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Evaluation of the Integration Level of Urban and Rural Logistics in Henan Province

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Abstract: This paper uses factor analysis method based on 15 relevant data to evaluate the Development Level of Urban-Rural Logistics Integration in 18 cities of Henan Province. Through the establishment and analysis of the model, three key factors affecting the integration of urban and rural logistics in Henan Province are summarized: economic development level, transportation infrastructure and utilization rate of transportation facilities. Combining with the analysis of the model and the final factor score to find the problem of hindering the development of logistics and offering a proposal.

Keywords: Urban and Rural Logistics, Factor Analysis, Integration Level

1. Introduction

Urban-rural logistics is an important link between urban and rural areas in China. Effective integration and seamless docking of urban and rural logistics can give full play to the role of urban and rural logistics in supporting regional economic integration, and promote the two-way circulation of "industrial products to the countryside and agricultural products to the city" [1]. Under the promotion of national policy, urban logistics and rural logistics in China have achieved different degrees of development, However, the unbalanced and uncoordinated development of urban and rural logistics has also intensified [2]. Urban logistics occupies the advantage of resources and develops faster. Rural logistics develops slowly, which widens the gap with urban development [7].

In recent years, many scholars have put forward suggestions on the development of the "dual structure" between urban logistics and rural logistics, The scope of research is mostly national or individual cities in key construction areas. Few articles have taken the scope of province as the object of study. In this paper, under the background of new urbanization, structure Evaluation Index System for the Development Level of Urban-Rural Logistics Integration, determine the coordinated development degree of urban logistics and rural logistics in Henan province by factor analysis and grasp accurately the key factors affecting the development of urban and rural logistics in Henan Province. And put forward suggestions and measures for its influencing factors, so as to promote the overall development of urban and rural logistics in Henan Province.

2. Construction of Evaluation Index System of Urban and Rural Logistics Development Level

2.1. Index Selection

Logistics is a comprehensive field, which includes transportation, warehousing, information processing and other functions. The research institutes focus on different angles, and the selection of indicators of the index system will be different. The purpose of this paper is to study the level of regional urban-rural logistics development. Combining with the concept of urban-rural logistics integration [3]. Fifteen indicators were selected on the basis of referring to a large number of references on scientific research index system to evaluating the development level of urban and rural areas in Henan Province, for example Engel coefficient of town, Express delivery volume, Total postal traffic volume, Car ownership volume, Household consumption level, Transportation Warehousing and Postal Fixed Assets Investment and so on [4].

2.2. Selection of Evaluation Method

Due to this paper have many indicators, which are

overlapping information and complicated relationships. In order to facilitate analysis, this paper adopts factor analysis method, Starting from studying the dependence relationship within the index correlation matrix, the 15 indexes are reduced to a few unrelated comprehensive factors, which makes the correlation between variables in the same group higher, and the correlation between variables in different groups lower [5]. Using a few comprehensive factors to evaluate and analyze the development of urban-rural logistics integration in Henan Province, and finding out the main factors affecting its development. Finally, according to the factor score, make a ranking for the development level of logistics integration in each city [8].

3. Evaluating the Development Level of Urban-Rural Logistics Integration in Henan Province

3.1. Empirical Analysis Process

The collection and sources of data in this paper are from *Henan Statistical Yearbook 2017*, which is authentic, reliable and authoritative. Using SPSS20.0 software to collate, analyze and process the collected data. SPSS has the functions of dimension processing, extracting public factors and calculating factor scores, so as to objectively analyze the development level of urban-rural integrated logistics in Henan Province.

3.1.1. Correlation Test

Firstly, data correlation test is carried out. In this paper, KMO and Bartlett sphericity test are used to determine whether the data are suitable for factor analysis. Table 1 shows that the KMO test results are 0.733 > 0.5, Bartlett's test of sphericity results were 0.000 < 0.05, suitable for factor analysis.

Table 1. *KMO and Bartlett's Test.*

Kaiser—Meyer—Olkin Measure of Sampling Adequacy		0.733
Bartlett's Test of sphericity	Apptox.Chi—Square	479.505
	df	105
	Sig.	.000

3.1.2. Extraction of Common Factor

The principal component analysis method is used to construct the factor variable, and the maximum variance method is used to rotate the factor load matrix [9]. The results are as shown in Table 2, which shows that the characteristic value of the first three factors after rotation are not only greater than 1, but also can explain 92.754% of information. Therefore, we extract three common factors first three common factors can better represent the logistics development capacity of Henan Province cities.

Table 2. *Total Variance Explained.*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.783	65.222	65.222	9.783	65.222	65.222	6.831	45.539	45.539
2	3.385	22.567	87.789	3.385	22.567	87.789	5.066	33.771	79.31
3	0.745	4.965	92.754	0.745	4.965	92.754	2.017	13.444	92.754

3.1.3. Computing Factorial Load Matrix after Rotation

In this paper, the principal component method is used to calculate the factor load matrix. Factorial load matrix is a matrix composed of factor loads in front of common factors, which represents the relationship between principal components and variables. After the principal component analysis, the typical representative variables of each principal factor in the initial factor solution are not very prominent, which easily causes ambiguity in the meaning of the factor and Difficulty in qualitative analysis. For this reason, Implementing factor rotation for initial common factors in order to find the common factors with clearer meaning [10]. The rotating component matrix is shown in Table 3.

Table 3. *Rotated Component Matrix[a].*

	Component		
	1	2	3
Engel coefficient of town	.974	.006	.144
Express delivery volume	.969	.160	.145
Total postal traffic volume	.942	.250	.182
Car ownership volume	.888	.323	.286
Household consumption level	.866	-.213	-.038
Transportation warehousing and postal fixed assets investment	.859	.358	.188
Total retail sales volume of social consumer goods	.807	.456	.343
Total telecom business volume	.780	.471	.325
Number of posts and telecommunications bureaus	.262	.937	.134
Total length of rural delivery lines	.203	.911	.261
Highway mileage	-.156	.897	.289
Total length of postal routes	.419	.830	.180
Engel's coefficient in rural areas	-.122	-.816	-.236

	Component		
	1	2	3
Highway freight turnover	.268	.440	.845
Road freight volume	.353	.457	.792

As shown in table three, Seven indicators has a large load on Public factor 1: Engel coefficient of town, Express delivery volume, Total postal traffic volume, Car ownership volume, Transportation warehousing and Postal fixed assets investment, Total retail sales volume of social consumer goods and Total telecom business volume. These indicators represent the scale of regional economic development and can be defined as the level of economic development factor. Highway mileage, Total length of rural delivery lines and Total length of postal routes has larger load on public factor 2. These indicators represent mileage of transport infrastructure and can be defined as transport infrastructure factor. Highway freight turnover and Road freight volume have a large load on the public factor 3 and can be defined as utilization rate of transportation facilities factor [6].

3.1.4. Calculating Factor Score

When the factor model is established, this paper uses the idea of regression to estimate the public factor scores of each city, and then the factor scores of 18 cities were sorted in descending order. In order to more intuitively see the city's comprehensive component score F. The eigenvalue of the selected factor is used as the scoring weight of the factor, so that the selection of the weights avoids artificial interference, thus making the selection of the weights objective [11]. The weights of each factor are respectively:

$$\omega_1 = \frac{\lambda_1}{\lambda_1+\lambda_2+\lambda_3} = \frac{9.783}{9.783+3.385+0.745} = 0.723$$

$$\omega_2 = \frac{\lambda_2}{\lambda_1+\lambda_2+\lambda_3} = \frac{3.385}{9.783+3.385+0.745} = 0.243$$

$$\omega_3 = \frac{\lambda_3}{\lambda_1+\lambda_2+\lambda_3} = \frac{0.745}{9.783+3.385+0.745} = 0.056$$

On the basis of weight, the total score F of each city is calculated and ranked. The higher the score, the higher the level of urban and rural logistics development. Formula for calculating specific total score:

$$F = \omega_1 F_1 + \omega_2 F_2 + \omega_3 F_3$$

In the formula, F1 is the Value on the first factor, F2 is the Value on the second factor F3 is the Value on the third factor and F is the total score. From SPSS, the factor scores of economic development level factor F1, transportation infrastructure factor F2, transportation facilities utilization factor F3 and overall urban and rural logistics development level factor F are ranked. As shown in Table 4.

Table 4. *Factor scores.*

provincial municipalities	F1	ranking	F2	ranking	F3	ranking	F	ranking
Zhengzhou	3.920	1	.388	6	.199	7	2.800	1
Nanyang	-.400	16	2.037	1	.461	4	.370	2
Xinyang	-.211	8	1.833	2	-1.933	18	.369	3
Luoyang	-.029	5	-.253	11	2.675	1	.192	4
Jaozuo	.159	2	-.646	15	.007	10	.016	5
Kaifeng	.040	3	-.050	8	-1.391	17	-.030	6
Xinxiang	-.215	10	.234	7	.363	5	-.111	7
Zhumadian	-.371	13	.813	3	-.330	13	-.160	8
Shangqiu	-.463	17	.713	5	.637	3	-.172	9
AnYang	-.215	9	-.127	9	.248	6	-.180	10
Xuchang	-.121	7	-.336	13	-.259	11	-.295	11
Zhoukou	-.685	18	.727	4	1.249	2	-.324	12
Pingdingshan	-.377	14	-.134	10	.193	8	-.339	13
Puyang	-.254	11	-.507	14	-.471	14	-.346	14
Luohe	-.057	6	-1.163	16	-.278	12	-.355	15
Sanmenxia	-.387	15	-.285	12	-.662	14	-.385	16
Jiyuan	.004	4	-1.650	18	-.885	15	-.400	17
Hebi	-.339	12	-1.595	17	.176	9	-.650	18

3.2. Empirical Analysis Results

Previously, this paper have defined each factors. Common factor F1 is the level factor of economic development, common factor F2 is the factor of transportation infrastructure, and common factor F3 is the factor of utilization of transportation facilities. Table 4 show that Zhengzhou, Jiaozuo and Kaifeng scored higher on the public factor 1, which shows that the economic development of the three cities is better. Shangqiu and Zhoukou are not optimistic about their economic development because of their low ranking in factor score 1. Although Zhoukou and Shangqiu rank ahead in factor 2, the comprehensive urban and rural logistics development level of the two cities is still in the middle or lower position because factor 1 occupies a larger weight. Nanyang, Xinyang and Zhumadian rank high on factor 2, which shows that the three cites have developed well in transportation infrastructure. And Luohe, Hebi, Jiyuan's highways, postal roads and other

transportation infrastructure construction are obviously inferior to other city. Luoyang, Zhoukou and Shangqiu scored higher in the utilization rate of transportation infrastructure, indicating that the transportation facilities in these four cities have been fully utilized. According to the comprehensive ranking, the development level of urban and rural logistics in Zhengzhou, Nanyang, Xinyang and Luoyang is better than other provincial cities, while the urban and rural logistics in Luohe, Sanmenxia, Jiyuan and Hebi need to be improved.

4. Problems and Suggestions

Through the establishment and analysis of the model, this paper finds that there are three main problems in the process of integration of urban and rural logistics in Henan Province.

Firstly, the urban transport infrastructure of the provincial capital is imperfect. As the capital city of Henan Province, Zhengzhou is in the forefront of economic development, but its utilization rate of transportation infrastructure and transportation infrastructure is not outstanding. The provincial capital not only connects the economy, politics and civilization, but also plays a radiating role in the surrounding areas and counties. As a central point of a region, the improvement of transportation facilities is of vital importance.

Secondly, The economic foundation of individual cities is not solid, which affects the development of regional urban-rural logistics. In Shangqiu and Zhoukou, the utilization ratio of transportation infrastructure and transportation infrastructure has developed well, but because the economic development level is in the lower level of 18 cities, it hinders the development of two cities, thus causing the urban and rural logistics of the two cities is in the lower middle level.

Thirdly, the widening gap between urban and rural development. The rural Engel coefficient is negatively correlated with each factors which indicates that the bigger the Engel coefficient in rural areas, the lower the level of economic development, and the more imperfect the transportation infrastructure needed for logistics development. The Engel coefficient of cities and towns is positively correlated with each factors, which indicates that if the living standard of cities and towns declines, the government will formulate policies to improve economic development and strengthen the construction of transportation infrastructure, which will lead to a serious urban-rural dual structure and thus a vicious circle.

In view of the existing problems, suggestions for improvement are put forward: One is to increase investment in urban transport infrastructure in provincial capital and make effective use of it. Zhengzhou has become the pole city of regional logistics development in Henan because of its location, economic foundation, industrial distribution orientation and resource endowment ability. Regional pole cities are connected with surrounding areas through transportation channels such as highways, railways, waterways and so on to form efficient logistics networks. Promote the development of logistics in this region through the polarization effect caused by the high concentration of resources. When the polarization effect occurs to a certain extent, it can drive the development of logistics in the surrounding areas through diffusion effect. Therefore, it is urgent to improve the traffic environment of the pole cities.

Secondly, perfecting and utilizing existing resources to promote the development of regional urban-rural logistics. To enable Make other cities and surrounding counties take advantage of their comparative advantages in location, transportation, industrial base and market space, and to improve the infrastructure of logistics such as channels, parks and ports. Strengthen regional distribution and logistics distribution function. Develop into an important logistics node city serving local and radiating surrounding areas. Zhengzhou International Logistics Center and other logistics node cities have reasonable division of labor, close cooperation, mutual support and interactive development. Thus forming a city logistics network composed of each node

Thirdly, Break the dual structure of urban and rural areas and promote the integration of urban and rural logistics. Equal exchange of urban and rural elements and the establishment of a unified urban and rural construction land for urban residents are conducive to the transformation of urban and rural structure to integration, thus greatly promoting the integration of urban and rural logistics.

5. Conclusion

Through the evaluation and analysis of the integration level of urban and rural logistics in Henan Province, summarize the problems of imperfect transportation infrastructure in provincial capital, and increasing investment and effective utilization of urban transport facilities in provincial capitals is a solution. Secondly, the inadequate economic foundation of individual cities affects the development of regional urban-rural logistics. Be going to start with the development of economy with Existing Resources for promoting the Development of Logistics Industry. Finally, When formulating policies, the government should pay more attention to the development of rural logistics so as to improve the level of rural logistics development.

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