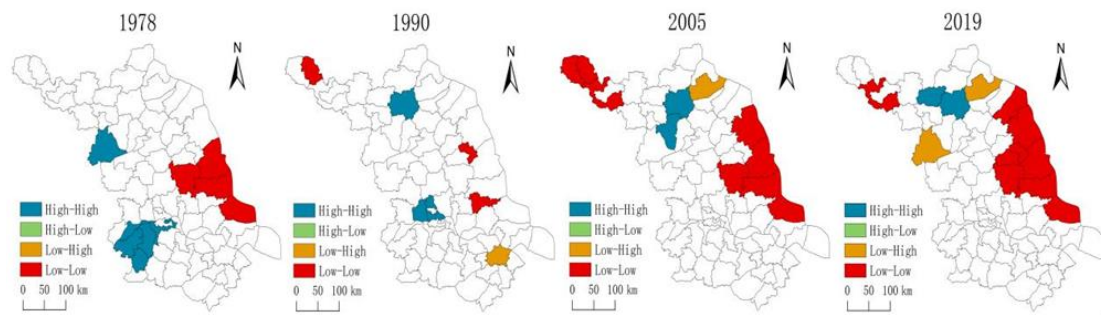
Figure 9. Local agglomeration evolution of the ecotourism function in Jiangsu (1978–2019).

(1) H–H cluster type: The H–H cluster type of the grain production function showed a trend of transferring from southern Jiangsu to northern Jiangsu. The evolution trend of the H–H cluster pattern of the economic development function and the social security function was relatively consistent and was mainly distributed in southern Jiangsu. The ecotourism function's H–H cluster type was mainly distributed in the counties around Nanjing-Zhenjiang, near Gaoyou Lake, Hongze Lake, and Luoma Lake. The counties of this type were mainly concentrated in areas with rich mountain and hill resources or dense water networks.

(2) L–L cluster type: The L–L cluster pattern of the grain production function showed a trend of transferring from northern Jiangsu to southern Jiangsu, mainly concentrated in the municipal districts and surrounding areas. The L–L cluster type of the economic development function was mainly distributed in northern Jiangsu and Nanjing–Zhenjiang–Yangzhou. The L–L cluster type of the social security function was mainly distributed in the counties of northern Jiangsu. The L–L cluster type of ecotourism function was mainly distributed in the coastal counties of Jiangsu and some counties of Xuzhou in northern Jiangsu.

(3) H–L cluster type and L–H cluster type: During the study period, the H–L and L–H cluster types of the grain production function, the economic development function, the social security function, and the ecotourism function presented a "point" distribution, their spatial distribution pattern was relatively scattered, and there was no significant spatial agglomeration effect.

3.3. Analysis of the Driving Mechanism

3.3.1. Factor Index Selection

Most of the studies on the factors influencing agricultural multiple functions proposed that the development of agricultural multiple functions was the result of the joint action of internal and external factors, mainly affected by the comprehensive influence of multiple factors, such as natural resource conditions, geographical location conditions, population and economic development [55–57]. On the basis of the research results on the impact mechanism of agricultural multifunctional development and in combination with the characteristics of agricultural multifunctional development in Jiangsu, taking 2019 as the research year, 11 factors, such as natural, population, and economic development, were selected. The annual average temperature (X_1), annual total precipitation (X_2), and annual total sunshine duration (X_3) represented the natural factors. The proportion of nonagricultural employees (X_4), population density (X_5), and urbanisation rate (X_6) represented the population factors. Per capita GDP (X_7), the proportion of the second industry in GDP (X_8), the proportion of the third industry in GDP (X_9), the per capita savings deposit balance of urban and rural residents (X_{10}), and the per capita retail sales of social consumer goods (X_{11}) represented the factors of economic development. The dominant factors of the spatial differentiation of the grain production function (Y_1), the economic development function (Y_2), the social security function (Y_3), and the ecotourism function (Y_4) were quantitatively identified through the geographic detector model.

3.3.2. Dominant Factor Detection

With the help of ArcGIS 10.2 software (Environmental Systems Research Institute, Redlands, CA, USA), the influencing factors of the spatial differentiation of the agricultural grain production function (Y_1), the economic development function (Y_2), the social security function (Y_3), and the ecotourism function (Y_4) in Jiangsu were reclassified and then sampled. According to the geographical detector theoretical model, the action intensity value Q of each influencing factor was calculated. Table 3 shows that different impact factors had different intensities on the grain production function, the economic development function, the social security function, and the ecotourism function. In general, the intensity value Q of four factors, namely, the proportion of nonagricultural employment (X_4), urbanisation rate (X_6), per capita GDP (X_7), and the proportion of the secondary industry in GDP (X_8), on the functions of grain production, economic development, social security, and ecotourism were greater than 0.5, indicating that they were the leading factors affecting the differentiation in the patterns of agricultural multifunctions in Jiangsu.

Table 3. Detection results of agricultural multifunctional spatial differentiation factors in Jiangsu.

Index	Grain Production Function		Economic Development Function		Social Security Function		Ecotourism Function	
	q Value	Rank	*q* Value	Rank	*q* Value	Rank	*q* Value	Rank
Annual mean temperature	0.760	2	0.175	10	0.241	9	0.609	4
Annual total precipitation	0.563	8	0.234	9	0.220	10	0.501	9
Annual total sunshine duration	0.670	4	0.124	11	0.117	11	0.618	3
Proportion of nonagricultural employees	0.833	1	0.659	3	0.728	2	0.575	6
Population density	0.702	3	0.449	8	0.501	6	0.541	7
Urbanisation rate	0.592	5	0.526	4	0.513	5	0.697	2
Per capita GDP	0.578	7	0.717	1	0.833	1	0.606	5
Proportion of secondary industry in GDP	0.580	6	0.683	2	0.551	4	0.766	1
Proportion of tertiary industry in GDP	0.328	11	0.450	7	0.455	7	0.411	10
Per capita savings of urban and rural residents	0.402	9	0.507	5	0.708	3	0.507	8
Per capita retail sales of social consumer goods	0.342	10	0.496	6	0.453	8	0.363	11

(1) In terms of the grain production function, the Q values of the proportion of nonagricultural employment (X_4), annual average temperature (X_1), and population density (X_5) ranked at the top, which showed that the development of the agricultural grain production function was greatly affected by these factors. (2) In terms of the economic development function, the Q values of per capita GDP (X_7), the proportion of the secondary industry in GDP (X_8), and the proportion of nonagricultural employment (X_4) ranked at the top, indicating that these factors had significant impacts on the development of the agricultural economic development function in Jiangsu. (3) In terms of the social security function, the Q values of per capita GDP (X_7), the proportion of nonagricultural employment (X_4), and the per capita savings of urban and rural residents (X_{10}) ranked at the top, indicating that the development of the agricultural social security function in Jiangsu was greatly affected by them. (4) In terms of the ecotourism function, the Q values of the proportion of the second industry in GDP (X_8), the urbanisation rate (X_6), and the annual total sunshine duration (X_3) ranked at the top, indicating that they had significant impacts on the agriculture ecotourism function.

3.3.3. Explanation of the Influencing Mechanisms

The basic, important, and leading factors affecting the spatial differentiation of agricultural multifunction were summarised by using the detection results of geographical detectors, forming the frame diagram of the influencing mechanisms underlying the spatial differentiation of agricultural multifunction in Jiangsu, and by carrying out a preliminary interpretation of its influencing mechanisms (Figure 10).
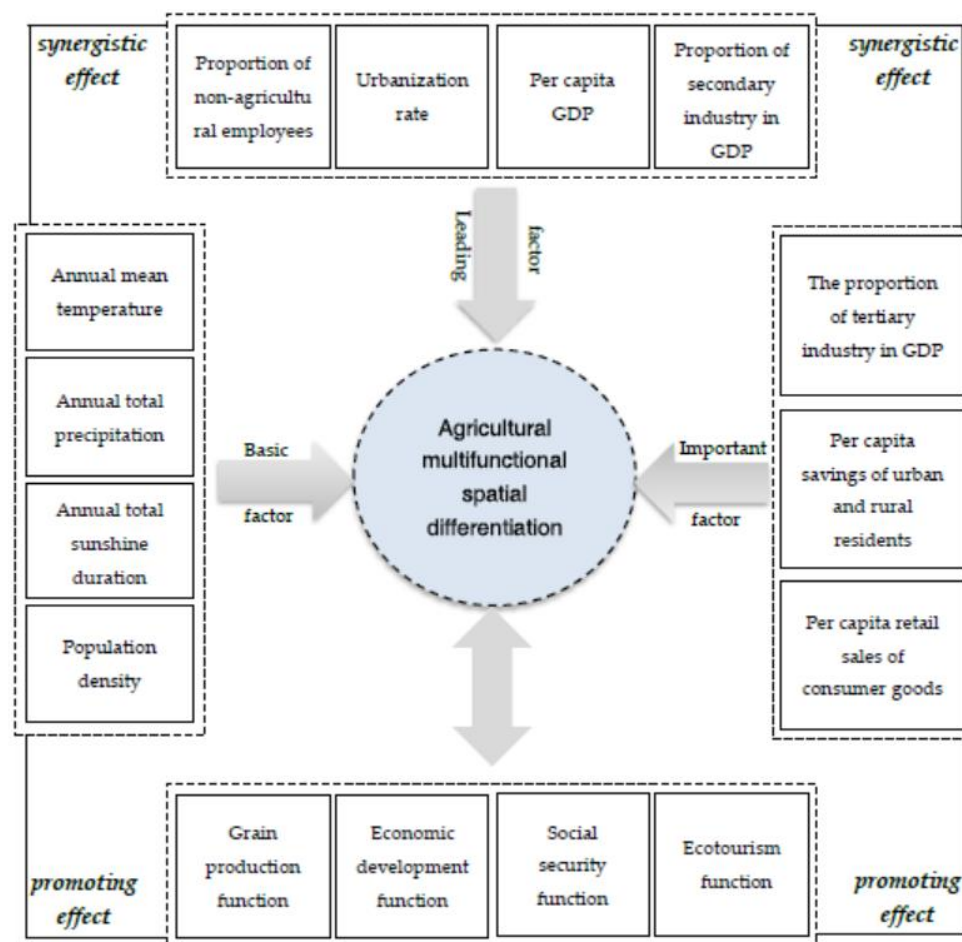
Figure 10. Influencing mechanisms of agricultural multifunctional spatial differentiation.

(1) The level of regional economic development and the population employment structure were the leading factors of agricultural multifunctional spatial differentiation. Regional economic development has a certain driving effect on the comprehensive development of agriculture; at the same time, as the main body of society, human beings can promote the development of agricultural economic functions and food production functions [58]. In 2019, the per capita GDP of southern Jiangsu reached 167,995 yuan, approximately twice that of northern Jiangsu, which indicated that the economic development level of this region was relatively high and played a greater role in radiating the functions of agricultural economic development. However, economic expansion continued to encroach on cultivated land and destroy the ecological environment, which hindered the development of the agricultural grain production function and the ecotourism function. The rural agricultural labour force of northern Jiangsu was 4.5825 million, approximately 4.7 times that of southern Jiangsu, indicating that the development of its grain production function had obvious advantages and that human activities would cause certain negative effects on the ecological environment.

(2) The industrial structure and people's living conditions were the important driving forces of agricultural multifunctional spatial differentiation. The transformation and upgrading of the industrial structure and the transformation from the primary industry to the secondary and tertiary industries provided farmers with a large number of employment opportunities and increased the farmers' income. Their social security function was improved but also led to a surge in the nonagricultural population and a decline in the absorption capacity of agriculture for rural labour, and the development of its food production function was hindered [59]. In 2019, the

proportion of output value in the secondary and tertiary industries in southern Jiangsu reached 93%, and the labour force in the secondary and tertiary industries reached 18.951 million, accounting for 92%, indicating that the employment of the rural labour force was obviously being transferred. The improvement of people's living standards promoted the transformation of their consumption structure from single-staple food consumer goods to high-quality agricultural products and promoted the development of green agriculture and other new models, thus promoting the improvement of agricultural grain production and economic development. At present, the per capita disposable income of residents in southern Jiangsu has reached 55399 yuan, while in northern Jiangsu, it is only 29,380 yuan. The difference in people's living conditions has had an important impact on the spatial differentiation of the multiple functions of agriculture in Jiangsu.

(3) The natural environment and population density were the basic factors of agricultural multifunctional spatial differentiation. A reduction in the rural population is accompanied by a reduction in agricultural employees, and therefore, agricultural development would be impossible [60]. The natural environment affects the agricultural production, economic development, transportation, and ecological environment in the region, leading to different levels of agricultural multifunctional development in Jiangsu, and the difference between the north and the south was relatively large. In northern Jiangsu, arable land resources are abundant, light and heat resources are well matched, and the number of agricultural workers is large, so its grain production function is prominent. However, the rapid development of industrialisation and urbanisation in southern Jiangsu has led to a reduction in the amount of cultivated land, the transfer of agricultural labour, and a relatively low level of grain production functions.

4. Discussion

(1) Taking Jiangsu Province as a typical case, this paper constructed an evaluation index system of agricultural multiple functions and analysed the spatial evolution and driving mechanism of agricultural multiple functions in economically developed areas since 1978 by using the entropy weight TOPSIS method, the ESDA model, and the geographic detector model. Through this study, the characteristics of the agricultural multifunctional evolution in economically developed areas were preliminarily revealed. Comparing the results of the agricultural multifunction research, it was found that (1) in the research on agricultural multifunction in Jiangsu Province, only Wang [61] used the dynamic factor analysis method to study the change characteristics of agricultural multifunction in Jiangsu Province at the regional level and found that there were regional differences in the level of agricultural multifunction in northern Jiangsu > central Jiangsu > southern Jiangsu. This paper focused on the county scale to reveal the spatial agglomeration characteristics of different agricultural functions at the county level, such as the grain production function, the economic development function, the social security function, and the ecotourism function, which provides guidance for the coordinated development of Jiangsu's agricultural multifunction at the county scale and ideas for the optimisation of county agricultural multifunction zoning from the perspective of dominant functions. (2) As for the research on the influencing factors of agricultural multifunction, at present, scholars such as Barnes [62], Fang [63], and Peng [64] have studied the driving factors of the spatial differentiation of agricultural multifunction, and most of them were qualitative descriptions. This paper selected the geographical detector model to study the dominant factors of the spatial differentiation of the different functions of grain production, economic development, social security, and ecotourism, thus revealing the driving mechanisms of the spatial differentiation of agricultural multifunction in Jiangsu, which will help improve the understanding of the driving mechanisms of agricultural multifunction spatial differentiation in economically developed areas.

(2) At present, under the condition of sustainable development and the progress of the social economy, the agricultural industry is increasingly showing its multifunctional value. In the future, agricultural development should continue to consolidate the basic position of agriculture. It should be recognised that agriculture not only has the economic function of grain production but also has the functions of social security and ecotourism to promote the diversified development of agricultural functions. Combined with the analysis of spatial differentiation and the driving mechanisms of agricultural multifunction in Jiangsu since 1978, it is necessary to give full consideration to natural conditions and resource endowments; give full play to regional comparative advantages; adhere to the principles of zoning optimisation, regional coordination, and overall planning; and put forward future agricultural multifunction optimisation suggestions in Jiangsu Province [65,66]:

     (1) The advantageous area of the grain production function of agriculture: In the future, on the basis of stabilising grain production guarantees, the advantageous regions of the grain production function in northern Jiangsu should speed up the cultivation of the intensive processing industry of agricultural products and build a base for agricultural production and processing by integrating production, supply, and marketing. At the same time, we should increase support for regional organic agriculture and promote the development of green agriculture.

     (2) The advantageous area of the economic development function of agriculture: In the future, the advantageous areas of the economic development function in southern Jiangsu should increase the development of their characteristic agriculture, expand the agricultural industrial chain, strengthen the integrated development of agriculture and secondary and tertiary industries, vigorously develop high-efficiency facility agriculture focusing on characteristic planting and leisure picking, and strive to build a characteristic agricultural industrial cluster model in the suburbs of the city.

     (3) The advantageous area of the ecotourism function of agriculture: In the future, the ecotourism function's advantageous areas around Nanjing–Zhenjiang and Gaoyou Lake should fully tap into the local agricultural ecological advantages, carry out the planting of the forest and fruit industry and other characteristic agricultural economic crops, vigorously develop the leisure agricultural tourism industry, actively develop agricultural ecotourism, and take the route of eco-economic characteristic development.

5. Conclusions

(1) The spatial pattern of agriculture multifunction was significantly different at the city scale in economically developed areas. The cities with higher grain production functions were mainly concentrated in Yancheng and Huai'an in northern Jiangsu, both of which are rich in cultivated land resources. The cities with higher economic development functions were mainly distributed in the coastal areas of Jiangsu. The cities with higher social security functions were mainly distributed in the economically developed Suzhou–Wuxi–Changzhou metropolitan area, and the level of the economic developmental function in northern Jiangsu had an obvious increasing trend during the study period. The cities with higher agricultural ecotourism functions evolved from the Nanjing–Zhenjiang area to the Suzhou–Wuxi–Changzhou area.

(2) The local spatial agglomeration patterns of agricultural multiple functions at the county scale were different, and the spatial agglomeration of different agricultural functions provides a spatial optimisation perspective for agricultural functions at the county scale in economically developed areas. The H–H cluster pattern of the agricultural grain production function in Jiangsu shifted from southern Jiangsu to northern Jiangsu, and the L–L cluster pattern was opposite to this changing trend. The H–H cluster of the economic development function was mainly distributed in southern

Jiangsu, while the L–L cluster type was mainly distributed in northern Jiangsu and Nanjing–Zhenjiang–Yangzhou. The H–H cluster of the social security function was mainly distributed in southern Jiangsu, while the L–L cluster was mainly distributed in northern Jiangsu. The H–H cluster type of the ecotourism function was mainly distributed in the counties near Nanjing–Zhenjiang, Gaoyou Lake, Hongze Lake, and Luoma Lake, and this type of function at the county level was mainly concentrated in areas with rich mountains and hilly resources or dense water networks.

(3) The diversity of agricultural multifunctional patterns in economically developed areas was the comprehensive result of natural, population, and economic factors, and the effects of the intensity of factors on agricultural grain production function, economic development function, social security function, and ecotourism function were different. The level of economic development and the structure of population employment were the leading factors of the spatial differentiation of agricultural multifunction; the industrial structure and people's living conditions were the important driving forces for the spatial differentiation of agricultural multifunction; and the natural environment and population density were the basic factors of spatial differentiation of agricultural multifunction. In the future, the pattern evolution of agricultural multifunction in economically developed areas will be mainly driven by the leading factors of economic and social development.

(4) This paper aimed to provide a practical reference for the optimisation of agricultural functions at the city and county scales and to provide practical guidance at the meso scale. In the future, research on agricultural multiple functions should further focus on the microscale, such as rural areas and farmers. The exploration of the relationship, evolution path, and development trend of agricultural multiple functions at the microscale, deeply revealing the impacts and mechanisms of local governments, enterprises, farmers, and other different subjects on the development of agricultural multiple functions, is a research direction that needs to be explored further.

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