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URBAN COMPETITIVE PATTERN AND ITS CHANGES IN CHINA

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ABSTRACT: With the national economy's transition from a planning one to a market one, the factors affecting regional economic pattern has changed greatly. In this paper we first construct an index system for evaluating competitiveness of Chinese cities based on modern competitive advantage theory. With principal component analysis and cluster analysis methods, we compare the factors affecting cities' integrated competitiveness in 1990 and 1997. We find that four major factors are capital (including investment, FDI and urban financial revenue), urban infrastructure (transportation and communication, urbanization level, education etc.), industrial performance and structure, degree of market openness and that these factors have become more advanced and complicated since 1990. Most Chinese cities are transforming from productive factors-oriented type to investment-oriented type and a few are becoming innovation oriented. The integrated competitiveness is closely related to cities' scale, urban function, regional policy and degree of market openness and displays an uneven spatial pattern. The difference between the south and the north and the difference between the west and the east co-exist but the former has been more larger. Finally, we discuss the mechanism behind the pattern and attribute the unevenness to change of factors dominating the cities' competitiveness regional innovation capacity and geographical difference of traditional culture.

KEY WORDS: urban integrated competitiveness; competitive pattern; China's cities

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During the process of national economy's transition, the determinant power of economic development has changed gradually from central government to local governments. Cities, as the center of regional economic development, not only determine the competitiveness of the region but have become the main impetus for the changes of macro economic pattern as well. So taking 209 perfecture-level cities as research subjects, we analyze the macro pattern of urban competitiveness and comprehend the internal impetus and mechanism of regional development, which have great significance on the development of regional and national economies. Until now, the researches on regional and urban competitiveness are far less thorough and comprehensive than those on industrial and national competitiveness (NIRRC, 1998), most of which concentrate on the case studies of several metropolitan areas and towns (HAO *et al.*, 1998; ZHANG *et al.*, 1998). Therefore penetrating into urban competitive pattern is an important and impending task.

1 URBAN INTEGRATED COMPETITIVENESS AND THE EVALUATION SYSTEM

1.1 Competitive Advantage Theory and Urban Integrated Competitiveness

Regional competitive advantage theory derives from

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classical trade theory. Several centuries later, PORTER Michael a professor in Harvard University, integrated many empirical researches and advanced national competitive advantage theory(PORTER, 1996). This is the theoretical basis of our urban competitive pattern research.

According to PORTER's competitive theory, to gain production competitiveness is the key for trade surplus. The more added values the product has in the industrial value chains, the stronger competitiveness it has and the more favorable it is for the country. Which factors determine the product advantage? SMITH Adam and RICARDO Davad attributed it to absolute and comparative advantage. OHLIN stated that the difference in production factors' endownments determine the product advantage. On the contrary, MILL John S and MARSHALL Alfred reasoned the advantage terms, which was from the perspective of demands and made the border of industrial competitive regions clear according to the competitive prices. Since the discovery of LEONTIEF, industrial competition has caused great attention and great number of papers on industrial structure and industrial organization appeared. Soon afterwards, SCHULTZ T W pointed out the importance of human resource, POSNER(1961) and VERNON (1966) indicated the periodical characteristic of industrial and regional development. On the basis of these researches, PORTER points out that the competitive advantage a region or nation owns lies in the integration of four factors — production factor, demands factor, related industries and enterprise strategies. Incorporating the governmental activities especially the industrial policies and trade policies into the framework of national comparable competition, we can get the "diamond theory" which is the framework for our analysis of urban competition system.

From regional perspective, cities, as the network of the regions, include not only the urban built-up area, but also the whole administrative region as well(ZHOU, 1995). Urban integrated competitiveness is the overall innovation abilities that were manifested in the interactions among cities. Here the overall abilities have specific meanings in contents, time scale and spatial scale. Urban integrated competitiveness reflects the production capacity, residents' living qualities, innovative milieu and the city's position in the innovation network. The promotion of urban production capacity refers to the increasing economic benefits deriving from all kinds of production activities in the region and it is mainly determined by the production factors. The improvement of residents' living qualities on one hand indicates the competitiveness of a city; on the other hand will influence the demand conditions of the city's competitiveness. A city's position in the innovation network indicates the ability of its driving and promoting peripheral regions and its ability of processing and absorbing the flows of people, commodities, energies and information.

From the perspective of spatial scale, urban integrated competitiveness displays as its innovation ability and the ability of pushing the whole region for further development. From the perspective of time dimension, it includes the actual competitiveness and the potential as well. The multiple aspects of urban integrated competitiveness determine the influences and potentials a city owns. It can be formulated as follows:

$$C = \mathrm{d}F(Y, P, D, I, E, G, F, \cdots\cdots)/\mathrm{d}t$$

where C: urban integrated competitiveness; Y: urban comprehensive economic level; P: production capacity; D: overall demands; I: industrial linkage; E: enterprise's performance; G: governmental behavior; F: inter-city communication.

1.2 Evaluation Index System of Urban Integrated Competitiveness

According to the connotation of urban integrated competitiveness, we construct the index system of city integrated competitiveness (Table 1). The principles for choosing indicators are: 1) The indexes must reflect the connotation of urban competitiveness as scientifically and comprehensively as possible. 2) We should take the function and terms of each index into thorough consideration. 3) The data incorporated into the system must can be acquired and processed. 4) The construction of index system should consider the principle of combining the practices with theories.

The whole index system can be divided into four subsystems:

(1) Urban development level subsystem: This index subsystem reflects the economic development level of the whole urban area. It mainly includes the economic base of urban development, urbanization level and inter-city linkage. $X_1 - X_3$ indicate the economic base of urban development, which reflects the overall economic power. X_4, X_5 indicate urbanization level.

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Table 1 Index system of urban integrated competitiveness in China

Subsystem of urban development level			
Economic base		Urbanization level	Inter-city linkage
X_1 GDP per capita X_2 Growth rate of GDP X_3 Labor production efficiency		X_4 Urbanization level X_5 Population density	X_6 Passenger traffic X_7 Freight traffic
Subsystem of production factors			
National resources	Human and knowledge resources	Capital resource	Infrastructure
X_8 Urban built-up areas per capita X_9 Urban location indicator X_{10} Water consuming per unit production	X_{11} Number of professionals per 10000 employees X_{12} Number of students in high schools and universities per 10000 person	X_{13} Local government revenue X_{14} The ratio of residents' savings to GDP X_{15} Utilization of foreign capitals per capita	X_{16} Electricity consuming amount per 100 yuan production value X_{17} Number of public facilities X_{18} Density of roads X_{19} Number of telephones per capita X_{20} Beds in hospitals per capita
Subsystem of demands			
Consuming demands	Investment demands	Government purchasing demands	Export demands
X_{21} Retail sales of consumer goods X_{22} Housing areas per capita	X_{23} Investment in fixed assets per capita	X_{24} Government expenditures	X_{25} Rate of experts to GDP
Subsystem of industrial and business performance			
Industrial structure	Industrial development		Real estate development
X_{26} The percentage of secondary sector in GDP X_{27} The percentage of the third sector in GDP	X_{28} Industrial output values per capita X_{29} Revenues and profits per 100 yuan output value		X_{30} Investments on real estate per capita

X_6 and X_7 reflect the material flows such as population flow and commodities flow which are the main activities of outward economic linkages.

(2) Subsystem of production factors: This system reflects the comparative advantages of urban development. It includes five aspects: natural resources, human resource, infrastructure, and knowledge resource and capital resource. The first three are called elementary production factors and the latter two are called superior production factors. In this subsystem, $X_8 - X_{10}$ reflect the natural conditions that a city owns and the location indicator was acquired by expert evaluation system. X_{11}, X_{12} represent the human resource and knowledge resource. $X_{13} - X_{15}$ represent the available capital resource. X_{16} and X_{20} is indicators of urban infrastructure, which represent the carrying capacity of the city for economic activities.

(3) Demands subsystem: This is the driving force of competitiveness enhancement. Usually, demands can be classified into four kinds: residents' consuming demands, enterprise' investment demands, governments' purchasing demands and exports demands. In this system, X_{21} and X_{22} represent residents' consuming demands. X_{23} indicates enterprise' investment demands. X_{24} reflect the circumstance of governments' purchasing and X_{25} demonstrates the amount of export demands.

(4) Industrial and business development: It's the most important influential factors of subsystem affecting urban competitiveness and it usually includes industrial structure, industrial development level, the development of real estate, enterprise' efficiency. In this system, X_{28} and X_{29} represent industrial development level and industrial structure. X_{30} indicates the development of real estate.

2 THE PRINCIPLE FACTORS ANALYSIS OF URBAN INTEGRATED COMPETITIVENESS IN CHINA

2.1 The Determination of the Principal Factors

The basis for urban competitiveness pattern research is to seek the main factors affecting urban integrated competitiveness. The sample of this research was obtained from city statistic yearbooks and the statistical caliber is the whole administrative perfectures. Putting all data into the index system of urban integrated competitiveness, we get a matrix base of two years. Because of the large number of variables, the various norms of

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factors and the complexity it may produce dealing with multi-dimensions sample, we firstly use Principal Components Analysis to get the principal factors and find out the principal factors' features as follows:

(1) Principal factors affecting urban integrated competitiveness become more complex in 1997 than 1990. In 1990, the first ten principal components can interpret 86.36% of the competitiveness, and the first three can interpret about 55.81%. In 1997, the first twelve principal components can interpret 87.11% and the first 3 only 49.42%. These figures indicate that the affecting factors become more disperse.

(2) Principal factors affecting urban integrated competitiveness become more superior. In 1990, there are 13 principal factors. According to the contribution values they are (the figure in the parenthesis is the cumulative contribution value): $X_4(0.933)$、$X_{21}(0.931)$、$X_1(0.921)$、$X_{18}(0.902)$、$X_{28}(0.886)$、$X_{24}(0.878)$、$X_{13}(0.828)$、$X_{12}(0.785)$、$X_8(0.708)$、$X_{19}(0.751)$、$X_{17}(0.748)$、$X_{10}(0.934)$、$X_{16}(0.916)$. In 1997, the number of principal factors, they are: $X_{29}(0.923)$、$X_{15}(0.907)$、$X_1(0.836)$、$X_{18}(0.766)$、$X_{13}(0.701)$、$X_3(0.819)$、$X_{11}(0.797)$、$X_{12}(0.963)$、$X_4(0.821)$、$X_9(0.801)$、$X_{27}(0.590)$、$X_{23}(0.558)$. From these two lists, we could find the following features.

Firstly, in 1990 7 factors belonged to the subsystem of production factors and they took 63.6% of all the principal factors; while in 1997 there were 6 factors and they counted for only 50% of all.

Secondly, from the principal components' comprising variables we found that the first principal component's comprising variables was equally distributed in all four subsystems. The second and third principal components have great disparities between 1990 and 1997. In 1990, the second principal component mainly reflects the infrastructure construction and the third principal component mainly manifests the natural resources. In 1997, the second mainly reflects the city's location, human resource and the relative position of the tertiary industry. The third indicates the investments on fixed assets and industrial production performance.

Finally, from the distribution conditions of variables' contribution, we could get two conclusions. The first is that GDP per capita is a very comprehensive factor, which has its contribution on each principal component. The second is that in 1997 real estate investment per capita and the utilization of foreign capitals per capita have most significant contribution and they mainly concentrate on the first two principal components. These conclusions prove that real estate and foreign-funded enterprises are forceful propellers for the promotion of a city's economic development and competitiveness(GAO *et al.*, 1999). They give evidence to the upgrade of principal factors of urban integrated competitiveness in China.

(3) All principal factors can be classified into four categories (Table 1): capital conditions (including investment, utilization of foreign capitals, government revenues, etc.), urban basic qualifications (e.g. transportation, communication, urbanization level, location conditions, etc), industrial performance and structure (e.g. labor production efficiencies, the rate of the third sector in GDP, etc), market openness level (e.g. utilization of foreign capitals).

In all, we get such conclusions: 1) The principal factors that affect urban competitiveness are mainly production factors, and now they are upgraded from elementary factors to superior ones such as capital and knowledge resources. 2) Enterprises' performances and industrial structure have been keeping their influences on urban developments. 3) Some demands factors such as government's willingness for investment, markets openness and outward linkages have begun to take effect.

2.2 Stages of Urban Development

According to competitive advantage theory, the competitive advantage of a nation or a region is dynamic and its development can be classified into four stages. 1) Production factors stage: In this stage, all industries depend greatly on the basic production factors. 2) Investment-oriented stage: On the basis of governments and enterprises' investment willingness and abilities, production factors, enterprise's strategies, industrial structure and competition environments keep improving. 3) Innovation-oriented stage: In this stage, the region or nation has integrated competition system and the industrial specialization and globalization degree increase greatly. 4) Affluence-oriented stage: The region has strong economic strength and its development objective concerns greatly with social values. In this stage the impetus for innovation and competition are not strong. Based on the outcome of Principal Components Analysis, we process the samples with Cluster Analysis to get an evaluation on the development stages and situations of cities in China.

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We use Maximal Distance Method (0 – 100) and get the results as listed in Table 2. It shows that most of the cities in China are still in their first stage. In 1990 this percentage is 66. 3%. In 1997 the percentage has fallen down a little to 58. 2%. Some cities have already shifted to or are on the process of shifting to the second stage. In 1997, the number of this kind of cities is 65, which accounts for about 29. 5% of all cities. The percentage has increased by 7% from 1990 to 1997. A few cities such as Shenzhen, Shanghai is striding forward to the third stage.

Combining the basic judgement of urban development stages and the features of principal factors, we could point out the direction of urban development in China. Now a days, knowledge economy has already become the most powerful impetus for economic development and the innovation factors such as human resource, ideas, technologies and capitals have formed a network through out the world. Cities, especially the global cities havebecome the nodes in the network and they are the main sources where innovations generate from. In order to promote and improve China' s situations in the Silicon-Network, urban development towards investment and innovation oriented stages is an important task. So we should pay much attention to such issues: firstly, improve urban infrastructure; secondly, develop the mechanism to attract talented people; third, improve investment environment to attract more foreign capitals; fourth, develop markets, reinforce interaction and participate actively in global division; the last one' also the most important and basic one' to adjust city' s industrial structure and enhance enterprise's competence.

3 FEATURES OF URBAN INTEGRATED COMPETITIVENESS PATTERN AND THE RULES OF ITS CHANGES IN CHINA

3. 1 Ranking Pattern of Urban Integrated Competitiveness Pattern

Urban competitiveness can be represented by competitiveness indicator. There are several ways to compute the indicator. In this research we use the concept of comparative competitiveness, namely according to the principal factors to calculate the scores of integrated competitiveness to represent the relative position of cities. Its calculating formula is:

$$CI_i = (1/n) \sum R_{ij}$$

where: CI_i is relative integrated competitiveness index for the ith city; R_{ij} the position of ith city according j feature; n the number of features.

1) Urban competitiveness is pertinent to urban scale. Usually the big and middle-sized cities have high CI and the small cities have low one. For example, in 1997 Shenzhen City has the highest score — 879. 71, other cities with high indexes are Guangzhou, Xiamen, Nanjing, Shanghai, Wuxi, Wuhan, Tianjin, etc. Most of the big cities with a population of over 1 million rank in the first hundred except several cities in middle and western China such as Datong, Baoji and Tongchuan. On the contrary, those relative small cities with a population about 500 thousand and less have low CI s of about 200 – 300. Most of them rank in the last fifties. Nevertheless, the relation between urban integrated competitiveness and population scale is not the exact positive correlation. The biggest city is not the one with most powerful competitiveness.

(2) Urban competitiveness has some relationship with urban openness degree and regional policies. Since the 1980s the development mode of national economy has changed greatly. The decision-making power has shifted from central government to local governments and the distribution policies have been adjusted. With the promotion of favorable polices, four special zones and 14 open coastal cities are all among first fifties in the list. All the cities taking the top 10 positions are all open coastal cities or in the openness areas. The spatial distribution pattern of the cities with strong integrated competitiveness shows that the south especially the (Pearl) River Delta and the Changjiang(Yangtze) River Delta own much more cities with good position. This coincides with the polies of developing southeast coastal areas firstly.

Table 2 The development types of cities in China

Development types of cities	1990		1997	
	Number	%	Number	%
Stage Ⅰ	138	66. 3	128	58. 2
Stage Ⅱ, Ⅲ	47	22. 5	65	29. 5
Stage Ⅳ	24	11. 5	27	12. 7

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(3) Urban competitiveness correlates with urban functions. Generally, all-round cities and the cities as regional political, economic and cultural centers have strong competitiveness. Firstly, most of the four municipal cities and the 26 principal capitals are all in the first fifties with exception of Chongqing, Hefei and Hohhot. For the capital cities, most rank first among all cites within the province except Hohhot and Hangzhou. The reason lies in the fact that in Inner Mongolia Baotou is an important industrial city in western China. As for Zhejiang Province is concerned, Ningbo City ranks first because of its coastal location and openness degree. Secondly, the cities with relative simple functions, especially some old mining cities have weak competitiveness such as Fuxin City in Liaoning Province, Tongchuan City in Shaanxi Province. The structural upgrade and adjustment of these cities is a common and urgent problem in China.

3.2 Spatial Pattern of Urban Integrated Competitiveness and Its Changes in China

Spatial pattern of urban integrated competitiveness indicates a serious imbalance.

(1) There are significant differences of urban competitiveness among cities in various provinces or regions

The differences in urban competitiveness among cities within each region are very great in both relative developed coastal regions and western lagging behind region. For instance, in Guangdong Province, Shenzhen, Guangzhou and Fushan cities rank the top positions in the list while Heyuan, Qingyuan, Yangjiang and Meizhou are at the position of 212, 205, 182 and 166. The maximum *CI* is about 3.8 times the minimum. Sichuan Province has 12 perfecture-level cities. The best one-Chengdu ranks the 32nd while the worst — Guangyuan ranks the 219th. The ratio of their *CI*s is about 3.9 to 1. In Shandong Province and Hubei Provice the ratio is 2.4 to 1 and 2.3 to 1 separately.

(2) There are great differences in urban competitiveness between the east and the west, the north and the south

According to urban relative integrated competitiveness indicators we can grade all the cities into five groups: Those with indicator between 800 and 1000 are cities with very strong competitiveness; 650 – 800 means strong competitiveness; 500 – 650 means moderate competitiveness; 350 – 500 means weak and less than 350 means very weak. From Table 3, we draw such conclusions.

Firstly, the difference between the east and the west is still one of the most important features of spatial pattern of urban competitiveness. In 1997 the seven cities with most strong competitiveness were all located in the east. Although the percentage of the second grade cities in the east is approximate to that of the west (east 18.1%, west 14.6%), the percentages of third, fourth and fifth grades have great disparities. The cities that belong to the third and fourth grades hold about 30 % of all the cities in the east while in the west they only account for about 20 % . On the contrary, the fifth grade cities are about 46.3 % of all in the west, this figure is about 4 times of that of the east.

Secondly, the gap between the south and the north becomes more and more huge. Because the number of cities in the west is relative small, we compare the southeast and the northeast to illustrate this feature. In 1997 the seven cities with most strong competitiveness

Table 3 The distribution pattern of urban competitiveness and its changes (number of cities)

	Very strong (> 800)		Strong(650 – 800)		Moderate(500 – 650)		Weak(350 – 500)		Very weak (<350)	
	1990	1997	1990	1997	1990	1997	1990	1997	1990	1997
Southeastern region	9	7	13	28	19	26	25	27	30	16
Northeastern region	4	0	20	10	23	28	15	23	17	11
Western region	2	0	7	4	7	6	5	9	13	15

Note: Northeastern region includes these provinces and municipal cities: Heilongjiang, Jilin, Liaoning, Inner Mongolia, Beijing, Tianjin, Shanxi, Shandong, Henan. Southeastern region includes Guangdong, Guangxi, Hainan, Fujian, Zhejiang, Jiangxi, Anhui, Hunan, Hubei, Jiangsu, Shanghai, Chongqing. Others belong to Western region.

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are all in the southeast region. In this region the first and second grade cities accounts for 24.2% and this ratio is more than 2 times of that of the northeast. Most of the cities in the northeast are of the third and fourth grades with percentage of 34.9% and 44.6% separately. Compared with 1990, the number of cities belonging to the first and second grades in the northeast has decreased and in the southeast it has increased. These data indicate that the gap between the north and the south has deepened.

In order to analysis this change, we divide all the 209 cities in the 1990 sample into two groups to carry out further research. The first group including 54 cities comprised of national metropolises and regional metropolises, open coastal and inland cities. The rest comprise the second group. Fig. 2 indicates the position changes of each group from 1990 to 1997. The ordinate indicates the relative value changes during the seven years, in each group the cities are classified into three clusters by region. The abscissa indicates the position of these clusters in 1997 descending from left to right. From the figure we could see that the southeast cluster rises significantly, half of the northeast cluster rises while the other half falls and most in the west cluster falls down the list. This research manifests that the disparity between the east and the west has been increased in the 1990s and this change mainly derives from the rapid development of the south and the staggering of the north. Finally we should point out that the position in 1997 is related to their position changes, this manifests the rule of building-up in changes of urban competitiveness in China.

3.3 Causality Analysis of the Differences in Competitiveness

In this part we will analyze the causes of differences in urban integrated competitiveness.

(1) Causality analysis of disparities between the south and the north and the change of principle factors of urban integrated competitiveness. Firstly, the disparities between the south and the north partly derive from the disparities in production factors such as location factors, spatial accessibility and population distribution pattern(YANG *et al.*, 1999). For example, the southeastern region has advantages on location factors. The distribution of population and resources, especially water resource has significant regional disparities. There are south and north gap in the distribution of increasingly more important advanced production factors such as capital. Most of capitals especially FDI concentrates in the southeast. Secondly, the south has excellent enterprise's performance and industrial structures than the north does. Moreover there is more diversified economy in the south (ZHAO, 1998). Thirdly, the reform and openness policies were firstly carried out in the southeast coastal regions. There are higher degree and bigger scale of openness in the south and the preferential policies given by central governments also have the spatial gradient(CHEN, 1999).

(2) The difference in innovation abilities between the north and the south. Innovation abilities are the sources of competitiveness and the innovation ability of a region affect directly its competitive advantage and potential. Regional innovation systems have different input, output, diffusion capacity and innovation is a relatively localized activity, which has close relationship with regional economy, society and culture, so innovation capacity has distinct regional feature(ERKKO, 1998). In a research carried out recently in Peking University, the researchers use input indicator, output indicator, indicator of science and technology achievement to evaluate the regional innovation capacities of the provinces in China(ZHOU, 1997). This research indicates that there are distinct disparities in regional innovation capacities between the north and the south. The innovation capacities of most of the provinces in the northeast are lower than those of the provinces in the southeast(Table 4).

(3) The difference in cultural tradition between he north and the south. Regional difference in cultural tradition has great influence on the development of regional economy and they further influence the cultivation of innovation capacity and competitive environment. Firstly, the intellectual and behavior patterns of the northern people under the planning economy for a long time have become the obstacle to the economic transition. Secondly, in our traditional culture the southern people have gentle, fine and astute characteristics while the northern people have forthright, doughty characteristics. These differences make the southern peoples more easily to engage in industry and commerce, especially the proprietors. They also more easily adapt to the operation and circumstance of market economy. This means that differences of southern and northern cultures could influence human resource's mobility, market environments and enterprise's behaviors then furthermore influence urban competitive-

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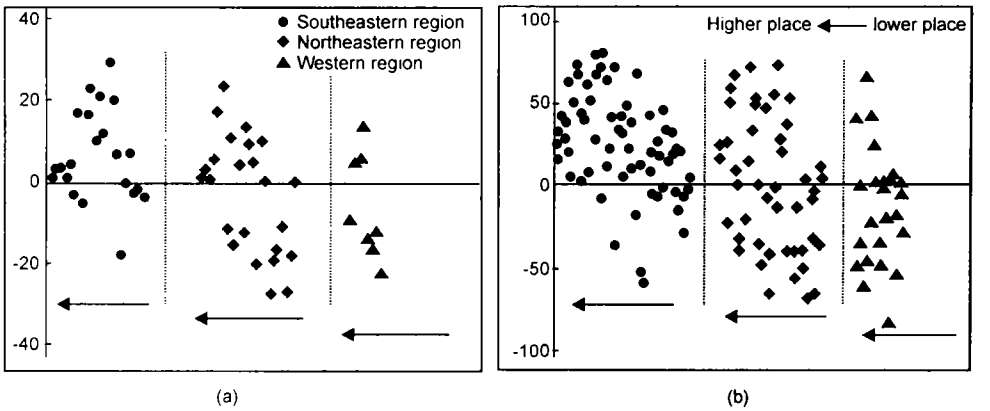

Fig. 1 Rank change of city relative competitiveness in China

Table 4 Innovation capacity indicators of northeastern and southeastern China

Kind	Province (region or City)	Input indicator	Sci-tech achievement indicator	Output indicator
1	Beijing	100.00	100.00	100.00
2	Shanghai	43.47	60.45	239.86
3	Jiangsu	62.71	69.35	66.07
4	Tianjin, Fujian, Zhejiang	34.08	22.18	85.01
5	Hebei, Jilin, Heilongjiang, Hunan, Henan, Hubei	47.56	33.35	18.28
6	Liaoning, Shandong, Guangdong	62.61	40.56	41.55
7	Anhui	31.78	12.79	33.41
8	Shanxi, Jiangxi, Inner Mongolia, Guangxi, Chongqing, Hainan	22.91	7.09	7.35

ness level and development pattern of regional economy. Summing these up, we could find that urban competitiveness pattern and its changes depend on not only the urban development stages, urban scales, functions and open-up degrees but also the innovation abilities and cultural traditions.

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