

Analysis on Spatial Structure of Logistics-Economic in Guantian Urban Agglomeration

Lele Wang

Xian International University, Xi'an, Shaanxi, China

Keywords: Guantian urban agglomeration, spatial economic linkages, logistics.

Abstract: Taking several cities as the economic development fulcrum to promote the development of surrounding regions and then the wider regions is the prevailing practice in almost all the World's mature and Developed Economic Zone. From China's urbanization development strategic pattern since the issuance of 11th Five-Year Plan, fostering and strengthening urban agglomerations in some conditional areas is the important strategic orientation of China's urbanization development. As China moves towards a higher level of open economy, the establishment of free trade zones in northwest China will make the logistics, business flow, information flow and capital flow between cities in the region emerge continuously, and the traffic logistics activities among cities will become more frequent, and the logistics network will become increasingly intensive. For this reason, this paper calculates the existing data in Guantian urban agglomeration area, then analyses the economic spatial structure and transportation logistics capacity of urban agglomeration in the region, and puts forward the spatial organization strategy to promote the development of urban agglomeration in the region.

1. Analysis on Economic Development of Guantian Urban Agglomeration

Guantian urban agglomeration is one of the nine most influential urban agglomerations in China on the Silk Road Economic Belt. There are six advantages: of abundant scientific and technological resources, strong industrial foundation, highly dense population, profound cultural accumulation, long history and tradition, and distinct regional characteristics in the region.

According to the Data of *China Urban Statistics Yearbook 2016*, the total population of Guantian urban agglomeration is 30.667 million, accounting for 2.20% of the country's total population; 128.801 billion yuan of GDP, accounting for 1.90% of the country's total; 1445.438 billion yuan of fixed assets investment, accounting for 2.62% of the country's total; 4161.65 million yuan of foreign capital actually utilized, accounting for 3.30% of the country's total; 1810.12 of fiscal revenue, accounting for 1.19% of the country's total; 56.6487 billion yuan of social consumer goods, accounting for the national proportion, accounting for 1.88% of the country's total. However, in the region of Guangdong, Hong Kong and Macao, which have the same amount of total population and fixed assets investment, the development level of urban agglomeration is far higher than that of Guantian City Cluster. The total fiscal revenue in the region of Guangdong, Hong Kong and Macao is 8 times that of Guantian City Group, 6 times that of foreign capital actually utilized, 4 times that of GDP and nearly 4 times that of retail sales of social consumer goods. It is not difficult to draw a

conclusion that the economic operation efficiency of Guantian urban agglomeration is far lower than that of Guangdong, Hong Kong and Macao.

Table 1: Comparison of economic indicators between Guangdong, Hong Kong and Macao urban agglomerations and Guantian Urban Agglomerations.

Index	Total population ^a (10,000 people)	GDP (Billion yuan)	Investment in Fixed Assets (Billion yuan)	Total actual utilization of foreign capital (US\$10,000)	Total revenue (Billion yuan)	Total retail sales of consumer goods (Billion yuan)
Whole country	136782	676708	551590	1262.7	152217	300931
Urban Agglomeration of Guangdong	5874.28	62257.45	19524.54	256.2435	15307.08	22521.05
The Proportion of the Whole Country	4.29%	9.20%	3.54%	20.29%	10.06%	7.48%
Guantian Urban Agglomeration	3006.67	12828.01	14454.38	41.6165	1810.12	5664.87
The Proportion of the Whole Country	2.20%	1.90%	2.62%	3.30%	1.19%	1.88%
Index Comparison	1.95	4.853	1.351	6.157	8.456	3.976

2. Analysis of Economic Spatial Structure of Guantian Urban Agglomeration

On the one hand, the economic disparity between urban agglomerations is related to external factors such as geographical location and policy, and also to the urban economic spatial structure in urban agglomeration. This part will further analyze the spatial allocation structure of production factors and the intensity and grade of urban center in Guantian urban agglomeration.

The spatial allocation structure table of production factor in Guantian urban agglomeration (Table 2) shows that: With one eighth of the land, Xi'an, as the capital city, concentrates one third of the population and nearly one-half of GDP. The population of Xi'an is 20.34 times, 9.75 times, 3.95 times and 2.22 times of Yangling, Tongchuan, Shangluo and Tianshui, respectively. The GDP of Xi'an is 55.74 times, 17.902 times, 9.34 times and 10.49 times of those cities respectively. The smallest gap between the population of Xi'an and Baoji, Xianyang and Weinan is 1.47 times, and the biggest gap is 2.12 times. The GDP of Xi'an is 3.25 times, 2.70 times and 3.96 times of the three cities respectively. The minimum gap between Xi'an's GDP and those of the three relatively developed cities in Guantian is 2.70 times and the largest gap is 3.96 times. The cities in Guantian urban agglomeration are graded according to the calculated Guantian City Function Strength Table (Table 3). It shows that: the central function intensity of Xi'an in Guantian urban agglomeration is much higher than that of other cities. It is the only first-class center in this region. Baoji, Xianyang, Weinan and Tianshui are all three-level centers with similar function intensity. Tongchuan, Shangluo and Yangling are the four level centers, but there are no secondary centers(Table 4).

Table 2, table 3 and table 4 show that in Guantian urban agglomeration, the cities presents a typical unipolar development trend, which is an obvious "single-center, cliff-like" structure. The urban economic spatial structure of Guantian urban agglomeration performs the "breaking slope and standing alone peak" appearance. Xi'an City is the peak of Guantian City Group, and seem as the lonely peak which stands alone. Tongchuan, Shangluo and Yangling are the deep gullies of Guantian urban agglomeration. Baoji, Weinan, Xianyang and Tianshui are between them. The difference between the peak and the plateau is huge, and also the difference between the peak and the gully is huger. According to the current urban development plan of Shaanxi Province, in the future, more than 80% of the scientific and technological resources, 64.3% of the production factors, 55% of the cultural strength and 70% of the R&D capacity of Guantian urban agglomeration will be concentrated in the new area of "Xixian Area". The degree of unipolarization of Guantian urban agglomeration will be further aggravated, the structure of spatial distribution of science and technology resources, production factors, cultural forces and R&D capabilities in the urban agglomerations will continues to be unbalanced.

Table 2: Analysis Table of Spatial Allocation Structure of Production Factor in Guantian Urban Agglomeration.

		Xian	Baoji	Xianyang	Weinan	Tongchuan	Shangluo	Yangling	Tianshui	Σ
Land	Area (km ²)	10026	18175	10119	13000	3382	19292	135	14300	88429
	Concentration ratio	0.113	0.206	0.114	0.147	0.038	0.218	0.002	0.162	1
	Primacy	1.000	0.552	0.991	0.771	2.965	0.520	74.267	0.701	
Population	Quantity (10,000 people)	815.66	384.54	527.59	556.72	83.64	251.01	20.34	367.17	3006.67
	Concentration ratio	0.271	0.128	0.175	0.185	0.028	0.083	0.007	0.122	1
	Primacy	1.000	2.121	1.546	1.465	9.752	3.250	40.101	2.221	
GDP	Amount of money	5810.03	1788.59	2155.91	1469.08	324.54	621.83	104.23	553.8	12828.01
	Concentration ratio	0.453	0.139	0.168	0.115	0.025	0.048	0.008	0.043	1
	Primacy	1.000	3.248	2.695	3.955	17.902	9.343	55.742	10.491	

Table 3: Functional Strength Table of Urban Center of Guantian Urban Agglomeration.

City	Permanent population (10,000 people)	GDP (billion yuan)	Fixed assets investment (billion yuan)	Total retail sales of consumer goods (billion yuan)	The proportion of added value of tertiary industry (%)	Functional Strength of Urban Centers
Xian	815.66	5810.03	5086.93	3405.38	58.9	2.993
Baoji	384.54	1788.59	2520.59	612.87	26.4	1.019
Xian	527.59	2155.91	3014.08	601.58	27.2	1.196

Weinan	556.72	1469.08	1978.21	503.25	35.3	1.026
Tongchuan	83.64	324.54	380.51	110.05	33.7	0.335
Shangluo	251.01	621.83	731.33	154.66	33.2	0.510
Yanglin	20.34	104.23	139.94	14.66	40.8	0.258
Tianshui	367.17	553.8	602.79	262.42	48.9	0.662

Table 4: Central City Grade of Guantian Urban Agglomeration.

City Grade	K_{E_i}	Central City			
First Class Center	1.8~2.4	Xian			
Second Class Center	1.2~1.8				
Third Class Center	0.6~1.2	Baoji	Xianyang	Weinan	Tianshui
Fourth Class Center	0~0.6	Tongchuan	Shangluo	Yanglin	

3. Evaluation of Transportation Logistics Competitiveness of Guantian Urban Agglomeration

The space distance and economic distance between cities are often shortened by the rapid development of transportation links. Close transportation and logistics links between cities are the vitality of the development of urban agglomerations. Transportation infrastructure construction is the precondition for the construction of urban agglomeration. The intensive transportation links between cities by means of transportation infrastructure constantly stimulate the economic power of urban exchanges and transactions. Transportation infrastructure construction is the precondition for the construction of urban agglomeration. The intensive transportation links between cities by means of transportation infrastructure constantly stimulate the economic vitality of urban exchanges and transactions. In urban agglomeration, the continuous improvement of transportation and logistics capacity of central cities will lead to the concentration of goods to central cities, thus improving the spatial radiation capacity of central cities, expanding the spatial radiation scope of central cities, and vice versa. Further analysis of the competitiveness of transportation logistics of cities in Guantian urban agglomerations in this part will help us deeply understand the reasons for the unreasonable economic spatial structure.

In evaluating the competitiveness of urban traffic logistics in Guantian urban agglomeration, thirteen specific evaluation indicators, including GDP, industrial output value, total retail sales of social consumer goods, investment in fixed assets, total freight volume, turnover of goods, number of enterprises, ownership of trucks, total mileage of grade roads, number of employees in transportation, warehousing and postal industry, income of postal and telecommunications business, number of mobile phone users and number of Internet users, were selected to evaluate Guantian City comprehensively. Logistics competitiveness of cluster cities.

To evaluate the competitiveness of urban traffic logistics in Guantian urban agglomeration, using SPSS software operation and principal component analysis method, two principal components are obtained by orthogonal rotation. The cumulative variance contribution rate reaches 94.105%. The score of urban traffic logistics competitiveness is calculated as shown in Table 5.

Table 5: Scores of Competitiveness of Urban Transportation Logistics in Guantian Urban Agglomeration.

City	First Principal Component Score	Second Principal Component Score	Composite score
Xian	2.44913	0.28704	2.2113
Baoji	-0.37367	0.6468	-0.26142
Xianyang	-0.43426	1.22867	-0.25134
Weinan	-0.51603	1.17244	-0.3303
Tongchuan	-0.26325	-0.81795	-0.32427
Shangluo	-0.51681	-0.25635	-0.48816
Yanglin	-0.09733	-1.53345	-0.2553
Tianshui	-0.24779	-0.7272	-0.30053

From the scores of competitiveness of urban traffic logistics in Guantian urban agglomeration, we can see that: in Guantian urban agglomeration, only the provincial capital city, Xian, has achieved above the average level of traffic logistics competitiveness, while the other cities' respective traffic logistics competitiveness is below the average level and has little difference between each other., and Shangluo transportation logistics has the worst competitiveness. The transportation and logistics competitiveness of Xi'an, the only first-class central city in Guantian Urban Agglomeration, is quite different from other cities, showing a unique state. The cities of various scales and types of Guantian urban agglomeration are scattered in the narrow East-West Guantian area, from east to Tongguan, from west to Tianshui, and from east to West nearly 600 kilometers. It takes Weihe River and Longhai Railway as its axes and presents a strip layout, which is a typical point-axis strip layout structure. If the super-large central city is not located in the middle of the point-axis zonal area, but at one end, it will lead to the disadvantage that the super-large central city is too far away from the other end of the small and medium-sized cities, and the radiation pull is weak. If the urban agglomeration is single-center, the drawbacks are even worse. This is precisely the situation of Guantian urban agglomeration,

4. Logistics-Economic Network Analysis of Guantian Urban Agglomeration

Accessibility is a relative index to measure the degree of communication and convenience between the two places. The higher the accessibility value, the more convenient the communication between the two places, and vice versa. The specific method of accessibility analysis is to calculate the time between a certain point in the region and other points in the region according to the current situation of the regional traffic network and the scale of the line grade, and to reflect the close degree of spatial economic links through the relative comparison of the time needed for traffic links.

Regional transportation logistics network composed of central cities and links in urban agglomeration is an important force to promote and remould regional economic space. With the rapid development of traffic and communication technology, the trend of urban cluster integration is gradually strengthened, the regional traffic network is becoming more and more perfect, the accessibility between cities is increasing, the time of inter-city traffic links is greatly reduced, and the effect of traffic logistics network on the organization and driving role of urban cluster development is manifested. Especially in the context of the development of urban agglomeration, the full play of the effect of urban regional transportation logistics network has a profound impact on the economic spatial structure of urban agglomeration. Therefore, the analysis of inter-city

accessibility of Guantian urban agglomeration can further understand the impact of transportation logistics network on economic spatial pattern. In the calculation, the speed V_i (km/h) between the two cities chooses the fastest mode of transportation. If the two cities have high-speed rail, the average speed is 250 km. If there is no high-speed rail, the average speed is 120 km. Guantian urban agglomeration is a typical unipolar urban agglomeration. Therefore, only the accessibility of cities and Xi'an in Guantian urban agglomeration is calculated (Table 6).

Table 6: Accessibility of Cities in Guantian Urban Agglomeration and Xi'an.

City	D_i (kilometre)	V_i (km/h)	Time (T_i)	Average Time (\bar{T})	Accessibility
Baoji	176.6	200	0.883	0.682	0.772
Xianyang	31.6	200	0.158	0.682	4.316
Weinan	66.4	250	0.266	0.682	2.568
Tongchuan	67.4	120	0.562	0.682	1.214
Shangluo	131.1	120	1.093	0.682	0.624
Yangling	89.9	200	0.450	0.682	1.517
Tianshui	341.3	250	1.365	0.682	0.500

From Table 6, we can see that the average time for each city of Guantian urban agglomeration to reach the central city of Xi'an is 41 minutes, but the accessibility gap is large, which indicates that the spatial economic links in Guantian urban agglomeration are unbalanced. This is related to the strip layout of Guantian urban agglomeration and the unbalanced distribution of traffic modes in the region. Xianyang, the closest city to Xi'an, has the best accessibility, followed by Weinan, Yangling, Tongchuan, Baoji, Shangluo and Tianshui. Among them, Tongchuan is closer to Xi'an than Yang Ling, and its accessibility is lower than Yang Ling. Shangluo is closer to Xi'an than Baoji, but its accessibility index is lower than Baoji. Tianshui is the worst accessibility. Based on the spatial analysis of transportation logistics competitiveness and urban production factors, the three urban transportation logistics competitiveness in Guantian urban agglomeration are at the bottom of the valley, and the competitiveness of transportation logistics is also poor. This shows that the radiation of central city Xi'an is very small, and the development of urban agglomeration has little effect on its economy.

5. Conclusion

The GDP of Xi'an is 32.05% in Guangzhou and 33.14% in Shenzhen. The economic development of Guantian urban agglomeration lags far behind that of Guangdong, Hong Kong and Macao. Guantian urban agglomeration presents a "single-center, cliff-like" strip structure, which is not conducive to the development of urban agglomeration in terms of geographic and economic spatial structure. The most disadvantageous consequence is that the agglomeration effect of the first-level central city Xi'an is constantly strengthened and the cliff phenomenon of economic spatial pattern of Guantian urban agglomeration is aggravated. According to the city center degree of Guantian urban

agglomeration, Baoji, Xianyang, Weinan and Tianshui are the four three-level centers. Baoji, Xianyang and Weinan have higher central index. In order to make the economic spatial layout more reasonable, speeding up the economic development of Baoji and Weinan to make the two cities become two secondary centers on the East and west sides of Xi'an, the first-class centers in geographical space, and make the economic spatial pattern of Guantian urban agglomeration develop in a balanced way. From the results of the competitiveness calculation of urban traffic logistics in Guantian urban agglomeration, we can see that the competitiveness of traffic logistics in Baoji and Weinan are below the average. The main reason is that the total economic value affects their score, that is to say, the economic scale of the two cities limits their transportation and logistics capabilities. Considering the characteristics of the East-West strip structure of Guantian City Group, we should take Baoji as the center in the west of Xi'an, integrate Pingliang and Qingyang into the Guantian City Group, construct Weinan-Tongchuan Industrial Zone to the East and north of Xi'an, radiate further north to Yan'an, and make Yan'an become an integral part of Guantian City Group. Considering the characteristics of the East-West strip structure of Guantian City Group, we should take Baoji as the center in the west of Xi'an, integrate Pingliang and Qingyang into the Guantian City Group, construct Weinan-Tongchuan Industrial Zone to the East and north of Xi'an, radiate further north to Yan'an, and make Yan'an become an integral part of Guantian City Group. In addition, Guantian urban agglomeration should refer to the structure of urban agglomeration of Guangdong, Hong Kong and Macao in its economic spatial layout, and bring Lanzhou, the capital city of Gansu Province, into the scope of urban agglomeration, so that Lanzhou can become two first-level centers parallel to the north and south of Xi'an, and construct a reasonable urban agglomeration structure along the Silk Road Economic Belt.

References

- [1] Wang Tiejun. *Urban Primacy and Regional Economic Growth: An Empirical Study Based on Panel Data of 24 Provinces and Regions* [J]. *Exploration of Economic Issues*, 2012, (5): 35-40.
- [2] Chen Jie, Lu Feng, Cheng Changxiu. *Review on accessibility measurement methods and application research progress* [J]. *Progress in geographic science*, 2007, 26 (5): 101 - 110.
- [3] Zeng Peng, Huang Tuiyi, and Que Feifei. *A comparative study of spatial structure characteristics of ten urban agglomerations in China* [J]. *Economic Geography*, 2011, 31 (4): 603 - 608.