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Study of Cross-Border E-Commerce Exports Comprehensive Ability

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Abstract

In recent years, with the rapid development of cross-border electronic commerce in China, cross-border e-commerce has become an important growth point of China's foreign trade. In order to evaluate the cross-border e-commerce exports comprehensive ability level, the paper selects 23 national e-commerce model cities as research target. Firstly, by using the factor analysis method, this paper constructs 4 first level indexes and 18 second level indexes of cross-border e-commerce exports evaluation system. Secondly, it divided 23 cities into three different categories combining with cluster analysis. Finally, according to the data analysis results, it analyzes the characteristics of each category, and puts forward the corresponding suggestions for each clustering results aiming at the existing problems of cross-border e-commerce.

Keywords: cross-border e-commerce; exports comprehensive ability level; factor analysis; cluster analysis; index system

1 Introduction

In recent years, traditional trade has slowed down while cross-border e-commerce has maintained a rapid growth trend. The data of Commerce Department shows that China's cross-border e-commerce transaction volume in 2011 is 1.6 trillion yuan, and 2.3 trillion yuan in 2012, 3.1 trillion yuan in 2013, 4 trillion yuan in 2014, with an increase of 33.3% from a year earlier. Cross-border e-commerce has great potential for development, which has become an important part of China’s foreign trade. According to estimation made by Commerce Department, cross-border e-commerce will grow to 6.5 trillion yuan with an increase of 25.90% in 2016.

Cross-border e-commerce export comprehensive ability is an important indicator of the level of urban logistics and economic development. It not only can maintain the normal operation of the basic capabilities of the city, but also can be the internal factor to maintain urban development and keep the city competitive vitality. Therefore, only by scientific assessments and analyses to cross-border e-commerce exports comprehensive ability level can we optimize urban logistics resources, improve operational efficiency of urban logistics, and promote rapid and coordinated development of the city.

2 Scope of the study and data sources

At present, most cities can apply for approval of cross-border electronic commerce export pilot cities. Taking into account that the cross-border e-commerce is an important subset of e-commerce, the article selects the data of the first batch of 23 national e-commerce model cities in 2012 to build models. The 23 cities include: Beijing, Tianjin, Shanghai, Chongqing, Qingdao, Ningbo, Xiamen, Shenzhen, Harbin, Wuhan, Guangzhou, Chengdu, Nanjing, Changchun, Hangzhou, Fuzhou, Zhengzhou, Kunming, Yinchuan, Nanning, Jilin, Suzhou, Shantou. The data is from cities bureau of statistics website and related statistical yearbook and bulletin (2013).

3 Comprehensive ability evaluation index system

There are a lot of factors affecting the export comprehensive ability of cross-border e-commerce, including urban economic development, local logistics supply and demand, transport capacity of ports, railways and air, and a series of factors. Through analysis of the index selection of relevant literature, combined with the characteristic of the cross-border e-commerce development, the paper intends to build the following 18 indicators to measure the cross-border e-commerce comprehensive ability of 23 cities, as shown in Table 1.

The economic development indicator (B1) is an important prerequisite for the development of logistics, and can pledge to support the sustainable development of the logistics industry. Economic development indicators, including GDP, import and export volume, transportation, storage and postal industry total production value and other related content.

The logistics supply and demand indicator (B2) is the direct cause of the logistics. The paper selects the total tonnage of logistics, the total cargo turnover, above-scale port capacity to handle throughput as three secondary indexes to evaluate the supply and demand situation of logistics in the region.

Transportation logistics level indicator (B3) is a direct factor affecting the efficiency of logistics and cost. The paper selects transport routes with a total mileage, circulation radiation ability and so on which constitute traffic level indicators. Circulation radiation ability is used to characterize the effect of the extension of urban logistics which, to a certain extent, reflects the commodity flow capacity and the scope of logistics. Circulation radiation ability in the paper is calculated by Equation 1.

$$\text{the city's circulation radiation ability} = \frac{\frac{\text{the city's total social retail sales}}{\text{the city GDP}}}{\frac{\text{the country's total social retail sales}}{\text{GDP}}} \qquad (1)$$

Logistics industry quality indicator (B4) does not directly characterize the cross-border e-commerce export comprehensive ability, but reflect the cross-border e-commerce export comprehensive ability according to synergies caused by the development of logistics. The paper chooses the balance of deposits and loans of Chinese-funded financial institutions, e-commerce transactions, the level of informatization as three elements to summarize city logistics industry quality.

4 Factor Analysis

Original data of 23 cities' export comprehensive ability of cross-border e-commerce is shown in Table 2. Based on the above data, the paper uses factor analysis to do empirical research.

The basic purpose of factor analysis is to use a few factors to describe the link between many indicators or factors. It means that several closely related variables are put into the same class and each kind of class becomes a factor, then most of the original data information can be reflected by fewer factors. This kind of research methodology can effectively evaluate the research through the data with convenience and reliability, and the common factor contribution rate determines the size of the weight of the corresponding factor, avoiding the subjectivity of evaluation results.

4.1 KMO and Bartlett sphericity tests

Before performing factor analysis, it needs to verify whether the data is suitable for factor analysis. KMO value is closer to 1, the correlation between variables means stronger and original variables are more suitable for factor analysis.

KMO and Bartlett sphericity tests are made by SPSS and the test results are shown in Table 3. The results show that KMO value is 0.656, Bartlett sphericity text approximate chi-square value is 495.056 with 153 degrees of freedom and the significant probability test is 0.000, meaning collected data suitable for factor analysis.

4.2 Total variance table explained

Table 4 is total variance table based on the correlation coefficient matrix. It is shown that four common factors cumulative variance contribution rate is 83.434% which can be more comprehensive to reflect all information.

4.3 Rotation component matrix

The rotated factor loading matrix is computed by principal component extraction method and the 18 indicators can be integrated into the main factors F1, F2, F3, F4, which are shown in Table 5.

F1 has a great load factor on GDP, transportation, storage postal added value, and customs exports indicators, so F1 can be attributed to the scale of logistics, demand, and collaborative industry factor. F2 has a great load factor on transport, post and telecommunications, fixed asset investment, rail, road, inland transportation routes indicators, so F2 can be summarized as logistics investment and infrastructure factor. Common factor F3 has a great load factor on the two indicators of total cargo turnover and above-scale port, so F3 can be summarized as logistics capability factor. Common factor F4 only account for a large load on the circulation radiation ability, so F4 can be attributed to the flow of logistics factor. According to the rotated ingredient matrix, factor analysis model can be constructed as follows:

$$\begin{cases} C_1 = \mathrm{F}_1 * 0.701 + \mathrm{F}_2 * 0.523 + \mathrm{F}_3 * 0.423 + \mathrm{F}_4 * 0.124 \\ C_2 = \mathrm{F}_1 * 0.137 + \mathrm{F}_2 * 0.896 + \mathrm{F}_3 * 0 + \mathrm{F}_4 * 0 \\ \vdots \\ C_{18} = \mathrm{F}_1 * 0.745 + \mathrm{F}_2 * 0 + \mathrm{F}_3 * 0.311 + \mathrm{F}_4 * 0 \end{cases} \quad (2)$$

4.4 Calculate the common factor score and total score

For the factor analysis model constituted by rotating component matrix, factor score coefficients are calculated by regression method, which are shown in Table 6.

Public factor score function is:

$$\begin{cases} \mathrm{F}_1 = C_1 * 0.084 + C_2 * (-0.035) + C_3 * 0.028 + \cdots + C_{17} * 0.297 + C_{18} * 0.191 \\ \mathrm{F}_2 = C_1 * 0.079 + C_2 * 0.271 + C_3 * 0.078 + \cdots + C_{17} * (-0.006) + C_{18} * (-0.095) \\ \mathrm{F}_3 = C_1 * 0.012 + C_2 * (-0.065) + C_3 * 0.099 + \cdots + C_{17} * (-0.260) + C_{18} * 0.022 \\ \mathrm{F}_4 = C_1 * (-0.023) + C_2 * (-0.039) + C_3 * (-0.044) + \cdots + C_{17} * (-0.103) + C_{18} * (-0.097) \end{cases} \quad (3)$$

According to the results of the factor score function, the urbanization evaluation function constituted by four common factors is shown as follows:

$$\mathrm{Z} = \frac{\mathrm{F}_1 * 33.881\% + \mathrm{F}_2 * 22.602\% + \mathrm{F}_3 * 18.416\% + \mathrm{F}_4 * 8.535\%}{83.434\%} \quad (4)$$

According to the above formula, the results obtained by data calculation are shown in Graph 1 and Table 7.

5 Cluster analysis

The paper uses cross-border e-commerce comprehensive ability evaluation indicators of e-commerce demonstration cities chosen by factor analysis to do cluster analysis of 23 e-commerce demonstration cities. Through the Ward clustering method, the metric is the squared Euclidean distance, which is shown in Graph 2.

According to clustering Ward connection diagram, the cross-border e-commerce exports comprehensive abilities of the 23 demonstration cities are divided into three classes and the clustering analysis results are shown in table 8.

The most cities' economic level of first class is at the top with perfect conditions of roads, railways and ports, developed electronic commerce, high information level and strong cross-border e-commerce exports comprehensive abilities.

The cities of second class have strong cross-border e-commerce exports comprehensive abilities. Ningbo and hangzhou were approved in 2011 as cross-border e-commerce imported pilot cities with special policy support and strong e-commerce business development. With development of cross-border e-commerce, these cities' cross-border e-commerce exports comprehensive abilities will be steadily improving.

The cities of third class such as Kunming, changchun are in less developed regions with imperfect urban basic facilities, poor logistics supply ability, low informatization level which can hinder the development of logistics industry to a certain extent. These cities' comprehensive cross-border e-commerce exports comprehensive abilities are significantly lower than the first two classes, so the third class cities need to be invested more manpower and material resources continuously to improve the level of city logistics.

6 Conclusion and recommendation

6.1 Conclusion

The paper establishes the index system for evaluation of cross-border e-commerce exports comprehensive ability, based on all the data of the first list of national e-commerce demonstration cities in 2012, which includes the cities' economic development level, urban logistics supply and demand, the urban logistics transportation level indicators, city logistics industry quality indicators, and so on, applying the method of factor analysis to analyze the comprehensive abilities of 23 national demonstration cities of cross-border e-commerce enterprises, by the way of system clustering analysis of 23 cities which reveals the division results agreeing with the evaluation results. Analysis result shows that all the cities have capacity of logistics supply to some degree. But for some cities, the weak economic foundation, the backward traffic logistics construction, the imperfect development of electronic commerce, the vulnerable abilities of logistics supply and the weak competitive power can't meet the demand of economic construction for the moment. What's more, the comprehensive capacities of cross-border e-commerce exports in different regions are different, which isn't beneficial to improve the development of the logistics in remote cities because strong competitiveness only belongs to a few cities. Therefore, in order to improve the comprehensive export abilities of cross-border e-commerce demonstration cities, we should take practical measures like perfecting the construction of logistics infrastructure, developing e-commerce vigorously, increasing assets investment of transportation industry, establishing and perfecting the policy systems which are suitable for logistics' development, etc.

6.2 advice

The cities of first class have a strong level of cross-border e-commerce abilities. The cross-border electricity enterprises can provide powerful support to cross-border electricity industry in our country based on their strong economic strength and prosperous flow capacity. These cities should actively response to the relevant national policies to strengthen the construction of industry chain and regulatory measures, give impetus to the development of surrounding areas' cross-border electricity business logistics, and create a good environment for the logistics development.

In Shanghai, for example, in the aspect of industrial chain, construction of public service platform, development of cross-border business logistics system and building of cross-border electricity demonstration garden, it should be taken into account encouragement of cross-border business mode innovation. In terms of regulatory measures, we should implement the new pattern of customs supervision, optimize the inspection and quarantine supervision system, improve cross-border payment system, innovate tax system, and increase the fiscal and taxation financial support. In addition, the importance to the development of talent, integrity and statistics supporting systems should not be ignored.

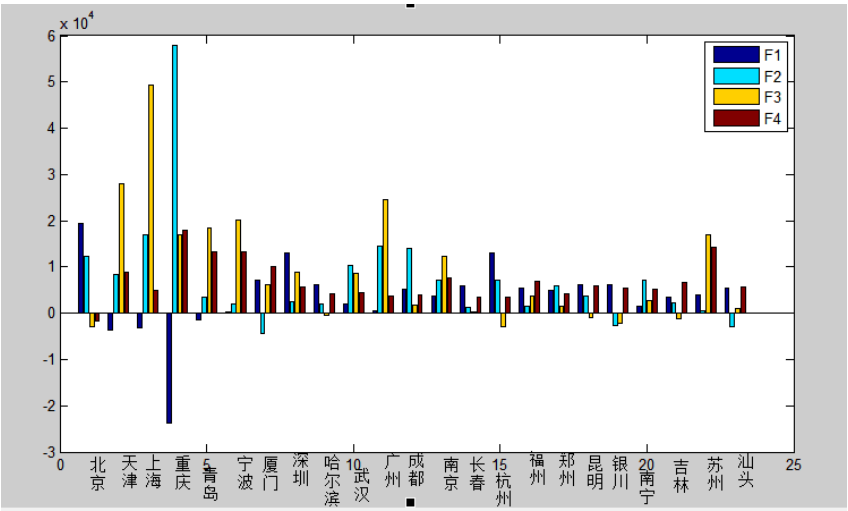
The cities of second class have relatively strong cross-border e-commerce exports comprehensive abilities and potentials, and they can take the advantages of the ports and the geographical positions to grab the growing international trade and business opportunities. At the same time, customs clearance, tax and other issues which hinder development of cross-border e-commerce will become the focus of these cities' reform.

1. Speed up customs clearance and simplify the process. With the development of big data and Internet of things technology, customs clearance, customs inspection, and other relevant things could be simplified. Hangzhou has launched the bonded stock model and used big data to predict the hot items in advance. Through the warehouse system platform docking with the commodity inspection bureau, customs and other departments, order information can be quickly completed in the process of the customs clearance and it can be ensured that only 1 hour does customs clearance process require under normal conditions.

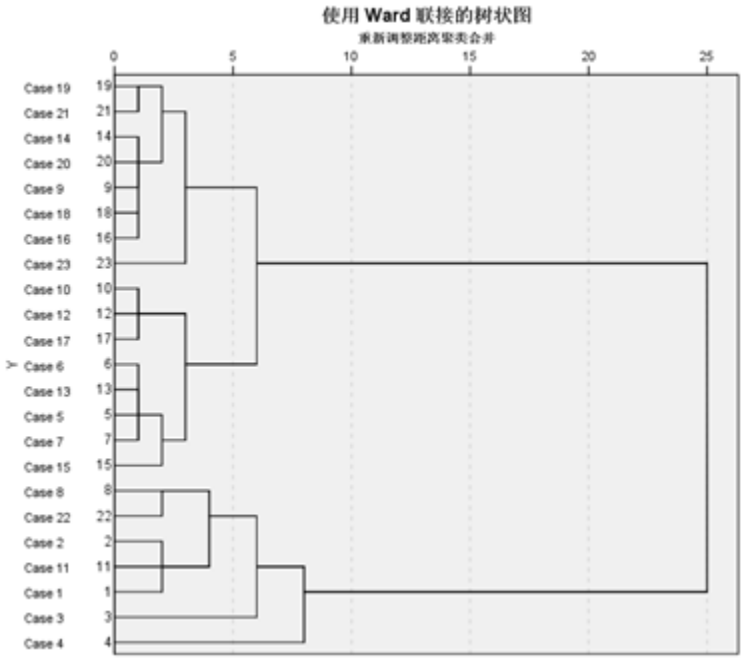
2. Cut tax rates. Currently, bonded mail modes are relatively popular in the cross-border electricity business patterns, which only needs to pay line post tax. The imports tax of the patterns would be lower than general import product taxes by 30%. But this model still can't sharply lower prices of imported goods, so we should further reduce part of cross-border electricity business tax rates according to the actual situation to promote cross-border e-commerce.

Cross-border e-commerce exports comprehensive abilities of the third class cities are weak relative to the first and second class cities. And the third class cities should fully develop their own potential competitive power, exploit innovative logistics service mode, and promote professional upgrading of cross-border e-commerce.

For example, Harbin can further consolidate the construction of the Russian e-commerce border warehouse and Russia's channel, implement the state's development plan of " the Silk Road Economic Belt and the 21st-Century Maritime Silk Road ", promote cross-border trade logistics with Russia, establish logistics distribution center, like railway container center, attract domestic and foreign industries to gather along the channel, and create a new economic and social situation to the outside world.



Graph 1 City comprehensive ranking



Graph2 Hierarchical diagram

Table 1 Cross-border e-commerce comprehensive ability evaluation index system

Target(A)	Factor level(B)	Index level(C)
Cross-border e-commerce comprehensive ability	City economic development level indicator(B1)	Gross regional domestic product(a hundred million yuan)(C1) Investment in fixed assets of postal transportation (a hundred million yuan)(C2) Total value of transportation, warehousing and postal service(a hundred million yuan)(C3) Total exports of customs(a hundred million yuan)(C4) Total retail sales of consumer goods(a hundred million yuan)(C5) The level of the resident consumption(yuan)(C6) Per capita disposable income of resident (yuan)(C7) Total business of posts and telecommunications(a hundred million yuan)(C8)
	City logistics supply and demand indicator(B2)	Gross logistics tonnage(ten thousand tons)(C9) The total cargo turnover(a hundred million tons/ kilometer)(C10) above-scale port handling capacity(ten thousand tons)(C11)
	City logistics transportation level indicator(B3)	Total mileage of railways, highways and inland water transport mileage(kilometers)(C12) Truck number(ten thousands)(C13) Number of warehousing logistics center(C14) Circulation radiation ability(C15)
	City logistics industry quality indicator(B4)	The balance of deposits and loans of Chinese-funded financial institutions(a hundred million yuan)(C16) e-commerce transaction(a hundred million yuan)(C17) The level of informatization(C17)

Table 2 Part of the original data set

	Beijing	Tianjin	Shanghai	Chongqing	Qingdao	Ningbo	Xiamen	Shenzhen
C1	17879.4	12893.88	20181.72	11409.6	7302.11	6582.206	2815.17	12950.06
C2	804.1	596.3846	510.57	1054.607	236.4232	351.3512	182.58	240.0099
C3	816.3	683.56	895.31	515.15	549.24	526.35	197.99	470.9554
C4	596.3212	596.3212	596.3212	596.3212	596.3212	596.3212	596.3212	596.3212
C5	7702.8	3921.43	7412.3	4033.704	2635.62	2329.258	881.91	4008.779
C6	24046	22984	26253	16573.14	20391	21234	24922	26727.68
C7	36469	26959	40188	22968.14	32145	37901.76	37576	40741.92
C8	546.4681	186.7423	638.18	277.1655	359.0182	124.6526	97.84	563.58
C9	28650	47698	94376	110135.8	29229.09	32615.72	13641.83	30335
C10	638.3052	7635	20427	2831.022	1113.93	2071.045	864.07	2018.88
C11	0	47697	73559	12502.4	41465	45302.7	17200	22807
C12	22607	16906	15898	126631	17223.9	12588	2134.49	6623
C13	23.7	22.1867	20.73	31.5642	17.5373	12.2983	9.44	29.6849
C14	269	99	673	76	78	65	87	169
C15	1.0803	0.7626	0.9209	0.8865	0.9051	0.8873	0.7855	0.7762
C16	82615.9	36333.84	89546.15	35018.08	17381.44	23941.51	10579	51470.74
C17	5500	1136	7000	1500	1200	2500	791	6000
C18	0.922	0.922	0.922	0.761	0.761	0.922	0.761	0.922

Table 3 KMO and Bartlett sphericity text

Sampling enough degrees of Kaiser - Meyer - Olkin measurements		0.663
Bartlett sphericity test	The approximate chi-square	495.056
	df	153
	Sig.	0

Table 4 The total variance explained

Element	Initial Eigenvalues			Extraction of sum of squares loaded			Rotated sum of squares loaded		
	Sum	Variance	Accumulation	Sum	Variance	Accumulation	Sum	Variance	Accumulation
1	9.990	55.501	55.501	9.990	55.501	55.501	6.099	33.881	33.881
2	2.72	15.158	70.659	2.72	15.158	70.659	4.068	22.60	56.483
3	1.17	6.513	77.172	1.17	6.513	77.172	3.315	18.41	74.899
4	1.12	6.261	83.434	1.12	6.261	83.434	1.536	8.535	83.434
5	.702	3.898	87.332						
6	.600	3.332	90.664						
7	.495	2.748	93.412						
8	.386	2.144	95.556						
9	.252	1.402	96.958						
10	.187	1.039	97.997						
11	.144	.799	98.796						
12	.088	.487	99.282						
13	.051	.285	99.567						
14	.037	.207	99.775						
15	.021	.118	99.893						
16	.013	.071	99.963						
17	.005	.028	99.992						
18	.001	.008	100.000						

Table 5 Rotating component matrix

	Element			
	F1	**F2**	**F3**	**F4**
C17	.810	.184		
C16	.772	.453	.356	
C7	.766	-.125	.220	.422
C18	.745		.311	
C8	.732	.401	.326	.113
C6	.724	-.123	.416	.203
C5	.711	.548	.366	-.112
C1	.701	.523	.423	.124
C4	.665		.353	.476
C3	.577	.507	.482	
C2	.137	.896		
C12	-.203	.859		.132
C9	.176	.792	.472	
C13	.520	.735		.252
C10	.256	.217	.887	
C11	.318		.806	.356
C14	.575	.145	.644	.154
C15	-.106	-.165	-.107	-.901

Table 6 Component Score Coefficient Matrix

	F1	F2	F3	F4
C1	.084	.079	.012	-.023
C2	-.035	.271	-.065	-.039
C3	.028	.078	.099	-.075
C4	.085	-.065	-.017	.266
C5	.134	.087	-.008	-.212
C6	.136	-.128	.047	.026
C7	.184	-.111	-.121	.220
C8	.137	.045	-.052	-.030
C9	-.145	.202	.195	-.032
C10	-.189	-.026	.506	-.144
C11	-.176	-.076	.408	.169
C12	-.149	.300	-.058	.157
C13	.102	.198	-.229	.149
C14	-.008	-.050	.230	-.012
C15	.124	-.053	.065	-.716
C16	.154	.054	-.037	-.125
C17	.297	-.006	-.260	-.103
C18	.191	-.095	-.022	-.097

Table 7 The factor score and total score

	F1	Rank	F2	Rank	F3	Rank	F4	Rank	Total	Total rank
Shanghai	19348.45	1	12	5	-0.2971	23	-0.17	23	1.0506	2
Beijing	-3577.99	22	84	7	2.7975	2	0.8883	6	0.7011	6
Shengzhen	-3070.35	21	16	2	4.9387	1	0.4978	15	1.4257	1
Guangzhou	-23704.78	23	57	1	1.7056	6	1.7914	1	0.9848	3
Chongqin	-1532.99	20	35	13	1.839	5	1.3243	4	0.4397	13
Suzhou	259.44	19	20	16	2.0122	4	1.3392	3	0.51	12
Tianjin	7087.16	4	-	23	0.6058	11	1.0036	5	0.3025	18
Hangzhou	12998.55	3	24	14	0.8831	9	0.5753	11	0.7891	5
Ningbo	6171.63	5	20	17	-0.0534	18	0.4173	17	0.2938	19
Nanjing	2035.01	16	10	6	0.8584	10	0.4483	16	0.5534	10
Chengdu	471.27	18	14	3	2.447	3	0.3814	20	0.955	4
Qingdao	5194.21	11	14	4	0.1813	14	0.3929	19	0.6309	8
Wuhan	3698.10	14	71	9	1.2332	8	0.754	7	0.6172	9
Zhengzhou	5911.11	8	12	19	0.0268	17	0.3368	22	0.279	20
Xiamen	13149.22	2	72	8	-0.2953	22	0.343	21	0.6644	7
Fuzhou	5474.75	9	14	18	0.3762	12	0.7001	8	0.3458	15
Harbin	4934.38	12	58	11	0.1604	15	0.4088	18	0.3944	14
kunming	6136.83	6	38	12	-0.0842	19	0.5998	10	0.3337	16
Changchun	6080.18	7	-	21	-0.2068	21	0.5453	13	0.1276	23
Nanning	1563.87	17	70	10	0.2822	13	0.5087	14	0.3176	17
Jilin	3534.46	15	21	15	-0.1285	20	0.6597	9	0.1744	21
Shantou	3970.14	13	62	20	1.6866	7	1.4269	2	0.5504	11
Yinchuan	5332.91	10	-	22	0.09	16	0.5563	12	0.1596	22

Table 8 Cluster analysis result

Category	Cities
First class	Chongqing, Shanghai, Beijing, Guangzhou, Tianjin, Suzhou, Shenzhen
Second class	Wuhan, Chengdu, Zhengzhou, Ningbo, Nanjing, Qingdao, Xiamen, Hangzhou
Third class	Harbin, Changchun, Fuzhou, Kunming, Yinchuan, Nanning, Jilin, Shantou

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