China Urban Competitiveness Report No.15（Short version）

The housing price system: the leverage and trap of economic transformation and upgrade in China

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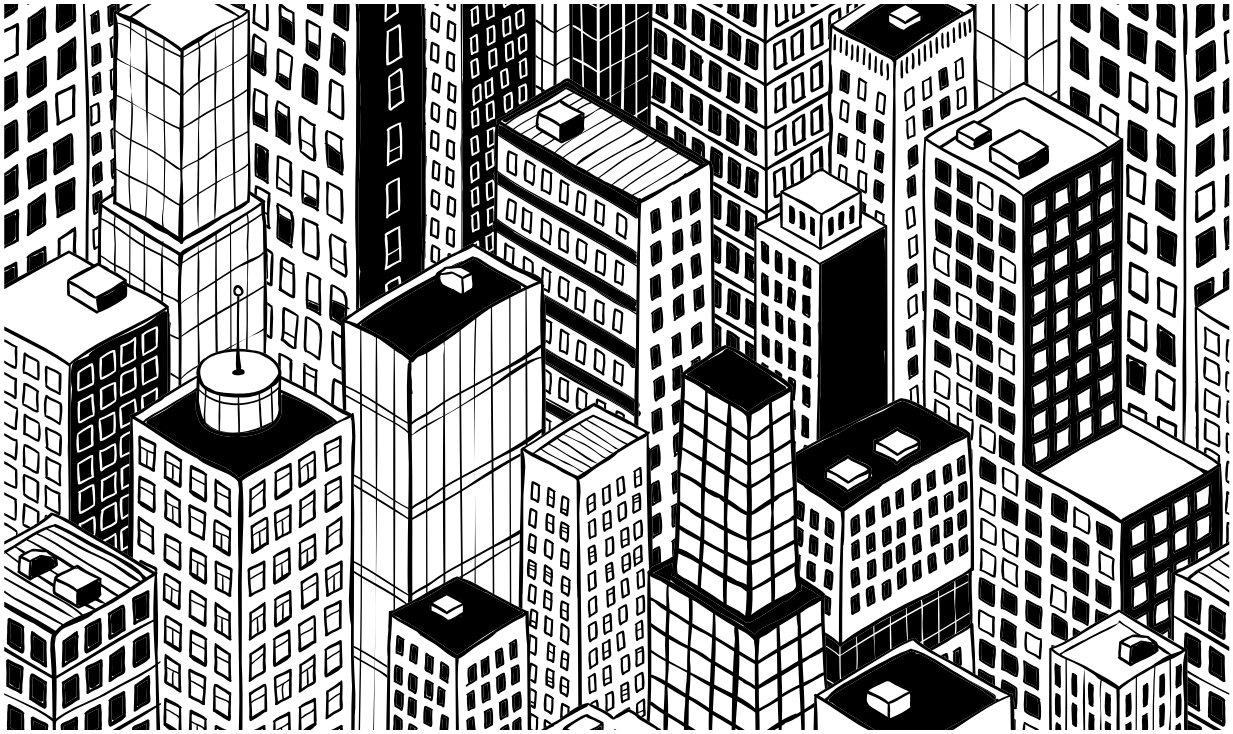
Foreword

China Urban Competitiveness Report No.15 shifts its perspective from inter-city comparison to the national economic and social development landscape and trend and makes the following observations. First, the new spatial structure of economic development with East China and Central China as one and urban agglomeration as the pillar force is taking shape. Secondly, economic growth has slowed down, and equal attention is paid to both quality and quantity in accelerating urbanization. Thirdly, economic transformation and upgrade is in the stage of differentiation. Fourthly, most small- and medium-sized cities lack momentum for sustainable development.

In the theoretical framework of previous editions, this report streamlines and amends the indicator system, divides it into three major groups, tries to collect key data by using the big data technology, stresses the role of key indicators in reflecting a city's competitiveness, and thus can better measure city competitiveness.

This year's report is themed on "The housing price system: the leverage and trap of economic transformation and upgrade in China", and contains three parts: new discoveries and new theories, empirical study of China, and China's story. It finds that, first, China will form a multi-center, multi-tiered housing price system; second, the housing price bubble is inevitable in central cities; third, the housing price system is dynamic and will be increasingly based on urban agglomeration; fourth, the housing price system might be a leverage or a trap for China's economic transformation and upgrade; fifth, the housing price system will in turn affect the urban system; and sixth, central cities have the spillover effect on the real estate market of peripheral cities.

In the report by item and the report by region, analysis is made from various perspectives to probe into the relationship between relevant variables. Based on the new indicator system and framework structure, the report looks at the relationship between the three major aspects of competitiveness, technological innovation, transformation & upgrade and the housing price in and between Chinese provinces, regions and municipalities, including Hong Kong, Macao and Taiwan.



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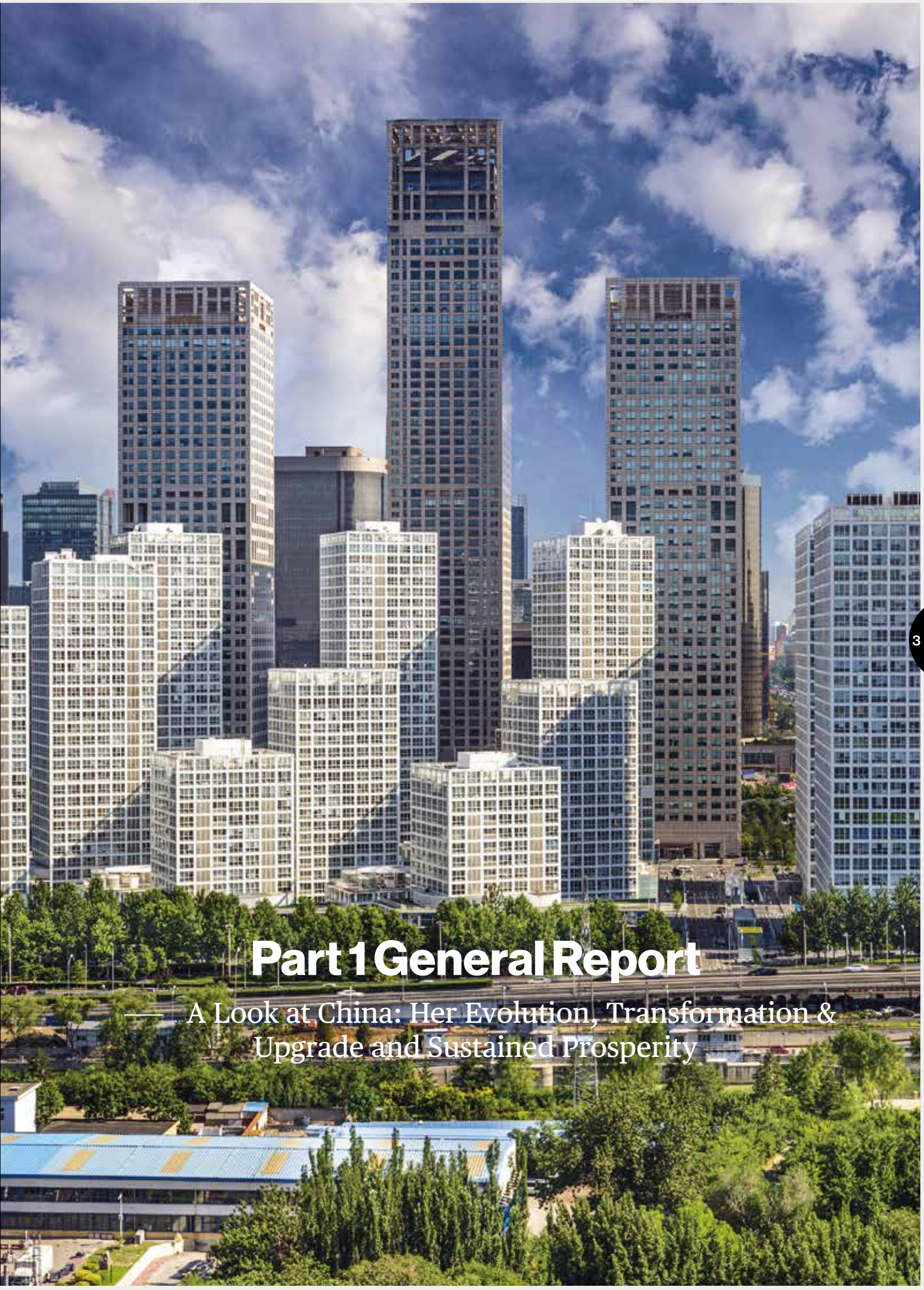


Part 1 General Report

A Look at China: Her Evolution, Transformation & Upgrade and Sustained Prosperity

1 China's spatial structure of economic development: East China and Central China as one and urban agglomeration as the pillar force

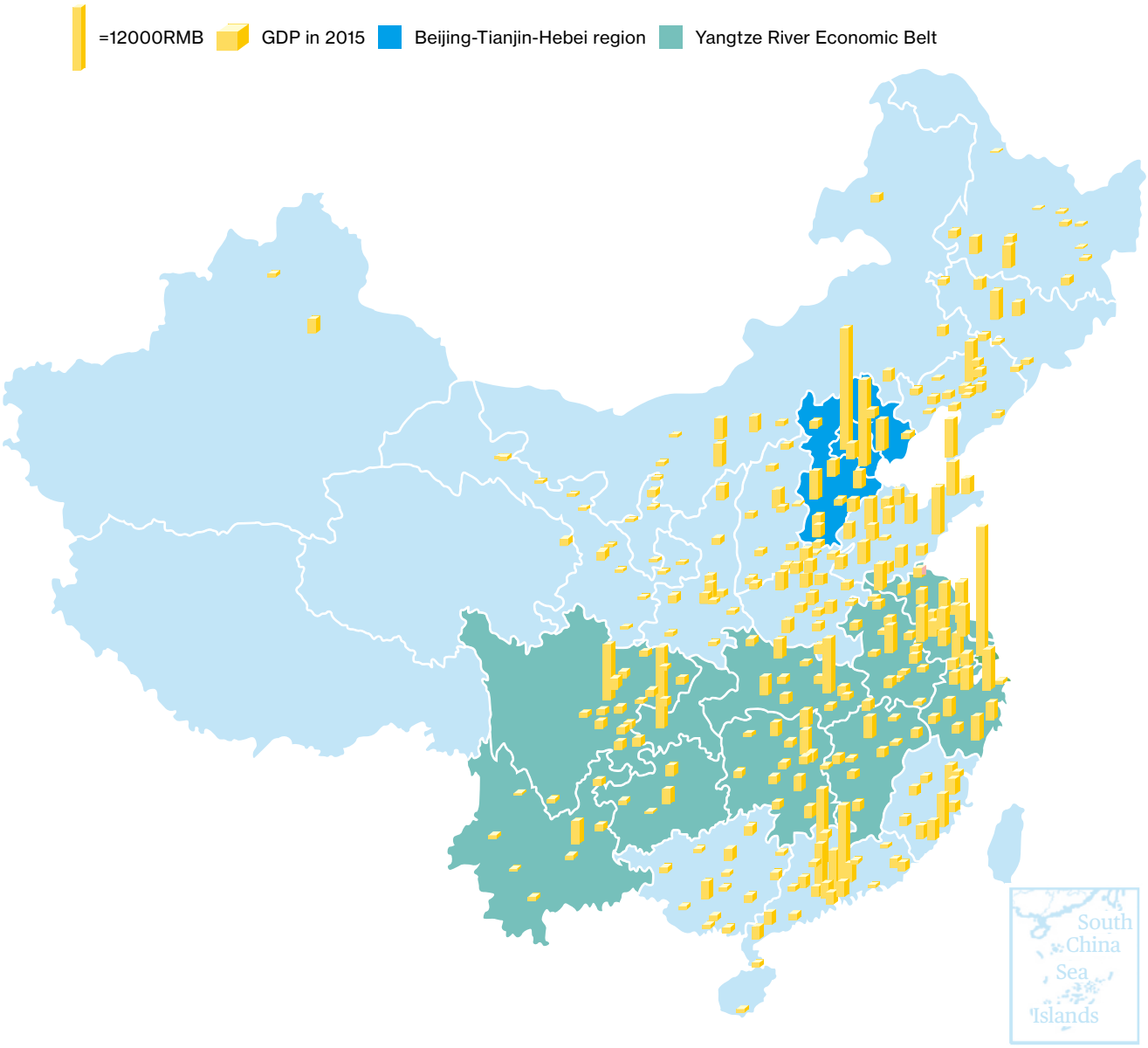
1.1 The spatial distribution of GDP and changes: the integration of East China and Central China as one and the formation of "one network and five urban development belts"

First, economic agglomeration is intensified in central cities, with nearly three fifth of national wealth concentrated in the top 20% of cities at the prefecture level and above.

Secondly, Central China is rising thanks to the robust development of central cities, while Northeast China is declining due to the diminishing role of its central cities.

Thirdly, the spatial structure of "one network and five urban development belts" for economic development is taking shape.

GDP distribution in cities above the prefecture level in 2015



1.2 The spatial distribution of population and changes: more people flow into Central China and some cities of a higher administrative level

First, urban population growth shows signs of differentiation at the regional level and the administrative level.
Second, the permanent population in some cities in Central China starts to grow.
Third, mature city clusters in East China, such as the Yangtze River Delta, tend to have multiple centers, while in Central and West China, urban agglomeration tends to intensify in standalone central cities.

Spatial distribution of the incremental permanent population in cities above the prefecture level 2010-2015

Note: Only cities with positive growth in the permanent population are indicated on the figure.

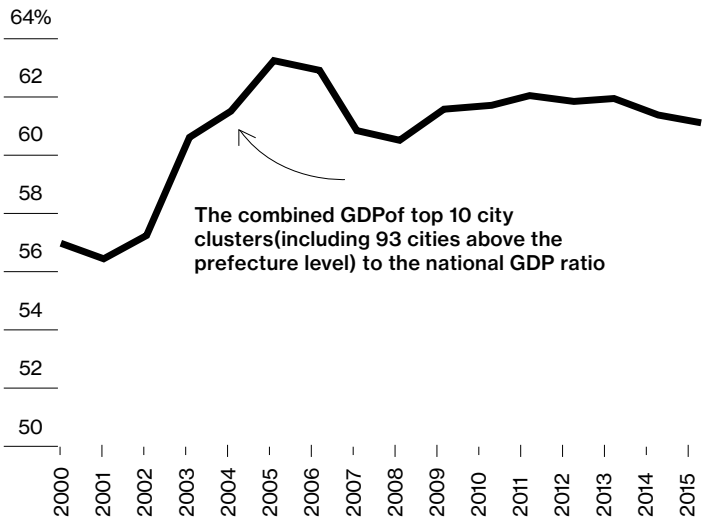
Proportion of the combined permanent population in cities at the prefecture level and above in Central China in the national population

2013	2014	2015
25.774%	**25.77%**	**25.787%**

1.3 China's city cluster system: development around a growing number of centers and a bigger role in regional economy

First, China's city cluster system increasingly develops around a growing number of centers in terms of the primacy ratio and the size-rank rule.
Second, the gap between city clusters and between city clusters and non-city clusters is widening, and the ten major city clusters including the Pearl River Delta, the Yangtze River Delta and the Beijing-Tianjin-Hebei region have become pillars of China's economic development.
Third, most of the city clusters outgrow the national average level economically, creating new momentum for economic development.

The combined GDP of top 10 city clusters to the national GDP ratio

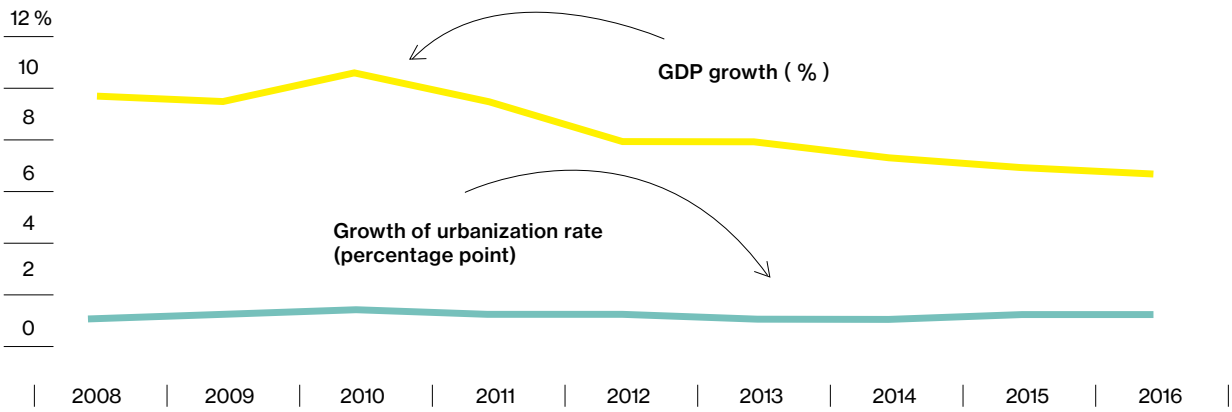


2 China's development landscape: economic growth has slowed down, and equal attention is paid to both quality and quantity in accelerating urbanization

2.1 At the national level: urbanization doesn't slow down as economic growth does

In recent years, China's economic growth has slowed down, with her GDP growth rate falling from 10.6% in 2010 to 6.7% in 2016. But the urbanization rate of national permanent population has maintained a growth rate not less than one percentage point. At the end of 2015 and 2016, the urbanization rate hit 56.10% and 57.35%, respectively, 1.33 and 1.25 percentage points higher than the previous year. There is no evidence showing that China's urbanization is slowing down.

Changes to China's growth in the urbanization rate and GDP growth rate since 2008



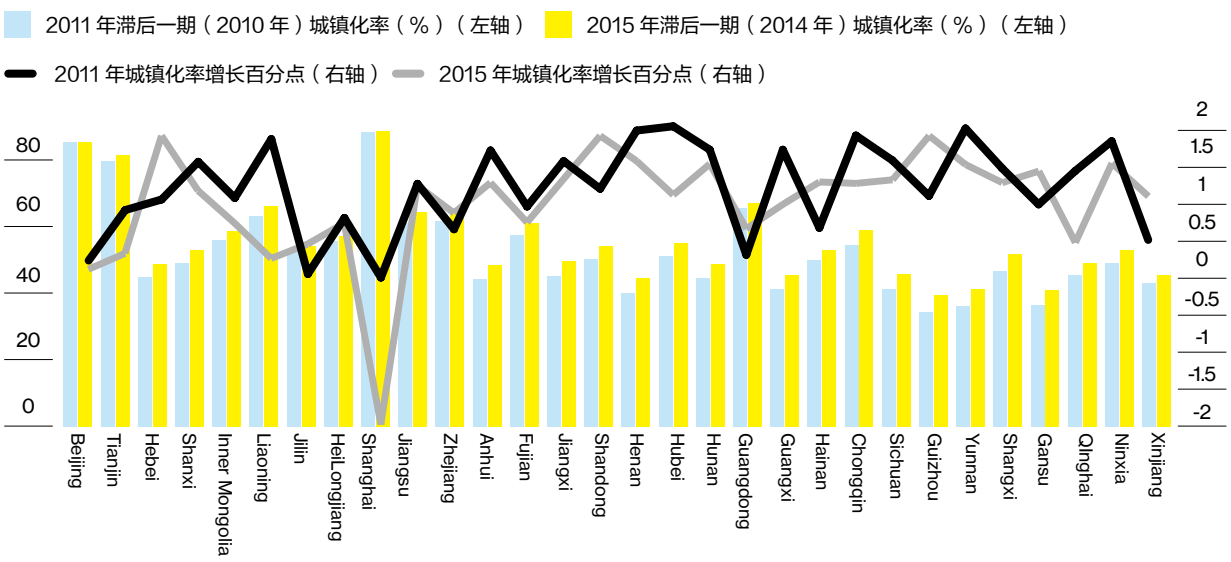
2.2 Urban economic growth

First, the urban economic growth is faster in the west and south but slower in the east and north, and negative in cities where resources are deplete, industrial development declines, the industrial structure lacks diversity, and suffers from a net outflow of population.
Second, some second-mover cities are catching up, and provincial capitals such as Chengdu, Wuhan and Changsha are witnessing rapid economic agglomeration.

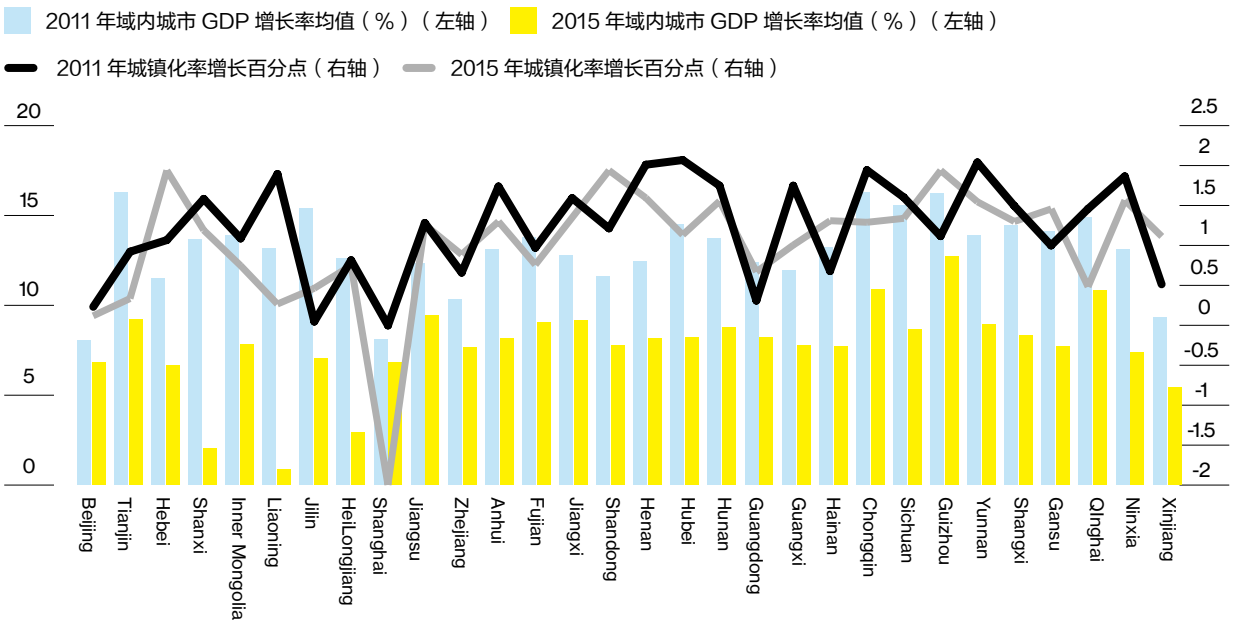
2.3 Urbanization

First, regions and cities at different development stages vary in their speed of urbanization.
Second, the overall slowing urban economic growth and the widening growth gap are reshaping the spatial structure of urbanization, and the permanent population in some provincial capitals in Central and West China is growing rapidly.
Third, urbanization doesn't slow down as economic growth does. Reasons: more reform and policy dividends are being released, urbanization is expanding spatially, the service sector is hiring, and more floating population move with their family, etc.

Urbanization growth of provinces/regious/municipalities at different development stages（%）



The relationship between the urbanization growth rate and the GDP growth rate

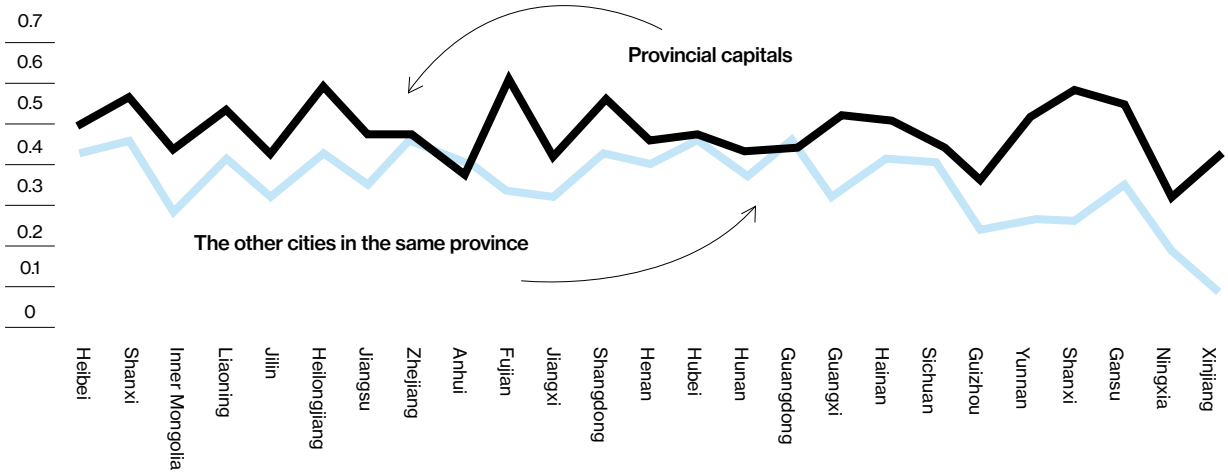


3 Economic transformation and upgrade is in the stage of differentiation

3.1 Consumption plays a growing role in economic growth, and some cities are doing a particularly good job

Most of the cities see steady growth in consumption, but municipalities directly under the central government and provincial capitals are doing particularly well in this regard.

The consumption to GDP ratio of different cities in 2015

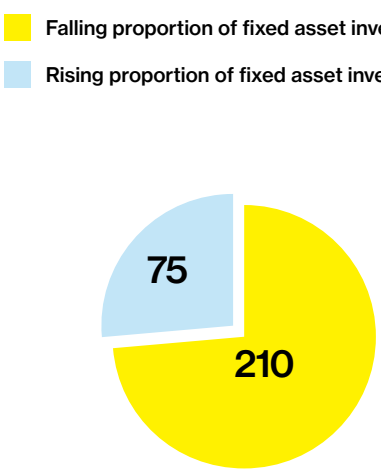


Data source: The statistical bulletin of these cities

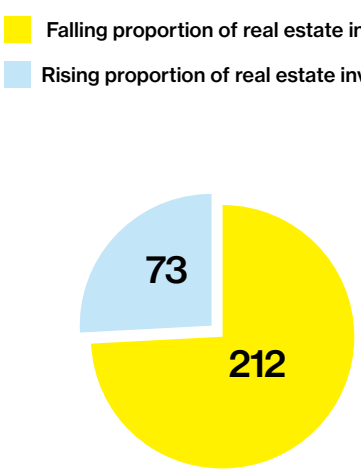
3.2 The majority of cities still relies on investment, in particular real estate investment, for economic development

If we compare the data of 2014 and 2010, we can see that in nearly three quarters of the cities, the portion of fixed asset investment and that of real estate investment are still on the rise.

The number of cities whose fixed asset investment proportion increases and that of those decreases



The number of cities whose real estate investment proportion increases and that of those decreases



3.3 The gap between Chinese cities is widening in the process of transformation and upgrade

As far as emerging industries are concerned, coastal cities in East China and some inland central cities are vigorously promoting the “new economy” strategy, but less developed cities are obviously lagging behind and struggling to shift from the traditional economy to the new economy.

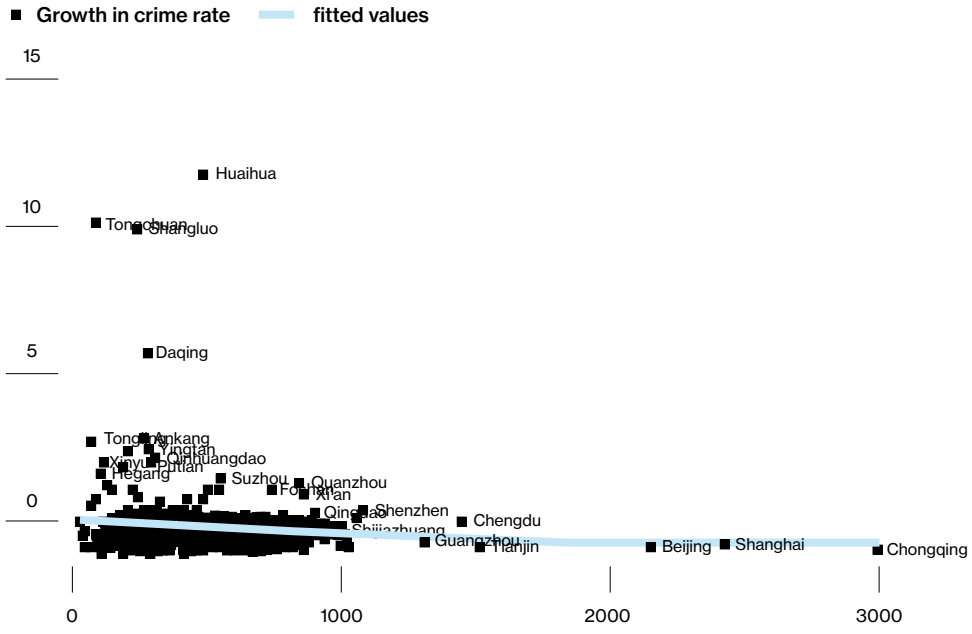
As far as patent application is concerned, among the top 20 cities, there are only two inland cities: Xi’an and Chengdu, and the rest are all located in developed coastal areas, in particular the Yangtze River Delta (9 of them) and the Pearl River Delta (6). It means that the two regions have become engines behind China’s innovation and development.

4 Compared with large cities, small- and medium-sized cities lack momentum for sustainable development

4.1 Small- and medium-sized cities face more and bigger threats to public security

Compared with large cities, small- and medium-sized cities are becoming more and more unsafe. Generally speaking, the crime rate is significantly negatively correlated to the city size, with the correlation coefficient of -0.112.

The crime growth rate and the city size



Source: City and Competitiveness Index Database, Chinese Academy of Social Sciences

4.2 The traffic jam is worsening in small- and medium-sized cities

Compared with large cities, small- and medium-sized cities are faced with faster growth in car ownership.

4.3 The home purchase pressure in small- and medium-sized cities outgrows that in large cities

The growth of the housing price to income ratio in small- and medium-sized cities is not slower than that in large cities.

Growth in car ownership 2003-2013

Tier-4 cities	Tier-1&2 cities
698%	472%

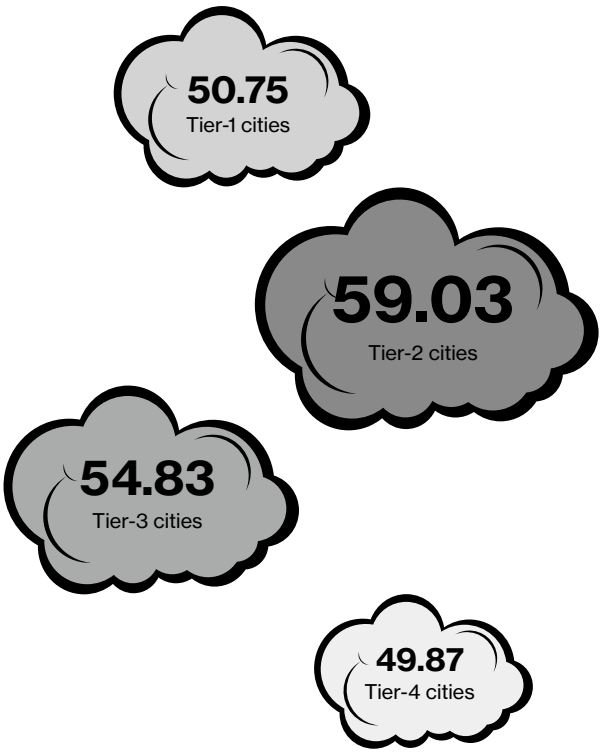
Growth of the housing price to income ratio in cities of different tiers

Tier-1 cities	Tier-2 cities	Tier-3 cities	Tier-4 cities
31%	1.96%	9.5%	15%

4.4 Environmental pollution is more serious in some small- and medium-sized cities

On the whole, air pollution in tier-2 and tier-3 cities is worse than in tier-1 and tier-4 cities and there is little difference between the air quality in tier-1 cities and that in tier-4 cities. Hence, it's wrong to assume that the bigger the city, the more polluted it is.

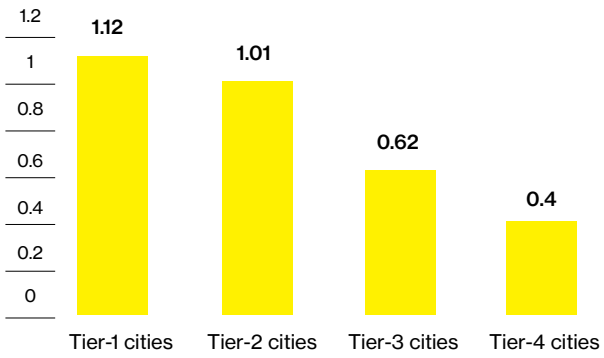
Annual average PM2.5 value



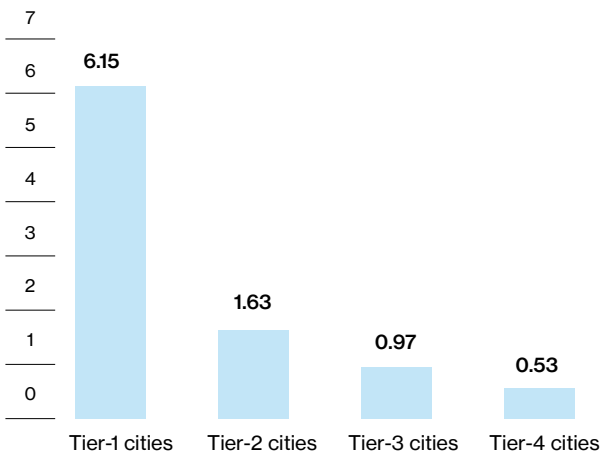
4.5 Small- and medium-sized cities lag far behind large cities in terms of the quantity and quality of public services

Large cities have far more medical resources and educational resources than small- and medium-sized cities.

Annual average PM2.5 value(mac/m^3)



Average value of middle school index



Part 2 Thematic Report

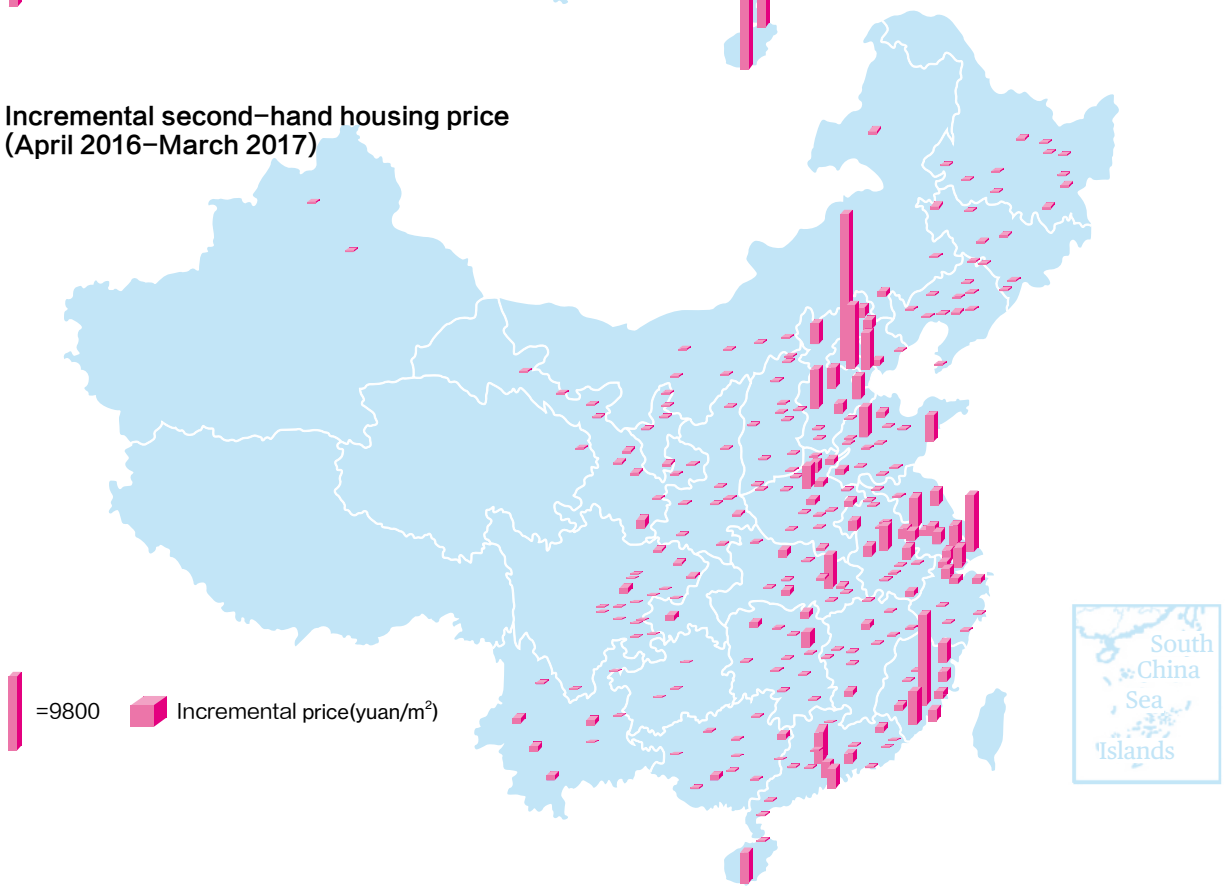
The housing price system: the leverage and trap for China's transformation and upgrade

1 Theoretical and empirical study

1.1 Three characteristics of China's housing price system

The housing price system refers the distribution of differences in and dynamic association of urban housing prices in certain space, and features centrality, connection and dynamic changes.

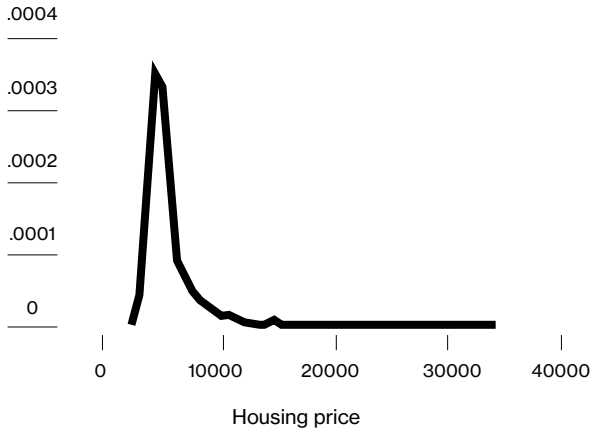
The housing price of Chinese cities at the prefecture level and above



1.1.1 China's housing price system is of a pyramidal structure, consists of multiple tiers, and features agglomeration and single centrality.

The housing price system is of a pyramidal structure, with a huge gap between a few cities and the rest. In 2015, Shenzhen claimed the highest housing price of 33,942.16 yuan/m2, 6.41 times the average housing price in the country.

Density of housing price distribution in Chinese cities at the prefecture level and above



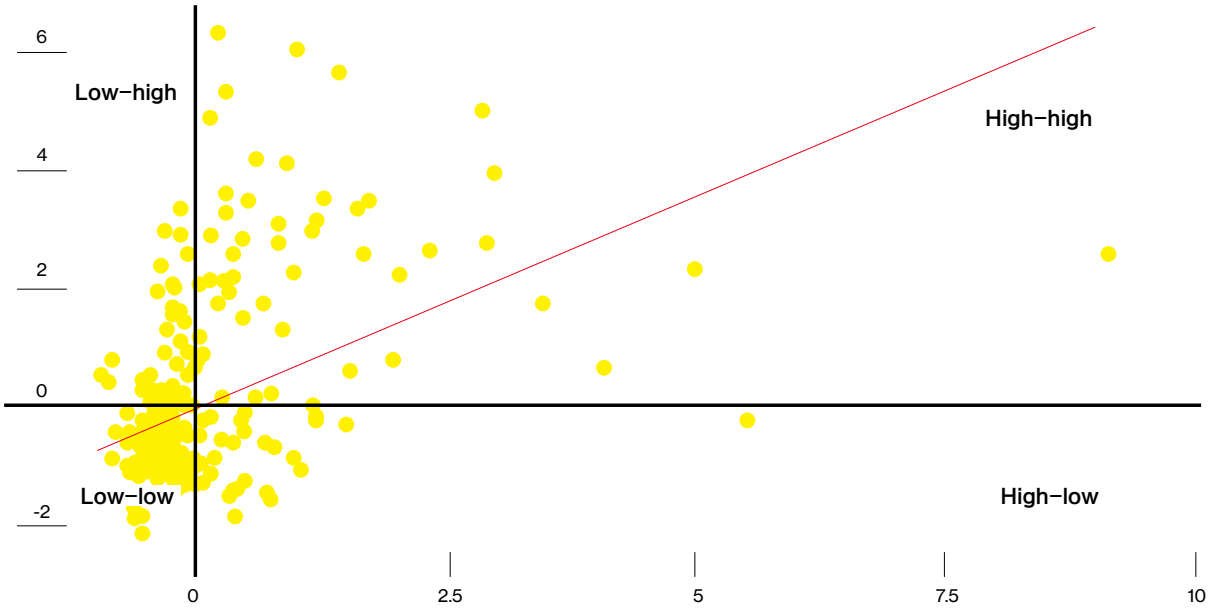
In terms of the absolute price, China's housing price system consists of multiple tiers. Based on the clustering analysis of the average sales price of commodity housing in 285 Chinese cities at the prefecture level and above in 2015, the housing price can be divided into 9 tiers in a descending order, and the lower the price, the bigger the sample size.

Results of clustering analysis of housing prices by group

Group	Sample size	Average value	Median
1	1	33942.16	33942.16
2	2	21787.64	21787.64
3	3	17144.2	17144.2
4	4	14422.71	14423.54
5	5	11908.85	11653.33
6	6	8643.44	8412.86
7	7	6171.67	6199.26
8	8	4351.17	4297.63
9	9	3250.65	3320.09

The agglomeration of the housing price system is mainly reflected in the co-existence of high-high agglomeration and low-low agglomeration of urban housing prices in the spatial dimension. The Moran's index value is positive, showing that China's urban housing price has significant spatial autocorrelation.

Moran's I scatter diagram of China's urban housing price in 2015

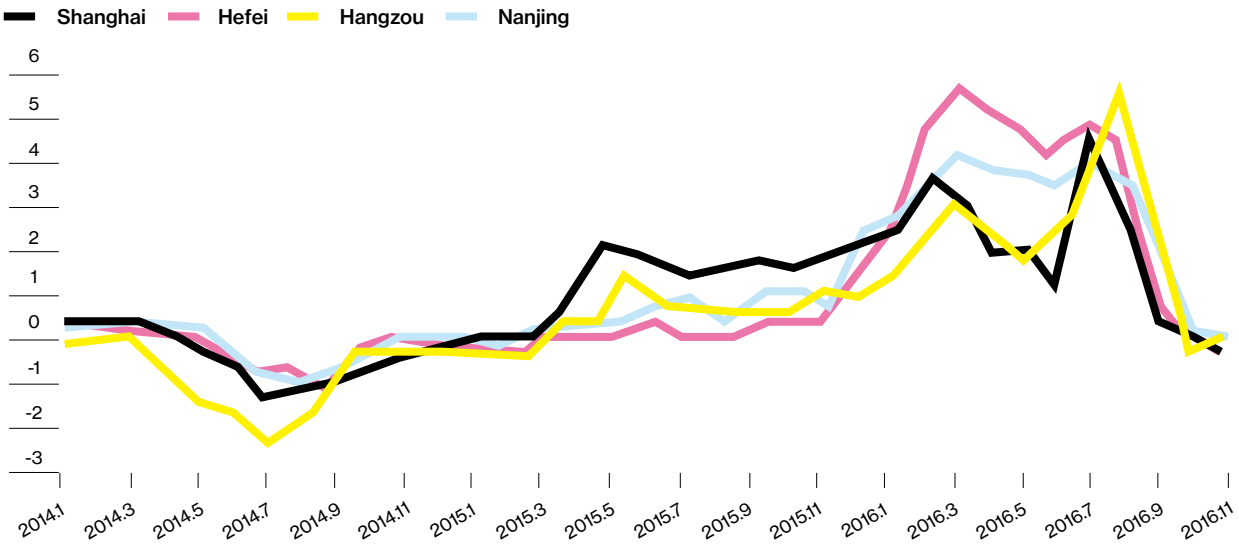


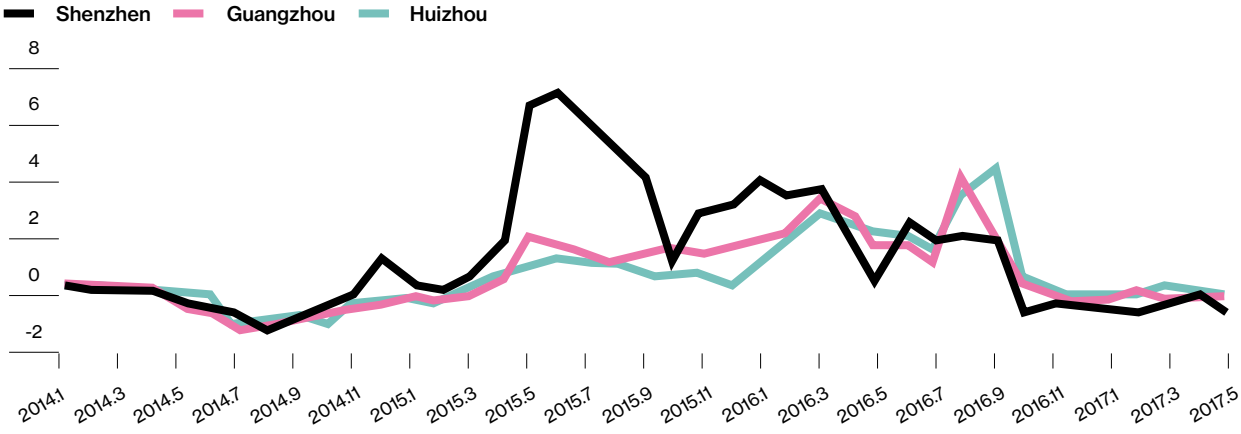
The housing price at the national level and that within city clusters both feature single centrality, with a huge gap between cities. According to the housing price-rank relationship, when the estimate (n) of the power exponent, which is the coefficient, is larger than 1, the housing price gap within the city cluster is huge. The power exponent of the price-rank relationship in 2015 was 2.230, much higher than the normal level of 1, and the estimate (n) was also larger than 1 in most city clusters.

1.1.2 The connectivity of the housing price system: housing prices in different cities affect each other, as shown in the diffusion effect, siphon effect, contagion effect and transfer effect

The diffusion effect is more noticeable in developed city clusters. By diffusion effect we mean that when the housing price goes up in the central city, it will increase in nearby cities too. In the three major mature city clusters, the housing price of the central city bears much influence on that in nearby cities.

Month-on-month growth of the housing price in Shanghai, Nanjing, Hangzhou, and Shenzhen





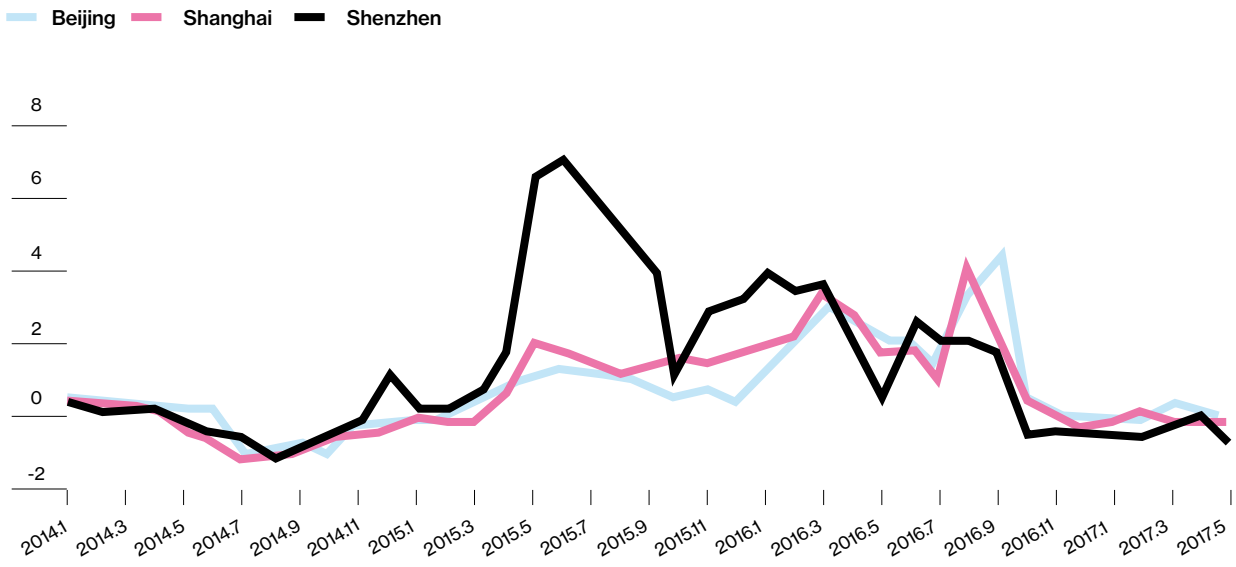
The siphon effect is more prominent in city clusters with only one center. By siphon effect we mean that when the housing price goes up in the central city, it will have negative impact on nearby cities.

City clusters with the siphon effect of the housing price (from April 2016 to March 2017)

City cluster	Housing price of the primate city (yuan/m2)	Growth in the average housing price of the primate city (%)	Average housing price of the other cities (yuan/m2)	Growth in the average housing price of the other cities (%)
Shijiazhuang-centered city cluster	14072	59.93	6261	12.22
City cluster in central and southern Liaoning	10211	4.61	4477.09	0.64
City cluster in Central China	13193	34.91	4725.29	7.21
Wuhan-centered city cluster	15429	40.31	3960.4	7.3
Changsha-Zhuzhou-Xiangtan city cluster	8246	26.65	3922.43	4.02
Nanning-centered city cluster	7965	11.04	3745.5	2.86
Chengdu-Chongqing city cluster	9391	13.9	4805.8	3.97
Guanzhong city cluster	7107	4.68	3547.75	-0.91

The housing price contagion effect is distinct between cities in the same region. By contagion effect we mean that when the housing price goes up in the central city, it will affect the housing price in another central city. Since 2015, the housing price contagion effect has been going in the south-north direction from Shenzhen, Shanghai to Beijing.

Month-to-month housing price growth in Beijing, Shanghai and Shenzhen

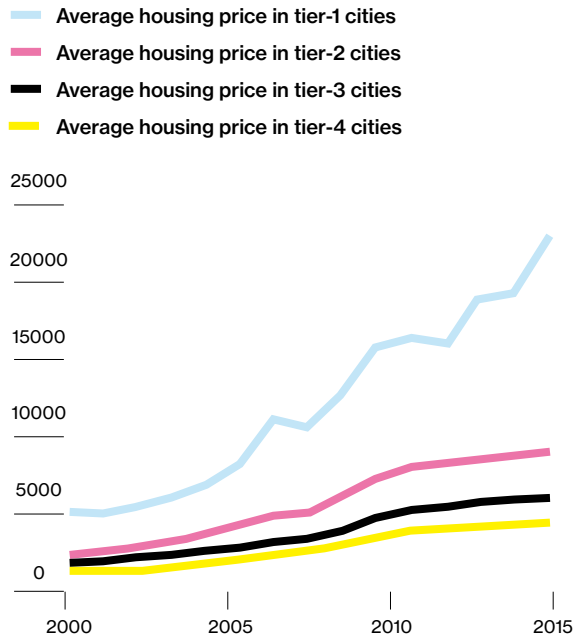


The transfer effect is more distinctly felt between some cities in Northeast China and between some in Hainan. By transfer effect we mean that when the housing price goes up in the central city of a region, it will have negative impact on the housing price of the central city in another region.

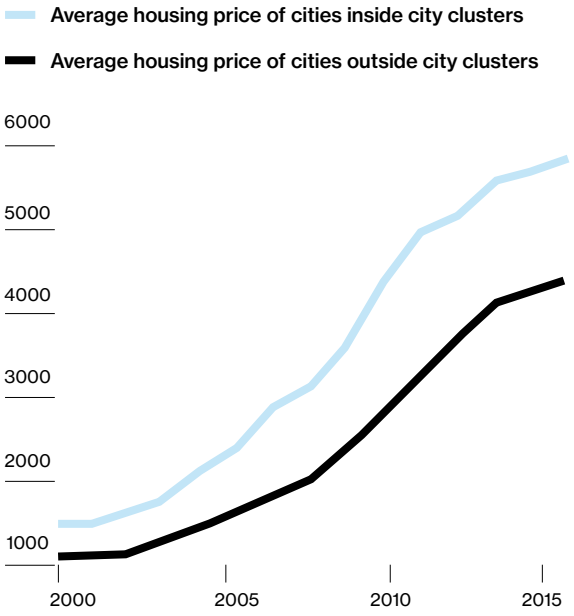
1.1.3 Dynamic changes to the housing price system: the gap is extending from the city level to the city cluster level

The housing price gap between different tiers of cities continues to widen and centrality is intensified in the housing price of tier-1 cities. Since 2001, the housing price gap between different tiers of cities above the prefecture level has been widening year by year. At the meantime, Shenzhen and Shanghai have seen remarkable growth in the comprehensive potential index of their housing price.

Changes to the average housing price in cities of different tiers Figure

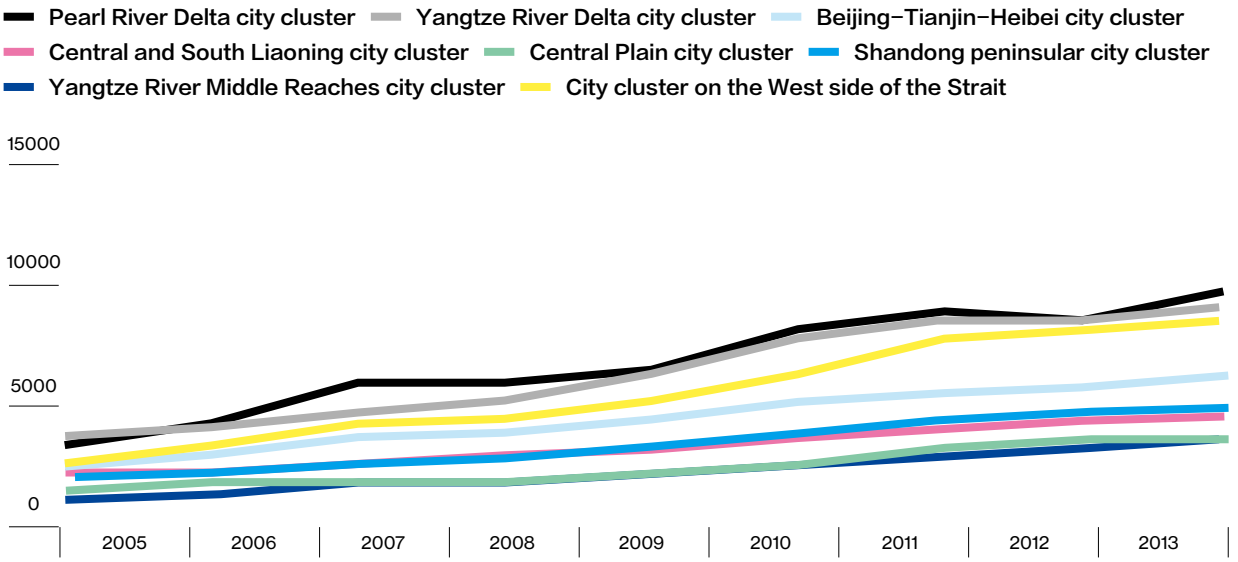


Changes to the average housing price in cities inside city clusters and those outside city clusters



The housing price system is more and more based on city clusters. The price gap between city clusters and non-city clusters is expanding and the average housing price of tier-1 city clusters beats that of other city clusters.

Changes to the average commodity housing price in the top 10 city clusters



The housing price gap inside tier-1 city clusters starts to narrow, that inside tier-2 and tier-3 city clusters slightly increases and that between city clusters of different tiers continues to widen.

1.2 China's housing price system is not reasonable

1.2.1 The housing price system is decided by the urban system.

In cities at the prefecture level and above, changes to the housing price are highly consistent with those to the population and economic density. As the average value increases steadily, the standard error grows year by year and the coefficient of variation also displays a similar trend.

1.2.2 Similarities between the housing price system and the urban system

Both have multiple tiers, but the housing price system has more tiers than the urban system. Both are characterized by agglomeration.

The multi-tier urban system and housing price system

Results of city size clustering analysis			Results of housing price clustering analysis		
Group	Sample size	Average value (10,000 persons)	Group	Sample size	Average value (yuan/m2)
1	1	3016.55	1	1	33942.16
2	2	2292.885	2	2	21787.64
3	3	1454.27	3	2	17144.2
4	7	1074.131	4	3	14422.71
5	38	802.0767	5	3	11908.85
6	72	522.1121	6	25	8643.439
7	95	309.4861	7	40	6171.668
8	67	153.8596	8	155	4351.167
–	–	–	9	54	3250.654

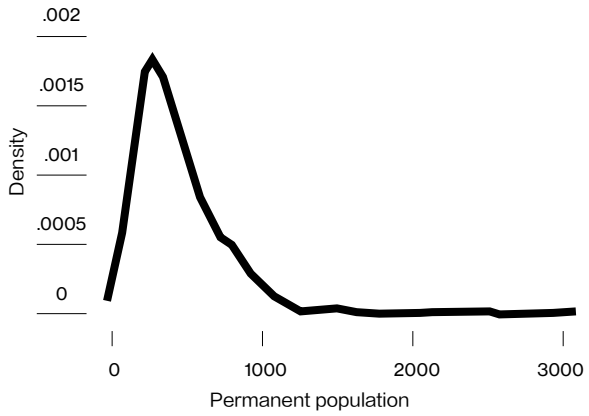
1.2.3 In many cities, the housing price to income ratio has gone beyond what's reasonable

The ratio is higher than 1:6 in 58 out of the 104 tier-1, -2 and -3 cities in China. Specifically the ratio is between 1:6 and 1:9 in 45 cities and above 1:9 in 13 cities. The real estate bubble is bigger in some cities.

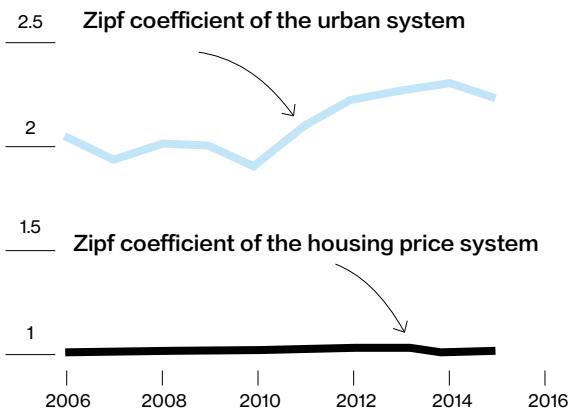
1.2.4 Compared with the urban system, the housing price system is more steeply distributed and shows more obvious signs of single centrality.

The distribution chart shows that the housing price is less skewed to the right than the permanent population in the 285 cities, and the size-rank power exponent of the housing price system is much bigger than that of the city size.

Density of the housing price and the permanent population in cities at the prefecture level and above in 2015



Changes to the Zipf coefficient (power exponent) of the urban system and the housing price system

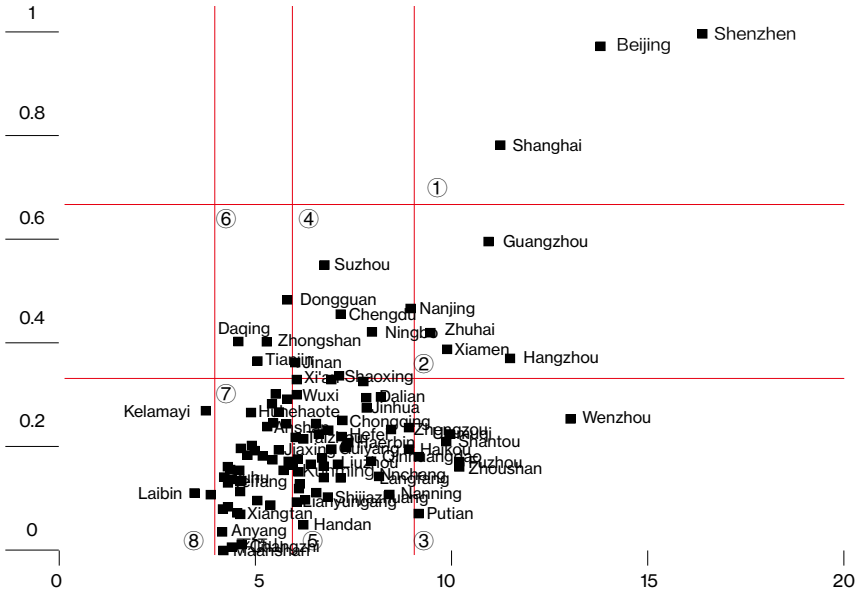


1.3 The housing price system: the leverage and trap of China's transformation and upgrade

Economic transformation and upgrade requires both the condition and the engine, but in reality, the condition is often a double-edged sword. The housing price system is a typical one.

In this report, structural competitiveness (industrial structure upgrading) includes the proportion of employment in key industries, GDP per 1,000km2 area, the proportion of fixed-asset investment in the GDP (reverse), and the number of patents granted. Based on the clustering analysis of their respective housing price bubble (the housing price to income ratio) and structural competitiveness, tier-1, -2 and -3 cities can be roughly divided into nine groups.

The scatter diagram of the economic upgrading index and the housing price to income ratio and grouping of sample cities



Based on the grouping result, we observed the orientation of the four indicators of the economic upgrading index of sample cities in different groups, and further probed into the urban housing price bubble and structural transformation.

According to analysis results by group, there are two kinds of relationship between economic transformation and upgrade and the housing price to income ratio. In Group 1, 2, 4, 7 and 8, the economic upgrading index is significantly positively correlated to the housing price bubble, a higher housing price and a higher housing price to income ratio can stimulate structural transformation to certain extent, while a lower housing price to income ratio hinders the process. In Group 3, 5 and 6, the economic upgrading index is mismatched with the housing price to income ratio. In Group 3 and 5, the high housing price has obstructed structural transformation and upgrade.

1.4 Escaping the trap, using the leverage and promoting transformation and upgrade

Based on the above analysis, this report concludes that the government is capable of regulating the current housing price system by following the principle of "using the leverage, escaping the trap and promoting transformation and upgrade", and the general goal is to "approach balance: the urban housing price should match the current housing price to income ratio, the housing price gap between cities should match their gap of income and expected income, and the housing price should increase side by side with income." Our policy recommendations are as follows.

First, to foster and improve the urban system network of multiple centers, rationalize the housing price system through the coordinated development of small-, medium- and large-sized cities (towns), and promote urban transformation and upgrade.

Secondly, to regulate the supply-demand relationship via market forces, rationalize the urban housing price and propel cities' transformation and upgrade. At the demand side, opportunism and investment should be curbed to restore and emphasize the residential property nature of commodity housing. At the supply side, more land shall be supplied to accommodate the true housing demand, stabilize the housing price in a reasonable range and stimulate urban transformation and upgrade.

Thirdly, to construct a regulation system that adopts different policies for different cities and features coordination and cooperation between different cities, allow it to stimulate economic transformation and upgrade, optimize spatial allocation of production factors, and give play to the functions of the urban system. An urban housing price regulation system by category based on demographic fundamentals should also be in place to prevent market risks that might be caused by cross-regional investment.

2 China's stories

Baotou: the government and people working together to rebuild shanty areas and explore a new development path

In transforming shanty areas, the Baotou government has strengthened organization and leadership to meet the requirements of the central government; played a leading role, placed people's interests foremost, and specified the transformation approach and goal; actively contacted and coordinated with parties concerned to solve the financing problem; made the process transparent and open to the public and mobilized their enthusiasm; paid more attention to blood making than blood transfusion to ensure sustainable development.

Suzhou: curbing the soaring housing price and valuing systematic innovation

The Suzhou government has taken a series of policy measures to curb the housing price and created a favorable external environment for systematic innovation; attracted and gathered innovation resources by promoting original innovation, recruiting high-end innovative talents, building major innovation vehicles and improving the innovation environment, in an attempt to seize the innovation highland in targeted areas.

It has also actively facilitated opening up and innovation, and has come to form an

open, equal international technology trade system and exchange environment; and has been promoting government innovation by transforming the governance mindset, and the role and behavior pattern of the government.

Nantong: stabilizing the real estate market and creating an environment in favor of innovation and entrepreneurship

Advantageously located, Nantong focuses on developing emerging industries such as equipment manufacturing and high-end manufacturing; has been striving to create a pro-sustainability environment
and rolled out original policies, introduced select industries and partnered up with other cities to build an industrial innovation system; has been working hard to reduce interferences and stabilize both supply and demand sides of the real estate market.

Foshan: forming the market-government synergy and coordinating the industrial upgrade and the city upgrade

The Foshan government is making full use of the market mechanism to achieve the structural reform at the supply side and industrial upgrade, to improve the land transfer income compensation distribution system, and has been working hard to build an accountable government to advance the city upgrade and stabilize the development of the real estate market.

Chengdu: promoting entrepreneurship and innovation through destocking and using the high housing price to force people to be entrepreneurial and innovative

The Chengdu government has been trying to promote entrepreneurship and innovation in the process of reducing the housing stock and use the high housing price to force people to be entrepreneurial and innovate. By integrating resources, implementing policies and preferential policies and exploring institutional innovation, provide innovative policies to support small and medium-sized enterprises, promote regional innovation and industrial upgrading, and enhance urban competitiveness.

Chongqing: emphasizing the nature of commodity housing as residential property and promoting employment by meeting people's housing demands

The Chongqing government has been trying to stabilize the land supply via the land quota system and reduce the land cost for businesses; Improve the affordable housing system to ensure that low-income workers do not lose their jobs and solve the problems of low-income and migrant workers.

Shenzhen: building a people-oriented market economy and shifting towards an innovation-driven urban economy

The Shenzhen government values social inclusiveness and diversity and individuals' originality and safeguards human dignity through affordable housing projects. Build a people-oriented market economy and attract talents through inclusive human values, creativity and human dignity. The ability to retain talent through the solution of human well-being; The innovation of talents drives the development of urban economy.

Changsha: promoting transformation through technological advancement and tapping huge development potentials

The Changsha government has managed to form an industrial cluster supported by six major emerging industries, by comprehensively deepening the reform and further tapping potentials for transformation and development; to strengthen technological innovation, highlight the leading role of businesses in the commercialization of technological innovation. It has also taken a wide range of actions to stabilize the real estate market, control the market size, reduce the housing stock, adjusting the housing structure and improve the housing quality.

Guangzhou: building a dynamic city that is inclusive, innovative and people-oriented

The Guangzhou government has been trying to strengthen the city's overall competitiveness and accelerate its economic transformation and upgrade by diversifying its functions; to build a new industrial development landscape through technological innovation; to contribute people's wellbeing by curbing the housing price and making it affordable for local residents; to boost economic growth by stimulating the confidence of market players and private investment; to create more "billionaire-making" legends by creating a pro-innovation-and-entrepreneurship environment for people of foreign nationalities.

Part 3 Report by Item

Showing a Spire - Level Distribution

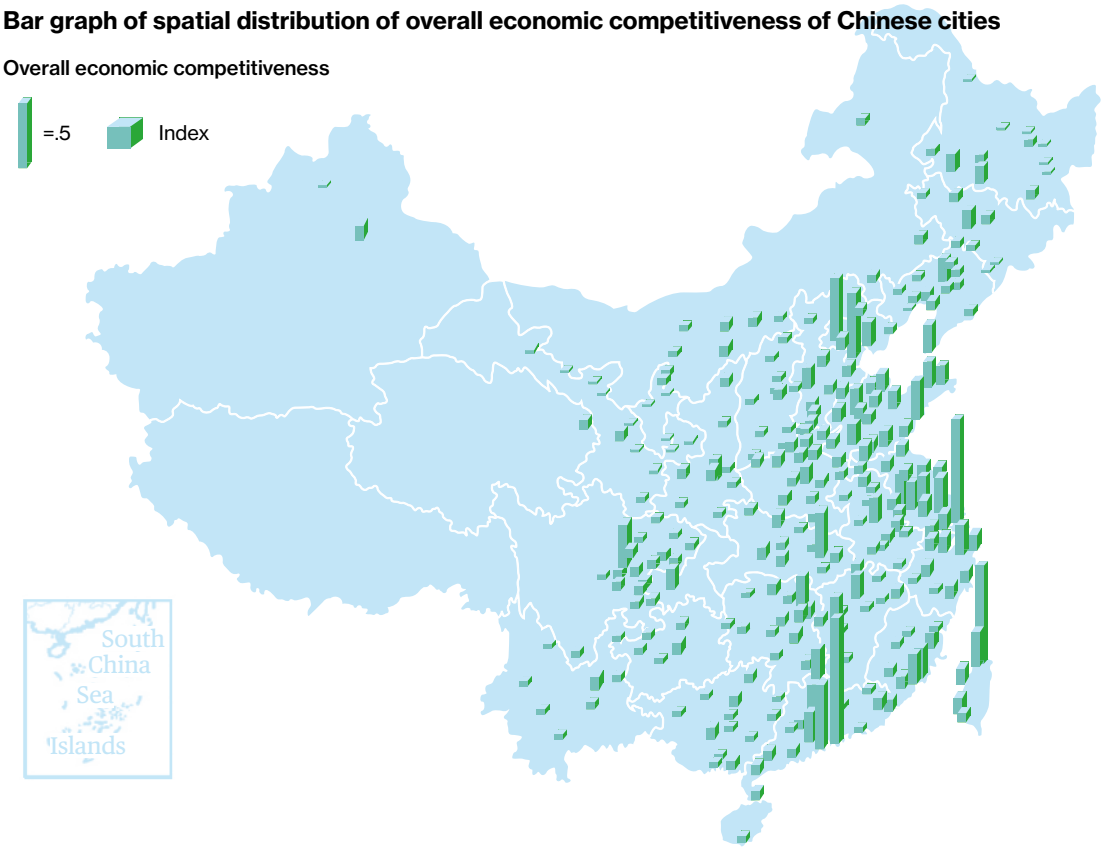
1 Overall economic competitiveness

1.1 Overall economic competitiveness of Chinese cities: four discoveries

1.1.1 The top 10 cities

Shenzhen, Hong Kong, Shanghai, Taipei, Guangzhou, Tianjin, Beijing, Macao, Suzhou, and Wuhan. This is the first time that Wuhan, a city in Central China, appears on the top 10 list.

Bar graph of spatial distribution of overall economic competitiveness of Chinese cities



1.1.2 Regional distribution

Southeast China leads the country while Northwest and Northeast China lags behind in terms of overall economic competitiveness

Overall economic competitiveness index of six major regions in 2016

Regional scope	The number of cities	Average value	Standard error	Coefficient of variation	Minimum value	Maximum value
Bohai Economic Rim	30	0.136	0.100	0.736	0.050	0.466
Central China	80	0.078	0.047	0.603	0.036	0.342
Northwest China	39	0.057	0.032	0.559	0.027	0.193
Northeast China	34	0.064	0.040	0.619	0.036	0.306
Southeast China	57	0.190	0.198	1.045	0.047	1.000
Southwest China	49	0.068	0.047	0.690	0.030	0.306

1.1.3 Vertical comparison result

the overall economic competitiveness slightly dips on the whole, and the gap between cities is widening.

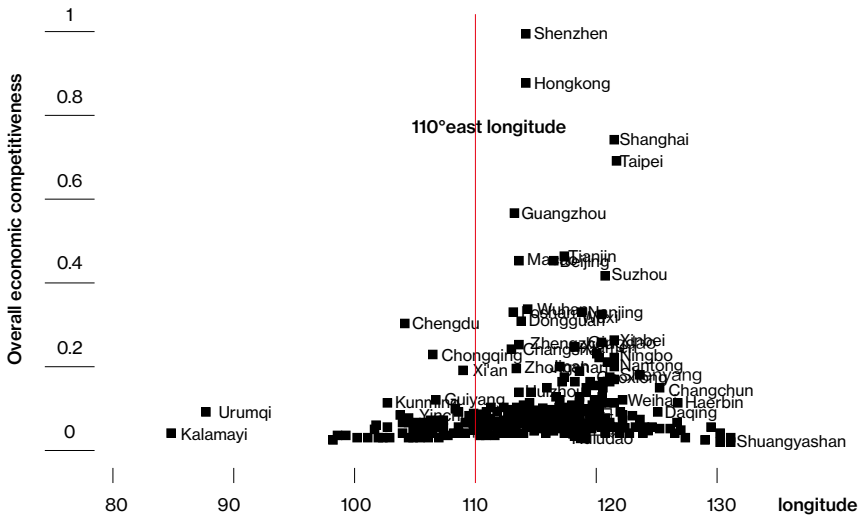
Changes to the overall economic competitiveness of Chinese cities 2012-2016

	The number of cities	Average value	Standard error	Coefficient of variation	Minimum value	Maximum value
2012	293	0.088	0.099	1.131	0.023	1
2013	294	0.103	0.115	1.113	0.022	1
2014	294	0.112	0.119	1.066	0.024	1
2015	294	0.108	0.113	1.044	0.025	1
2016	294	0.103	0.116	1.126	0.02	1

1.1.4 Spatial characteristics

regions in the east of the 110° east longitude display high-high agglomeration while West China and Northeast China regions tilt with signs of differentiation

Spatial distribution of Chinese cities' overall economic competitiveness along the dimension line



1.2 Overall economic competitiveness by item: six aspects

1.Cities in Southwest and Northeast China are poorer in enterprise ontology, with great differences between them.
2.Cities in Northwest and Southwest China have poorer local factors, with great differences between them.
3.Cities in Northeast, Northwest and Southwest China have weaker local demands, with great differences between them.
4.Cities in Northeast and Northwest China have a poorer soft environment, with great differences between them.
5.Cities in Northwest China have a poorer hard environment, with great differences between them.
6.Cities in Southwest and Northwest China have poorer global connections, with great differences between them.

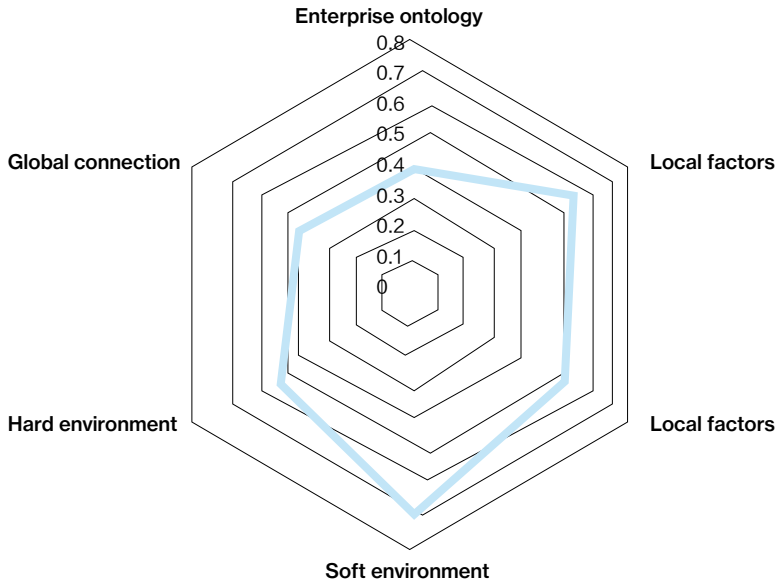
1.3 Five discoveries about the relationship between and the pattern of key economic variables

1.Provinces and regions with the least gap in overall urban economic competitiveness are Shanxi, Inner Mongolia, Guangxi, Shandong and Jiangxi; those with the biggest gap are Heilongjiang, Liaoning, Sichuan, Guangdong and Hubei.
2.The bigger the difference between the per capita GDP and the per capita disposable income, the weaker the overall economic competitiveness.
3.The wider the urban-rural income gap, the weaker the overall economic competitiveness.
4.The per capita GDP varies greatly among cities in Northwest China while the per capita GDP differs hugely among those in Southwest China.
5.The higher the per capital GDP, the less negative impact per unit of output has on the air quality, meaning that the Kuznets curve also holds in China.

1.4 Case study: Wuhan

Thanks to the implementation of the "Rise of Central China" strategy and the industrial gradient transfer of East China, Wuhan has seen steady growth in overall economic competitiveness in recent years and in 2016 it made breakthroughs and rose to be a star city countrywide. The figure below shows Wuhan's position in the country in terms of the performance in the six aspects of overall economic competitiveness.

Wuhan's performance in the six aspects of overall economic competitiveness



1.5 Prospects for China's urban development: three findings

1. As the Belt and Road Initiative unfolds, less developed coastal cities in East China and coastal cities and border cities in West China as well as cities along the Silk Road will have golden development opportunities.
2. Along with the formation of the network comprised of eight horizontal and eight vertical high-speed railway lines, it will create development opportunities for inland regions and cities with poor access to transport facilities.
3. Along with the gradient and orderly transfer of industries from developed cities in East China to less developed cities in the same province or in other provinces, second-mover advantages of underdeveloped cities will be highlighted.

2 Competitiveness in livability

2.1 The evaluation indicator system is refined and updated, highlighting the role of urban public services

This year's evaluation indicator system for the livable competitiveness of Chinese cities further divides the five dimensions selected in 2016 into seven dimensions, and increases the number of indicators from 14 in 2016 to 21 by keeping only seven of them and introducing 14 new indicators. Such adjustments reflects more comprehensively people's demand for livable cities, stress the quality of medical resources, educational resources and a safe living environment, and highlight the decisive role of public services in a city's livable competitiveness.

2.2 Livable competitiveness improves slowly on the whole and the gap between cities is widening

1.The overall urban livable competitiveness is low. Though a few cities are highly competitive in livability, the average score is lowered by the majority of low-scoring cities to around the median.
2.In the past three years, the overall livable competitiveness of Chinese cities has been fluctuating downward, but that of median cities upward, with slow improvement in the overall urban livable competitiveness.
3.The estimation of difference indicators shows that the gap of livable competitiveness between Chinese cities is widening as time passes, leading to increasing regional differences.

2.3 Hong Kong tops the ranking and the 10 most livable Chinese cities are concentrated in the Yangtze River Delta and the Pearl River Delta

In 2016, Hong Kong topped the ranking of 289 Chinese cities in terms of livable competitiveness, followed by Wuxi, Guangzhou, Macao, Xiamen, Hangzhou, Shenzhen, Nantong, Nanjing and Shanghai, displaying a strong echelon effect.

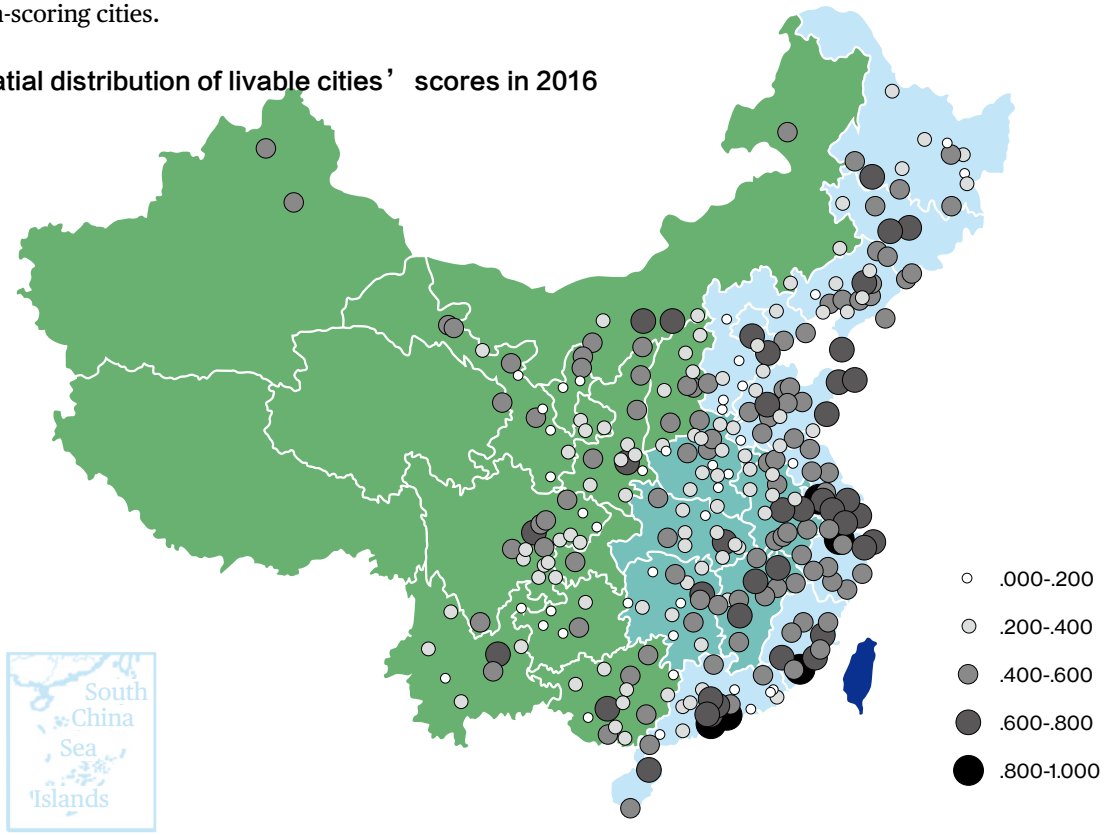
10 most livable Chinese cities 2014-2016

Ranking	2014	2015	2016 (index)
1	Zhuhai	Zhuhai	Hong Kong (1.000)
2	Hong Kong	Xiamen	Wuxi (0.896)
3	Haikou	Zhoushan	Guangzhou (0.830)
4	Xiamen	Hong Kong	Macao (0.809)
5	Shenzhen	Haikou	Xiamen (0.804)
6	Sanya	Shenzhen	Hangzhou (0.802)
7	Zhoushan	Sanya	Shenzhen (0.795)
8	Wuxi	Wenzhou	Nantong (0.786)
9	Hangzhou	Suzhou	Nanjing (0.778)
10	Suzhou	Wuxi	Shanghai (0.766)

2.4 Eastern cities beat central and western cities by a big margin

Eastern coastal cities have a clear edge in livable competitiveness, and only individual central and western cities score high in this aspect, but they are loosely scattered; the other cities tend to score low, with a huge gap with high-scoring cities.

Spatial distribution of livable cities' scores in 2016

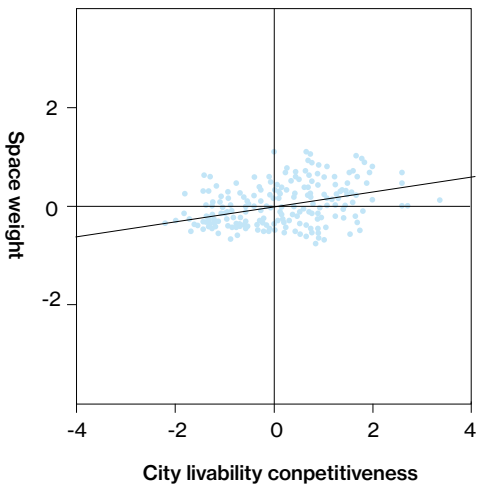


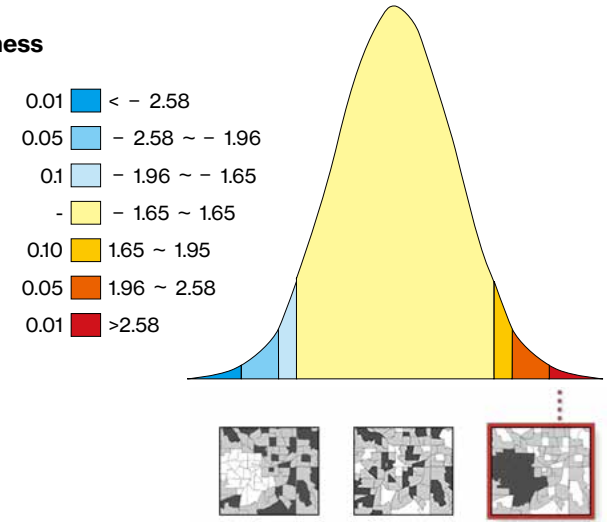
Source: City and Competitiveness Index Database, Chinese Academy of Social Sciences

2.5 Livable and less livable cities show signs of spatial clustering

Spatial statistical analysis shows that there is positive spatial autocorrelation in the livable competitiveness of the 289 Chinese cities. Further analysis of the spatial clustering of high-scoring and low-scoring cities shows that, spatial clustering is prominent for higher-scoring cities, which means that there is distinct spatial spillover effect and sound interaction between highly livable cities.

Spatial correlation analysis of livable competitiveness

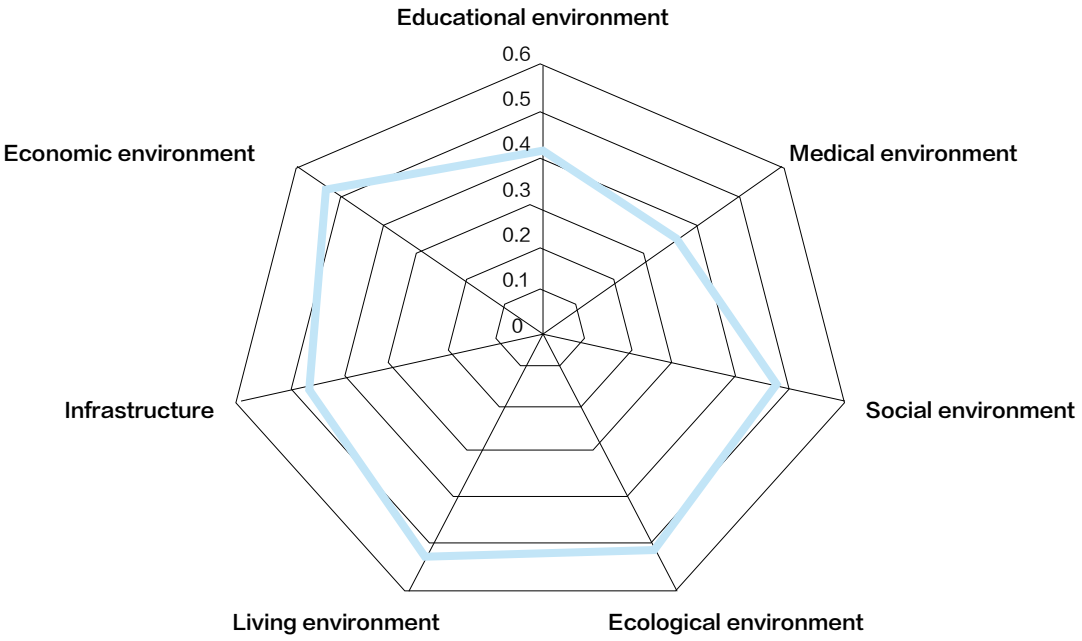




Source: City and Competitiveness Index Database, Chinese Academy of Social Sciences

2.6 Poor urban public resources have become constraints for livability

If we rank the average score of the seven dimensions of livable competitiveness in the descending order, we can see that the scores in infrastructure, the educational environment and the medical environment are the lowest, meaning that poor and insufficient public resources represented by these three have become major constraints for the development of livable cities.



2.7 Public educational services are highly unequal between cities of different administrative levels

By looking at the competitiveness score in the educational environment item we can see that, the higher the city's administrative level, the higher the score, and vice versa. In particular, prefecture cities, which are at a lower level in the administrative hierarchy, score only 0.347 in educational environment competitiveness, less than half of the score of municipalities directly under the central government and cities of special administrative regions.

2.8 viii. Case study: Wuxi

1.Wuxi boasts a favorable environment for economic development. In 2016 its GDP exceeded 920 billion yuan and per capita GDP 140,000 yuan.
2.Its wonderful cultural and natural environment has won it honors such as National Civilized City, National Historically and Culturally Famous City, National Model City in Ecological Progress, and China Habitat Award, etc.
3.According to the evaluation results of livable competitiveness of Chinese cities in 2017, Wuxi has scored high for its education environment, medical environment and economic environment.
4.Wuxi ranks the second in the ranking of the 2017 livable competitiveness report of Chinese cities, eight places higher than it was last year.

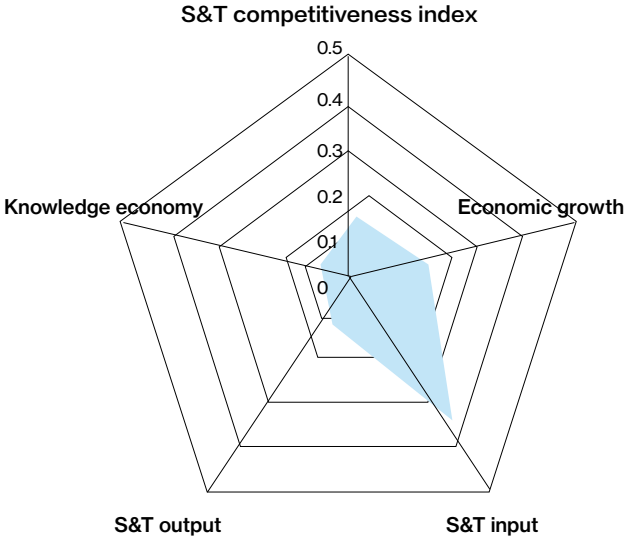
3 Competitiveness in sustainability

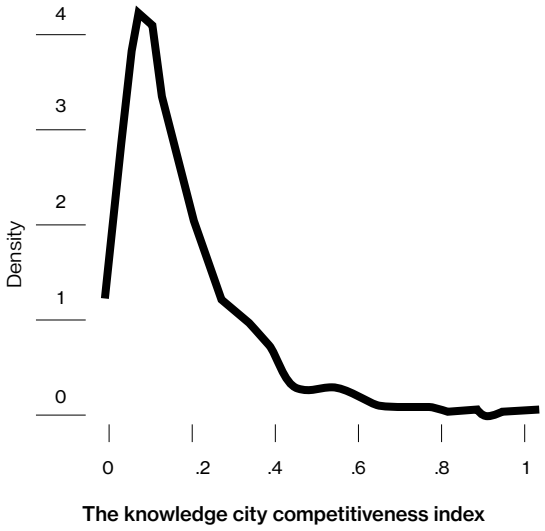
The top 10 cities: Hong Kong, Beijing, Shanghai, Shenzhen, Guangzhou, Hangzhou, Nanjing, Macao, Qingdao and Dalian.

3.1 China's knowledge city competitiveness

The overall knowledge innovation capacity is weak, the return of investment in science and technology is low and technological innovation is concentrated in only a few cities.

he knowledge city competitiveness index and Kernel density estimate



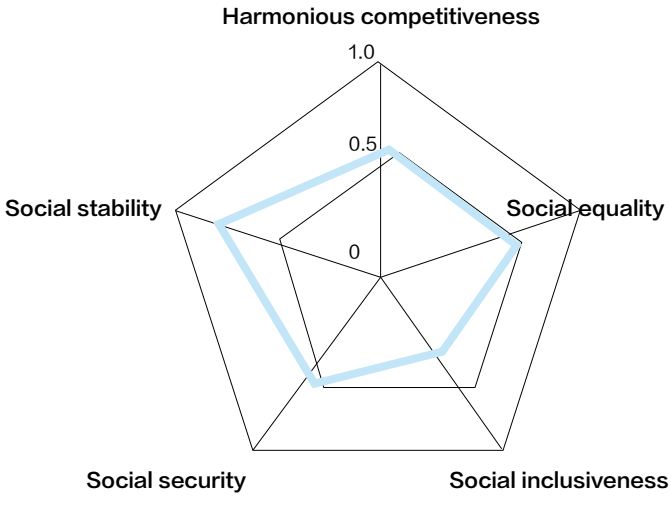


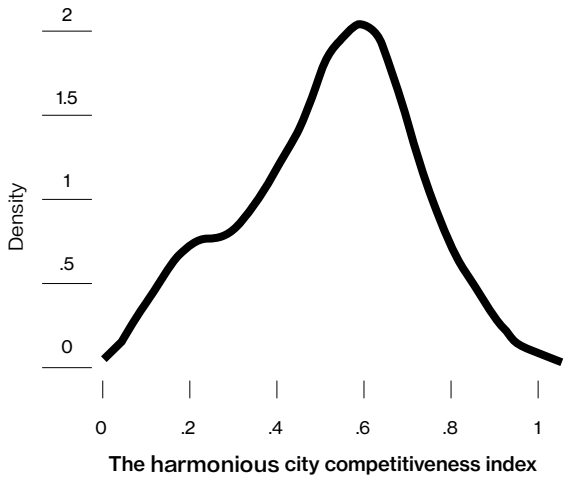
3.2 China's harmonious city competitiveness

It's measured mainly by education equality between local hukou holders and non-hukou holders, the social security index and the crime rate, etc.

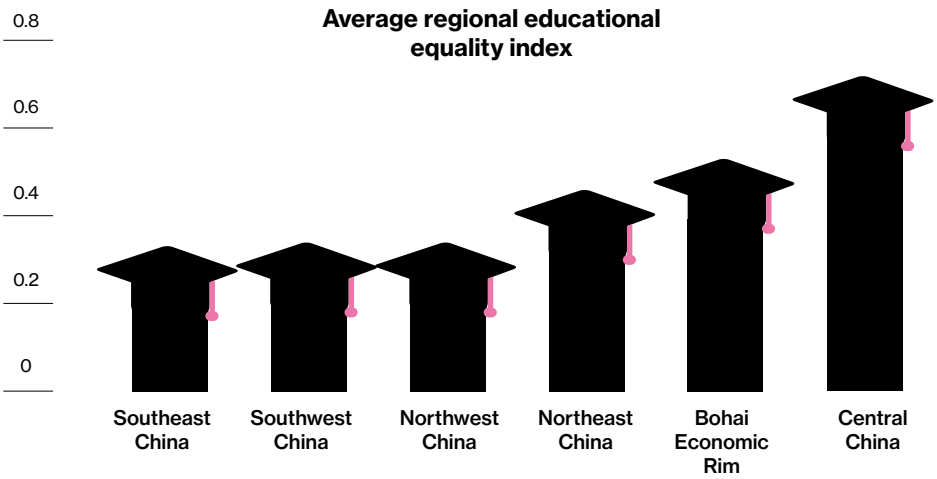
•Social harmony is generally good, the development is relatively balanced between cities, but social inclusiveness is to be improved.

The harmonious city competitiveness index and Kernel density estimate





•Educational inequality is prominent between local hukou holders and non-hukou holders in cities in East and West China, and less prominent in central cities.

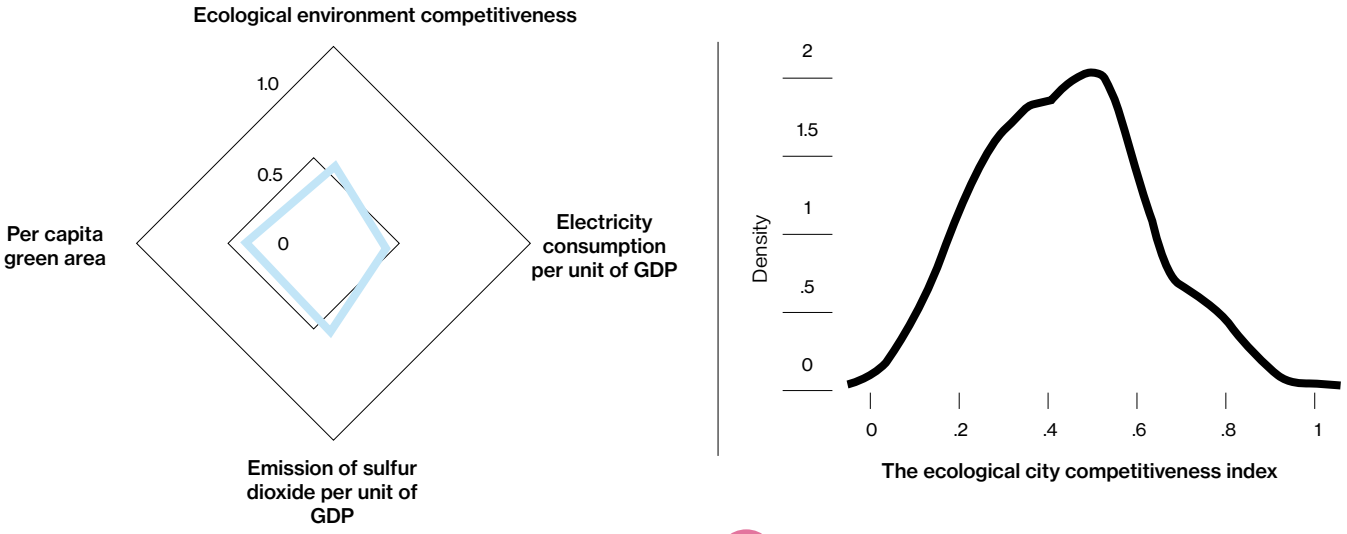


3.3 China's ecological city competitiveness

It's mainly measured by electricity consumption per unit of GDP, the emission of sulfur dioxide per unit of GDP, and per capita green area, etc

•The ecological environment is poor on the whole, the gap between cities small, the energy consumption per unit of GDP high and the urban energy utilization ratio low.

The ecological city competitiveness index and Kernel density estimate

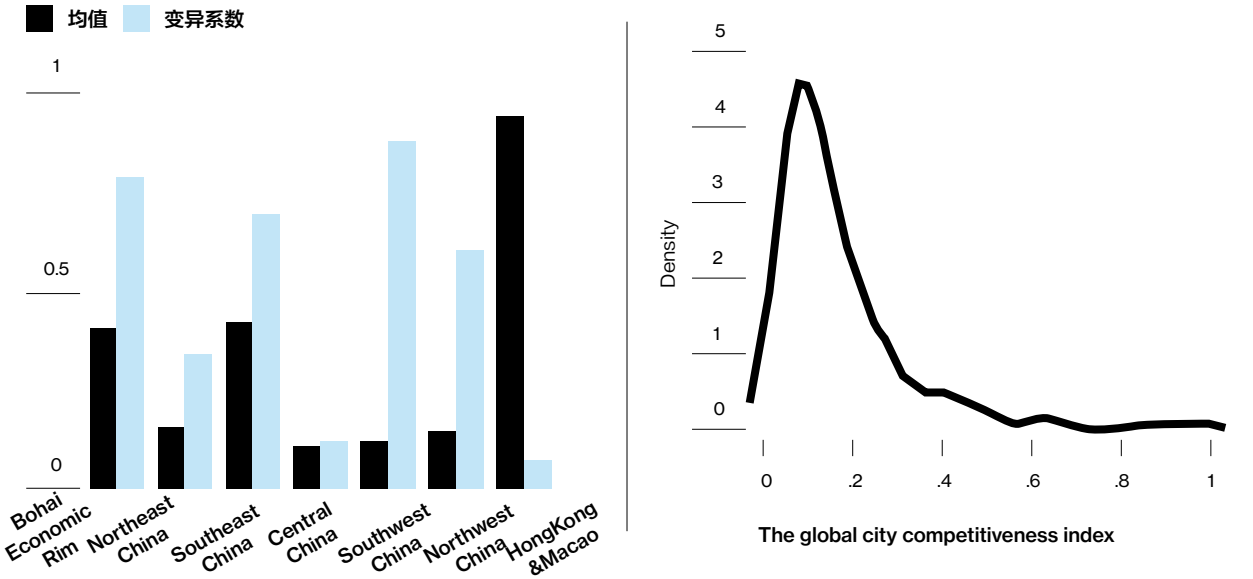


3.4 China's global urban competitiveness

It's mainly measured by the urban per capita income to rural per capita income ratio, the urban per capita road mileage to rural per capita road mileage ratio, and the number of books collected in the library per 100 people, etc.

•The urban-rural division is still prominent. Urban-rural integration is good in southeastern cities while urban-rural division serious in central and western cities.

The global urban competitiveness index and Kernel density estimate

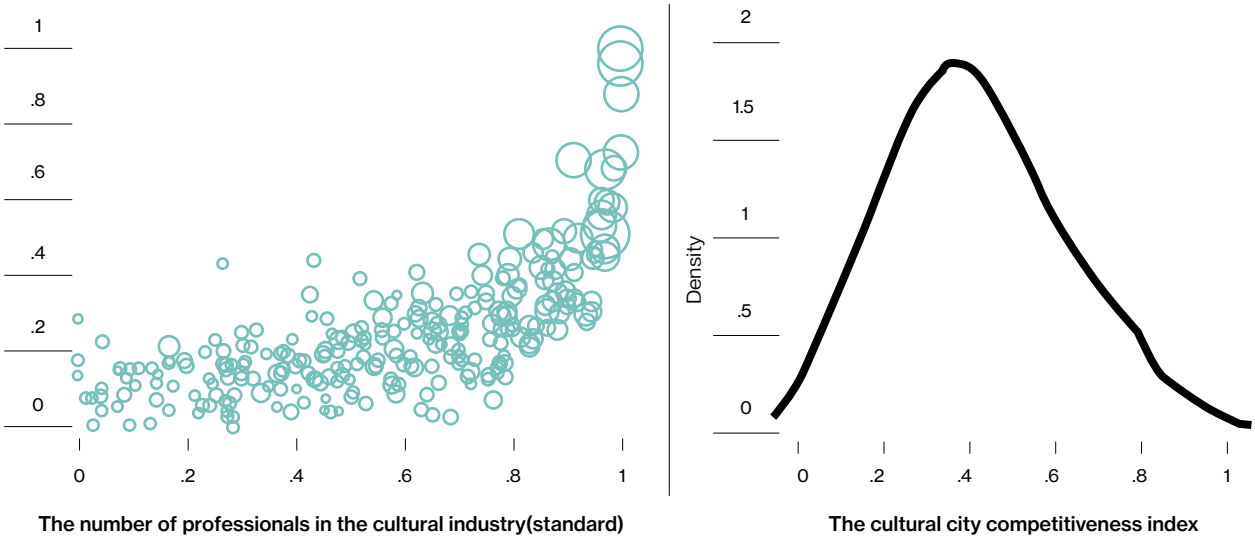


3.5 China's cultural city competitiveness

It's mainly measured by historical civilization, the number of cultural professionals per one million people, and the number of theaters and cinemas per 10,000 people, etc.

• Cultural city competitiveness is poor on the whole, and the gap between cities tends to narrow. Economically developed cities have boosted their cultural competitiveness through the robust development of cultural industry.

The cultural city competitiveness index and Kernel density estimate

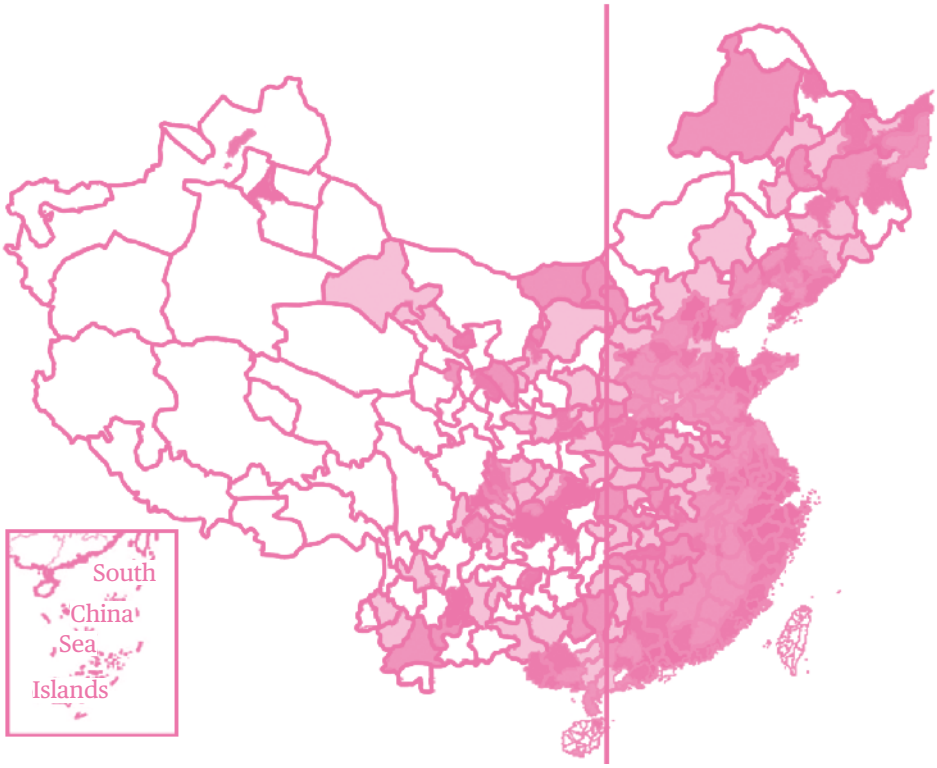


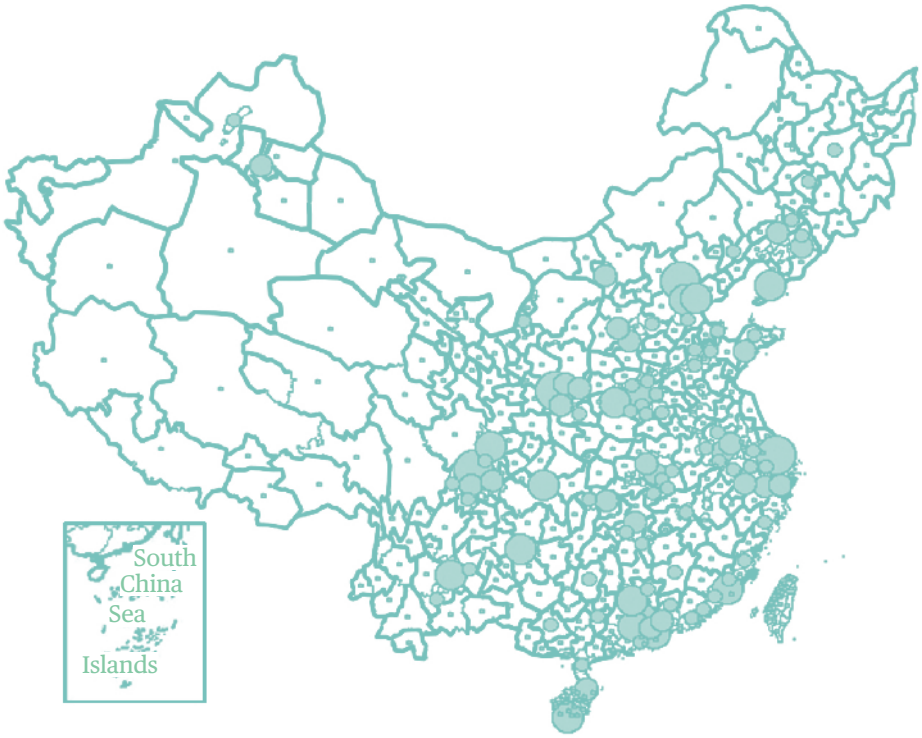
3.6 China's information city competitiveness

It's mainly measured by the number of international travelers, the convenience of air transport, and dependence on foreign trade, etc.

•Cities on the east and west sides of the 110 ° east longitude vary greatly in their external contacts. As far as air transport is concerned, external contacts are concentrated in only a few big cities.

Dimension distribution of information city competitiveness





Part 4 Report by Region

Urban Differentiation is Remarkable

1. In a region where the overall economic competitiveness is strong, the gap between cities is big Besides, the regional gap is bigger than the city gap in the same region.

Overall economic competitiveness index of six major regions in 2016

Regional scope	Average value	Ranking	Coefficient of variation	Ranking
Bohai Economic Rim	0.136	2	0.736	2
Central China	0.078	3	0.603	5
Northwest China	0.057	6	0.559	6
Northeast China	0.064	5	0.619	4
Southeast China	0.190	1	1.045	1
Southwest China	0.068	4	0.690	3

Source: City and Competitiveness Index Database, Chinese Academy of Social Sciences

2. Urban development is the most balanced in Northeast China, and though the gap of urban livable competitiveness inside Southeast China and Northwest China differs slightly, it falls between the second and third places in either case. Central China and the Bohai Economic Rim both fall between the fourth and fifth places in terms of balanced development. Last but not least, southwestern cities are at the bottom in terms of balanced development of livable competitiveness.

Description of the livability competitiveness index of six major regions

Region	Average value	Ranking	Coefficient of variation	Ranking
Southeast China	0.534	1	0.388	5
Northeast China	0.431	2	0.366	6
Bohai Economic Rim	0.409	3	0.506	2
Northwest China	0.393	4	0.399	4
Central China	0.389	5	0.456	3
Southwest China	0.353	6	0.638	1

Source: City and Competitiveness Index Database, Chinese Academy of Social Sciences

3. The Bohai Economic Rim and Southeast China have the highest average score in mainland China, but the city gap inside them is huge. Southwestern cities are weak in sustainability competitiveness on the whole, but their gap is particularly serious. In Northeast, Central and Northwest China, neither the overall average score nor the coefficient of variation is big, showing that cities there are at a low development level with little difference between them.

Appendix 1

Top 100 Most Competitive Chinese Cities 2016

City	Overall economic competitiveness		City	Competitiveness in livability		City	Competitiveness in sustainability	
	Index	Ranking		Index	Ranking		Index	Ranking
Shenzhen	1.000	1	Hong Kong	1.000	1	Hong Kong	1.000	1
Hong Kong	0.881	2	Wuxi	0.896	2	Beijing	0.989	2
Shanghai	0.747	3	Guangzhou	0.830	3	Shanghai	0.922	3
Taipei	0.697	4	Macau	0.809	4	Shenzhen	0.818	4
Guangzhou	0.569	5	Xiamen	0.804	5	Guangzhou	0.770	5
Tianjin	0.466	6	Hangzhou	0.802	6	Hangzhou	0.738	6
Beijing	0.459	7	Shenzhen	0.795	7	Nanjing	0.729	7
Macao	0.457	8	Nantong	0.786	8	Macao	0.706	8
Suzhou	0.424	9	Nanjing	0.778	9	Qingdao	0.682	9
Wuhan	0.342	10	Shanghai	0.766	10	Dalian	0.681	10
Foshan	0.334	11	Wuhan	0.759	11	Wuhan	0.677	11
Nanjing	0.333	12	Ningbo	0.755	12	Ningbo	0.663	12
Wuxi	0.325	13	Xi'an	0.749	13	Chengdu	0.656	13
Dongguan	0.311	14	Zhenjiang	0.742	14	Wuxi	0.645	14
Chengdu	0.306	15	Beijing	0.740	15	Xiamen	0.645	15
New Taipei	0.265	16	Fuzhou	0.739	16	Suzhou	0.644	16
Qingdao	0.260	17	Hefei	0.736	17	Xi'an	0.630	17
Zhengzhou	0.253	18	Zhoushan	0.734	18	Tianjin	0.611	18
Xiamen	0.250	19	Changsha	0.733	19	Yantai	0.606	19
Changsha	0.244	20	Suzhou	0.727	20	Chongqing	0.604	20
Changzhou	0.234	21	Nanchang	0.723	21	Zhoushan	0.587	21
Chongqing	0.231	22	Daqing	0.722	22	Jinan	0.581	22
Ningbo	0.226	23	Chengdu	0.714	23	Nanchang	0.581	23
Hangzhou	0.226	24	Changzhou	0.709	24	Zhuhai	0.578	24
Nantong	0.210	25	Dalian	0.708	25	Shenyang	0.571	25
Dalian	0.208	26	Qingdao	0.706	26	Changsha	0.564	26
Jinan	0.202	27	Ma'anshan	0.702	27	Zhengzhou	0.563	27
Zhongshan	0.200	28	Weihai	0.696	28	Shaoxing	0.562	28
Xi'an	0.193	29	Zhongshan	0.691	29	Dongguan	0.554	29
Quanzhou	0.189	30	Jinan	0.688	30	Fuzhou	0.548	30
Shenyang	0.184	31	Baotou	0.687	31	Changchun	0.541	31
Hefei	0.180	32	Quanzhou	0.683	32	Hefei	0.538	32
Zhenjiang	0.173	33	Yantai	0.673	33	Changzhou	0.533	33
Yantai	0.173	34	Haikou	0.667	34	Kunming	0.533	34
Xuzhou	0.172	35	Dongguan	0.667	35	Harbin	0.523	35
Kaohsiung	0.166	36	Wuhu	0.657	36	Jiaxing	0.517	36
Tangshan	0.165	37	Hohhot	0.657	37	Wenzhou	0.508	37
Fuzhou	0.165	38	Tianjin	0.656	38	Yinchuan	0.503	38
Jiaxing	0.163	39	Changchun	0.656	39	Jinhua	0.500	39
Zibo	0.163	40	Zhuhai	0.654	40	Hohhot	0.495	40
Yangzhou	0.160	41	Yangzhou	0.652	41	Zhenjiang	0.489	41
Taizhou	0.155	42	Shenyang	0.646	42	Haikou	0.488	42
Nanchang	0.151	43	Ji'an	0.630	43	Qinhuangdao	0.484	43
Shaoxing	0.148	44	Jiaxing	0.627	44	Yangzhou	0.482	44
Changchun	0.147	45	Foshan	0.622	45	Zhongshan	0.471	45
Shijiazhuang	0.145	46	Nanning	0.621	46	Foshan	0.468	46

Taichung	0.143	47	Longyan	0.615	47	Huizhou	0.467	47
Zhuhai	0.142	48	Jilin	0.613	48	Quanzhou	0.465	48
Weifang	0.141	49	Kunming	0.612	49	Dongying	0.464	49
Jining	0.131	50	Jingdezhen	0.612	50	Nantong	0.461	50
Dongying	0.129	51	Zhuzhou	0.601	51	Weihai	0.461	51
Wenzhou	0.129	52	Panzhihua	0.597	52	Taiyuan	0.461	52
Weihai	0.124	53	Zhengzhou	0.596	53	Nanning	0.460	53
Yancheng	0.124	54	Shaoxing	0.594	54	Huzhou	0.459	54
Shantou	0.123	55	Ordos	0.592	55	Yichang	0.458	55
Guiyang	0.123	56	Ya'an	0.589	56	Weifang	0.456	56
Tai'an	0.121	57	Tongling	0.587	57	Jingdezhen	0.451	57
Huizhou	0.119	58	Huangshan	0.587	58	Huangshan	0.446	58
Harbin	0.117	59	Dongying	0.586	59	Zibo	0.442	59
Tainan	0.116	60	Yinchuan	0.583	60	Urumqi	0.441	60
Kunming	0.116	61	Yuxi	0.582	61	Daqing	0.440	61
Wuhu	0.116	62	Harbin	0.573	62	Lanzhou	0.432	62
Taizhou	0.116	63	Weifang	0.573	63	Wuhu	0.421	63
Jinhua	0.113	64	Putian	0.567	64	Jiujiang	0.420	64
Linyi	0.113	65	Mianyang	0.566	65	Guiyang	0.417	65
Xuchang	0.110	66	Baoji	0.565	66	Guilin	0.416	66
Xiangyang	0.106	67	Panjin	0.564	67	Luoyang	0.414	67
Yichang	0.105	68	Baishan	0.564	68	Xuzhou	0.407	68
Cangzhou	0.105	69	Quzhou	0.562	69	Chengde	0.399	69
Huai'an	0.104	70	Guilin	0.561	70	Zhuzhou	0.398	70
Nanning	0.103	71	Jiujiang	0.561	71	Zhangzhou	0.397	71
Liaocheng	0.101	72	Lishui	0.560	72	Mudanjiang	0.396	72
Jiaozuo	0.101	73	Taiyuan	0.560	73	Sanya	0.388	73
Luoyang	0.101	74	Karamay	0.557	74	Anqing	0.387	74
Jieyang	0.100	75	Qiqihar	0.555	75	Shiyan	0.386	75
Baotou	0.100	76	Jinhua	0.554	76	Jiamusi	0.382	76
Zaozhuang	0.100	77	Taizhou	0.554	77	Xianyang	0.382	77
Dezhou	0.100	78	Jiuquan	0.552	78	Lishui	0.381	78
Langfang	0.099	79	Anshan	0.551	79	Jinzhou	0.381	79
Taiyuan	0.099	80	Chongqing	0.551	80	Langfang	0.380	80
Zhangzhou	0.099	81	Bengbu	0.546	81	Taizhou	0.379	81
Yueyang	0.098	82	Wenzhou	0.543	82	Mianyang	0.377	82
Daqing	0.098	83	Guiyang	0.542	83	Ganzhou	0.375	83
Urumqi	0.097	84	Yangquan	0.542	84	Anshan	0.374	84
Ordos	0.097	85	Fuzhou	0.540	85	Tai'an	0.374	85
Hohhot	0.095	86	Huzhou	0.539	86	Yan'an	0.373	86
Xianyang	0.095	87	Anqing	0.536	87	Baoding	0.373	87
Handan	0.094	88	Xinyu	0.535	88	Jincheng	0.369	88
Maoming	0.093	89	Sanming	0.534	89	Fushun	0.367	89
Huzhou	0.092	90	Binzhou	0.525	90	Jilin	0.366	90
Putian	0.092	91	Yichang	0.524	91	Kaifeng	0.365	91
Heze	0.092	92	Zhangzhou	0.517	92	Qiqihar	0.362	92
Changde	0.092	93	Mudanjiang	0.516	93	Liuzhou	0.361	93
Hengyang	0.091	94	Jinchang	0.516	94	Quzhou	0.359	94
Lianyungang	0.091	95	Nanping	0.510	95	Jining	0.358	95
Zhuzhou	0.091	96	Hulunbuir	0.509	96	Yancheng	0.358	96
Suqian	0.091	97	Huizhou	0.506	97	Tongling	0.357	97
Baoding	0.090	98	Pingxiang	0.504	98	Ordos	0.357	98
Zhoushan	0.090	99	Xiangtan	0.504	99	Shijiazhuang	0.354	99
Xiangtan	0.089	100	Changzhi	0.503	100	Zhaoqing	0.354	100

Appendix 2

Key members of the editorial team

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Assistant president of the National Academy of Economic Strategy, director and research fellow of the City and Real Estate Economy Research Institute, and doctoral supervisor of Chinese Academy of Social Sciences. Specialized in theoretical and empirical studies in urban economics, real estate economics, space finance, urban competitiveness and national competitiveness, etc. He won the 11th Sun Yefang Economic Book Award for the China Urban Competitiveness Report. His research findings are valuable for policy making regarding national and urban development and have important academic influence at home and abroad.

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