

## Research Article

### Influencing Factors of Catering and Food Service Industry Based on Principal Component Analysis

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**Abstract:** Scientific analysis of influencing factors is of great importance for the healthy development of catering and food service industry. This study attempts to present a set of critical indicators for evaluating the contribution of influencing factors to catering and food service industry in the particular context of Harbin City, Northeast China. Ten indicators that correlate closely with catering and food service industry were identified and performed by the principal component analysis method using panel data collected from 2000 to 2011. The result showed that three principal components were extracted out of ten indicators, which can be synthesized respectively as comprehensive strength of catering and food service industry, development of social and economy and residents' consumption willingness to catering services. Additionally, among ten indicators, five relatively important indicators were prioritized as Revenue from principal business of above designated size, Profits of principal business, Cost of principal business, Total investment in fixed assets in hotel and catering services and Retail sales of hotel and catering services.

**Keywords:** Catering and food service industry, influencing factors, principal component analysis

## INTRODUCTION

As an important part of service industry, catering and food service industry is the important carrier of the brand and culture for a country or region with the characteristics of wide market, extensive influence and more employment opportunities. A wide variety of catering products and different styles of food culture has been shaped in the background of different regions and cultures (Yang, 2009). On the other hand, as one of the six elements of tourism activities, "food" has been given to attention by tourists. Catering and food service industry plays an important role in the promotion of local food features and culture of tourism destination through providing catering products and services for tourists. Many countries have designed and developed catering and food brand with own features and style, such as the Beer Festival of Munich in German, Pickled Cabbage Festival in South Korea, series unique meal of cactus and corn in Mexico, Samba Carnival and characteristic barbecue in Brazil and so on. These unique food resources and new product ideas not only attract tourists from all over the world, but also bring considerable catering income (Kang, 2010).

In recent years, the development of global catering and food service industry maintains a rapid and healthy momentum of development (Table 1). According to Fortune Magazine in the United States in July 2012, three food service enterprises enter the world top 500,

including American McDonald's Group, the magnate in the snack industry of the world; British Compass Group, one of biggest food group of the world; and Sodexo Group, tourism catering service enterprises in France. Rounding out the top 500 enterprises in the United States was Aramark (the international leading professional company), Yum Brands (the largest network of worldwide restaurants), Starbucks (the leading retailer and roaster of specialty coffee in the world) and Darden Restaurants (the most recognizable and successful brands in full-service dining). These food service groups provide a fast catering and food service for the consumers from more than 100 countries and regions all over the world, accounting for about 5% of global market share (Yang, 2009). It can be seen from Table 1 that the convenience has gradually become the trend of the development of catering market with the rapid development of economy and society.

In China, catering and food industry shows a steady and rapid growth with the rapid growth of Chinese economy and increase of urban and rural residents' incomes since Reformation and Opening. The retail sales of hotel and catering services were 5.48 billion Yuan in 1978, exceeded 10 billion Yuan and reached 11.21 billion Yuan in 1983, exceeded 100 billion Yuan and reached 117.5 billion Yuan in 1994 and exceeded 1000 billion Yuan and reached 1034.6 billion Yuan in 2006. At the end of 2010, it reached 1764.8 billion Yuan produced by over 4.9 million catering and food service sites, accounting for 11.24%

Table 1: Survey of global main food services groups (issue date: May 21, 2012)

Company	Headquarter	Revenues (\$ millions)	Profits (\$ millions)	Rank	Distribution countries (unit)	Service sites (unit)	Employees (person)
McDonald's	Oak Brook, U.S.	27006	5503.1	410 (global), 107 (U.S.)	118	33000	420000
Compass	Chertsey, Britain	25417.6	1168.7	432 (global)	50	40000	471108
Sodexo	Issy-les-Moulineaux, France	22262.4	625.7	495 (global)	80	34300	391148
Aramark	Philadelphia, U.S.	13244.7	100	204 (U.S.)	22	-	203500
Yum Brands	Louisville, U.S.	12626	1319	213 (U.S.)	125	39000	263290
Starbucks	Seattle, U.S.	11700.4	1246	227 (U.S.)	62	18000	149000
Darden	Orlando, U.S.	7500.2	476.3	342 (U.S.)	-	2000	185000

<http://www.fortunechina.com> and each enterprise's website

of total retail sales of consumer goods. For top 100 catering enterprises, the gross income, the total assets and profit respectively reached 139.58 billion Yuan, 34.64 and 6 billion Yuan and employed about 287400 persons (Yang and Jing, 2011). Food consumption has become an important force in promoting the steady growth of consumption demand (Liao, 2010).

Meanwhile, catering culture is one of important tourist attractions in China. In the ten tourism resources interested by inbound tourists in 2009, food and cooking ranked fourth, up to 35.6%. The tourism theme was designed as "Travel in Chinese cooking kingdom" by China National Tourism Bureau in 2003. Many catering festivals of local characteristics were held throughout the country. In addition, catering market present the pattern of rich types and diverse forms, in which the time-honored brand catering, ethnic catering, theme banquet and rural food were representative. With the rapid development of tourism industry, catering and food service industry will pay more attention to the protection of "intangible heritage" of traditional catering culture and raise catering culture to marketing level of city image.

This study takes Harbin City of Northeast China as a case study. Depending on unique natural environment, historical styles and features, Chinese and Western and traditional customs, Harbin City has formed the catering culture with strong local characteristics. Since 1990s, through market competition, catering and food service industry in Harbin City has maintained a good momentum of development with expanding scales, increasing service nets and economic incomes and made a significant contribution to improving the living quality, increasing the rate of employment and promoting the development of social economy, which has become the new economic growth point of Harbin City. For a better understanding of current situation and development trend, this study analyzes the influencing factors of catering and food service industry from 2000 to 2011 by using the method of principal component analysis. Based on the results, some development countermeasures are put forward in a scientific way. The research results can contribute to guide the healthy

development of catering and food service industry in Harbin City.

**Study area:** Harbin is located in the south-central part of Heilongjiang Province, Northeast China, from 44°04'N to 46°40'N and from 125°42'E to 130°10'E, with a total area of 53100 km<sup>2</sup>. Influenced by Chinese traditional food culture and Western food culture, Harbin City has formed a unique food culture and its characteristics can be summarized as "Delicate showed in artless appearance, essence contained in crude style". Some representative foods include northeast stew, time-honored brand snacks, kvass, sausage, bread, popsicles, yogurt and so on. The management forms of catering and food services enterprises is diversified, such as Chinese restaurant, western restaurant, leisure restaurant, fast-food restaurant, cafeteria, chain catering, home-style restaurant and sidewalk snack booth, to meet different levels of consumer demand. A large number of active food enterprises and associations constitute the main body of catering and food services industry in Harbin City. In 2010, there were about 20000 enterprises of hotel and catering services in Harbin City. Among them, 505 corporation enterprises, chain catering and self-employed households of the annual income of main business at and over 2 million Yuan made 5.39 billion Yuan business revenue and 1.08 billion Yuan profits by 31550 engaged persons (Harbin Statistics Bureau, 2001-2012).

## MATERIALS AND METHODS

**Data source:** In accordance with previously studies, this study selected ten indicators related to catering and food service industry and aim to gather an in-depth understanding of influencing factors of the development of catering and food service industry (Table 2). The original data utilized in the analyzing process from 2000 to 2011 were collected from the corresponding Harbin Statistics Bureau (2001-2012). All the statistical analyses are performed using the Statistical Package for Social Science (SPSS v.20).

**Analysis methods:** Principal Component Analysis (PCA) is a statistical technique that transforms the

Table 2: The original data of ten indicators related to catering and food service industry in Harbin City

	Per capital annual cash consumption expenditure in catering services (Yuan) ( $x_1$ )	Per capital annual disposable income of urban households (Yuan) ( $x_2$ )	Engel's coefficient of urban households (%) ( $x_3$ )	Tourism earnings (100 million Yuan) ( $x_4$ )	Total investment in fixed assets in hotel and catering services (million Yuan) ( $x_5$ )	Retail sales of hotel and catering services (100 million Yuan) ( $x_6$ )	Number of employed persons (person) ( $x_7$ )	Revenue from principal business of above designated size (million Yuan) ( $x_8$ )	Cost of principal business (million Yuan) ( $x_9$ )	Profits of principal business (million Yuan) ( $x_{10}$ )
2000	88	5632	43.1	40	13.47	41.30	42909	525.20	307.91	66.46
2001	111.8	6407.3	41	55	10.06	47.90	46850	588.58	332.01	71.51
2002	187.4	7003.8	39	69	11.64	56.70	48326	626.10	351.57	61.47
2003	209.8	7907	38.8	81.7	30.80	65.30	77085	663.54	406.17	60.03
2004	232.4	8940.3	38.9	95.3	69.65	76.40	63032	927.97	533.52	234.43
2005	451.9	10064.8	34.4	113.2	17.20	86.26	61825	891.54	508.54	312.53
2006	493.1	11230.9	33.7	161.3	302.99	99.91	55109	946.92	560.13	314.22
2007	606.5	12772	35.3	192.8	1287.01	117.86	55060	911.16	525.83	302.37
2008	590.8	14588.6	34.5	233.2	2194.15	147.60	62543	1460.72	804.42	531.95
2009	777.3	15887	34.2	300.3	2919.95	180.57	78796	1823.85	888.73	757.43
2010	861.8	17556.8	33.3	371.8	2537.75	229	89923	2598.43	1242.47	1131.02
2011	1085.9	20030.6	32.7	447.9	2743.72	270	104628	1667.90	880.59	648.47

Harbin Statistics Yearbook (2001-2012)

original set of inter-correlated variables into a new set of independent uncorrelated variables or principal components. The steps of PCA: (Xu, 2002; Chen and Lin, 2008).

**Data pre-processing:** In order to eliminate the noise interference caused by different dimensions of the indicators, the original data need to be dealt with. This study standardizes the original data with the following method (Z-score):

$$ZX_{ij} = \frac{X_{ij} - \overline{X_{ij}}}{S_{ij}} \tag{1}$$

where,

$ZX_{ij}$  = The non-dimensional value processed by standardization

$X_{ij}$  = The value of raw data

$\overline{X_{ij}}$  = The average value of raw data

$S_{ij}$  = The standard deviation value of raw data,  $i = 2000, 2001, \dots, 2011, j = 1, 2, \dots, 10$

**Calculating the correlation matrix:**

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1p} \\ r_{21} & r_{22} & \dots & r_{2p} \\ \vdots & \vdots & & \vdots \\ r_{p1} & r_{p1} & \dots & r_{pp} \end{bmatrix} \tag{2}$$

where,  $r_{ij}$  ( $i, j = 1, 2, \dots, p$ ) is the correlative coefficient between  $x_i$  and  $x_j$  of the original variables. The following is the calculation formula:

$$r_{ij} = \frac{\sum_{k=1}^n (x_{ki} - \overline{x_i})(x_{kj} - \overline{x_j})}{\sqrt{\sum_{k=1}^n (x_{ki} - \overline{x_i})^2 \sum_{k=1}^n (x_{kj} - \overline{x_j})^2}} \tag{3}$$

Because R is the real number symmetrical matrix, i.e.,  $r_{ij} = r_{ji}$ , only the upper or lower triangle elements need to be calculated.

**Calculating eigenvalue and eigenvector:** Firstly, the eigenvalue  $\lambda_i$  ( $i, j = 1, 2, \dots, p$ ) of the equation  $|\lambda I - R|=0$  is solved by the Jacobi method and are ranked as  $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0$ . Then, the corresponding eigenvector  $e_i$  ( $i = 1, 2, \dots, p$ ) of eigenvalue  $\lambda_i$  is solved. Where,  $\|e_i\| = 1$ , i.e., that is,  $\sum_{j=1}^p e_{ij}^2 = 1$  and  $e_{ij}$  is the  $j^{\text{th}}$  of eigenvector  $e_i$ .

**Calculating the variance percentage and the cumulative variance percentage of the principal component:** The variance percentage of principal component ( $T_k$ ) is calculated:

$$T_k = \frac{\lambda_i}{\sum_{k=1}^p \lambda_k} (i, j = 1, 2, \dots, p) \tag{4}$$

The cumulative variance percentage ( $D_k$ ) is calculated:

$$D_k = \sum_{j=1}^k T_j = \frac{\sum_{k=1}^i \lambda_k}{\sum_{k=1}^p \lambda_k} (i, j = 1, 2, \dots, p) \tag{5}$$

Generally, the first several principal components accounting for 85% of the total variance are retained whilst the rest factors can be omitted in further analysis, that is, the 1, 2, ...,  $m^{\text{th}}$  principal components should accord with  $D_k \geq 85\%$  of the corresponding eigenvalues  $\lambda_1, \lambda_2, \dots, \lambda_m$  ( $m \leq p$ ) (Zhang, 2004; Li, 2008; Shen *et al.*, 2012).

**Calculating principal component squared loadings:**

The equation is:

$$I_{ij} = p(Z_i, x_j) = \sqrt{\lambda_i} e_{ij} (i, j = 1, 2, \dots, p) \tag{6}$$

Then, component score is calculated as follows:

$$Z = \begin{bmatrix} z_{11} & z_{12} & \dots & z_{1m} \\ z_{21} & z_{22} & \dots & z_{2m} \\ \vdots & \vdots & & \vdots \\ z_{n1} & z_{n1} & \dots & z_{nm} \end{bmatrix} \tag{7}$$

**RESULTS AND DISCUSSION**

**Principal component analysis:** According to above research methods, this study analyzed the data sets by virtue of statistical software SPSS 20. The primary results of principal component analysis are presented as follows:

**KMO test:** KMO (Kaiser-Meyer-Olkin) test is used to compare simple correlation coefficients and partial correlation coefficients among the variables. KMO test value ranges from 0 to 1. When it is closer to 1, meaning that the stronger the correlation among the variables, the more suitable the variables are analyzed through PCA. On the contrary, when it is closer to 0, indicating that the weaker the correlation among the variables, the more unsuitable the variables can be used for PCA. The KMO value over 0.6 usually indicates suitability for PCA (Lin, 2007).

According to Table 3, the result of KMO test for all the variables was 0.795, which is suitable for PCA. Similarly, Bartlett’s test of sphericity produces a concomitant probability of 0.000, which is less than the significance level of 0.05. Therefore, it is acceptable for the data set to be processed by the PCA method (Shen *et al.*, 2012).

**Determination of principal components:** The variances are analyzed with the PCA method and its varimax rotation after KMO test. The explanatory table

Table 3: Results of KMO and Bartlett’s test

Kaiser-Meyer-Olkin measure of sampling adequacy		0.795
Bartlett's test of sphericity	Approx. chi-square	247.760
	df	45
	Sig.	0.000

of total variance and rotated component matrix are generated (Table 4 and 5). Table 4 shows that there are the first 3 principal components whose eigenvalues are bigger than 1 and their rotated cumulative variance have a contribution percentage of 96.85%. Therefore, three synthesized factors out of ten variables were extracted through PCA with the cumulative up to 96.85%.

Table 5 shows the rotated component matrix, where the coefficients refer to the correlations between a principal component and its corresponding variables. The left most column includes ten related indicators. The top row includes three principal components as obtained by PCA. The realistic meaning of a principal component can be synthesized by combining those of the variables which have relatively high coefficients (absolute value) on it. The foremost three principal components, identified by PCA, were thus interpreted as follows (Table 6):

The 1<sup>st</sup> principal component represents the comprehensive strength of catering and food service industry. Four variables, as shown in Table 6, whose coefficients (absolute value) on this principal component are relatively high among all the variables, are identified to interpret it (Fang *et al.*, 2004). They are, respectively: Revenue from principal business of above designated size ( $x_8$ ) (0.855), Profits of principal business ( $x_{10}$ ) (0.845), Cost of principal business ( $x_9$ ) (0.821) and Total investment in fixed assets in hotel and catering services ( $x_5$ ) (0.675). The combination of these variables indicates the comprehensive strength of catering and food service industry.

The 2<sup>nd</sup> principal component reflects the development of social and economy. Among all the variables, Number of employed persons ( $x_7$ ) (0.854), Retail sales of hotel and catering services ( $x_6$ ) (0.647) and Tourism earnings ( $x_4$ ) (0.628) are identified. Their factor loadings are relatively high among all the variables. Summarily, this principal component

Table 4: Total variance explained

Component	Initial eigenvalues			Rotation S.S. loadings		
	Eigenvalues	% of variance	Cumulative %	Eigenvalues	% of variance	Cumulative %
1	8.843	88.426	88.426	4.005	40.045	40.045
2	0.469	4.691	93.117	2.905	29.053	69.098
3	0.373	3.734	96.850	2.775	27.752	96.850
4	0.242	2.417	99.267			
5	0.053	0.527	99.794			
6	0.014	0.139	99.933			
7	0.005	0.050	99.983			
8	0.001	0.008	99.992			
9	0.001	0.005	99.997			
10	0.000	0.003	100			

Extraction method: Principal component analysis; S.S.: Sum of square

Table 5: Rotated component matrix

	Principal component		
	1	2	3
$x_1$	0.484	0.552	0.669
$x_2$	0.547	0.559	0.614
$x_3$	-0.359	-0.272	-0.872
$x_4$	0.560	0.628	0.522
$x_5$	0.675	0.498	0.422
$x_6$	0.566	0.647	0.496
$x_7$	0.365	0.854	0.276
$x_8$	0.855	0.386	0.330
$x_9$	0.821	0.399	0.390
$x_{10}$	0.845	0.341	0.397

indicates the development of social and economy also play a role in catering and food service industry.

The 3<sup>rd</sup> principal component represents residents' consumption willingness to catering services. Three variables, which have relatively high coefficients among all the variables on this principal component, are respectively, Engel's coefficient of urban households ( $x_3$ ) (0.872), per capital annual cash consumption expenditure in catering services ( $x_1$ ) (0.669) and per capital annual disposable income of urban households ( $x_2$ ) (0.614). Note that  $x_3$ 's coefficient is negative. It discloses the actual phenomenon that the more the percentage expends on food, the residents' consumption towards catering and food service industry is.

**Expression of principal components:** Table 7 shows the component score coefficient matrix. In other words, the comprehensive score of 1st principal component ( $F_1$ ) can be expressed through the equation below:

$$F_1 = -0.236x_1 - 0.124x_2 + 0.308x_3 - 0.103x_4 + 0.211x_5 - 0.093x_6 - 0.374x_7 + 0.591x_8 + 0.499x_9 + 0.571x_{10}$$

Accordingly,

$$F_2 = 0.085x_1 + 0.094x_2 + 0.508x_3 + 0.290x_4 + 0.043x_5 + 0.344x_6 + 1.072x_7 - 0.228x_8 - 0.229x_9 - 0.361x_{10}$$

$$F_3 = 0.409x_1 + 0.265x_2 - 1.083x_3 + 0.037x_4 - 0.104x_5 - 0.030x_6 - 0.464x_7 - 0.290x_8 - 0.171x_9 - 0.127x_{10}$$

Table 6: Explanation of the principal components

Principal component	Explanation of principal components	Main indicator	% of variances
1	Comprehensive strength of catering and food service industry	Revenue from principal business of above designated size ( $x_8$ ), profits of principal business ( $x_{10}$ ), cost of principal business ( $x_9$ ), total investment in fixed assets in hotel and catering services ( $x_5$ )	40.045
2	Development of social and economy	Number of employed persons ( $x_7$ ), retail sales of hotel and catering services ( $x_6$ ), tourism earnings ( $x_4$ )	29.053
3	Residents' consumption willingness to catering services	Engel's coefficient of urban households( $x_3$ ), per capital annual cash consumption expenditure in catering services ( $x_1$ ), per capital annual disposable income of urban households ( $x_2$ )	27.752

Determining relative weights of the principal components is critical to formulate the comprehensive assessment model. In general, the weights can be obtained by calculating the proportion of the corresponding variance to the cumulative variance of all selected principal components (Zhang, 2004; Shen *et al.*, 2012), as shown in Formula (8):

$$F = \sum_{i=1}^m \left( \frac{\lambda_i}{\lambda_1 + \lambda_2 + \dots + \lambda_m} \right) \cdot F_i \tag{8}$$

where,  $m$  is the number of principal components.

As a result, the comprehensive assessment model in this study is:

$$F = 0.413F_1 + 0.300F_2 + 0.287F_3 \tag{9}$$

Moreover, this study can get the relation between  $F$  and the original variables as shown by the equation below (Table 8):

$$F = 0.045x_1 + 0.053x_2 - 0.031x_3 + 0.055x_4 + 0.070x_5 + 0.056x_6 + 0.034x_7 + 0.093x_8 + 0.088x_9 + 0.091x_{10} \tag{10}$$

**Extraction of the relatively important indicators:** In addition, this study respectively uses the importance coefficient of each assessment indicator to minus the mean value (0.056). If the result is larger than 0, it means that the indicator is relatively important; while if it is smaller than 0, it indicates that the indicator is relatively unimportant.

It can be seen from Fig. 1 that 5 indicators consisting of  $x_5$ ,  $x_6$ ,  $x_8$ ,  $x_9$  and  $x_{10}$ , have importance coefficients that are larger than the mean value, indicating they are relatively important for affecting the development of catering and food service industry.

**Comprehensive scores of principal components:** At last, standardized data of each indicator are substituted in Formula (10) to calculate the comprehensive scores of principal components for all years 2000-2011 (Table 9). The higher the value, it is shown that the development of catering and food service industry is the better.

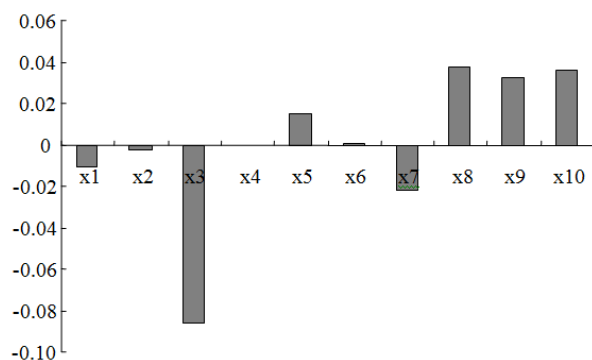


Fig. 1: Comparison of the importance of assessment indicators

Table 7: Component score coefficient matrix

	Principal component		
	1	2	3
x <sub>1</sub>	-0.236	0.085	0.409
x <sub>2</sub>	-0.124	0.094	0.265
x <sub>3</sub>	0.308	0.508	-1.083
x <sub>4</sub>	-0.103	0.290	0.037
x <sub>5</sub>	0.211	0.043	-0.104
x <sub>6</sub>	-0.093	0.344	-0.030
x <sub>7</sub>	-0.374	1.072	-0.464
x <sub>8</sub>	0.591	-0.228	-0.290
x <sub>9</sub>	0.499	-0.229	-0.171
x <sub>10</sub>	0.571	-0.361	-0.127

Table 8: The importance coefficient of assessment indicators

Indicator	Principal component			Σ
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	
x <sub>1</sub>	-0.097	0.026	0.117	0.045
x <sub>2</sub>	-0.051	0.028	0.076	0.053
x <sub>3</sub>	0.127	0.152	-0.310	-0.031
x <sub>4</sub>	-0.042	0.087	0.010	0.055
x <sub>5</sub>	0.087	0.013	-0.030	0.070
x <sub>6</sub>	-0.039	0.103	-0.009	0.056
x <sub>7</sub>	-0.155	0.321	-0.133	0.034
x <sub>8</sub>	0.244	-0.068	-0.083	0.093
x <sub>9</sub>	0.206	-0.069	-0.049	0.088
x <sub>10</sub>	0.236	-0.108	-0.036	0.091

Table 9: The comprehensive scores from 2000 to 2011

	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	ΣF
2000	-0.120	-0.446	-1.669	-0.662
2001	-0.335	-0.495	-1.072	-0.594
2002	-0.585	-0.622	-0.371	-0.535
2003	-1.108	1.034	-0.995	-0.433
2004	-0.110	-0.034	-0.858	-0.302
2005	-0.661	-0.659	0.946	-0.200
2006	-0.511	-1.000	1.380	-0.116
2007	-0.482	-0.465	1.066	-0.033
2008	0.742	-0.536	0.631	0.327
2009	1.123	0.309	0.272	0.635
2010	2.516	0.269	-0.197	1.064
2011	-0.468	2.645	0.869	0.849

**Discussion:** From the analysis above, it can be seen that relatively important indicators in terms of catering and food service industry comprise Revenue from principal business of above designated size (x<sub>8</sub>), Profits of principal business (x<sub>10</sub>), Cost of principal business (x<sub>9</sub>), Total investment in fixed assets in hotel and catering

services (x<sub>5</sub>) and Retail sales of hotel and catering services (x<sub>6</sub>). Among them, the former three indicators are all related to the own development of catering and food service industry. Meanwhile, according to principal component analysis theory, the first principal component accounts for the largest proportion of total variance of the cases. It implies that the own comprehensive strength differentiates most greatly on catering and food service industry in Harbin City. It can be seen from Table 1, the revenue from principal business showed an increasing trend from 2000 to 2011 in Harbin City, but a decrease in 2011. Profits of principal business increased from 66.46 million Yuan in 2000 to 648.47 million Yuan in 2011, approximately 9.76 times. In 2011, there were about 20000 enterprises of hotel and catering services in Harbin City. Among them, 571 corporation enterprises, chain catering and self-employed households of the annual income of main business at and over 2 million Yuan created 5.29 billion Yuan business revenue. Therefore, enhancing the own comprehensive strength is considered to be the key to improve the development of catering and food service industry in Harbin City.

Meanwhile, the final comprehensive scores (ΣF) showed an increasing trend, which the development of indicated catering and food service industry keep a good impetus. In terms of own condition, the revenue and profits of catering and food service industry has increased year by year. With respect to the macroscopic circumstances of society and economy, total investment in fixed assets in hotel and catering services showed a trend of substantial increase, from 13.47 million Yuan to 2743.72 million Yuan, approximately 204 times. The retail sales of hotel and catering services increased from 4.13 billion Yuan in 2000 to 27 billion Yuan in 2011. The rapid development of tourism industry attracts a large number of tourists, further drives the development of catering and food service industry. Furthermore, a great change has taken place in residents' consumption structure and consumption demand for catering services has risen sharply. Consequently, these combined factors create favorable circumstances for the development of catering and food service industry in Harbin City.

## CONCLUSION

After the analysis of the current situation of catering and food service industry at home and abroad, ten indicators were identified as influencing factors. Furthermore, principal component analysis approach is applied to establish an indicator system for assessing the contribution of influencing factors to catering and food service industry. Finally, a principal component structure consist of three principal components are extracted out of ten indicators, which can be synthesized respectively as comprehensive strength of catering and food service industry, development of social and economy and residents' consumption

willingness to catering services. Among ten indicators, five relatively important indicators in terms of catering and food service industry were prioritized as Revenue from principal business of above designated size ( $x_8$ ), Profits of principal business ( $x_{10}$ ), Cost of principal business ( $x_9$ ), Total investment in fixed assets in hotel and catering services ( $x_5$ ) and Retail sales of hotel and catering services ( $x_6$ ).

The indicators presented in this study have been proved to be reliable and reasonable through a series of statistical analysis. The identified indicators can be adopted to assess the contribution to catering and food service industry. Therefore, it is concluded that principal component analysis method have great application potential for better understanding of influencing factors of catering and food service industry.

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