

# Research on the current situation and promotion of talent vitality in small and medium-sized cities in the Yangtze River Delta area

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**Abstract:** Objective: This paper aims to redefine talents based on literature reports and characteristics of small and medium-sized cities in the Yangtze River Delta. Subjects and Methods: The talent vitality index model of small and medium-sized cities in the Yangtze River Delta is constructed using the analytic hierarchy process (AHP) and subjective weighting evaluation method. This paper compares the vitality index of each city and its four first-level indexes. Results: The top county-level city in the talent index of small and medium-sized cities in the Yangtze River Delta was Kunshan. Conclusions: The development of vocational education is an important way to improve talent vitality in small and medium-sized cities in the Yangtze River Delta.

**Key words:** small and medium-sized cities in the Yangtze River Delta; talent vitality index; comparison; promotional path; vocational education

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## 1 Introduction

On 5th November 2018, Chinese President Xi Jinping announced at the opening ceremony of the first China International Import Expo that China has decided to support the integrated development of the Yangtze River Delta region and elevate it into a national strategy. The level of regional integration in the Yangtze River Delta has significantly increased. However, the differences in integration levels between cities have also expanded. The spatial agglomeration effect is significant, resulting in the formation of a high-level integrated agglomeration zone composed of "the area south of the Yangtze River" and "the area around Taihu Lake" [1]. The Yangtze River Delta region comprises Shanghai, Jiangsu, Zhejiang, and Anhui provinces. In addition to large metropolitan cities like Shanghai, Nanjing, Hangzhou, and Suzhou, it also includes several small and medium-sized cities with solid development foundations, robust economic strength, and unique characteristics. "The 2020 China Top 100 County Economy Study", jointly released by CCID Consulting Co., Ltd and *Xinhua Outlook Weekly Magazine*, reveals that Jiangsu has 25 seats, Zhejiang has 18 seats, and Anhui has 3 seats. These small and medium-sized cities have a robust industrial base and excel in specific industries and fields. In contrast, the Yangtze River Delta region still has several small and medium-sized cities with a "weak economic foundation" and a

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"difficulty in attracting talent". These cities often have inadequate infrastructure, insufficient social safety nets, traditional industries with a lack of innovation capacity, and private business owners who lack the mentality and space to become industry leaders. The main reason for the lack of innovation is the absence of a talented team. To solve this problem, it is crucial to construct a team with a high degree of talent aggregation. This factor has the greatest impact on per capita GDP [2]. Today's social competition focuses on talent, which plays a vital role in the economic and social development of a region. Therefore, it is of great significance to develop a scientific, objective, and operable talent vitality index model for medium and small-sized cities in the Yangtze River Delta. This will help evaluate the current situation of talent in the region and speed up talent cultivation and reserve.

In the 21st century, skilled individuals play a crucial role in the development of cities and the knowledge economy. As producers, disseminators, and users of knowledge and information, they are essential to economic growth. The concept of talent is defined from the perspective of enterprises as having high skills or abilities in a specific technical field within an organization [3]. From a social practice perspective, talents are defined as individuals with specialized knowledge, high technical ability, and the capacity to make significant contributions to understanding and transforming nature, society, and human progress through their creative work [4]. In addition, in terms of creative labour, talents are those who make significant contributions in a particular field, industry or job [5]. Huang defines talents as individuals possessing exceptional knowledge, skills, and willpower that are valuable to society and can make significant contributions under specific conditions [6]. This includes intellectuals, skilled craftsmen, entertainers, leaders, and heroes. *The Decision of the State Council on Further Strengthening Talent Work* (ZBF [2006] No. 15) explicitly states that individuals who possess social skills and are able to use their own initiative for creative activities can make a positive contribution to the construction of socialism by promoting material, spiritual, and political civilization. The talents required by the Party and the country are classified in *The Outline of National Medium- and Long-term Talent Development Plan (2010-2020)* (ZF [2010] No. 6) as follows: Party and government talents, enterprise operation and management talents, professional and technical talents, high-skilled talents, rural practical talents, and social work talents.

This paper defines talents as individuals who consciously use Xi Jinping's thought on socialism with Chinese characteristics in the new era as a guide, possess a firm and correct political direction, a solid theoretical foundation, rich practical experience, and can use their subjective initiative to carry out creative activities. They are capable of making positive contributions to the cause of socialist modernization. The definition is based on literature reports and the characteristics of small and medium-sized cities in the Yangtze River Delta. Therefore, this paper includes statistics on individuals who have completed technical secondary school education or higher, as well as those who hold professional and technical positions such as technicians or equivalent titles.

## **2 Materials and methods**

A model for the talent vitality index has been constructed. With the deepening of the integration of the Yangtze River Delta, competition between cities is increasingly based on their comprehensive economic and technological strength, with talent becoming a key factor. Extensive research has been conducted by scholars on the indicator system for innovative science and technology talents, covering talent scale, cultivation, and performance [7][8][9][10]. This paper presents the talent vitality index model, which is not a random combination or a simple pile of indicators. Instead, it follows the principles of scientific nature, index optimization, operability, comparability, dynamic continuity, and the combination of qualitative and quantitative measures. This paper utilizes literature research and expert consultation to identify four primary indicators and six secondary indicators of talent vitality in small and medium-sized cities in the Yangtze River Delta, as presented in Table 1. The weight of the secondary indicators is determined through subjective weighting

evaluation, while the weight of the primary indicators is determined using the analytic hierarchy process (AHP) [11]. The talent vitality index model is then established. The data is sourced from the 2019 *Statistical Bulletin of National Economic and Social Development* and the 2019 Statistical Yearbook of each city.

Table 1. Talent vitality index table

	Level indicators	Weight of first-level indicators	The secondary indicators	Secondary index weight
Talent vigor	Human resource Index A1	0.23	Number of skilled workers per 10,000 people	
	Talent effectiveness Index A2	0.31	Number of patents filed per 10,000 people	
	Talent environment index A3	0.35	Number of secondary vocational schools or above per 10,000 people B1	0.34
			Number of health technicians per 10,000 people B2	0.33
			Number of full-time teachers per 10,000 people B3	0.33
	Talent characteristics index A4	0.11	Number of academician workstations and technical awards above provincial level per 10,000 people	

The secondary indicators' weight is evaluated using a subjective weighting method,  $A_3 = 0.34B_1 + 0.33B_2 + 0.33B_3$

The importance of each index in the index system is determined through pairwise comparison scoring, using a 1-9 scaling method and reciprocal base. The final comparison matrix is then determined, and the judgment matrix consistency is tested. Statistical analysis software MATLAB is used to objectively calculate the judgment matrix. The language used is clear, concise, and objective, with a formal register and precise word choice. The text adheres to conventional structure and formatting features, including consistent citation and footnote style. The text is grammatically correct and free from errors. No changes in content have been made. The weight of each index at each level is determined by using the analytic hierarchy process (AHP) to level index weight.

$$\text{Talent vitality index model (F)} = 0.23A_1 + 0.31A_2 + 0.35A_3 + 0.11A_4$$

### 3 Results and discussion

#### 3.1 Ranking of small and medium-sized cities in the Yangtze River Delta according to the talent vitality index

The top 10 county-level cities in the talent index are Kunshan, Yuyao, Yongkang, Changshu, Taicang, Tongxiang, Cixi, Danyang, Hai'an, and Yizheng. Six of these cities are in Jiangsu province, four are in Zhejiang province, and none are in Anhui province. Kunshan, located in Jiangsu province, ranks first according to Figure 1.

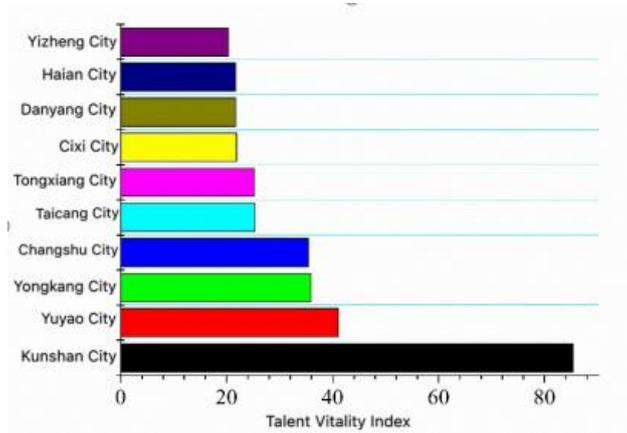


Figure 1. Ranking of talent vitality index of small and medium-sized cities in the Yangtze River Delta

### 3.2 Analysis of the talent vitality index of small and medium-sized cities in the Yangtze River Delta

#### 3.2.1 Human resource index ranking and reason analysis

The human resource index is defined as the number of skilled workers per 10,000 people. Figure 2 shows the top ten county-level cities in the human resource index of small and medium-sized cities in the Yangtze River Delta, which are Kunshan, Yuyao, Changshu, Yixing, Tianchang, Shengzhou, Linhai, Mingguang, Guangde, and Wenling, respectively. There are three cities in Jiangsu province, four in Zhejiang province, and three in Anhui province. Kunshan, located in Jiangsu province, ranks first. The talent index of the top four cities is significantly higher than that of other county-level cities in the Yangtze River Delta. These cities are mainly located around economically strong cities such as Suzhou, Ningbo, and Wuxi. This indicates that the talent reserve of county-level cities in the Yangtze River Delta is positively correlated with economic development.

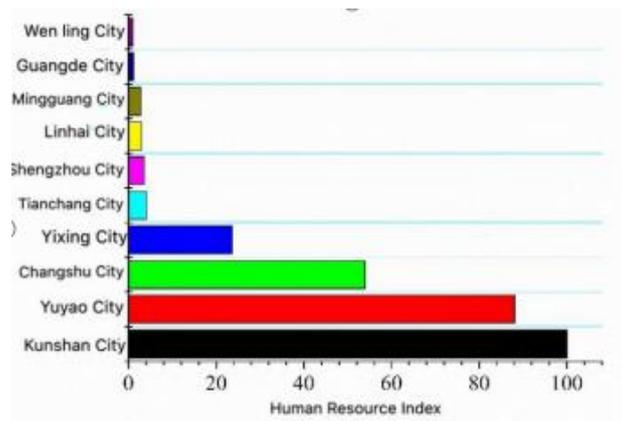


Figure 2. Ranking of human resource index of county-level cities in the Yangtze River Delta

The survey and research indicate that these cities excel at learning from more advanced experiences and practices. They implement highly competitive talent policies to provide accurate and efficient services, bringing together and utilizing talented individuals. This fosters an environment where individuals are willing to come, able to stay, and work for an extended period of time. In Kunshan, Jiangsu province, the municipal government recognizes that talent is a key factor in urban construction and industrial transformation and upgrading. The policy "command stick" can help enterprises attract and retain talent, creating a talent highland. Talent advantages promote industrial development, which in turn attracts more talent, achieving a virtuous circle.

#### 3.2.2 Talent efficiency index ranking and cause analysis

Talent efficiency index: number of patents applied per 10,000 people, unit: unit per 10,000 people.

As shown in Figure 3, the talent effectiveness index of small and medium-sized cities in the Yangtze River Delta reveals that Kunshan, Yongkang, Taicang, Tongxiang, Haining, Cixi, Danyang, Yizheng, Pinghu and Taixing are the top 10 county-level cities. Among them, 5 are located in Jiangsu province, 5 in Zhejiang province, and Kunshan in Jiangsu province ranks first. The data indicates that these ten cities have a high concentration of innovative talents and outstanding innovation capabilities.

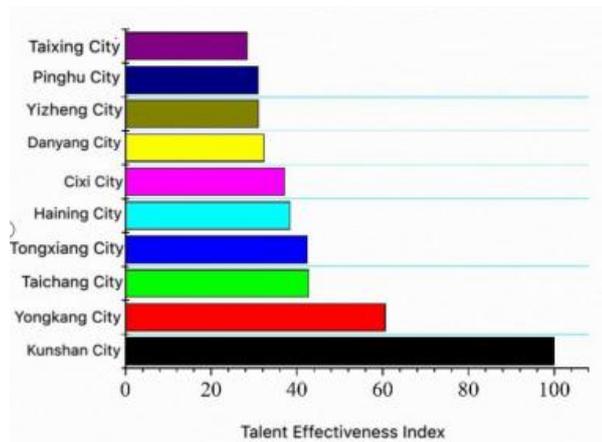


Figure 3. Ranking of talent effectiveness index of county-level cities in the Yangtze River Delta

These cities are reported to have effective innovation policies, ample innovation funds, a positive innovation atmosphere, and a concentration of innovative talent. The creative potential of these talents is fully realized, resulting in fruitful innovations that allow all talents to demonstrate their strengths. For instance, in 2015, Taicang, Jiangsu province implemented *Several Policy Opinions on Further Accelerating the Construction of Technological Innovation System*, followed by *Several Policies on Further Promoting the Construction of Technological Innovation Highland* in 2017. The documents above aim to accelerate the construction of Taicang's innovation carrier platform, strengthen intellectual property rights protection, expand the cooperation mode of scientific and technological innovation, promote the rapid development of scientific and technological services, comprehensively improve the ability of scientific and technological innovation, and speed up the construction of a scientific and innovative city.

### 3.2.3 Talent environment index ranking and cause analysis

The talent environment index includes three secondary indicators, namely the number of secondary vocational schools or higher per 10,000 inhabitants, the number of full-time teachers per 10,000 inhabitants and the number of health technicians per 10,000 inhabitants, with weights of 0.34, 0.33 and 0.33 respectively. Therefore, the talent environment index = 0.34 \* number of secondary vocational schools or higher per 10,000 inhabitants + 0.33 \* number of full-time teachers per 10,000 inhabitants + 0.33 \* number of health technicians per 10,000 inhabitants.

As can be seen from Figure 4, the top 10 county-level cities in the talent environment index of small and medium-sized cities in the Yangtze River Delta are Kunshan, Yongkang, Zhuji, Lanxi, Jiande, Tongxiang, Yuyao, Linhai, Danyang, and Jingjiang respectively. Among them, 3 are in Jiangsu province, 7 are in Zhejiang province, and Kunshan in Jiangsu province is ranked first.

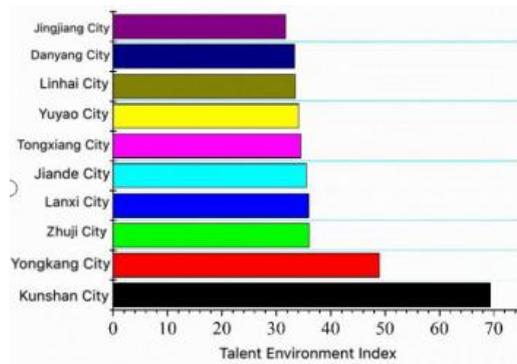


Figure 4. Ranking of talent environment index of county-level cities in the Yangtze River Delta

In addition to providing a platform for entrepreneurs to start their own businesses, we have developed and implemented a package of plans to address their domestic concerns, such as their spouse's employment, their children's education, and their family's medical care. Using Yongkang, Zhejiang province as an example, the municipal Party committee and municipal government have formulated the *Temporary Measures on the Green Card System for Life Services* for high-level talents in Yongkang District. The measure stipulates that high-level talents and core members of key innovation teams recognized by the government will be granted "Green Cards for Life Services". This will enable them to enjoy priority services in life such as healthcare, education for their children, household registration, residence services, and car purchases.

### 3.2.4 Ranking and reason analysis of the talent characteristics index of small and medium-sized cities in the Yangtze River Delta

The index of talent characteristics is determined by the number of academician workstations and technical awards above the provincial level per 10,000 people. As can be seen from Figure 5, the top 10 county-level cities in the Yangtze River Delta talent characteristic index (including the eight suburbs of Shanghai) are Hai'an, Yuyao, Changshu, Kunshan, Yizheng, Gaoyou, Ningguo, Zhangjiagang, Taicang and Haimen. Among them, there are 8 in Jiangsu Province, 1 in Zhejiang Province, 1 in Anhui Province, and Hai'an in Jiangsu Province ranks first.

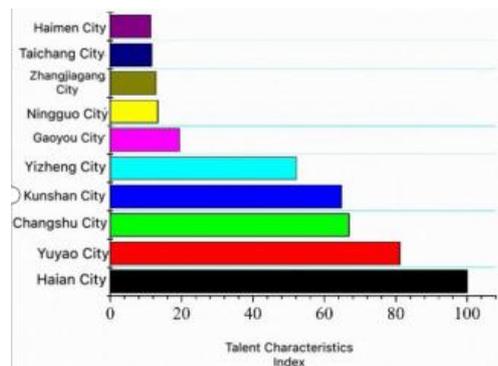


Figure 5. Ranking of talent characteristics index of county-level cities in the Yangtze River Delta

Through our research, we discovered that we have redefined the concept of recruitment to be more inclusive and welcoming to all potential candidates. Using Hai'an, Jiangsu province as an example, high-level talents from urban areas can connect with local industries and projects in Hai'an through the implementation of loose and strategic cooperation mechanisms. This will facilitate the landing and transformation of mature scientific and technological achievements in Hai'an. The concept of scientific and technological innovation advancement has been established and put into practice through annual events such as "Innovation and Entrepreneurship in Hai'an" and "Experts from Chinese Academy of Sciences Go to Hai'an". These events have strengthened the collaboration between industry, universities, and scientific

research departments.

3.3 Analysis of the reasons for the ranking of talent vitality in small and medium-sized cities in the Yangtze River Delta

#### 3.3.1 Geographical location

In terms of geographical location, most of these ten cities are situated around mega and large cities in the Yangtze River Delta. This allows them to benefit from the quality resources of the larger cities, making them attractive to talented individuals. Consequently, the talent index of these cities is much higher than that of other cities.

#### 3.3.2 Traffic conditions

In terms of traffic conditions, the Yangtze River Delta region has a total of 484,700 km of highways, including 14,800 km of motorways, which accounts for approximately 10.38% of the total mileage of highways in China. Additionally, the region has a total of 10,665 km of railways, accounting for 8.10% of the total mileage of railways in China. Furthermore, the mileage of inland waterways in the region amounts to 40,600 km, which accounts for 31.09% of the total mileage of inland waterways in China. Currently, the Yangtze River Delta region has the highest number of airports in China, with 23 civil airports available for navigation. This includes 2 in Shanghai, 9 in Jiangsu province, 7 in Zhejiang province, and 5 in Anhui province. These 10 cities are located near mega and large cities, with well-developed air, rail, road, and water transport systems, providing convenient transportation and good conditions for attracting talent.

#### 3.3.3 Industrial base

From an industrial perspective, the aforementioned ten cities have a robust industrial base, ranking among the top cities in terms of both gross domestic product (GDP) and per capita GDP. For instance, as of the end of 2019, Kunshan had industrial clusters worth 100 billion in IT (communication equipment, computers, and other electronic equipment) and 12 billion in other industries. Additionally, it boasts 111 large industrial enterprises and 375 medium-sized enterprises. There are 920 enterprises with an output value of over 100 million yuan. Among them, there are 111 enterprises with more than 1 billion yuan and 12 enterprises with more than 10 billion yuan.

## 4 Conclusion

The location of cities cannot be changed, and traffic conditions and industrial development require long-term accumulation. As Shanghai, Nanjing, Hangzhou, Suzhou, and other major cities continue to develop, industries that do not align with their development orientation will be gradually transferred to smaller cities. Small and medium-sized cities in the Yangtze River Delta possess a strong environmental bearing capacity and resource advantages. This provides strategic space for integrated development through industrial layout, functional division, and coordination.

The human resource needs of small and medium-sized cities should be dominated by highly technical and skilled personnel due to the industrial structure and urban division of labour. Therefore, small and medium-sized cities in the Yangtze River Delta should actively promote vocational education, explore the pilot reform of five-year vocational colleges and universities, support the construction of a modern vocational education system, cultivate high-quality technically skilled talents, and make every effort to prepare a talent pool for industries that are transferred from large cities. Compared with the aforementioned factors, the vigorous development of vocational education can train and produce more professional and technical personnel for local industrial production lines. This has a high input-output ratio and is one of the best ways for small and medium-sized cities in the Yangtze River Delta to develop and progress.

Kunshan is a notable example. As a city covering an area of 927.68 square kilometers and having a population of 903,200, it is home to eight colleges and universities, including Duke Kunshan University, Kunshan Branch of PLA Foreign Languages University, Applied Technology College of Soochow University, Silicon Lake College, Kunshan

Dengyun College of Science and Technology, Suzhou Top Information Vocational and Technical College, Funa Film and Television College, and Kunshan College of Jiangsu Radio and Television University. These higher education institutions provide the economic and social infrastructure for Kunshan. They have laid a solid foundation for sustainable and high-quality economic development, making Kunshan one of the top 100 counties in China for many years.

### **Conflicts of interest**

The author declares no conflicts of interest regarding the publication of this paper.

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