An Evaluation Model of Talent Attraction in Fujian Province Based on Principal Component Analysis

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Abstract. Today's economic development is focused on abilities, and the rivalry for talents is becoming increasingly evident. This paper identifies fifteen key influencing indicators of talent attraction of nine cities in Fujian Province. The principal component analysis (PCA) approach is then utilized to examine the talent attractiveness of nine cities in Fujian Province in depth. The results show that the ranking of talent attractiveness of nine cities in Fujian Province is as follows: Xiamen, Fuzhou, Putian, Quanzhou, Ningde, Sanming, Longyan, Zhangzhou, and Nanping. It shows that the cities with higher economy are more attractive to talents. Talents have the potential to propel the economy forward. On the contrary, the growth of the economy will draw an influx of talent.

Keywords: talent attraction; principal component analysis (PCA); higher economy.

1. Introduction

Human resources have become a significant aspect influencing the growth of cities in today's globe. With the advancement of science and technology, the battle for talent has grown increasingly tough. Scientific and technological abilities are the driving force behind scientific and technological innovation, and they have evolved into a strategic resource for which large cities compete. Improving the appeal of urban science and technology talent has also become a critical condition for encouraging urban innovation and growth [1]. With all nations in the globe and across the country increasing their attention and introduction of talents, the degree of urban talent attraction has become a critical issue for urban management authorities. A city must pay attention to talent to sustain its competitiveness and capacity to innovate. Attract the system to do appropriate planning and study [2]. The cornerstone of all economic and social activity is population, and talent is the primary resource.

The emergence of a big number of talents in today's globe has increased the country's growth chances. Attracting talents is a vital requirement for a city's growth. To sustain the city's good creativity and positive energy, all parts of the city must be altered to increase the attraction of talents, and then a big number of exceptional talents must be introduced to establish a good cycle. There are several elements that influence the appeal of a city's skills, and each city or region's corresponding conditions vary. Human resources are the initial resources for economic and social growth, and talents are the most important treasure [3]. The country has released a series of talent policies to establish a policy environment conducive to the generation of talents and the best use of their talents. There has also been tremendous rivalry for talents around the country, and they have begun a new wave of offensives directed at the talent highlands, continually upgrading the level of funding, platforms, and treatment, and seeking to bring all types of talents under their grasp. As a result, talent recruitment has steadily become an essential indication of the urban society's and economy's healthy growth [4].

Excellent talents will choose to settle in cities based on a variety of reasons, and talent selection encourages city growth. As a province with enormous potential, Fujian is consistently raising the degree of economic growth in each city. The growth potential of Fujian's nine sites is inextricably linked to talent. By analyzing data, this research investigates the talent attraction level of nine Fujian locations and develops a mathematical model to assess talent attraction. The most important aspect of power displays the temporal and spatial evolution pattern of the nine sites in Fujian and makes recommendations that are beneficial to recruiting talents.

2. Select Talent Attraction Indicators

2.1 Idea Analysis

There are many factors that affect the attractiveness of a city, the first being the "development prospects": the prospects of the employment entity and the city in which it is located, and whether the current good prospects can be sustained in the coming period, after all, people must consider the "cost of moving". There are also other factors: educational resources, health care, traffic conditions, pollution, and security management. This paper collects data on 15 indicators that affect the attractiveness of talent in nine cities in Fujian Province: GDP, total import and export, greenery coverage, express business, number of health institutions, etc. Using MATLAB software to conduct principal component analysis on the indicators, the comprehensive score of talent attractiveness of nine cities in Fujian Province is obtained and ranked for analysis, so as to judge the status of the level of talent attractiveness of each city by means of quantitative evaluation.

2.2 Selection of Indicators

The attractiveness of urban talent is a comprehensive concept that involves more areas, so the first consideration is to select the appropriate indicators to accurately measure the attractiveness of urban talent. Li et al [5] quantified the three aspects of regional economic level, talent living environment and employment environment in a comprehensive manner and used entropy analysis to evaluate the situation of talent attractiveness level in Guangxi region. Most scholars review the research related to the talent attractiveness evaluation index system, following the principles of scientific, operability and systematicity, and establish the first and second level indicators such as the level of talent economic environment, the level of talent science and technology education environment and the level of talent living environment to constitute the talent attractiveness index system. Therefore, this paper selects indicators through three dimensions: economic environment, living environment and urban construction, and constructs an attractiveness index system consisting of three primary indicators and 15 secondary indicators, as shown in Table 1.

Table 1 The comprehensive evaluation indicators of talent attraction

	The primary indicators	The secondary indicators
Comprehensive evaluation of talent attraction	Economic environment	GDP
		Total imports and exports
		Per capita disposable income of urban residents
		Per capita disposable income of rural residents
		Local general public budget revenue
	Urban construction	City area
		Passenger traffic
		Road cleaning and sanitation area
		Area covered by greenery
		Road mileage
	Living Environment	Number of participants in basic health insurance
		Number of health institutions
		Total length of rural delivery routes
		Courier services
		Total retail sales of social consumer goods

3. Model Establishment and Solution

3.1 Principal Component Analysis

The principal component analysis (PCA) methodology is a popular linear dimensionality reduction method [6]. The most (maximum variance) amount is utilized to employ fewer data dimensions while maintaining more of the original data point attributes. Under the condition that "as much information as possible is not lost," the original features are decreased in dimension, and the original data features are projected to the dimension with the most projected information as much as feasible. To minimize information loss following dimensionality reduction, the original features are projected onto these dimensions.

3.1.1 Data normalization

Since the dimensional discrepancies in the selected indicators, the original data must be normalized before performing principal component analysis [7]. There are 15 indicator variables, which are denoted by $x_1, x_2, \cdots, x_{15}$. There are a total of nine cities, termed evaluation items. The formula for data normalization is

$$\tilde{x}_{ij} = \frac{x_{ij} - \mu_j}{s_j}, i = 1, 2, \cdots, 9, j = 1, 2, \cdots, 15 \qquad \backslash* \text{ MERGEFORMAT (1)}$$

Where, μ_j, s_j are the sample mean and sample standard deviation of the j-th indicator.

3.1.2 Calculate the correlation coefficient matrix

$$r_{ij} = \frac{\sum_{k=1}^{9} \tilde{x}_{ki} \cdot \tilde{x}_{kj}}{8} \qquad \backslash* \text{ MERGEFORMAT (2)}$$

Where, r_{ij} is the correlation coefficient between the i-th indicator and the j-th indicator.

The correlation coefficient of the data gathered for 15 indicators was computed, and the correlation coefficient map of the indicators of talent attraction in nine cities in Fujian Province, as shown in Figure 1, was generated.
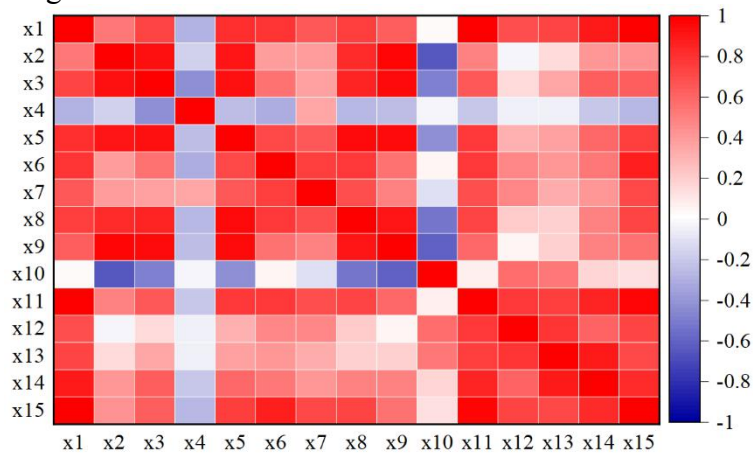

Fig. 1 The correlation coefficient diagram of 15 indicators

Figure 1 shows that the correlation between the 15 indicators is lighter in color, indicating that most of the variables are not linearly correlated, and the correlation between several variables stronger and the color is more noticeable.

3.1.3 Calculate the information contribution rate of the indicator

We compute the eigenvalues and normalized eigenvectors of the correlation coefficient matrix R. Then, as indicated in Table 2, we compute the information contribution rate and cumulative contribution rate of eigenvalues.

Table 2 The information contribution rate and cumulative contribution rate of eigenvalues

Numble	Characteristic root	Contribution rate	Cumulative contribution rate
1	9.5557	59.7230	59.7230
2	3.3496	20.9352	80.6582
3	1.4832	9.2700	89.9282
4	1.0328	6.4552	96.3834
5	0.2939	1.8368	98.2202
6	0.2544	1.5900	99.8102
7	0.0204	0.1272	99.9374
8	0.0100	0.0627	100

Table 2 shows that the cumulative contribution rate of the first four eigenvalues exceeds 96%, demonstrating the influence of principal component analysis. The first four major components will be chosen for full assessment in this paper.

3.2 Talent Attraction Evaluation Results

The calculation formula for evaluating the talent attractiveness of nine cities in Fujian Province using principal component analysis is as follows:

$$Z = \sum_{j=1}^{p} b_j y_j \qquad \text{* MERGEFORMAT (3)}$$

Where, b_j is the j-th primary component's information contribution rate.

The appropriate talent attraction level analysis is carried out based on the final comprehensive score value. The results of the comprehensive evaluation are shown in Table 3.

Table 3 The comprehensive score and ranking of talent attraction level

Ranking	City	Comprehensive score
1	Xiamen	3.2348
2	Fuzhou	2.8044
3	Putian	1.0437
4	Quanzhou	-0.4769
5	Ningde	-0.9503
6	Sanming	-1.2596
7	Longyan	-1.4359
8	Zhangzhou	-1.4553
9	Nanping	-1.505

As shown in Table 3, Xiamen has the greatest degree of talent attraction among the nine cities in Fujian Province, followed by Fuzhou as a special economic zone, Putian and Quanzhou ranking third and fourth, respectively. The above-mentioned four cities have a greater talent attraction rating than the rest of Fujian Province. Ningde and Sanming came in fifth and sixth place, respectively. Longyan, Zhangzhou, and Nanping have relatively varied levels of talent appeal.

4. Conclusion

In this paper, an evaluation model which based on the principal component analysis approach is adopted to study the talent attractiveness of nine cities in Fujian Province. The main conclusions can be summarized as follows:

(1) The ranking of talent attractiveness of nine cities in Fujian Province is as follows: Xiamen, Fuzhou, Putian, Quanzhou, Ningde, Sanming, Longyan, Zhangzhou, and Nanping. Xiamen has the greatest degree of talent attraction among the nine cities in Fujian Province, followed by Fuzhou as a special economic zone. The mentioned cities have a greater talent attraction rating than the rest of Fujian Province.

(2) It shows that the cities with higher economy are more attractive to talents. The movement of talents is critical to the economic prosperity of an area. Talents have the potential to propel the economy forward. On the contrary, the growth of the economy will draw an influx of talent.

Acknowledgments

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