Income Satisfaction Evaluation Based on Factor Analysis

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Abstract. From the perspective of residents, 20 indicators are selected to explore the influencing factors of residents' income satisfaction, and three public factors are selected by factor analysis method to evaluate the influencing factors of income satisfaction. The results show that the level of income has the strongest impact on residents' income satisfaction, and put forward the corresponding solutions.

Keywords: income, satisfaction degree, factor analysis, evaluation.

1. Introduction
Since its establishment, China has been solving the problem of people's food and clothing. In recent years, the state has issued a series of policies to solve the poverty problem of the poor in China. Looking back on the 70th anniversary of the founding of China, with rapid economic development, people's food and clothing problems and poverty problems have been well solved, and people's happiness has gradually improved. So how can we enhance the national happiness? Many foreign scholars also used cross-sectional data to prove that the improvement of income level can enhance people's happiness. Income satisfaction will also affect people's work efficiency, and the stronger the employee's income satisfaction is, the better the performance of work will be, and it will also promote the development of enterprises. Employees' income satisfaction is strong, which can be said to be beneficial to the enterprise without any harm.

Income satisfaction has been paid more and more attention by scholars since the 20th century. Income satisfaction refers to people's subjective feelings about their income, which is an effective measure of personal happiness or welfare, and also an important indicator of social welfare level of a country or region [1]. The components of income satisfaction refer to the dimensions included in the measurement of income satisfaction. Demand theory is based on Maslow's hierarchy theory, which holds that human needs are from low to high, and the satisfaction of these needs will lead to the improvement of satisfaction. At the most basic level, income can meet the needs of people's clothing, food, housing and transportation. For higher-level needs, such as social status, self-esteem, self-realization, etc., income also plays a significant role in meeting the needs of this part.

Therefore, the study of income satisfaction is of great significance to explore how to improve national happiness and people's welfare. From the perspective of enterprises, the research on income satisfaction is also of great significance to guide the salary system and human resource policies of enterprises. In addition, in the study of income distribution, income satisfaction index also has great reference value [2].
2. Research process and method

2.1. Data collection
We extracted 20 indicators (respectively unit identity, work belonging, work view, work managed attitude, stable income, actual income, income distribution, income and expenditure balance, income and effort comparison, comparison with others, work facilities, working conditions, work environment, work position, work recognition, ability improvement, leadership style, social place). In 2019, a comprehensive survey was organized in Liaoning Province. Some residents of all cities in Liaoning Province were interviewed. A total of 2356 questionnaires were collected, all of which were valid questionnaires, and data were entered. Data were analyzed through SPSS22.0. This paper mainly uses factor analysis to study the extracted factors and analyze the basic data.

2.2. Factor analysis
By studying the internal dependence among many variables, factor analysis explores the basic structure of observation data, and uses a few imaginary variables to express its basic data structure. That is to say, the variables with strong relationship can be classified into one category, each of which is a factor, and most of the information of raw materials can be obtained by a few common variables. The steps of factor analysis include: selecting the variables to be analyzed, calculating the correlation coefficient matrix of the selected variables, extracting common factors, factor rotation, and calculating factor scores[3]. The mathematical expression is as follows:

$$X=AF+B$$  \hspace{1cm} (1)

where A is factor load, F is common factor and B is special factor.

3. Empirical analysis

3.1. Factor suitability test
Factor fitness test mainly refers to KMO test and Bartlett sphericity test. The KMO value of sample data is 0.923. According to Kaiser's commonly used KMO measurement standard, the KMO value is greater than 0.9, indicating that it is very suitable for factor analysis. At the same time, the observation value of Bartlett's spherical test statistic is 30111.466, assuming that the significance level $\alpha$ is 0.05, and the associated probability product $P = 0.000 < 0.05$. The original hypothesis should be rejected, indicating that the correlation coefficient matrix is unlikely to be the unit matrix, so there are variables suitable for factor analysis. The inspection results are in Table 1:

3.2. Extraction of common factors
Through factor analysis of principal component analysis (PCA) on the data by SPSS, the common estimates of all factors are greater than 0.2, so all factors are retained. According to the SPSS internal set value, the characteristic value is more than 1 as the standard of principal component retention. In this extraction, there are three characteristic values greater than 1, which is also the number of common factors extracted by factor analysis. The cumulative variance contribution rate of the three factors is 64.626% (>0.6), so three factors are selected to describe residents' income satisfaction [4].

| Table 1. KMO and Bartlett sphericity test. |
|---------------------------------------------|
| Kaiser-Meyer-Olkin Measurement sampling suitability | .923 |
| Bartlett sphericity test                     |     |
| About Chi square                             | 30111.466 |
| df                                          | 190  |
| Saliency                                    | .000 |
3.3. Naming common factors
The correlation between variables and common factors can be reflected in the absolute value of factor load. The larger the absolute value of factor load, the stronger the correlation between factors and variables. By using the method of component matrix after rotating shaft, the load of each index on only one factor is ensured to be large to the greatest extent. The following table shows that the load of public factor F1 on b6 and b8 is more than 80%. At the same time, the above two indicators can describe the income satisfaction of residents in terms of work income, so F1 is named as work income factor. The load of public factor F2 on b16, b18, b17, b15 and b19 is more than 80%. In view of these five indicators and work status. Therefore, F2 is named as the working state factor; public factor F3 has more than 80% factor load on the index of b2, and this index refers to personal psychology, so F3 is a personal psychological factor.

3.4. Analysis of component score results
It can be obtained from the component score coefficient matrix in Table 2 (set each index as from x1-x20):

\[ F_1 = -0.138x_1 - 0.145x_2 - 0.013x_3 + 0.121x_4 + 0.171x_5 + 0.180x_6 + 0.136x_7 + 0.190x_8 + 0.166x_9 + 0.122x_{10} + 0.225x_{11} + 0.156x_{12} \]
\[ \quad - 0.017x_{13} + 0.081x_{14} + 0.004x_{15} + 0.024x_{16} + 0.022x_{17} - 0.023x_{18} - 0.016x_{19} + 0.015x_{20} \]  

(2)

\[ F_2 = -0.014x_1 - 0.020x_2 - 0.009x_3 - 0.002x_4 + 0.000x_5 + 0.004x_6 + 0.001x_7 + 0.001x_8 + 0.000x_{10} + 0.008x_{11} + 0.001x_{12} - 0.006x_{13} + 0.152x_{14} + 0.183x_{15} + 0.187x_{16} + 0.184x_{17} + 0.186x_{18} + 0.175x_{19} + 0.167x_{20} \]

(3)

\[ F_3 = 0.494x_1 + 0.521x_2 + 0.271x_3 - 0.007x_4 - 0.103x_5 - 0.116x_6 - 0.042x_7 - 0.141x_8 - 0.089x_9 + 0.001x_{10} - 0.254x_{11} - 0.094x_{12} + 0.235x_{13} - 0.024x_{14} + 0.034x_{15} + 0.033x_{16} + 0.044x_{17} + 0.022x_{18} + 0.043x_{20} \]

(4)

Finally, the scores of each factor are calculated, and the coefficients of 20 indicators are brought into three formulas in turn, and the scores of three factors can be calculated. The scores of each factor are weighted by the proportion of their variance contribution rate to the total variance contribution rate of the three factors, so as to get the comprehensive scores of residents' income satisfaction in each city[5]. The formula is as follows:

\[ F = (0.30398F_1 + 0.23018F_2 + 0.1121F_3) / 0.64626 \]  

(5)

According to the ranking of comprehensive scores F of each city from high to low, the factor scores of each city are in Table 3:

### Table 2. Component score coefficient matrix.

| Element | 1    | 2    | 3    |
|---------|------|------|------|
| b1      | -1.13| -0.01| 0.494|
| b2      | -1.45| -0.20| 0.521|
| b3      | -0.13| -0.01| 0.271|
| b4      | 0.121| 0.002| 0.007|
| b5      | 0.171| 0.000| 0.103|
| b6      | 0.180| 0.004| 0.116|
| b7      | 0.136| 0.001| 0.042|
| b8      | 0.190| 0.001| 0.141|
| b9      | 0.166| 0.001| 0.089|
| b10     | 0.122| 0.000| 0.001|
| b11     | 0.225| 0.008| 0.254|
| b12     | 0.156| 0.001| 0.094|
| b13     | -0.017| -0.006| 0.235|
| b14     | 0.081| 0.152| -0.182|
| b15     | 0.004| 0.183| -0.024|
| b16     | -0.024| 0.187| 0.034|

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Table 3. Scores of factors in each city.

| City          | Shenyang | Daian | Anshan | Benxi | Panjin | Dandong | Fushan | Jinzhou | Yingkou | Huluao | Liaoyang | Fuxin | Tieying | Chaoyang |
|---------------|----------|-------|--------|-------|--------|---------|--------|---------|---------|--------|----------|-------|---------|-----------|
| F1            | 2.27     | 2.67  | 1.99   | 2.31  | 1.45   | 1.14    | 1.56   | 1.16    | 2.02    | 0.78   | 0.58     | -0.06 | 0.02    |            |
| F2            | 1.93     | 1.77  | 0.77   | -0.36 | 0.54   | 0.71    | 0.99   | 0.22    | -1.55   | -1.01  | -0.61    | 0.46  | -0.58   |            |
| F3            | 1.76     | 1.81  | 1.29   | 0.25  | 1.33   | 1.60    | -0.67  | 0.87    | 0.32    | 0.68   | -0.4     | -1.07 | -1.09   |            |
| F4            | 2.06     | 2.01  | 1.91   | 1.25  | 1.19   | 1.14    | 0.99   | 0.85    | 0.76    | 0.46   | 0.12     | -0.02 | -0.05   | -0.26     |

4. Conclusion

From the cumulative variance contribution rate, we can see that income has the greatest impact on residents' income satisfaction. Through the calculation of factor scores, it is concluded that the comprehensive scores of Shenyang and Dalian are the highest, indicating that the residents of Shenyang and Dalian have the highest income satisfaction. Tieling and Chaoyang have the lowest comprehensive scores, which are in line with the actual situation. Generally speaking, Liaoning Province should pay more attention to the development of these cities with low scores, so as to improve the residents' income satisfaction. From the factor scores of each common factor, we can see that the scores of income are generally higher than other factors, so we can also see that residents' income has the greatest impact on income satisfaction, that is, the proportion of income is the largest. It can be seen that the most direct way to improve residents' income satisfaction is to improve residents' income. The government should continue to work to improve residents' income, especially the income level of low-income people. The increase of residents' income should be the increase of disposable income as much as possible, which requires that while improving residents' income level, we should realize the equalization of public services and reduce residents' living costs.

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