



The International Symposium on Megaregions in China

Assessing the comprehensive competitiveness of Shandong Peninsula Megaregion

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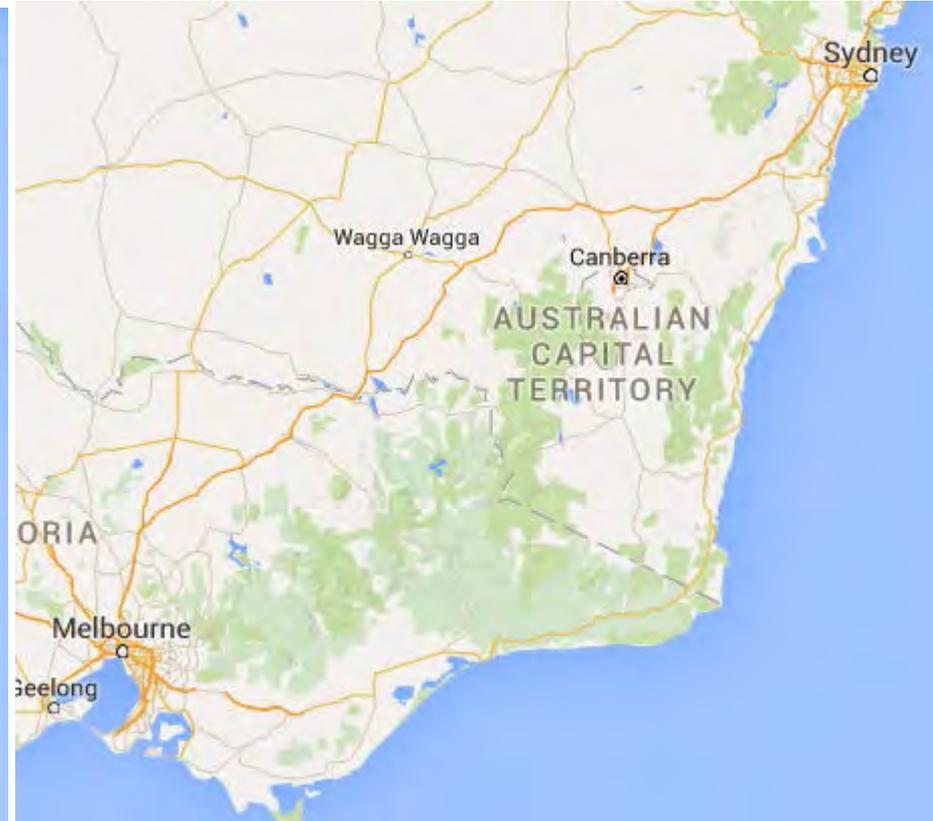
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1. Introduction

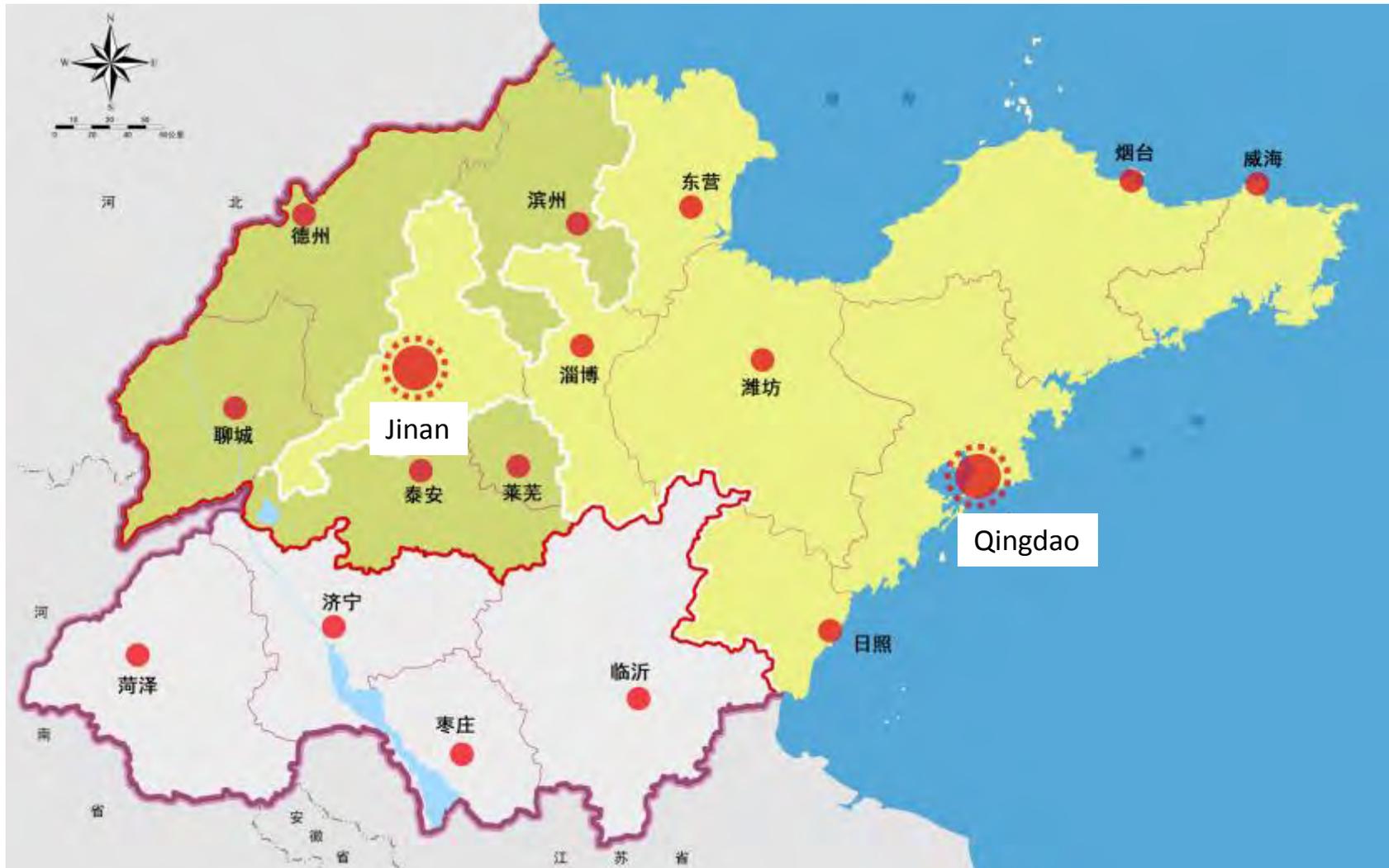
Maps in the same scale



Status overview

Includes 13 city regions with 67 million population

Area 112,800 km² ; urbanization level 57.8% ; GDP 4.75 trillion yuan



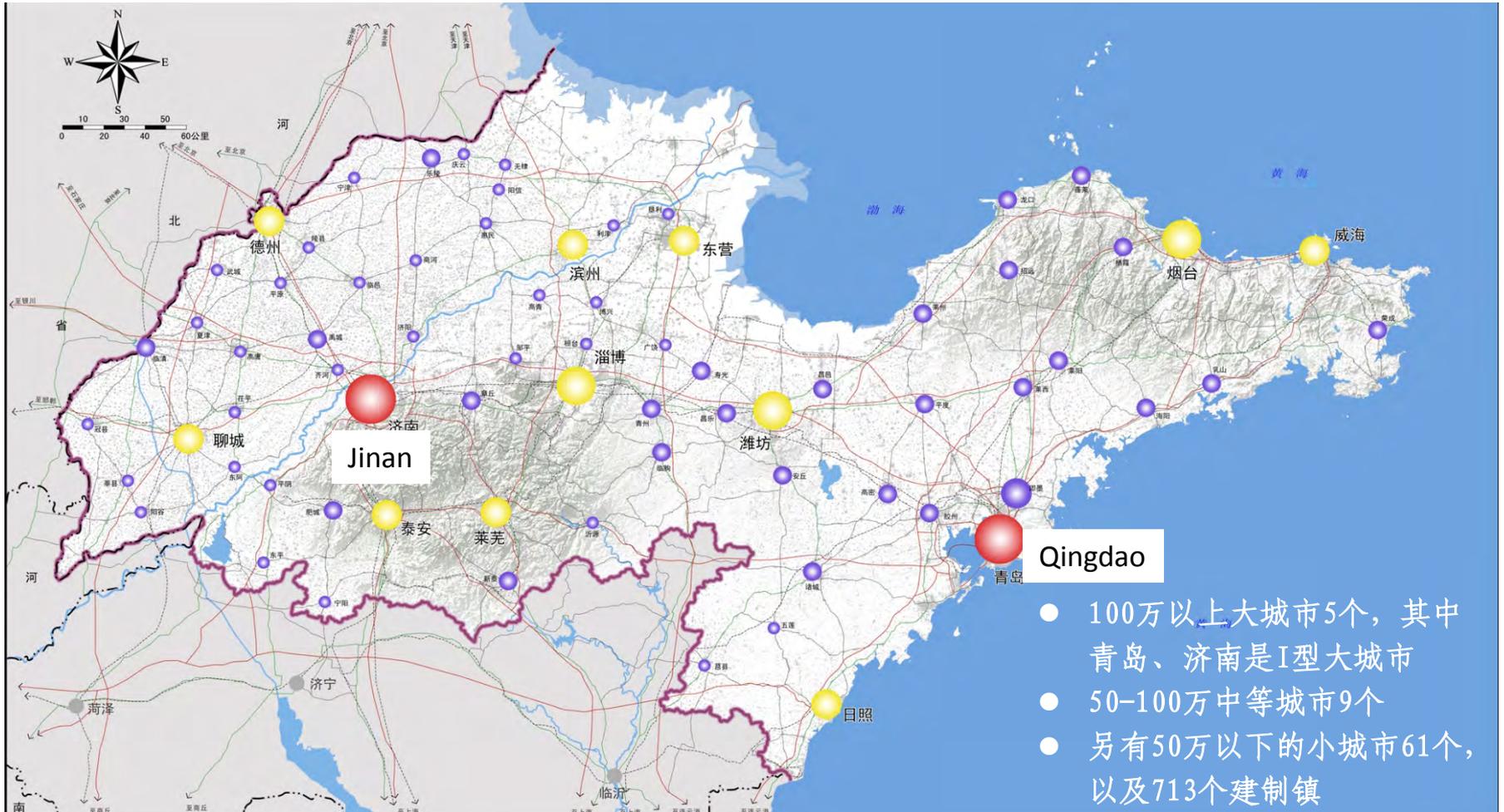
Current urban structure

> 1 million: 5 cities

0.5-1 million: 9 cities

< 0.5 million: 61 cities and 713 towns

Core cities: Jinan and Qingdao



What is comprehensive competitiveness?

Comprehensive competitiveness (or overall competitiveness) in this paper means looking into competitive abilities from five aspects:

- **economic development**
- **innovativeness**
- **infrastructure status**
- **resources and environment**
- **spatial structure**

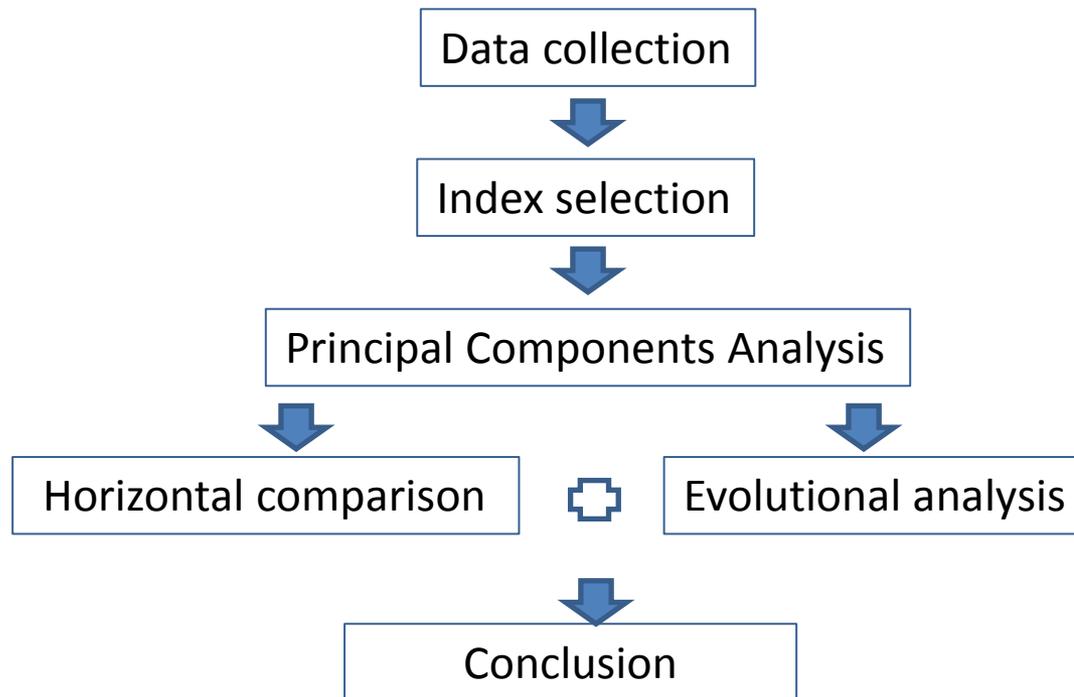
Why is assessing competitiveness important?

Assessing the competitiveness of SPM could contribute to **a scientific understanding of its development status and position in the national urban system**; it could also provide **a basis for its competition, transformation and innovation** in its future development.

How can we assess competitiveness?

Although research into the competitiveness of SPM is increasing ([Li, 2009](#); [Wang, Li, Wang, & Yao, 2012](#)), studies comparing its national competitiveness to those of the other megaregions in China remain limited ([Ni, 2008](#); [X. Zhang & Li, 2014](#)).

To understand its status of development in the national context, this paper assessed its competitive ability through a comparison with 20 megaregions nationwide.



2. Study area and sources

Study area: 20 megaregions in China



Sources

The data were selected from yearbooks of 2006 and 2014, including

- China City Statistical Yearbook
- China Statistical Yearbook (County-level)
- China Urban Construction Statistical Yearbook
- Statistical yearbooks at provincial level

3. Methodology

Index selection

28 indices

Goal	System layer	Control layer	Index layer	Unit	Index property
Comprehensive competitiveness	Economic competitiveness	Economic scale	GDP	10,000 yuan	Positive
		Economic structure	The proportion of service industry in GDP	%	Positive
			The proportion of employed people in non-agriculture sectors	%	Positive
		Economic efficiency	Per capita GDP	10,000 yuan	Positive
			Per capita public revenue	%	Positive
		Economic vitality	The actual use of foreign investment	10,000 US dollars	Positive
			Fixed asset investment	10,000 yuan	Positive
			Number of registered urban unemployed people	people	Negative
			Private owners and self-employed people	people	Positive
			Per capita retail sales of social consumer goods	10,000 yuan	Positive
	Average wage		yuan	Positive	
	Innovative competitiveness	Educational Development	Number of full-time teachers in tertiary education	people	Positive
			Per capita education spending	yuan/person	Positive
	Technological development	Science and technology spending	10,000 yuan	Positive	
		Transport infrastructure	Total passengers	10,000 people	Positive
	Civil aviation passengers		10,000 people	Positive	
	Total freight		10,000 tons	Positive	
	Urban roads area at year-end		m ² /person	Positive	
	Information Infrastructure	Internet broadband access users	10,000 users	Positive	
	Environmental competitiveness	Polluting emission	Industrial sulfur dioxide emissions	kg/10,000 yuan	Negative
			Industrial smoke (powder) dust emissions	kg/10,000 yuan	Negative
		Environmental management	Utilization of general industrial solid waste	%	Positive
			Centralized treatment rate of sewage treatment plant	%	Positive
			Harmless treatment rate of domestic garbage	%	Positive
	Structural competitiveness	Urban compactness	Urban distribution density	number/10,000km ²	Positive
			Population density	person/km ²	Positive
		Regional structure	Proportion of population in the primate city	%	Positive
			Regional population	10,000 people	Positive

Research methods

Principal Components Analysis

A technique of dimensions reduction which can convert a large number of original related multi-indices into few independent comprehensive indices, with the purpose of comparing and evaluating competitiveness among megaregions

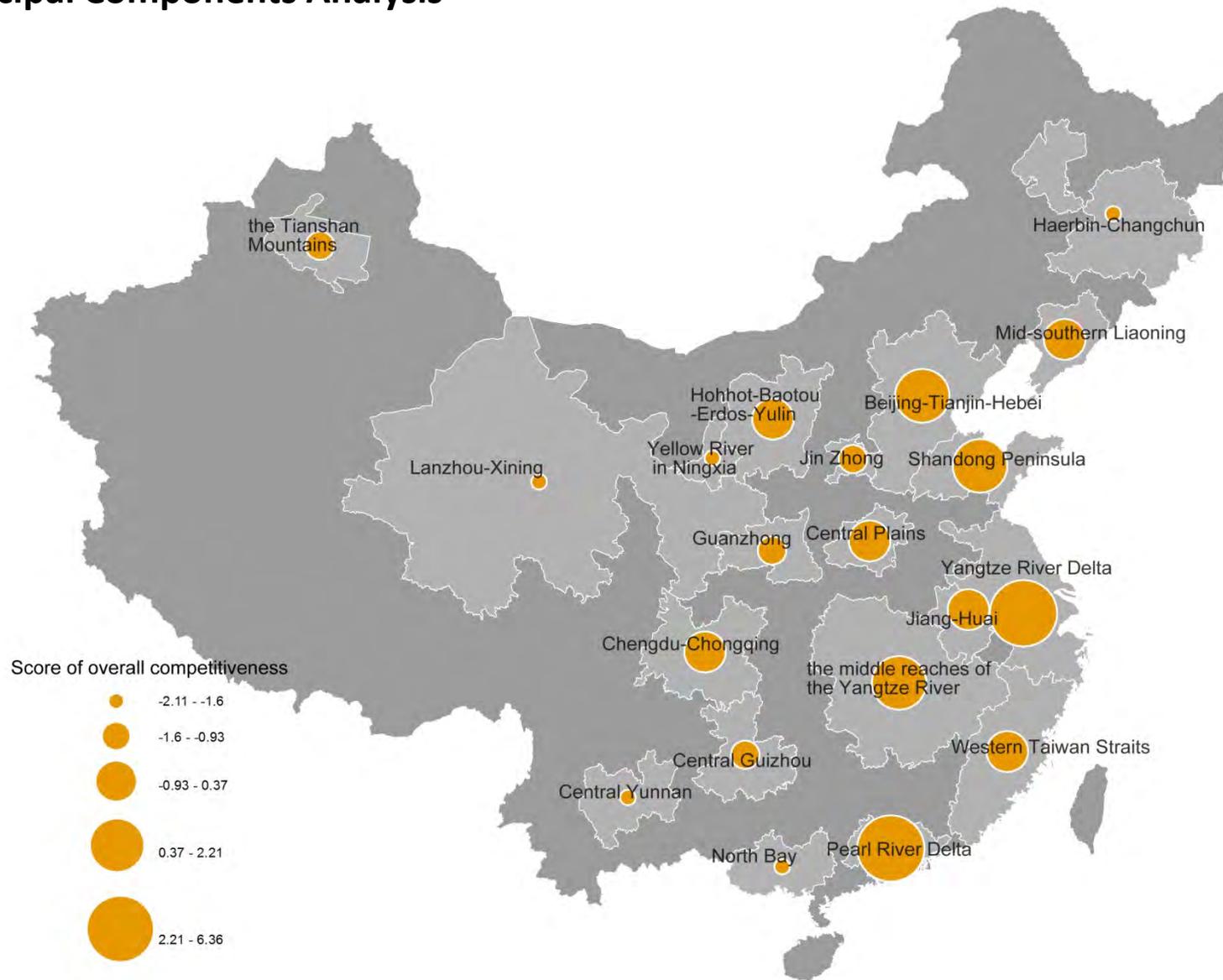
Hierarchical Clustering Analysis

To visualize hierarchy of megaregions based on the national competitiveness

4. Analysis and findings

4a. Horizontal comparison of comprehensive competitiveness in 2013

Principal Components Analysis





Megaregions	Component F1	Component F2	Component F3	Component F4	Component F5	Component F6	Total score	Order of overall competitiveness
Yangtze River Delta	11.66	-0.92	-0.93	-0.43	1.02	2.03	6.36	1
Pearl River Delta	4.91	5.69	0.88	1.44	-1.85	0.09	3.92	2
Beijing-Tianjin-Hebei	4.39	0.29	-0.49	-2.58	-0.09	-1.5	2.21	3
Shandong Peninsula	2.02	-0.11	1.83	1	0.29	-0.85	1.32	4
the middle reaches of the Yangtze River	3.23	-3.31	0.13	0.41	1.03	-2.21	1.18	5
Chengdu-Chongqing	1.33	-1.81	-0.19	-0.19	-0.37	0.42	0.37	6
Central Plains	0.16	-0.98	0.05	0.61	-0.5	0.83	-0.03	7
Western Taiwan Straits	-0.32	0.81	-1.13	1.21	0.27	-1.04	-0.07	8
Jiang-Huai	-1.57	3.61	-2.49	0.7	0.72	-0.95	-0.38	9
Mid-southern Liaoning	-0.78	-1.66	3.29	0.19	-0.94	-0.97	-0.53	10
Jinzhong	-0.91	-1.4	1.46	1.07	-0.39	0.31	-0.57	11
Guanzhong	-2.74	2.57	-0.14	1.05	1.01	0.06	-0.93	12
Hohhot-Baotou-Erdos-Yulin	-1.97	-0.19	1.16	-0.04	0.78	0.39	-0.98	13
Central Guizhou	-2.69	0.28	1.36	-0.62	0.47	1.06	-1.31	14
the Tianshan Mountains	-2.8	2.37	0.89	-4.34	-0.45	0.18	-1.38	15
along the Yellow River in Ningxia	-1.61	-1.78	-2.36	-0.35	-2.48	-0.28	-1.6	16
Haerbin-Changchun	-3.37	0.21	0	0.99	0.49	0.74	-1.72	17
North Bay	-3.3	0.12	-0.2	-0.57	2.34	0.36	-1.75	18
Central Yunnan	-2.48	-1.9	-2.65	-0.09	-0.28	-0.05	-2	19
Lanzhou-Xining	-3.15	-1.88	-0.46	0.53	-1.07	1.36	-2.11	20

F1: total amount of economic development and service delivery
 F2: per capita level of economic and social development
 F3: density distribution of urban areas

F4: amount of industrial smoke dust (powder) emissions
 F5: rate of domestic garbage disposal harmlessness
 F6: amount of industrial Sulphur Dioxide emissions.

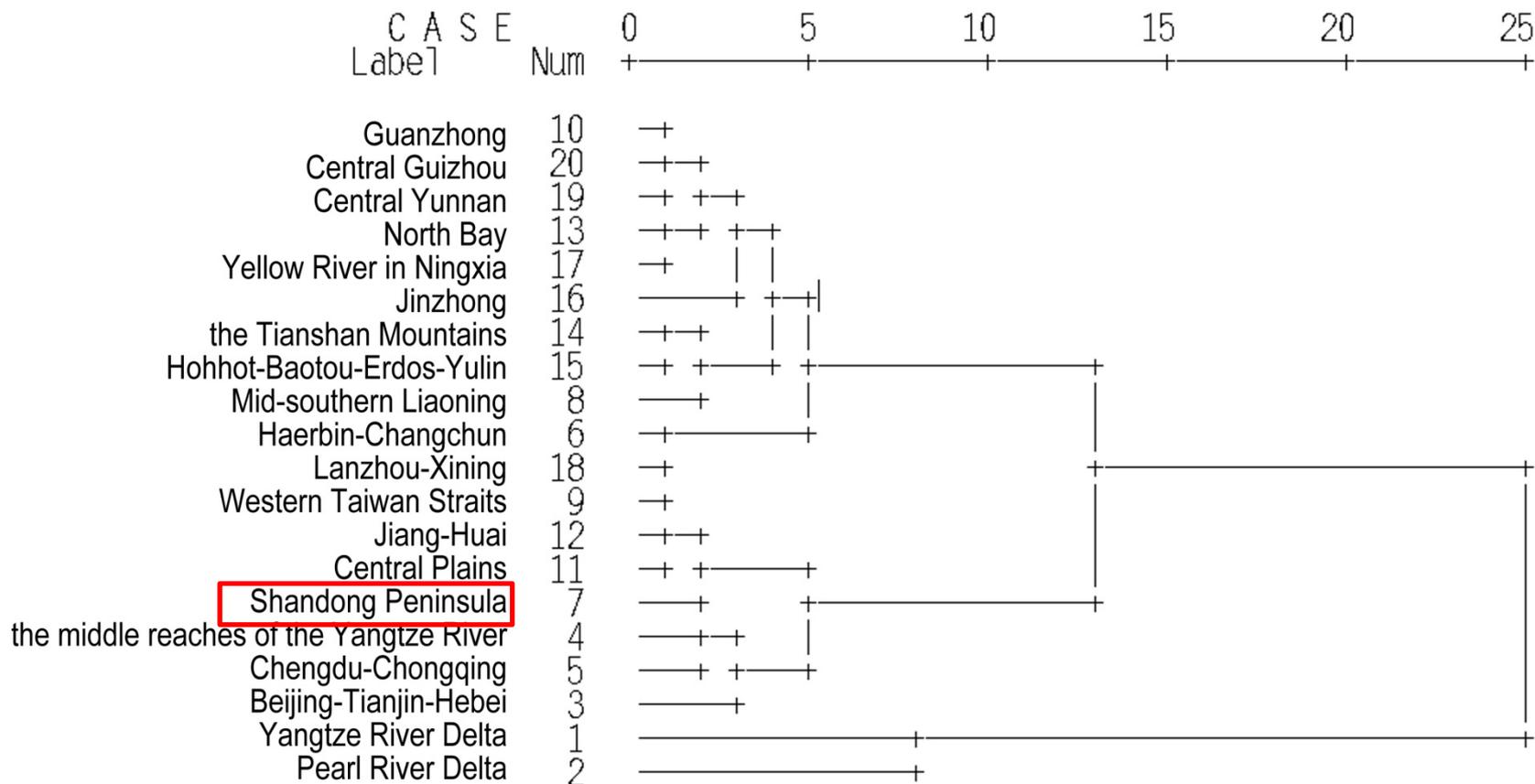
Findings from Principal Components Analysis

- The overall competitiveness of SPM ranked 4th , after the three major megaregions in China; Yangtze River Delta (Shanghai), Pearl River Delta(Guangzhou) and Jing-Jin-Ji (Beijing) megaregions
- The overall competitiveness score of SPM was much lower i.e., 1/6, 1/4 and 1/2 of the score of Yangtze River Delta, Pearl River Delta and Jing-Jin-Ji megaregions respectively.
- Economic development and service delivery (F1) ranked 5th, behind the three major megaregions and the Middle Yangtze River
- Per capita competitiveness (F2) only ranked 10th nationally
- Industrial sulphur dioxide emission (F6) ranked 15th, means very heavy pollution

Hierarchical Clustering Analysis

Dendrogram using Ward Method

Rescaled Distance Cluster Combine

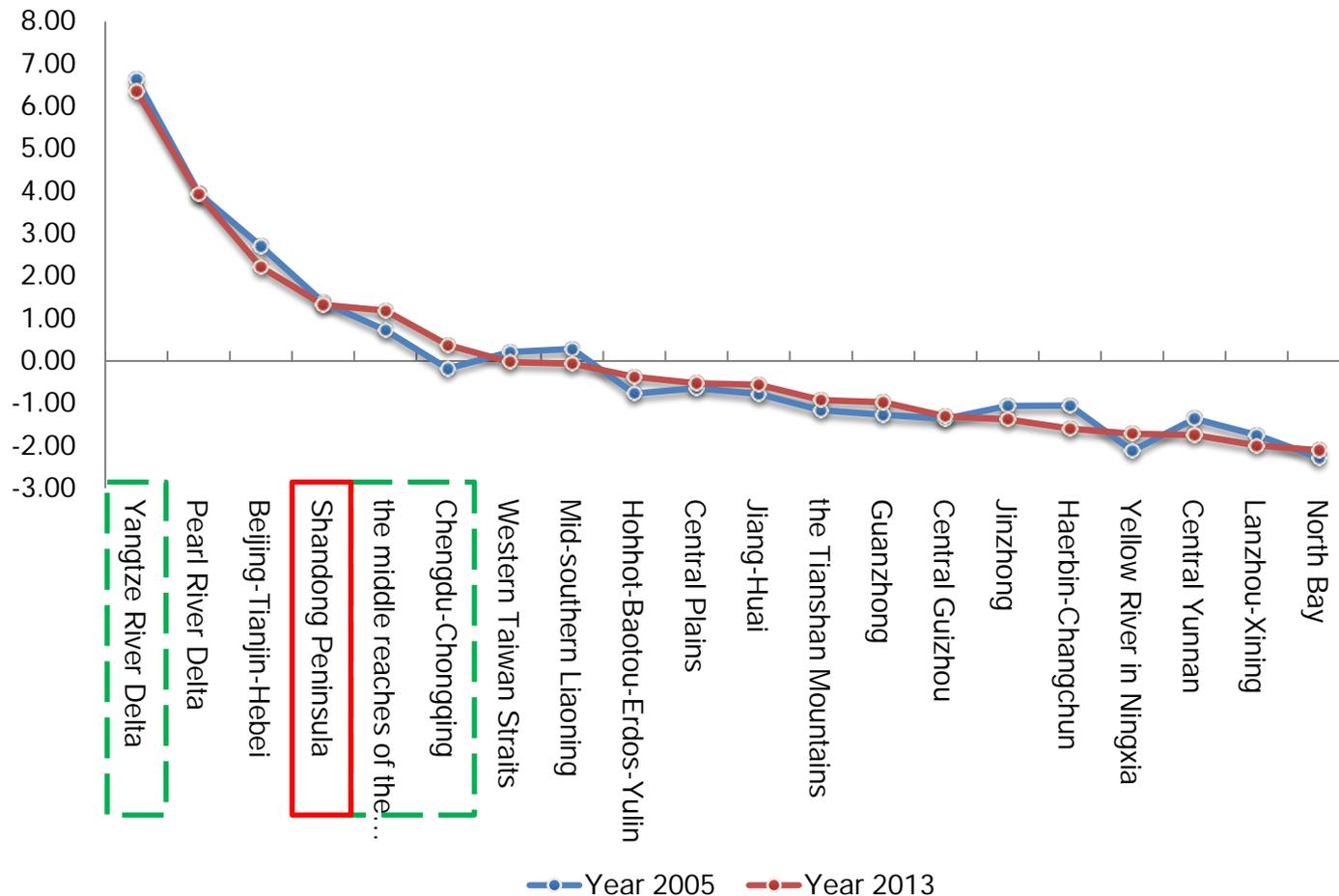


The Yangtze River Delta comprise the first cluster with the highest level of competitiveness. SPM is in the second cluster, which means medium level of competitiveness and economic development.

4b. Evolution analysis of comprehensive competitiveness between 2005 and 2013

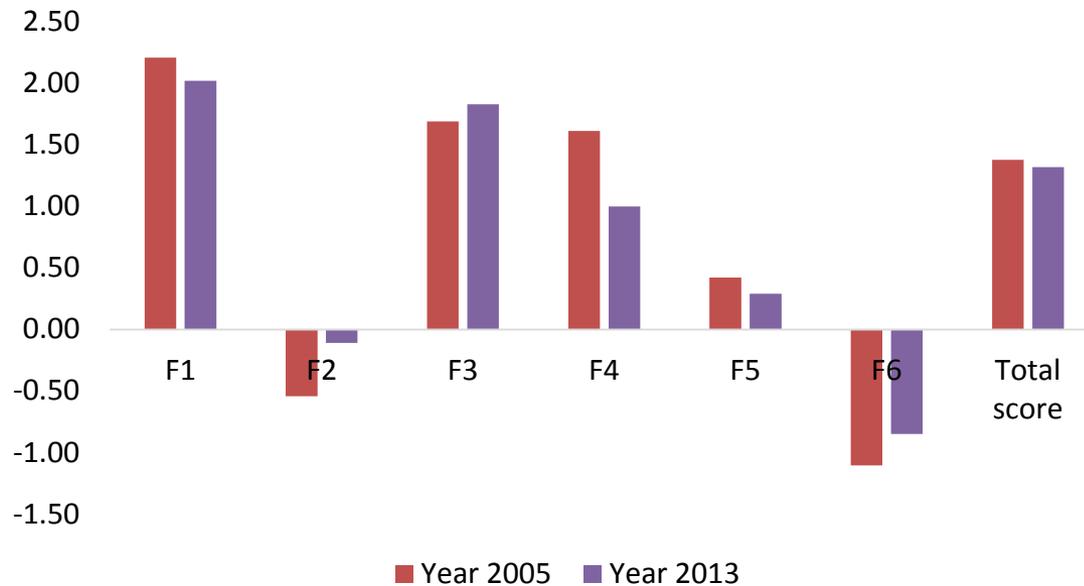
Changes in overall competitiveness

In 4th position, the overall competitiveness ranking of SPM had not changed between 2005 and 2013; The score difference between that of SPM and Yangtze River Delta tended to decline during this period. The score gaps between SPM and the middle Yangtze River (ranked 5th) and Chengdu-Chongqing (ranked 6th) became even smaller, because the developmental pace of these two megaregions was faster than that of the SPM.



Changes in main components

- Total score of competitiveness decreased slightly
- Economic competitiveness of both total amount (F1) and per capita of development (F2) was relatively stable
- Score of environmental competitiveness (F4+F5+F6) had dropped slightly

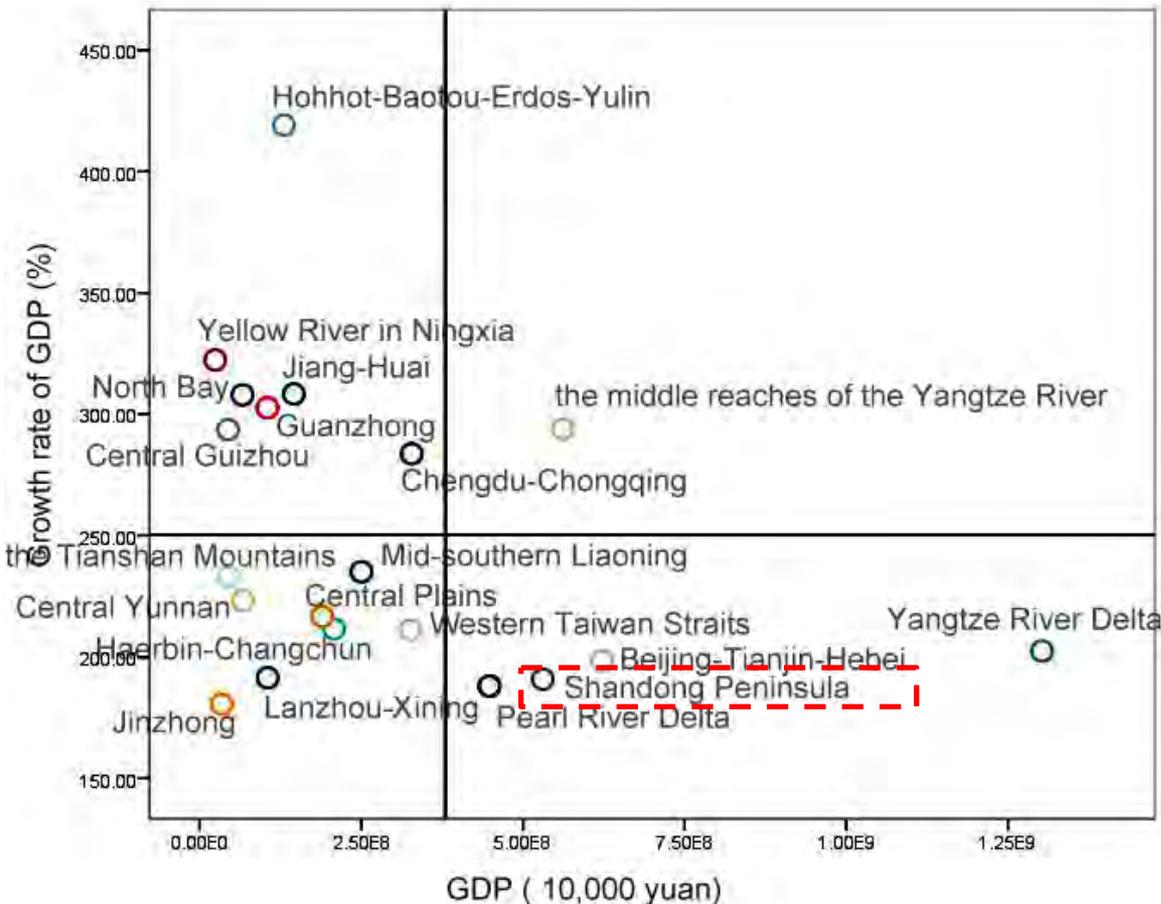


Scores of main components between 2005 and 2013

Commonalities between SPM and the three major megaregions

Both SPM and the three major megaregions were grouped under Category 2, as having a large economic volume but relatively low growth rate. The growth rate of the four megaregions had become slower than those in the middle and western China.

Our findings suggests that the future development of SPM should be based on acceleration of economic shift, upgrade of growth pattern by innovation, and improvement of quality and core competency.



Scatterplot based on the total GDP and its growth in megaregions

Differences between SPM and the three major megaregions

SPM lacks global accessibility from the core cities, and the weaker agglomeration ability of production factors. Due to its limited influence nationally and globally, this would further restrict its overall development.

City	Global rank	National rank	Correlation degree (%)
Hong Kong	3	1	73.0
Shanghai	7	2	62.7
Beijing	12	3	58.4
Taipei (Taiwan)	43	4	41.7
Guangzhou	67	5	34.1
Shenzhen	106	6	25.8
Tianjin	188	7	16.8
Gaoxiong (Taiwan)	223	8	14.3
Nanjing	245	9	13.5
Chengdu	252	10	13.1
Hangzhou	262	11	12.5
Qingdao	267	12	12.3
Dalian	275	13	12.0
Macao	291	14	10.9
Chongqing	319	15	8.9
Xi'an	323	16	8.7
Suzhou	325	17	8.6
Wuhan	337	18	8.0
Xiamen	346	19	7.5
Ningbo	348	20	7.5
Shenyang	356	21	7.2
Fuzhou	359	22	7.1
Xinzhu(Taiwan)	361	23	7.1
Taiyuan	367	24	6.7
Kunming	401	25	5.1

Correlation between Chinese major cities and global city network ([Derudder et al., 2013](#))

5. Conclusion

Key findings from analysis

- Horizontally, the comprehensive competitiveness of SPM within the national megaregions ranked consistently the 4th and was categorised as having a large economic volume but low growth rate in 2013.
- From 2005 to 2013, the quality of economic operation had improved at a constant rate annually, but the overall growth pace became slower, in particular when compared to that of megaregions in the middle and western China.
- Due to a lack of global accessibility from the two core cities, and the weaker agglomeration ability of advanced sectors, SPM had limited influence nationally and globally. This would further restrict its overall development.

Conclusion

To adapt to the global trend of new scientific and technological revolution, we suggest that the growth model and development path of SPM needs to change from one that is traditional to an **innovation-driven, technology-supported, production factor-agglomerated, ecological and sustainable** development model.

- The function of the core cities in SPM needs to be improved significantly. This would broaden its “radiating” ability and increase its international competitiveness.
- People-oriented development should be emphasized in a move to improve public services, social security and living environment, and enhance competitiveness of social infrastructure.
- A mechanism for developing internal cooperation needs to be established in order to ensure an integrated development of the entire megaregion.