

Research on Geographical Spatial Regional Integration and Sustainable Development in Guanzhong Region

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Abstract: New regionalism is an important perspective to solve regional development differences and urban agglomeration issues, and also an important theory for regional coordinated development. This paper analyzes the regional integration process of the Guanzhong urban agglomeration from the perspective of new regionalism, and uses the urban gravity model and the local Moran index to quantitatively analyze the integration process at the city and county levels. The results show that: ① Xi'an (including Xianyang) and Baoji are two urban centers that drive the development of surrounding cities; ②The internal differences of the urban agglomerations are gradually reduced, the inter-regional connections are gradually strengthened, and the regional coordinated development is becoming more reasonable.

1. Introduction

In the 1990s, with the further reorganization of the industrial structure, global economic ties were further deepened, and the relationship between economic organizations in the world changed from a pre-industrial society to a post-industrial society, which also had a profound impact on the regional development model. Economic ties continue to deepen, the development of regional integration has gradually become an important direction for global regional development, and coordinated regional development has become the focus of social attention [1, 2]. However, in this process, problems such as limited regional growth, disharmony of social factors, and unsustainable regional development have gradually been exposed [3]. In this context, the new regionalism with regional function integration and institutional innovation as its main theoretical content has gradually attracted the attention of Western academic circles and is regarded as an important perspective to solve the problem of regional cooperation [4]. New regionalism emphasizes that the interests of various stakeholders in the region are fully protected [5], and it is believed that governments at all levels or government departments in the region can achieve the best configuration through flexible collaboration [6].

After the 1990s, the phenomenon of economic restructuring occurred on a global scale, and the morphological space of global metropolitan areas also changed accordingly. In response to the practical attempts and problem reflections on the space governance of metropolitan areas, academia proposed "new regionalism", and used this as a model and concept to solve related problems of space governance in metropolitan areas. "New regionalism" adopts a bottom-up local government cooperation model, and through the establishment of corporate organizations and government associations and other governance innovations, it can effectively avoid top-down regional governments' arbitrary identification problems and reduce market operations. Therefore, the new regionalism is considered to be a mode that meets the actual needs of the current metropolitan area space governance [7].

At the same time, in the past regional governance process, the frequent use of re-scaled strategies is often favored, in order to quickly stimulate and quickly improve the vitality of top-down regional operations in the short term [8]. But in essence, the core of regional governance is to achieve reasonable and fair regional market rules through the establishment of a good institutional environment to coordinate regional industrial spatial layout and urban spatial layout [9, 10], while the focal point of regional industrial coordinated development It lies in the coordination of interest relations between

different levels of government and different development subjects [11]. Therefore, for regional development, regional fairness and justice have gradually become the main contradiction of current regional development. For this reason, domestic scholars, starting from the new human geography, proposed the concept of synchronous development between regions under the concept of space justice [3].

In addition, the National Development and Reform Commission has proposed that the "Twelfth Five-Year Plan" (2011-2015) period is a key node for accelerating the development of regional coordination. Regional coordinated development will vigorously promote the in-depth domestic regional cooperation. In recent years, domestic academic circles have also accelerated the introduction of new regionalism theories, and have carried out related studies such as metropolitan integration and major functional area planning from the perspective of new regionalism [12]. Based on this, starting from the relevant theories of new regionalism, the integration process of the Guanzhong urban agglomeration and its influencing factors are discussed to provide data support for regional sustainable development.

2. Current status and commentary of relevant research at home and abroad

The source of the theory of "New Regionalism" is not traditional geography, but the theories of economic sociology, institutional economics, and evolutionary economics and their spatial expansion and change [13]. New regionalism believes that the interior of the region is comprehensive, pluralistic, bottom-up, and a coordination mechanism of multiple social institutions. In the region, there are both the orderlyization of economy and trade, as well as the equalization of policies and the environment. In addition, the new regionalism theory advocates the fairness and coordination of society, economy, and the environment in the development process within the region, and introduces relevant theories of sustainable development to balance economic development, environmental protection, and social equity. Carry out a regional coordination planning system [14]. At the same time, "new regionalism" put forward many ideas for reference on how to improve the economic, trade and environmental basis of regional development and how to cultivate the capacity of regional sustainable development [15, 16].

Foreign research on new regionalism is relatively early. In 1938, the term "new regionalism" first appeared in Western academia. Howard and Harry used it to describe the phenomenon of coordinated regional development in social culture and political economy at that time [2]. Palmer uses the viewpoint of new regionalism to confirm the latest developments in regional cooperation, and related disciplines also use new regionalism to describe and confirm the coordinated development of social politics, culture and economy along with the development of industrialization [17, 18].

Since the 1990s, in order to further elaborate on the connotation of new regionalism, foreign scholars such as Carlo [19], Sapir [20] and John [21] have carried out a large number of related studies. The main representative works are "Regionalism and New Theory of International Trade", "New Regionalism: Trade Liberalization or Insurance" and other works. In the late 1990s, new regionalism was further practiced and developed in Western countries [22]. The publication of Savitch [23] "The Road to New Regionalism" marks the maturity of research on new regionalism. Since the 21st century, related research content has also shown a diversified trend, including not only its theoretical development in regional economic and trade activities, but also related practices of urban regional planning in this context [24] and research on related issues in the public domain [25]. In addition, there are also related topics such as regional revival, third Italy, new regionalist schools of thought, spatial differentiation, etc. [26].

On the whole, foreign theoretical research on new regionalism is complete and comprehensive, but there is a lack of relevant practical research, especially research on the integration of urban agglomerations.

Domestic research on new regionalism is relatively late. The concept of "new regionalism" was introduced to my country in the early 1990s, and it was used as a subject term in the literature only after 2002. At that time, our country's market economy system was still underdeveloped, urban and rural resources were also unreasonably allocated, and the city-administered county model and related

problems were also emerging. At this time, the emergence of new regionalism played an extremely important role. As a new concept of regional development, domestic research on new regionalism focuses on two aspects: one is the introduction and interpretation of new regionalism theories. As early as 2003, Wu Chao [1,27], Miao Changhong [28] and others combed the concept of new regionalism, and further elaborated its domestic practice foundation; Ye Lin [2] comprehensively and systematically discussed the development process and latest trends of new regionalism; with the development of the times, Wu Ruijian [29] and Sun Yuman [30] further elaborated on the superiority of the new regionalism concept and the importance of combining with practice; Wang Xingzhong, Chang Fang [3] It is believed that the essence of new regionalism is the view of regional coordinated development from the perspective of space justice.

The second angle is the practical application of new regionalism. Yin Weihua et al. [31], Hong Shijian [32] and others used the perspective of new regionalism to provide suggestions for my country's regional planning and the transformation and development of metropolitan governance. In terms of specific cases, Yao Jia [6], Li Hongying [33], Fang Wei [9], Jin Lixia [34], Geng Yun [35], Zhang Shujian [16], etc. respectively Take the Jiangsu coast, the Jinan metropolitan area, Guangdong, the Beijing-Tianjin wing, the Guantian Economic Zone, and the Guangdong-Hong Kong-Macao Greater Bay Area as case studies to carry out relevant research on new regionalism. In addition, in terms of urban governance, Luo Xiaolong et al. [36], Li Hong et al. [37], and Tang Fanghua et al. [38] used Nanjing metropolitan area, central Liaoning urban agglomeration, and Hunan Chang-Zhu-Tan urban agglomeration as case sites, respectively. From the perspective of new regionalism, conduct related research on the development of urban agglomerations and the integration process.

Generally speaking, domestic related research first focuses on concept introduction and analyzes its definition, characteristics and application prospects. With the complete introduction of new regionalism theory, new regionalism has gradually become an important theory or perspective of domestic regional development, and relevant scholars have carried out their own practical research on this basis. However, there are few verification analyses on the integration process of specific urban agglomerations based on the perspective of new regionalism.

3. Case areas and research methods

3.1 Case area analysis

The Guanzhong area is located in the central part of Shaanxi Province. From a geographical perspective, the Guanzhong area starts from Baoji in the west, reaches the Yellow River in the east, borders the Qinling Mountains in the south, and the Weibei mountains in the north, including the entire Weihe Plain.

It is about 360 km long from east to west and 30 to 80 km wide from north to south. It traverses the central part of Shaanxi Province. From the perspective of administrative divisions, the Guanzhong area includes 5 prefecture-level cities, including Xi'an, Baoji, Xianyang, Weinan, and Tongchuan (Figure 1). There are 31 counties with a population of 21,996,400, accounting for 60.39% of the province's total population, with a population density of 396.33. People/km² [39]. The terrain is high in the west and low in the east, with an average elevation of 500m. It is also known as the Guanzhong Basin. Its northern part is the Loess Plateau in northern Shaanxi, and the southern part is the Qinba Mountains in southern Shaanxi. It is a developed and densely populated area of industry and agriculture in Shaanxi, and is also an area with the best natural conditions in Shaanxi Province. Known as "Eight Baili Qinchuan" [40]. The Guanzhong area is an economic link, and its location advantage is very prominent. Therefore, the integrated research on the urban agglomeration in the Guanzhong area can not only help the economic development of the Guanzhong area, but also has important strategic significance for radiating northern and southern Shaanxi and driving the economic development of Shaanxi as a whole.

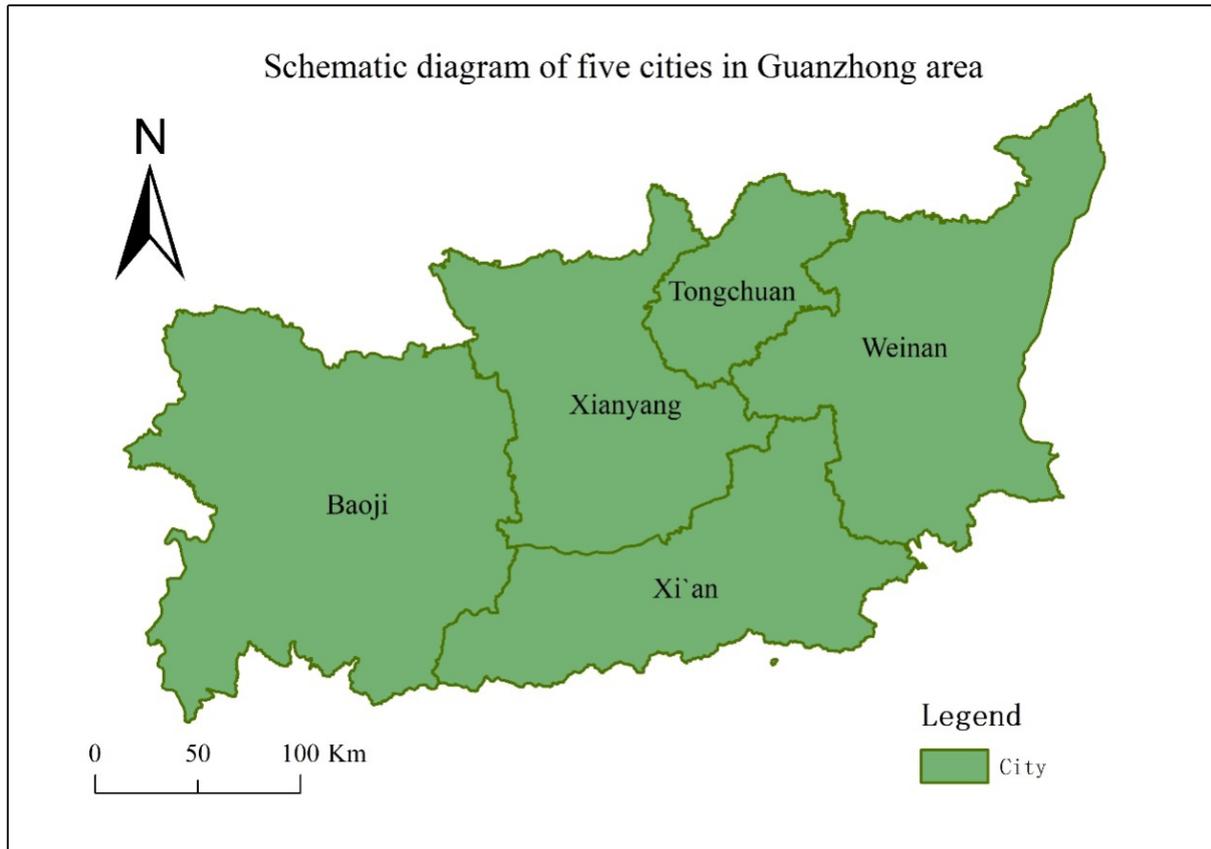


Figure 1. Guanzhong area map.

3.2 Data sources

The study time is from 2009 to 2019. Considering that the economic change between two adjacent years is limited, for the convenience of calculation, the time interval is 5 years, and a total of 3 years of 2009, 2014, and 2019 are intercepted as Samples for data collection. The GDP data comes from the statistical yearbook. The specific indicator is the total GDP of the city area, and the distance data is calculated from the central location of each city in ArcGIS.

3.3 Research methods

3.3.1 Urban gravity model.

The urban gravity model is the theoretical result of the socio-physical school during the geological measurement revolution. It believes that the economy between cities is interdependent, and the strength of the connection is proportional to the product of the two cities' "quality" (GDP). It is inversely proportional to the distance between cities.

The urban gravity model contains four variables: distance attenuation coefficient, distance, city quality and experience coefficient. The city quality is represented by the total GDP, and the distance between the two regions is represented by the geometric distance between the central cities of the region. The distance attenuation coefficient is expressed by a square relationship, and the empirical coefficient k has no effect on the final calculation result, and is assigned a value of 1 during the research process [41]. The strength of economic ties between regions is calculated using formula (1):

$$F_{ij} = G_i * G_j / D_{ij}^2 \quad (1)$$

Among them, F_{ij} is the economic link strength between area i and area j , G_i is the total GDP of area i , G_j is the total GDP of area j , and D_{ij} is the geometric distance between area i and the central city of area j . In terms of indicator units, the unit of GDP is 10,000 yuan, and the unit of distance is meters. Among them, the city does not calculate its own gravity, and it is processed as 0 in the data processing process.

3.3.2 Partial Moran Index.

The local Moran index can determine whether there is a correlation between spatial entities within a certain range, that is, to determine the autocorrelation relationship of the space [42]. In the local Moran index, the I value is significantly positive and the z value is greater than 0, indicating that the spatial correlation is obvious, which is high and high agglomeration; the I value is significantly positive and the z value is less than 0, which indicates that the spatial correlation is relatively low, which is low Low agglomeration; I value is significantly negative and z value is greater than 0, it is high and low agglomeration; I value is significantly negative and z value is less than 0, it is low and high agglomeration [40]. The local Moran index of regional autocorrelation connection is calculated by formula (2):

$$I_i = \sum w_{ij} * z_j * z_j \quad (2)$$

Among them, z_i and z_j are the standardized urban gravity observations, and w_{ij} is the standardized urban gravity spatial weight matrix element.

4. Analysis results

4.1 Analysis of City Economic Linkage

On the whole, the amount of regional economic connections within the Guanzhong urban agglomeration is quite different, but it is shrinking year by year, and the process of regional integration is accelerating. It can be seen from Figure 2, Figure 3, and Figure 4 that the gravitational force between cities in the Guanzhong region has increased year by year. The highest value in 2009 was 231, the highest value in 2014 was 1106, and the highest value in 2019 was 2003. The ratio of 14 years compared with 2009 and 19 compared with 14 years has dropped significantly, although Xi'an is still the largest city in the world, but its connection with the region has been significantly enhanced, and its economic connection has been more balanced, indicating that the process of urban integration has accelerated. The gravitational pull between Xi'an and other cities is several times that of other cities, which proves that Xi'an is a leading city in the development of the region. In each year, the economic link between Xi'an and Xianyang was the strongest. It can be seen that the promotion of the integration policy of Xi'an and Xianyang has strengthened its degree of economic integration. The second is the economic links between Xi'an and Baoji and Xi'an and Weinan. This is due to the geographical attributes of transportation. There are Lianhuo Expressway and railway between the three cities. The transportation is convenient and the flow of materials and personnel is convenient, thus driving the economic development between the cities. . Followed by the Weinan, Xianyang, and Baoji lines, which also benefit from the convenience of transportation between cities, especially the opening of high-speed railways. The Weinan-Xianbei-Xianyang-Baoji line has been shortened from three hours to one and a half hours, greatly improving commuting efficiency. Finally, the worst regional economic connection is from Tongchuan to the other four cities. Due to the special nature of Tongchuan city (a mining city), its economic exchanges with the other four cities are limited, which hinders the economic connection between the cities. With the acceleration of the integration process, the trend of economic integration in the Guanzhong urban agglomeration has increased significantly.

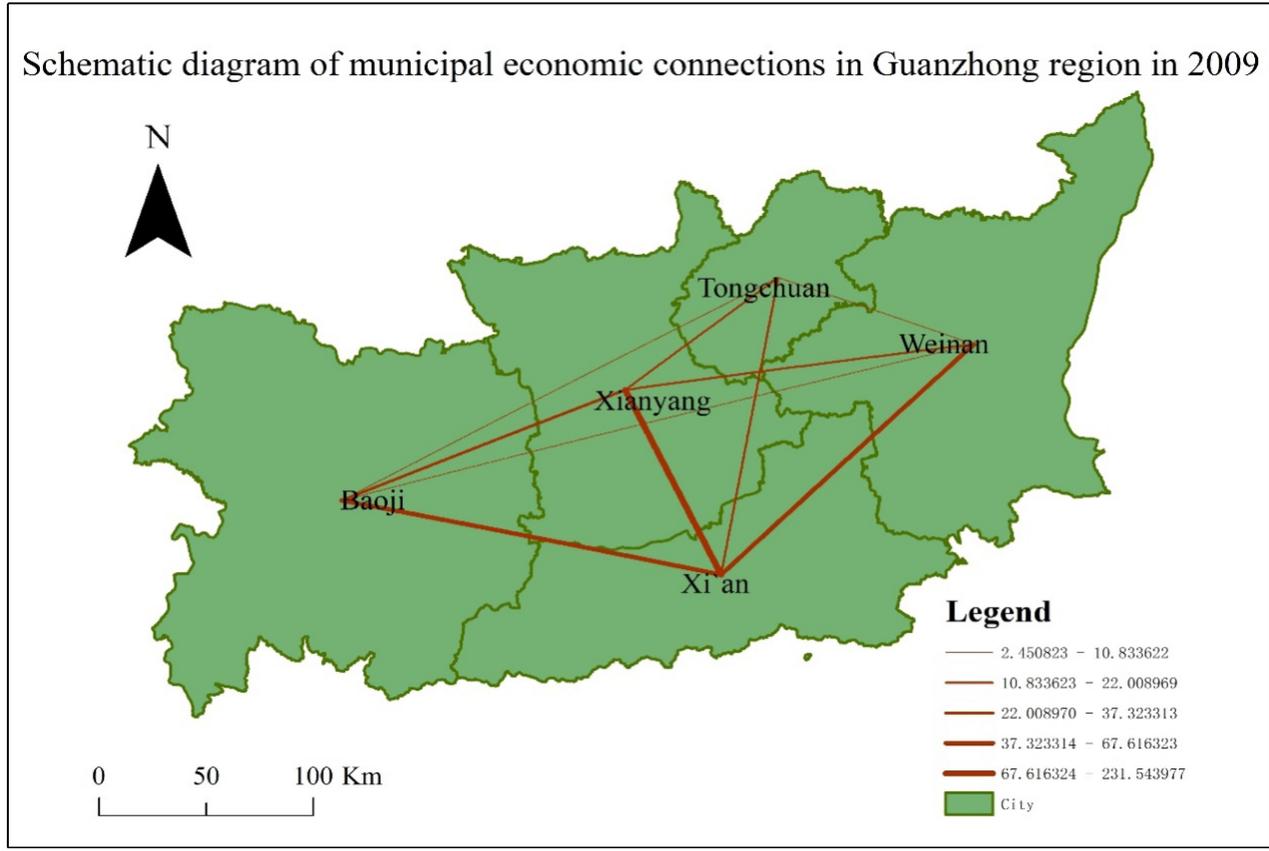


Figure 2. Municipal economic links in Guanzhong Region in 2009.

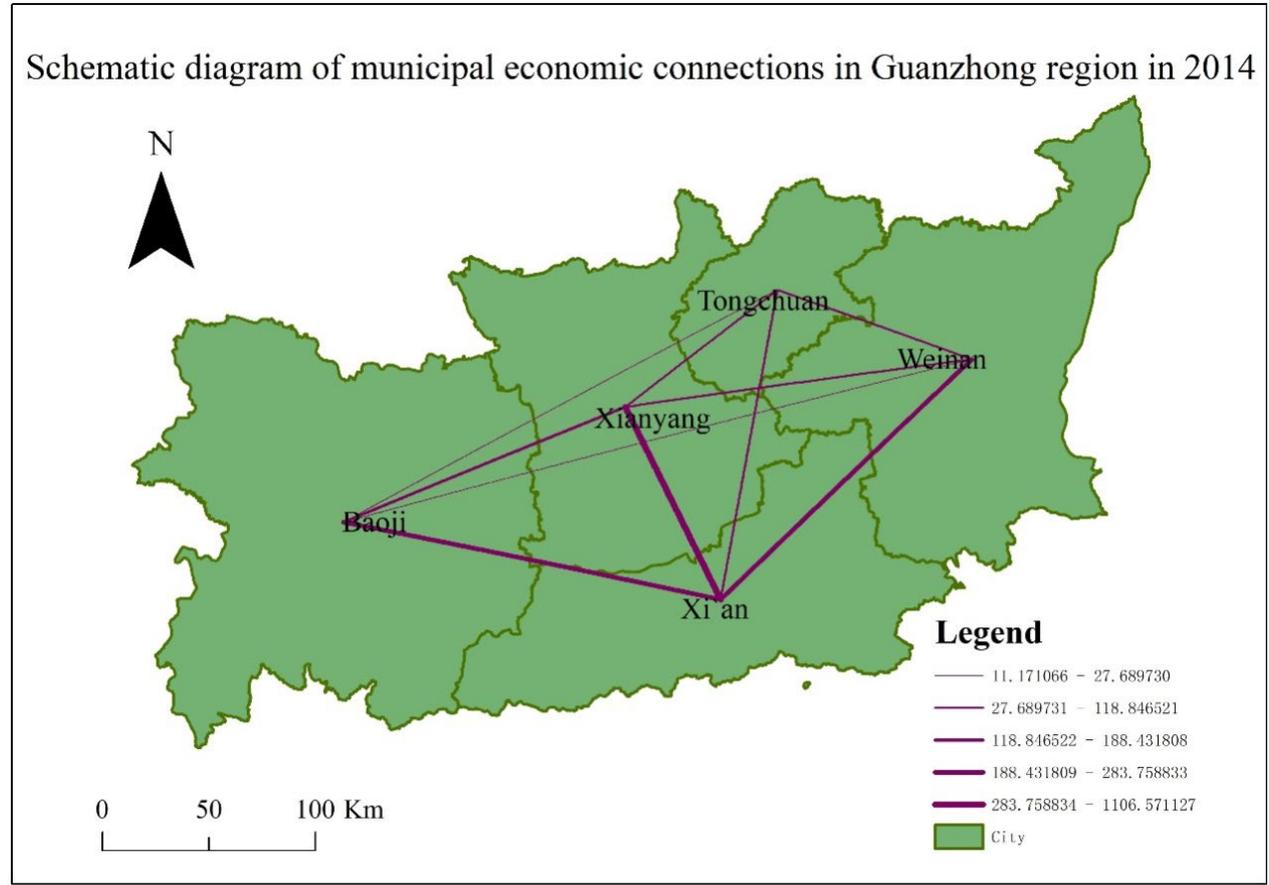


Figure 3. Municipal economic links in Guanzhong Region in 2014.

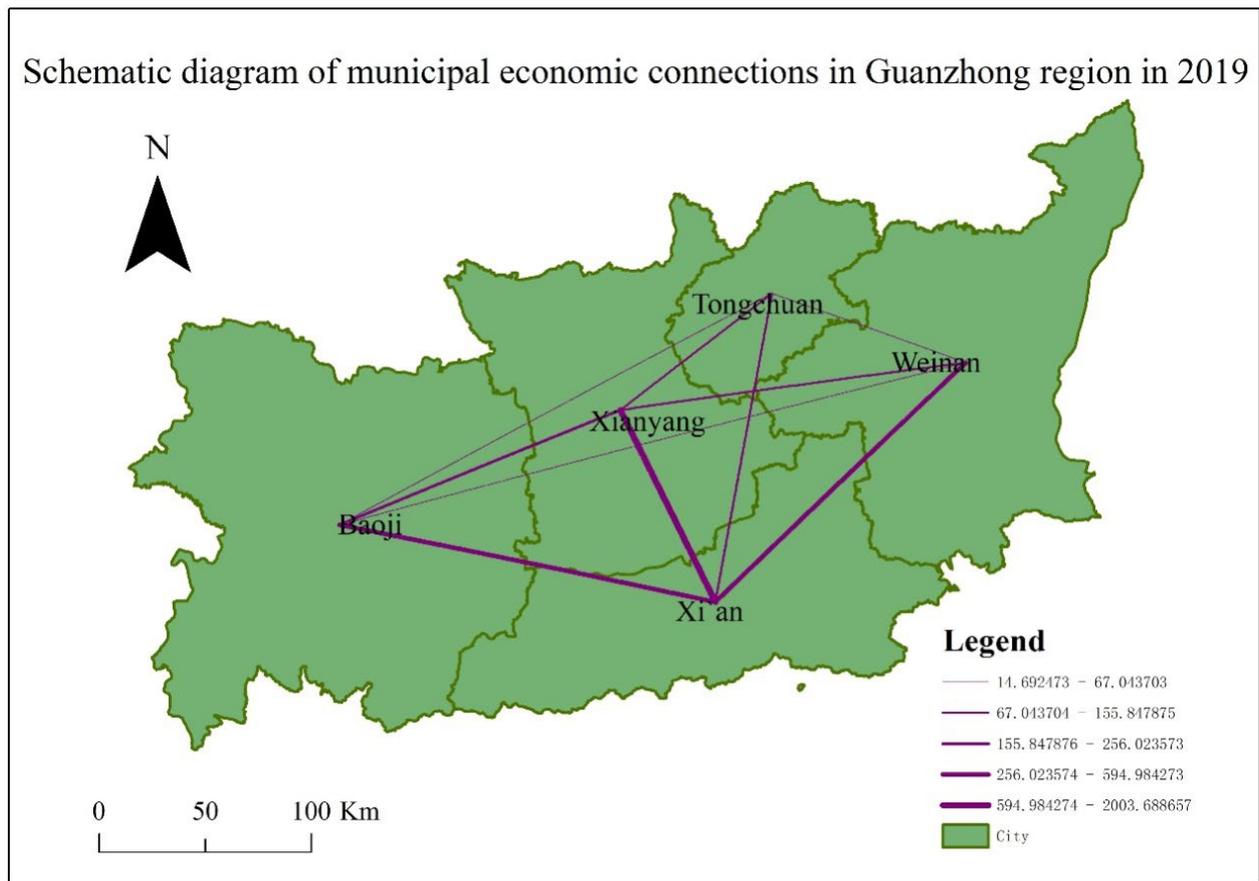


Figure 4. Municipal economic links in Guanzhong Region in 2019.

4.2 County-level city scale hierarchy

Based on the urban gravity model, subdivided to the scale of districts and counties, using the gravity values of districts and counties as reference values to plot the map, we can get the Figure 5 Figure 6 Figure 7 of the scale system of districts and counties in the Guanzhong area. , Can more intuitively understand the urban gravity changes in Guanzhong area, so as to further analyze the process of regional integration? It can be seen that in the three selected years, Xi'an is the core city, and its districts and counties have the highest gravity in the Guanzhong area, followed by the surrounding districts and counties of Xi'an, whose gravitational values have increased due to their geographical proximity, such as Weicheng and Qin Capital and Gaoling three districts and counties. The second is Baoji, whose district/county gravity value is the highest in the western part of Guanzhong. The illustrated results complement the national policies. In 2009, the Guanzhong-Tianshui Economic Zone was approved by the State Council to be established. The district was constructed with Xi'an (including Xianyang) as the central city and Baoji as the sub-central city. Baoji has been developing steadily since then. In addition, the coordinated regional development advocated in the "Twelfth Five-Year Plan" has also played an active role in advocating the development of Guanzhong City. In the past 10 years, although the gravitational value of various districts and counties has increased, the level has decreased, and the gap between regions has decreased, such as Lintong, Huyi, Huayin, Huazhou, Yintai, Wang Yi, Fufeng, Qishan, Fengxiang, In Chencang and other districts and counties, compared with 2009, the value has increased but the level has decreased, regional connections have gradually increased, and the process of regional integration has accelerated.

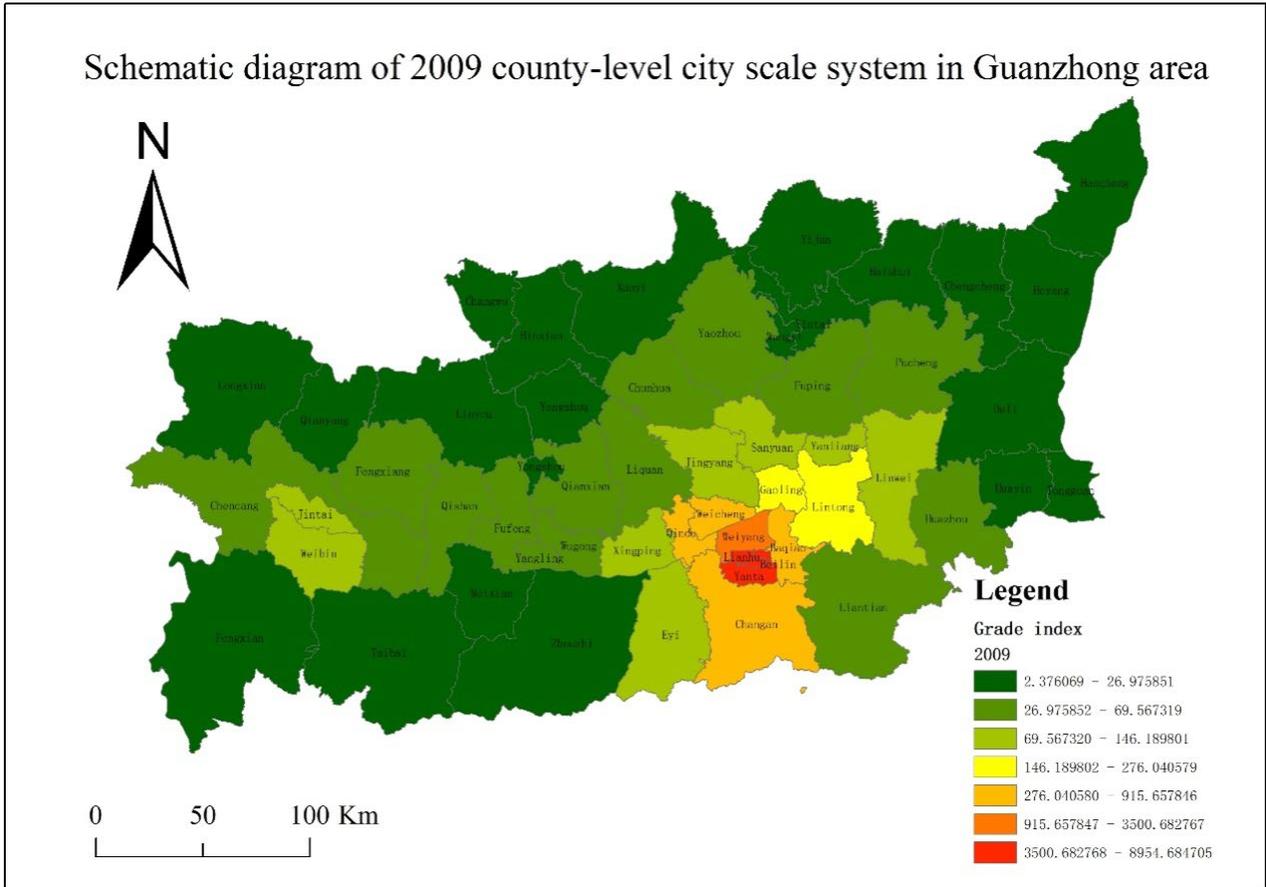


Figure 5. The county-level city hierarchy in Guanzhong area in 2009.

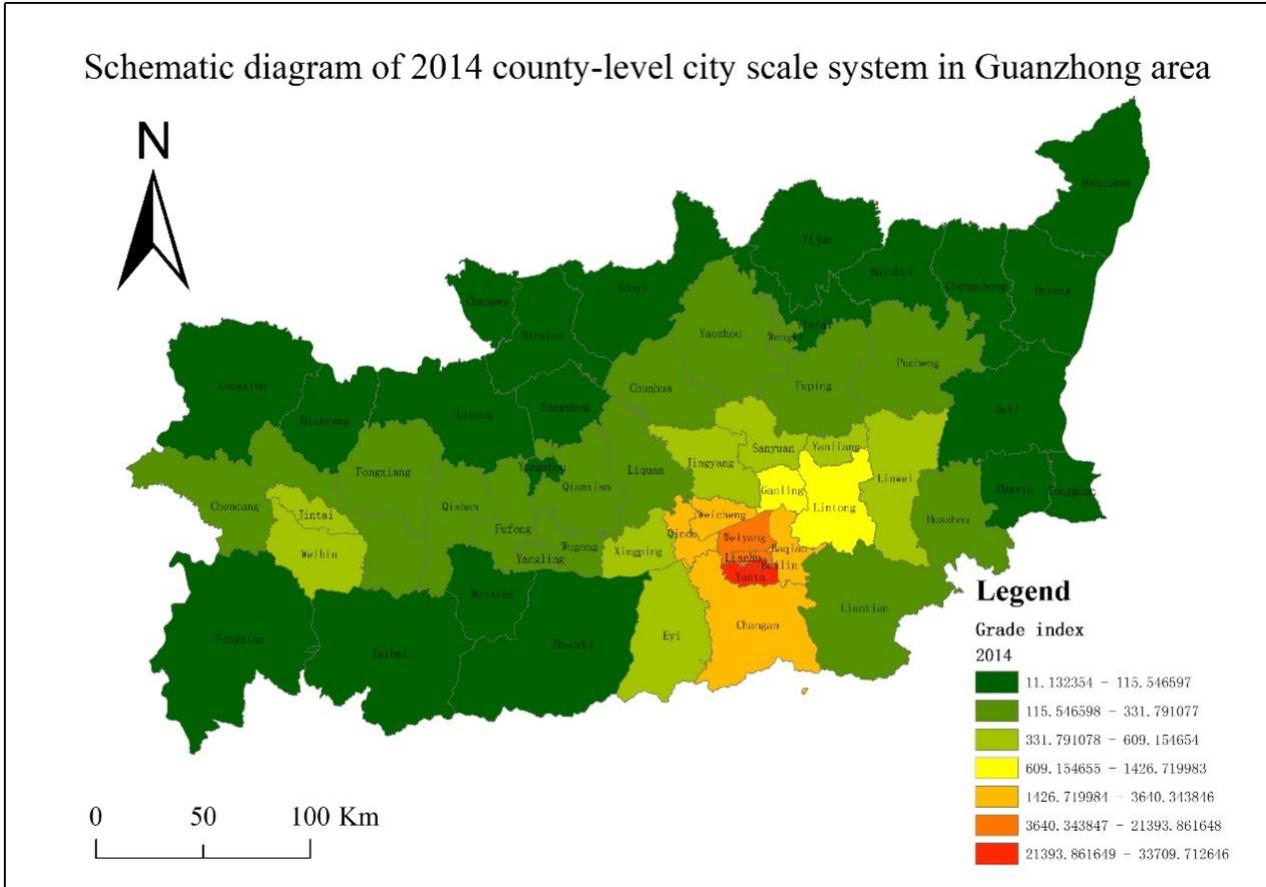


Figure 6. The county-level city hierarchy in Guanzhong area in 2014.

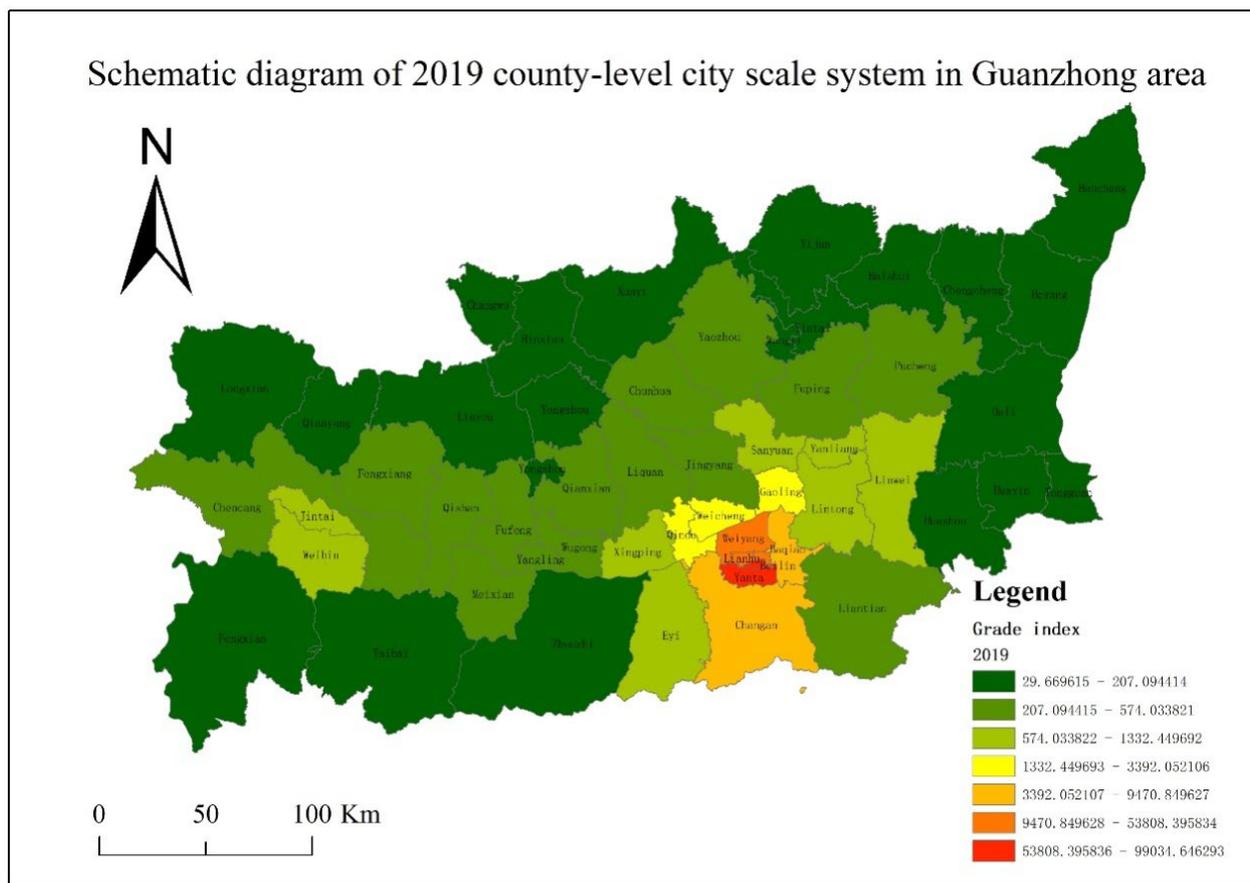


Figure 7. The county-level city hierarchy in Guanzhong area in 2019.

4.3 Analysis of Partial Moran Index

The local Moran index can judge the autocorrelation between cities. As shown in Table 1, taking districts and counties as the scale, the local Moran index of districts and counties in Guanzhong area can be obtained. Through ArcGIS software, a local Moran index map Figure 8 Figure 9 Figure 10 can be obtained at the county scale. As shown in the figure, at the three year nodes, the five districts of Xi'an (Weiyang, Beilin, Xincheng) , Yanta, Lianhu) I values are all greater than 0, z values are also positive, the five districts show high agglomeration, while the remaining districts and counties show insignificant results. Among them, the I values in 2009, 2014 and 2019 were 1.886567, 1.867975, and 1.769908 respectively; the Z values were 24.862112, 24.781927, and 22.890788, all of which were 2009>2014>2019. It shows that the agglomeration of districts and counties is decentralized, regional connections are strengthened, and regional gaps are narrowing. A decrease in the z value means a significant decrease and a decrease in agglomeration, which can also prove that the regional connection is enhanced, which is consistent with the above conclusions.

Table 1. Local Moran index map at county scale in Guanzhong area.

	2009	2014	2019
Moran's Index	1.886567	1.867975	1.676908
Expected Index	-0.018868	-0.018868	-0.018868
Variance	0.005874	0.005797	0.005488
z-score	24.862112	24.781927	22.890788
p-value	0.000000	0.000000	0.000000

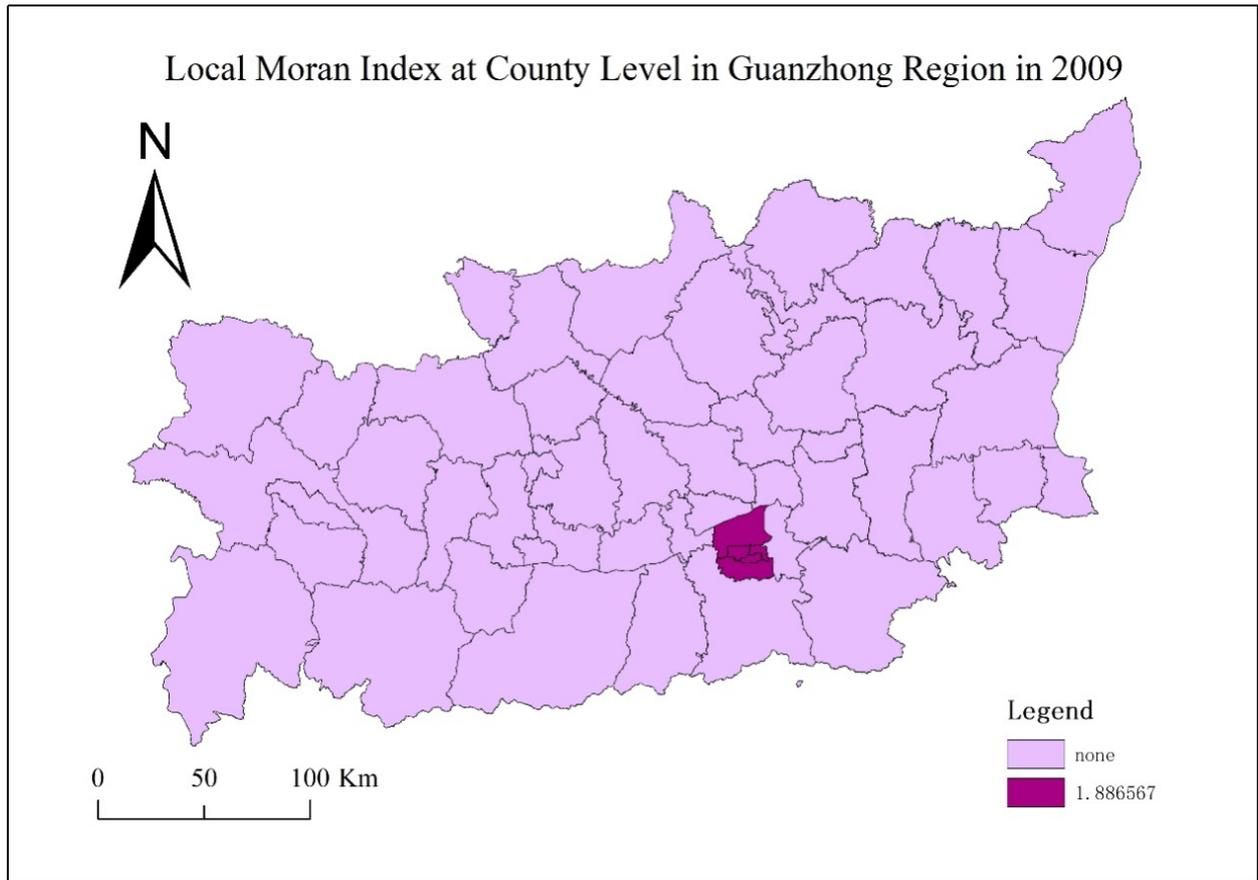


Figure 8. Partial Moran Index in 2009.

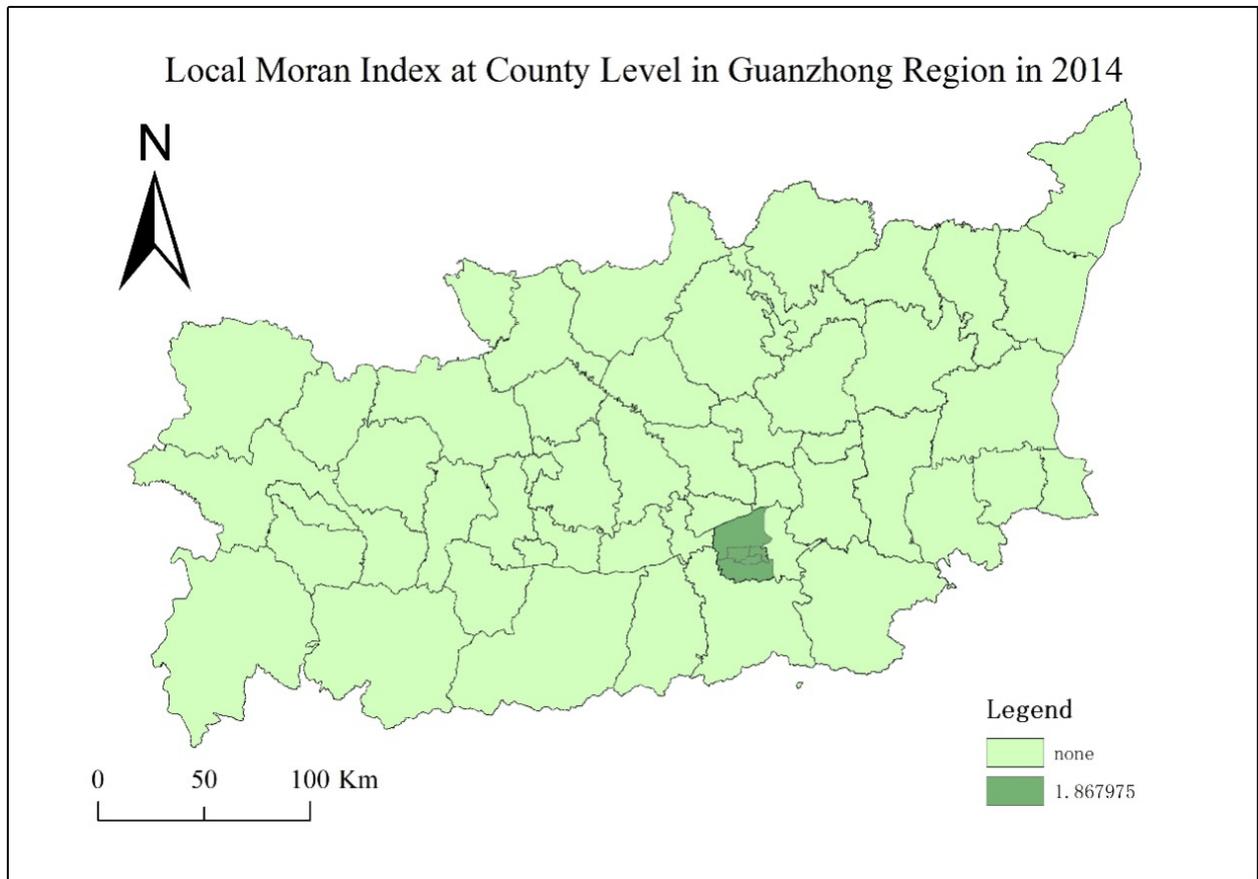


Figure 9. Partial Moran Index in 2014.

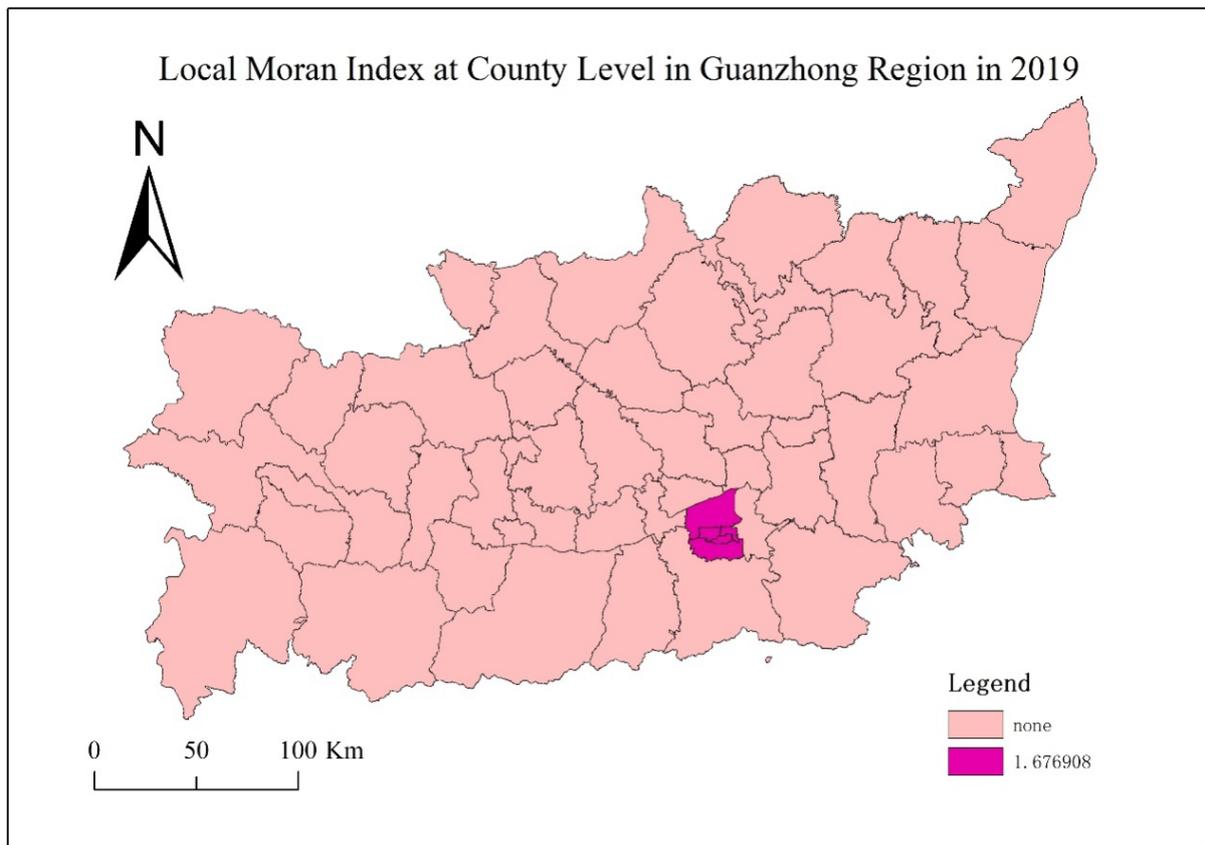


Figure 10. Partial Moran Index in 2019.

5. Conclusions and prospects

5.1 Conclusion

This paper measures the regional integration process of the Guanzhong urban agglomeration from the perspective of new regionalism, and uses the urban gravity model and the local Moran index to quantitatively analyze the integration process at the city and county levels. The results show that: the Guanzhong urban agglomeration area the integration process has shown a clear upward trend in the past ten years, and this trend coincides with the top-down government policy and the bottom-up regional development trend. Specifically, within the urban agglomeration, the city-scale Xi'an (including Xianyang) has the highest gravitational value, followed by Baoji. The new city, forest of steles, Lotus Lake, wild goose pagoda, Weiyang, and Chang'an are the gravitational centers, and Jintai and Weibin are the secondary centers. In the future, the gravitational value of each city will continue to rise, the differences between regions will continue to shrink, the process of regional integration will continue to accelerate, and interregional development will gradually become fair and reasonable, and further promote regional sustainable development.

5.2 Prospects

Social justice is the direction of social development, and social justice is its foundation. The theoretical attributes of new regionalism pay attention to spatial justice, and it is always guided by sustainable economic development, and the principle of justice is used to adjust the social space issues in the region. Therefore, the author believes that fairness and justice should be the direction of the future development of new regionalism. The most important thing; secondly, this article uses the city to introduce the model to measure the strength of the economic ties between cities, and draws the corresponding conclusions, but there are many influencing factors of the gravity between cities, and it is difficult to quantify all the factors in GDP, which needs to be further solved in the future.

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