Characteristic Analysis of the Village and Town Structure

——A Case of Jinhu County in Jiangsu Province, China

LUO Ya-li ∗, ZHANG Chang-xin
Huaiyin Institute of Technology, Huai’an 223001, China

Abstract This thesis gives overview of the connotation of rural spatial structure, indicating 4 kinds of elements, namely nodus, passage, region and flow. Their spatial arrangement and interaction lead to the corresponding rural spatial structure. This thesis also offers panorama of the related theoretical progress of intra-county and rural areas, indicating that the research theories of regional spatial structure at present, mainly focus on macroscopic region or urban space, but there is shortage of researches on county spatial structure, especially microscopic rural spatial structure. On such basis, 4 kinds of theoretical models and characteristics of regional spatial structure have been introduced. We build analysis index system of rural structural elements on the basis of 4 elements, and conduct rural spatial structural analysis, taking Jinhu County as an example. The result shows that rural spatial structure in Jinhu County is still at stage of nucleus-cluster development and rural system is not so sound. In addition, the passage network system of infrastructure has not taken shape, and county economy presents diseconomy of scale. The spatial interaction and association among towns in Jinhu County are weak. The characteristic analysis model of spatial structure in this research can objectively reflect regional characteristic of spatial structure.

Key words The Village and town spatial structure, Characteristic analysis, Crow distance, Jinhu County, China

Since China’s Interim Procedures for the County Town System Planning has been promulgated in 2006, all parts of the country have been organizing people to compile the country and village system in succession, to accelerate the pace of overall planning for the development of both urban and rural areas and the integration of urban and village area. Unfortunately, certain difficulties exist in the process of compiling the country and village system, for the reason that some places in China, lack both enough understanding of the law of spatial structure of the county town itself, and scientific and systematic research on its evolution process, factors, problems and development trend. This even stewards the sustained and healthy development of local economy. County economy is an important carrier of today’s regional economy. Village development is the key to the promotion of coordinated development of urban and rural areas. Taking county as the research subject, this paper focuses on the development theory and characteristic analysis of spatial structure of village, in the hope of boosting the coordinated development of urban and rural area and regional development.

1 An overview of the spatial structure of county and town

1.1 The meaning of the spatial structure of village and town Spatial structure refers to the spatial distribution and combination of the various economic activities within the region. Through a certain form of spatial organization, regional spatial structure link the relevant resources and elements together, which are scattered within the geographic space, resulting in various economic activities; and by relying on the spatial structure, economic activities lead to provident economies, agglomeration economies, and scale economies. So that spatial structure is the container of regional economy and a reasonable one that boosts spatial economy. The research of socio-economic development, especially during the socio-economic structure transformation period, focuses on spatial structure. Generally, village is believed to be village, town, and towns outside county. But considering the integrity of county space, the town space in this research, covers all space, including county, town, and village. Based on the above understanding, the spatial structure of the county can be understood as the inherently relatively stable, yet of certain variability, spatial distribution and the grade-scale relation between each spatial economy unit within the county. According to the geometric characteristics of the constituent elements, the spatial structure can be broken down as three material elements; node, passage, region, and one status element; flow. Nodes are the urban and rural settlements at all levels. Channels are the linear infrastructures that connect cities and towns, such as transportation networks, information networks. Domain surface is the spatial distribution of crop and economic rent. "Flow" is a dynamic expression form of material or non-material elements, which comprehensively reflects the internal organization of spatial structure, external validity, the quality of space channels and management level. The spatial arrangement of the four elements and their interactions constitutes the corresponding spatial structure of the town.

1.2 The theoretical progress of the researches on the spatial structure of the village and town As regards the
spatial structure of county towns, from the absolute sense, the theory generally is to study the theme of rural areas or rural space. Zeng Juxin in the *Space Economy: System and Structure* defines the basic pattern of rural spatial structure as "discrete structure", "strip-type structure", and "cluster-type structure". *China's Market and the Social Structure in Rural Areas*, a book studying the distribution of rural markets in Chengdu Plain written by scholar Skinner who expounded on the Chinese culture, towns and settlements in the context of the regional distribution of structural model, and pointed out that the traditional village fair space has characteristics of hexagonal distribution, which conforms to the Cristallerie Theory. Jin Zhaosen put forward centralized, satellite-style, and free style spatial layout form of village system. Besides, many scholars put forward local spatial structure model of towns and villages. Based on the analysis of village distribution characteristics in Guanzhong area, Chen Xiaojian posed that, influenced by spatial-temporal factors, the distribution characteristics in Guanzhong area are plain, mountain, and plateau, resulting in 3 types of settlements, namely clustered street settlement, clustered non-street settlement, and scattered settlement. Duan Jin, Wang Yue, Chen Zhiwen have made some researches on spatial characteristics of towns spatial structure. However, in the light of the dimension of space, scale, the current theories of spatial structure focus on macro-regional or urban space, and there is a shortage of researches on the spatial structure of county, especially micro-regional spatial structure.

### 2 Spatial structure of county towns and analysis framework

#### 2.1 The spatial structure of village and town in county

**theoretical model framework** Regional spatial structure is a dynamic process of evolution in different regions and stages of development, regional spatial structure elements show unique characteristics, the formation of the corresponding space structure. Summaries of the existing research results, generally, over times, will be followed by the formation of regional spatial structure of scattered point, most nuclear-style, point axis, network-style typical of the pattern, the corresponding features in Table 1. Therefore, by analyzing the characteristics of the four elements, it can accurately recognize a given period of the spatial structure of a regional status quo, so as to predict and to intervene effectively to help them structure the direction of the evolution of regional development.

<table>
<thead>
<tr>
<th>Spatial structure model</th>
<th>Scattered point type</th>
<th>Very nucleus type</th>
<th>Point axis type</th>
<th>Network type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of spatial structure elements</td>
<td>Node: Small scale and indistinctive level</td>
<td>The major towns are notable, but secondary center is under-developed</td>
<td>The major towns are notable, forming many secondary-level centers along the main axes</td>
<td>Hierarchical system of centers with many levels forms</td>
</tr>
<tr>
<td></td>
<td>Passage: Underdevelopment</td>
<td>Build tree form connection passages from high-level centers to low-level centers, and among low-level centers, there is a shortage of passages</td>
<td>High-level connection passages form the main connection axes</td>
<td>Multi-paths connection passages are built among centers, forming criss-crossed passage network</td>
</tr>
<tr>
<td></td>
<td>Region: The hinterland is mainly farmland with high homogeneity</td>
<td>In the hinterland, the focus is agriculture, and agricultural cash crops increase</td>
<td>The diverse functions of land use in hinterland</td>
<td>The land use structure in hinterland is rationalized</td>
</tr>
<tr>
<td></td>
<td>Flow: Few connections</td>
<td>The connections between adjacent centers are strengthened, and the connection direction is mainly the control of high level over low level</td>
<td>The mutual close connections along the main passages and the connections from high to low on the non-main-axes</td>
<td>The interactions among centers, close and frequent connections</td>
</tr>
</tbody>
</table>

#### 2.2 Analytical method of the spatial structure of county towns

*Every society is linked by three kinds of infrastructure, namely transportation networks, energy networks, and communications network. Considering the data availability, the article selected three indicators as analysis indicators: above four-level highway density, availability, and Internet coverage rate. Region reflects the face of agriculture, rural enterprises and other land use efficiency, and it can be construed by agricultural land per capita, and the land area per output value of township enterprises; flow mainly reflects the spatial transfer of various economic factors, and it can be analyzed by population conversion ratio, land conversion ratio, and effectiveness of non-agricultural land.*
Table 2 Analysis indicators of towns and villages spatial structure elements

<table>
<thead>
<tr>
<th>Elements</th>
<th>Objective indicators</th>
<th>Analysis indicators</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial structure of village and town</td>
<td>Node structure</td>
<td>Urban agglomeration degree</td>
<td>Primacy ratio indicators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural agglomeration</td>
<td>Average scale of town</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Passage network structure of infrastructure</td>
<td>Average village scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The transportation network of roads degree</td>
<td>4 level or more road connectivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information network</td>
<td>4 level or more road availability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The structure of land resources use</td>
<td>Network coverage rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The land use scale of town industry</td>
<td>Agricultural per capita cultivated land area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land use benefit</td>
<td>The land use area of per capita land of town enterprises</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The condition of flow</td>
<td>Per capita land value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Labor force transference rate</td>
<td>The proportion of non-agricultural land</td>
</tr>
</tbody>
</table>

3 Analysis of spatial structure of Jinhu County

3.1 Elements analyses of spatial structure of county town

3.1.1 Scale Structure of the village system: single-core structure, imperfect village system. Lake County has 11 townships. From its proportion of its urban population and the built area ratio (Fig. 1-2), we can see that within the county town, Li Town is the only urban center of town, undeveloped sub-urban, a relatively balanced number of secondary cities and towns that located within the county, and all remain in the town stage, and is typical of single-core structure. The average township has a population of 3.26 million, lower than the average registered population of Huaiian by 4.2 million, so is lower than that in Northern Jiangsu (5 million people) and Jiangsu Province (5.4 million). The average urban population is 1.14 million. Excluding county towns, other counties have an urban population of 0.44 million, showing significantly smaller scale.

Look on the village, the county has 4,092 natural villages, with an average size of 56.99 people, of which 3,289 villages have less than 50 people, accounting for 80.4% of the total natural villages; 387 villages have 51 – 100 people, accounting for 9.5%; 265 villages have 101 – 300 people, accounting for 6.4%; 153 villages have 301 – 800 people, accounting for 3.7%; none has more than 800 people. The node structures in towns and villages are not reasonable.

3.1.2 The unpaired system of infrastructure network access. First of all, considering the road network, Linnian road went through the west of Jinhu County, being the county's main access road. The road construction in recent years developed so rapidly that, all county roads that led to the towns were black, and the roads in towns and villages were concrete. Although highway construction in rural areas was in full swing, the rural road accessibility was still poor due to the scattered natural villages. In addition to the centers of the villages where the villages had built concrete roads, most of the villages are still dirt roads. The connectivity of roads above 4 degrees is 1.27. The

Note: Data are from planning text of villages and towns distribution in Jinhu County in 2008.

Fig. 1 Proportion of each town’s population in Jinhu County

Fig. 2 Proportion of each town’s developed area in Jinhu County
The spatial structure of cities and towns, that is, the self-similar fractal structure of spatial distribution of towns and villages. Research suggests that the space within a certain range of the urban system has fractal structure. Spatial correlation between towns generally uses the correlation dimension to scale. The geographic significance of correlation dimension mainly reflects the regularity of the interaction of urban space. Correlation dimension is calculated as follow:

\[
C(r) = \frac{1}{N^d} \sum_{i \neq j} \theta(r - d_{ij}),
\]

where \( r \) is indicator, \( d_{ij} \) is crow distance between \( i \) Town and \( j \) Town.

\[
\theta(r - d_{ij}) = \begin{cases} 
1, & \text{when} \ r - d_{ij} \leq r \\
0, & \text{when} \ r - d_{ij} > r
\end{cases}
\]

According to the town system distribution scale, \( C(r) \propto r^D \), \( D \) is the correlation dimension. The range of \( D \) is generally between 0 – 2. \( D \) = 0 shows that the urban system in the region has a high centralized spatial distribution, close relation and strong spatial interaction; on the other hand, \( D \) = 2, notes the urban system in the region has a less centralized spatial distribution, and close to the uniform dispersion state. And the spatial interaction is weaker.

Taking Jinhu County as the study area, we investigated its spatial distribution. With maps, the distance between each town was measured, and tabulated as in Table 3.

**Table 3** Crow distance among each town in Jinhu County

<table>
<thead>
<tr>
<th>Places</th>
<th>Licheng Town</th>
<th>Jinnan Town</th>
<th>Minqiao Town</th>
<th>Daliou Village</th>
<th>Tugou Town</th>
<th>Luliang Town</th>
<th>Yinji Town</th>
<th>Jinbei Town</th>
<th>Chenqiao Town</th>
<th>Qianfeng Town</th>
<th>Taji Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>LichengTown</td>
<td>0</td>
<td>7.000</td>
<td>19.000</td>
<td>5.655</td>
<td>20.700</td>
<td>10.400</td>
<td>16.225</td>
<td>5.990</td>
<td>10.174</td>
<td>16.600</td>
<td>15.600</td>
</tr>
</tbody>
</table>

According to the results after using the SPSS statistics software, \( d = 1.292 \), \( d \) is bigger than 1, indicating the correlation degree and spatial interaction of towns in Jinhu County are relatively weak. So we should exert the town feature, grasp favorable opportunities, strengthen the correlation degree and spatial interaction of towns, and further promote the socio-economic development.

**4 Conclusion**

The analysis of the current situation of Jinhu County spatial structure shows that, at present, it still is at its very core development stage, because the spatial association between the towns, and degree of spatial interaction are weak. This is consistent with the case and the reality on the ground. Moreover, this further proves the analytical framework of spatial structure, that is, through the analysis of the spatial structural elements, the spatial structure of the study area can be objectively reflected. The analysis also offers panorama of the related theoretical
tural park, to conduct agricultural sightseeing, agricultural experiencing and DIY education activity, such as the sightseeing agricultural park in Yuhuan Town, Wenzhou City.

2.2.2.3 Children’s agricultural education base. By using the local agricultural planting, husbandry, breeding, farming culture, agricultural technology and so on, it is to make the primary and middle school students participate in leisure agriculture activity and receive the agricultural technical knowledge education, such as Jiafa Agricultural Ecological Sightseeing Park in Qin Huangdao City, and the children agricultural science and technology experience education base in Qiongshan District, Haikou City.

2.2.2.4 Agricultural exposition. By using the local agricultural technology, agricultural production process, agricultural products, the production culture, it is to make the tourists to visit, such as the agricultural exposition in Shenyang City, Shouguang Ecology Agricultural Exposition in Shandong Province and so on.

3 Conclusion

The combination of the rural tourism development and modern agriculture reflects benign interaction between the tertiary industry and the primary, secondary industry during the contemporary China’s economic and social development. In terms of tourism resources, guest source, facilities, and economy, the rural tourism promotes the modern agriculture development while modern agriculture provides the material foundation, technical conditions, special tourism products and financial support for sustainable development of the rural tourism. So the modern agriculture and rural tourism promote and support each other mutually. Meanwhile, it needs to establish effective integration model and guarantee mechanism, reasonable planning, and develop rural resources, in order to make the marvelous interactive relationship between them. The interaction of the modern agriculture and rural tourism can realize the maximization of ecological, social and economic effects, and the sustainable development of rural tourism, so as to promote development of the modern agriculture and rural tourism concurrently.

References

