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RESEARCH ON CONSTRUCTING COMPOSITE INDEX OF OBJECTIVE WELL-BEING FROM CHINA MAINLAND*

Zhanjun Xing¹, Lei Chu²

ABSTRACT

This paper presents some results of the study employing the Quality of Life (QOL) index that was initiated in China during 1980s. Currently, some progress has been made in the research field. For one thing, many researchers defined QOL as a composite structure which included subjective and objective elements. Considerable summary of well-being indices has been constructed from different analysis units (e.g., cities, province, and nations). For another, statistical methods played an important part in determining the weights of these indices, either objective weighting or subjective weighting. This paper defines the concept of QOL as the quality of people's being, which is used in analyzing the well-being of people's living condition and also reflected their subjective well-being to the living condition. Based on this concept, an analytical system of Chinese people's well-being was elaborated. 115 indices from five aspects reflecting the characteristics of the Chinese people's objective well-being have been initially proposed. Economic well-being, health and basic survival well-being, social well-being, cultural well-being, political well-being and environmental well-being have been taken into consideration. Through the analysis of content validity of experts and correlation analysis, 58 indices were selected. The weights of the subjective and objective indices were determined through analytic hierarchy process (AHP) and principal component method respectively. By combining the weight coefficients obtained from the two approaches, the composite indicator of Chinese people's objective well-being was performed and the objective well-being level of 30 Chinese provinces was evaluated.

Key words: Quality of life, Objective well-being index, Analytic hierarchy process, China Mainland.

¹ School of Political Science and Public Administration, Shandong University, Jinan City, P.R. China. E-mail: xingzhanjun@163.com.

² School of Philosophy and Social Development, Jinan City, P.R. China. E-mail: alexchu0220@hotmail.com.

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1. Introduction

People's Republic of China, which has a total population of about 1.3 billion, economically frail before 1978, has again become one of the world's major economic powers with the greatest potential. In the last 30 years following the reform and opening-up in 1979 in particular, China's economy developed at an unprecedented rate, and that momentum has been held steady into the 21st century. But as the biggest developing country, China's rapid development faces a series of new problems including environmental pollution, income inequality, food safety, etc.; the effort to safeguard and improve people's quality of life (QOL) has been adversely affected. Now, the public policy aims at improving people's well-being and raise the level of public services included in the Twelfth Five-Year Plan (2011-2015) (China adopts the "five-year-plan" strategy for economic). This is an appropriate time to compile a composite index to monitor the well-being in China mainland.

The study of QOL indices had been initiated since the 1980s last century in China. Currently, some progress has been made in this research field and it can be summarized into three stages.

The Earlier research in China mainland can be traced back to the draft of social statistical indicators prepared by National Bureau of Statistics of China in 1983. In the mid-1980s, Chinese-American sociologist Lin cooperated with Tianjin Academy of Social Sciences and Shanghai Academy of Social Sciences to study the urban residents' quality of life (Lin, et al. 1989). This research defined quality of life based on the satisfaction preferences, obviously by the subjective well-being tradition. For example, through factor analysis and structural model analysis, Lin and his co-workers set forth a series of structures and indicators for urban residents' quality of life. Specifically, this study selected 22 aspects of people's lives, and classified into five categories by factor analysis: the social characteristics of work, the economic characteristics of work, the family relationships, the relationships outside the family and leisure time. In contrast with scholars' definitions of quality of life, the government departments and policy research institutions put emphasis on objective well-being that can reflect social development, for the data availability and effectiveness of policies.

Started from 1990s, Chinese Academy of Social Science, National Bureau of Statistics of China, Ministry of Agriculture of China and other organizations have attempted to define the concept of well-off and use a statistical monitoring indicator system to describe the process of Chinese building a well-off society in an all-around way (National Bureau of Statistics of China, 1992-2010). As an indispensable part of this indicator system, quality of life, especially the objective content, has been concerned by policy makers and society. Meanwhile, in order to narrow the gap with foreign researchers, Chinese researchers remain active in cooperation and exchanges with Western scholars (Zhou. et al., 2004). For this reason, much more advanced technologies and approaches have been used in

QOL researches, particularly in the constructions of objective well-being indicators.

Recently, with the strategic decision to build a harmonious society in China, subjective well-being (as the core indicators of QOL) has been brought into public focus. Meanwhile, a group of young scholars are becoming the main force in this field (Zhou. et al., 2004; Xing et al., 2007). In addition, in order to make the achievement can serve the public policy-making, Chinese scholars pay more attention on public policy-oriented of well-being and quality of life researches. It reflects in the concept of well-being, the selection of indicators and the presentation of the QOL reports.

From what has been discussed above, the goal of this research is to develop a composite indicator of objective well-being from China mainland, which could provide both theoretical and practical implications for public policy.

2. Concept of Well-being

Reviewed from literature on QOL or well-being, there is an absolute consensus that a comprehensive definition of QOL must include two linked dimensions, namely an objective one and a subjective one, and an increasingly number of comprehensive concepts of well-being which reflect both individual well-being and social well-being have been put forward. Examples can easily be found to show this trend.

Erik Allardt (Allardt, 1973) started from distinguishing between three basic needs of human beings, namely Having, Loving, and Being, to propose his concept of well-being, which includes objective conditions and subjective need satisfactions. Obviously, there is a great deal of difference between such a broader concept of quality of life and the traditional Scandinavian level of living approach (Erikson, 1993; Uusitalo, 1994). In addition, based on the constellation of objective living conditions and subjective well-being across different life domains, German notion of QOL also combines with objective and subjective dimensions together (Zapf, 1984). In this concept, well-being means good living conditions and positive subjective well-being. Another comprehensive concept of well-being was explored by the UK policy makers and stakeholders who identify the well-being as an implicit goal of Government policy. Such a common understanding of well-being was developed on the UK 2005 sustainable development strategy, *Securing the future*, written by Defra (Department for Environment, Food and Rural Affairs) and other government department of UK (Defra, 2005):

“Well-being is a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity. It requires that basic needs are met, that individuals have a sense of purpose, that they feel able to achieve important personal goals and participate in society.”

Moreover, this statement considers that well-being is enhanced by some essential conditions, "Supportive personal relationships, strong and inclusive communities, good health, financial and personal security, rewarding employment, and a healthy and attractive environment." Among others things, such understanding of well-being links with public policy by emphasizing the role of government about people's well-being, which is to enable people have a fair access to achieve the social, economic and environment resources now and in the future.

Therefore, taking into account this trend on concept of well-being that has been discussed above, this paper defines the concept QOL or Well-being as the quality of people's being, which is used in analyzing the well-being of people's living condition and reflecting their subjective well-being to the living condition (**Fig. 1**). In fact, this definition can be explained from four aspects as follows:

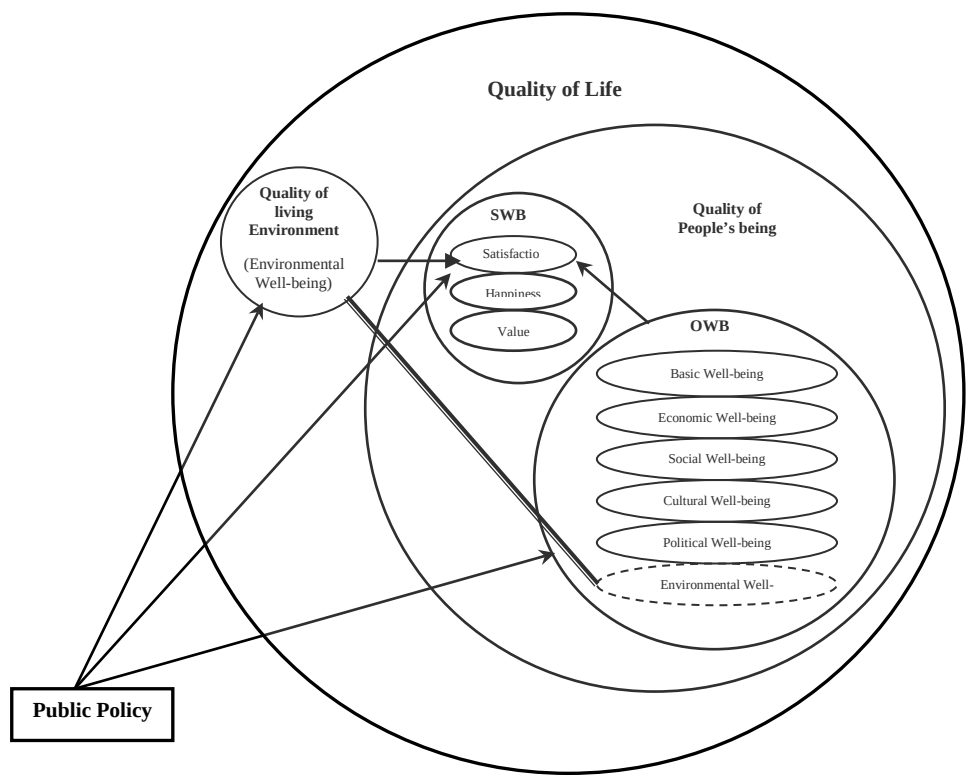
1. Combining the quality of people's being as well as the quality of the natural environment (Environmental well-being); Quality of life could be regarded as a complex system which adheres to the concept of sustainable development.

2. The quality of people's being means the degree of people's need are being met, it is reflected in citizens' satisfaction with objective living conditions and the level of subjective of well-being.

3. Subjective well-being here is defined as people's own subjective experience to their survival and development conditions. It mainly consists of satisfaction, happiness and value components. Specifically, satisfaction refers to the residents' cognition and evaluation of different domains; Happiness is the positive emotion that people can experience; Sense of self-worth means a person's target location and spiritual support of life.

4. Objective well-being state refers to the conditions that citizens achieve from social system, including health and survival well-being, economic well-being, political well-being, social well-being and cultural well-being. Furthermore, as a component of objective conditions, quality of natural environment also could be included, and could be operationalized as environmental well-being.

Figure 1. Theoretical framework of quality of life



3. Methods and Results

Regarding different characters of objective indicators and subjective indicators, we adopt distinct approaches of obtaining weight for each type of them. And in this research we put focus on obtaining weights of objective well-being and the final composite of objective well-being index.

3.1. Design of Life domains and sub-classifications

According to the concept of QOL above, this research defines six life domains of well-being, namely health and basic survival well-being, economic well-being, environmental well-being, cultural well-being, social well-being, and political well-being. Definitions of these six life domains are presented as follows:

Health and basic survival well-being, a major domain of quality of life index, is defined as the conditions provided by society to meet citizens' need of health

and basic survival as well as citizens' satisfaction of those conditions. To meet the needs of health and basic necessities of life is the most necessary conditions to ensure that people can engage in normal economic, political, social, and cultural activities. According to this definition, we will make evaluation both from health and basic survival.

Economic well-being is defined as the situation of residents' material wealth and its fairness, which are reflected by the sub-classifications of income level, consumption level, as well as labor and employment. While emphasizing residents' real income level, economic well-being pays more attention to fairness and rationality of the results of economic development. Specially, income level focuses on measuring of residents' income and its fairness, while consumption level focuses on measuring of residents' consumption. In addition, Labor and employment is regarded as the measurement of residents' employment status and the rationality of overall economic structure.

Environmental well-being is that some appropriate conditions provided by natural environment to meet the survival, reproduction and development of human being during a period of time. As a result of the protection and the governance of the natural environment by people in order to maintain these conditions favorable, people can maintain positive interaction between human activities and the environment. According to the definition of environment well-being which is mainly based on the theory of sustainable development, we set up three sub-classifications: resources and environmental quality, environmental pollution and governance, and the subjective evaluation. These three parts represent the evaluation of the quality of existing environment and resources, the situation of environmental pollution and governance, and citizens' satisfaction of the natural environment.

Cultural well-being could be defined as the security condition of a variety of spiritual activities and products as well as the degree of satisfaction of the needs of cultural life, which is a reflection of the quality of spiritual life of the residents and one of the crucial criteria of the comprehensive and sustainable development of human beings. According to the above definition and a synthesis of current situation of the research at home and abroad, we will construct a primary index framework of culture well-being in terms of the education level and leisure resources (including multifarious arts, sports and recreational activities). The education level refers to the potency dimension of the input and achievements of the output while the leisure resources refer to the security condition and degree of satisfaction of the leisure products and services of the inhabitants.

Social well-being is the state which universally provides all citizens with a social system in accordance with law to guarantee a certain standard of living and improve the fund and services for quality of life as much as possible. It aims to solve all aspects of social welfare issues for the majority of social members, including protection and non-protection of the welfare as a whole. In the sub-classification level: (1) relief protection is a way of guarantee that the nation and region provided the basic living security relief to poverty residents or ones with temporary difficulties. It covered protection situation of minimum living groups, social vulnerable groups and temporary disadvantaged groups. (2) social

interaction is the government encouragement and support, social organizations and social members voluntarily organize and participate in the activities to help the weak; their funding mainly come from donations and the voluntary payment, and the government often provides taxation support. (3) welfare service is the state and region input state in terms of infrastructure and public services to protect and improve quality of life of the residents. (4) public safety is the life, health of most people and safety of public property, which is the basic element to protect the residents enjoying a normal quality of life.

Political well-being refers to citizens in certain society on democracy, freedom and human rights, rule of law and the results of psychological satisfaction. Political demand is developed on the basis of a higher level of economic demand, this demand mainly for the desire for political freedom, the acquisition and use of political power and the participation in political process, etc. Political well-being, namely to the extent that political rights are fully realized, it is an important component of individuals' whole quality of life. Furthermore, political well-being will be analyzed at the national level only and not included in the next research procedures.

3.2 The Selection of indicators

Based on a great number of western studies on well-being indicators construction, and previous Chinese scholars' researches of QOL, this research chose 115 indicators mainly from China Statistical Yearbook for the selection by Content Validity Ratio analysis and Correlation analysis. The indicators of national level were not analyzed in next step.

However, because of differences among social indicators, the non-dimensional indicators of treatment must be done before data analysis. This treatment was computed from the following formulas:

$$Z_i = \frac{X_i - X_{\min}^i}{X_{\max}^i - X_{\min}^i} \quad (\text{For the positive indicators, such as Life expectancy})$$

$$Z_i = \frac{X_{\max}^i - X_i}{X_{\max}^i - X_{\min}^i} \quad (\text{For the negative indicators, such as Perinatal mortality})$$

Where X_i is the one index data of one province in China mainland for a year, $X_{\min}^i$ is the minimum data of the same index in the same year among 31 provinces, $X_{\max}^i$ is the maximum data of the same index in the same year among 31 provinces, Z_i is the new data as a result of the non-dimensional treatment, and will be analyzed in next steps.

3.2.1 Content Validity Ratio analysis

Through literature searching, we chose a number of scholars in the QOL or other related research fields and got contact with them by mail, E-mail or telephone to help us on selecting the appropriate indicators from these alternative ones. Moreover, most of those experts also took part in another survey of our study for the AHP analysis.

The content validity ratio (CVR) is a psychometric concept representing the rating of item relevance to select items for the test. By completing the Likert scale we designed, every expert was asked to evaluate the relevance of each indicator that we chose to people’s quality of life. Then, the content validity of ratio of each indicator was computed from the following formula (Lawshe, 1975):

$$CVR = \frac{n_i - \frac{N}{2}}{\frac{N}{2}} \tag{1}$$

3.2.2 Correlation analysis

The correlation between social indicators is another factor that should be taken into account during the process of selection of indicators. It is unaccepted neither high nor low correlation. First of all, we collected data of each social indicator from 2000 to 2009 to form a database and did the non-dimensional treatment. Secondly, the correlation analysis was operated between every two indicators which were in the same sub-classification, and between the sum of all indicators from the same sub-classification and one of those indicators. Thirdly, we set the criterion in this step for indicators selection: if an indicator presents a highly positive correlation with the sum of all indicators in the same sub-classification as well as presents a low positive correlation with other indicators in the same sub-classification, it should be selected into our well-being index.

Then, by content validity ratio analysis and correlation analysis, a total of 56 social indicators were selected to constitute the objective part of this well-being index (Table 1).

Table 1. Description of composite indicator of objective well-being from China mainland

Well-being index	Sub-classification	Indicators
Health and Survival well-being	Health	A1 Number of doctors per thousand population
		A2 Mortality rate of children under-five
		A3 Perinatal mortality
		A4 Life expectancy
	Basic survival	A5 Coverage rate of rural population with access to running water
		A6 Consumer spending accounts for clothing in the ratio of per capita annual consumption expenditure
		A7 Per capita floor space of residential building
		A8 Coverage rate of urban population with access to gas
		A9 Coverage rate of rural population with access to sanitary latrines

Economic well-being	Income level	A10 Number of civilian passenger cars per thousand population
		A11 Coverage rate of road accessibility in rural and towns
	Consumption level	A12 Mortality rate per ten thousand cars
		B1 Residents' Per Capita Income
		B2 Gini Coefficient
		B3 Annual Per Capita Living Expenditure of Urban and rural residents Households
	Labor and Employment	B4 Consumer Price Index
		B5 Urban and rural residents Household's Engel's Coefficient
B6 Registered Urban Unemployment Rate		
B7 The Ratio of Value-added of the Tertiary Industry to GDP		
Environment well-being	Resources and Environment quality	B8 The Ratio of Total Wages Bill of Staff and Workers to GDP
		C1 Energy Consumption per Unit of GDP
	Environment pollution and governance	C2 Urban air quality compliance rate
		C3 Per Capita Green Covered Area in the urban
		C4 Total Volume of Industrial Waste Gas Emission
		C5 Industrial Wastewater Discharge compliance rate
		C6 Proportion of Comprehensive utilization of industrial solid waste
		C7 Investment in Anti-pollution Projects as Percentage of GDP
Culture well-being	Education level	C8 Proportion of Harmless Treated Garbage in the urban
		D1 Teacher-student ratio of elementary, middle and high education
		D2 Adult Literacy Rate
		D3 Average years of education of six years old and above
	Leisure resources	D4 Ratio of Cultural and recreational consumption in aggregate consumption expenditure
		D5 Per capita expenditure for operating of cultural undertakings
		D6 Users accessing the Internet per million
		D7 Popularity rate of the color television receiver
Social well-being	Security and relief	D8 Numbers of published books, newspapers and magazines
		E1 Basic social insurance coverage ratio
		E2 Capita unemployment insurance benefits paid
		E3 Urban low level of average expenditure
	Social solidarity	E4 Rural minimum insurance average level of expenditure
		E5 Per expenditure on civil affair expenses
		E6 Ten-thousand capita the number of social organizations
	Welfare services	E7 Number of social donations capita
		E8 Thousand capita the number of hospital beds
		E9 Ten-thousand capita the number of urban benefit the public networks
Political well-being (National level)		E10 Ten-thousand capita the number of urban public toilets

3.3. A Subjective and Objective Integrated Approach to Determine Attribute Weights

The combined method of analytic hierarchy process (AHP) and principal component analysis (PCA) was applied to the comprehensive evaluation of objective well-being from China mainland. In the first stage, the weights of each indicators, sub-classification and life domain were obtained by AHP, than an

objective analysis was made, namely PCA, to evaluate the objective well-being in this study.

3.3.1. Analytical Hierarchy Process

The Multi Criteria Decision Making (MCDM) is a set of techniques which is able to weight and score a range of criteria and then the scores are ranked by the expertise and other related interested groups. Analytical Hierarchy Process (AHP) is one of the MCDM methods which are widely applied to human field such as project design, policy evaluation, and resources allocation (Cheng et al., 2005). In addition, the previous researches show that this subjective approach of obtaining weights is very suitable for solving complicate issues (Yuksel et al. 2007), and it was applied in obtaining subjective weights for composite well-being index (Sedigheh, et al., 2009; Lee, et al., 2011).

In this research, the AHP procedure involves three basic steps (Satty, 1985):

(1) The hierarchy construction: in this stage, we broke down our well-being concept into its component parts of which every possible attributes are arranged into multiple hierarchical levels (**Fig. 2**). The criteria and sub-criteria are not each equally important to the decision at each level of the hierarchy and each alternative rates differently on each criteria. Then, we combined and consolidated the evaluations of the alternatives and criteria by group involved in the decision-making task by the analytical process provided by AHP. For the characteristics of respondents (experts) for AHP, you can see from the part of content validity ratio analysis in this paper.

(2) Defining and executing data collection to obtain pair-wise comparison data on elements of the hierarchical structure. Given a pair-wise comparison, the analysis involves two tasks: ① Developing a comparison matrix at each level of the hierarchy starting from the second level and working down. Those comparisons were carried out through expert survey. **Table 2** shows the 9-point scale used in typical analytic hierarchy studies and also applied in our study ranging from 1 (indifference or equal importance) to 9 (extreme preference or absolute importance). This pair-wise comparison enabled the decision maker (experts) to evaluate the contribution of each factor to the objective independently, thereby simplifying the decision making process. ② Computing the relative weights for each element of the hierarchy and estimating the consistency ratio (*CR*) to check the consistency of the judgment (Chen, C.F., 2006). After the survey, each expert's choice in AHP judgment was collected by computer software and the relative weights of the objectives and corresponding criteria and the consistency ratios of the matrices could be calculated.

Figure 2. Structured hierarchy of objective well-being from China mainland

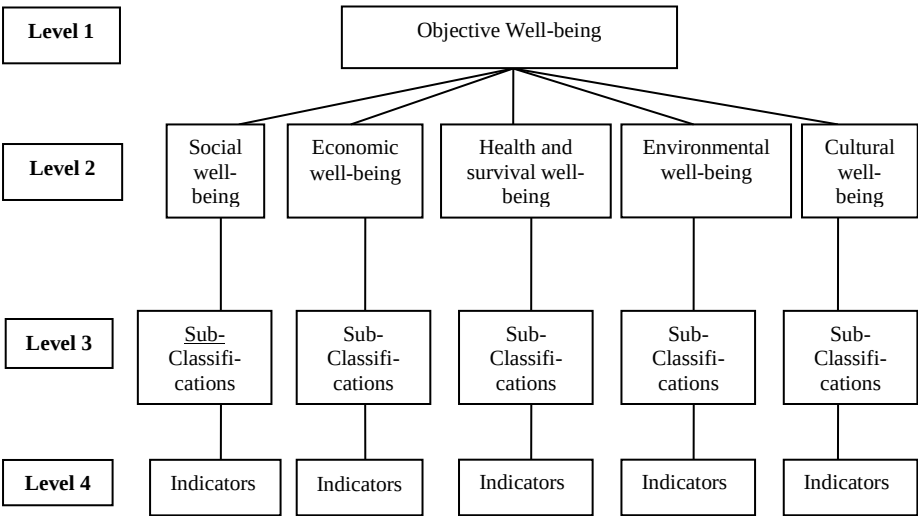


Table 2. 9-point intensity of relative importance scale (Satty and Kearns, 1985)

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored and its dominance
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values Between the two adjacent judgments	When compromise is needed
Reciprocals of above non-zero	If activity <i>i</i> has one of the above non-zero numbers assigned to it when compared with activity <i>j</i> , then <i>j</i> has the reciprocal value when compared with <i>i</i>	

Elements in each level are compared in pairs with respect to their importance to an element in the next higher level. Starting at the top of the hierarchy and working down, the pair-wise comparisons at a given level can be reduced to a number of square matrices $A = [\alpha_{ij}]_{n \times n}$ as in the following:

$$\begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{pmatrix}$$

The matrix has reciprocal properties, which are:

$$a_{ji} = 1/a_{ij}$$

After all pairwise comparison matrices are formed, the vector of weights, $w = [w_1, w_2, \dots, w_n]$, is computed on the basis of Satty's eigenvector procedure. The computation of the weights involves two steps. First, the pairwise comparison matrix $A = [\alpha_{ij}]_{n \times n}$ is normalized by Eq. (2) and then the weights are computed by Eq. (3):

$$a_{ij}^* = a_{ij} / \sum_{i=1}^n a_{ij} \quad (2)$$

for all $j = 1, 2, \dots, n$

$$w_i = \sum_{j=1}^n a_{ij}^* / n \quad (3)$$

for all $j = 1, 2, \dots, n$

Satty showed that there is a relationship between the vector weights, w and the pairwise comparison matrix, A , as shown in Eq. (4):

$$A w = \lambda_{\max} w \quad (4)$$

The $\lambda_{\max}$ value is an important validating parameter in AHP and is used as a reference index to screen information by calculating the Consistency Ratio (CR) of the estimated vector. To calculate the CR , the Consistency Index (CI) for each matrix of order n can be obtained from Eq. (5):

$$CI = \lambda_{\max} - n / (n - 1) \quad (5)$$

Then, CR can be calculated using Eq. (6):

$$CR = CI / RI \quad (6)$$

where, RI is the random consistency index obtained from a randomly generated pair-wise comparison matrix. **Fig. 3-8** shows the value of the CR . Suggested by Satty (Satty, 1980), if $CR < 0.1$, then the comparisons are

acceptable. If, however, $CR \geq 0.1$, the values of the ratio are indicative of inconsistent judgments and this expert's choice on this matrix will be deleted.

(3) Constructing an overall priority rating. The final weight was computed by computer software at group level (**Figure 3-8**).

Figure 3. Causal model of health & basic survival well-being (n=22)

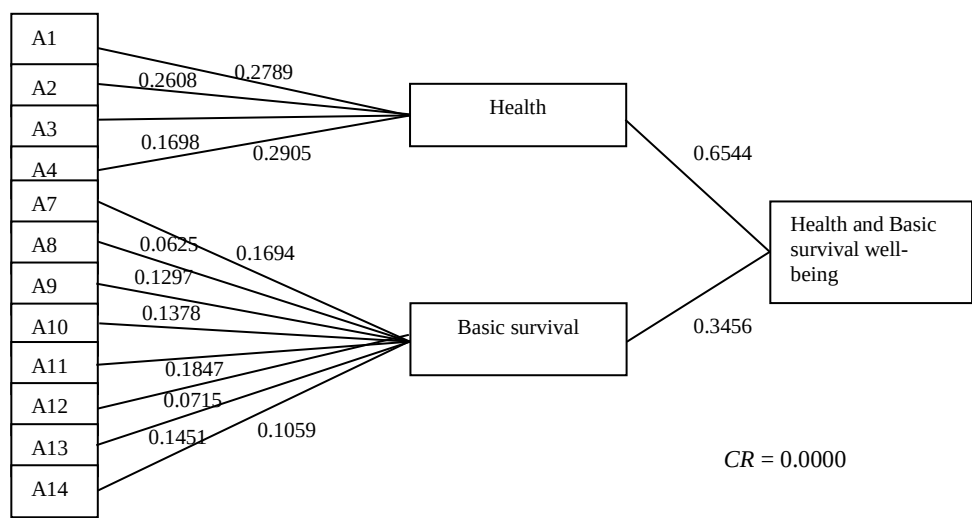


Figure 4. Causal model of economic well-being (n=22)

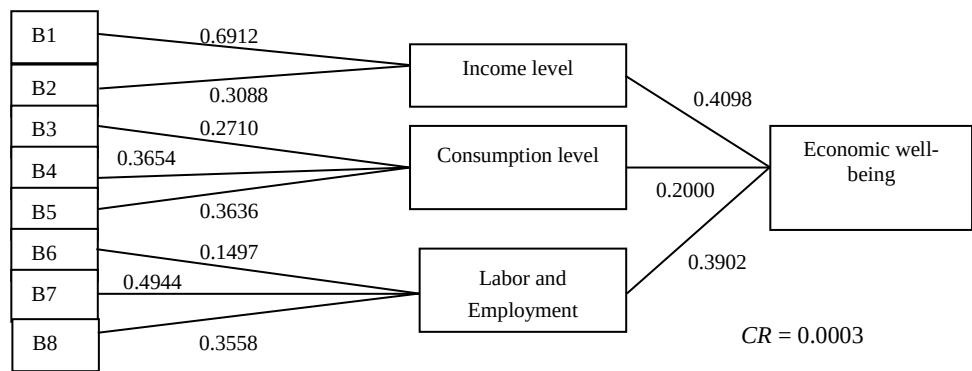


Figure 5. Causal model of environmental well-being (n=23)

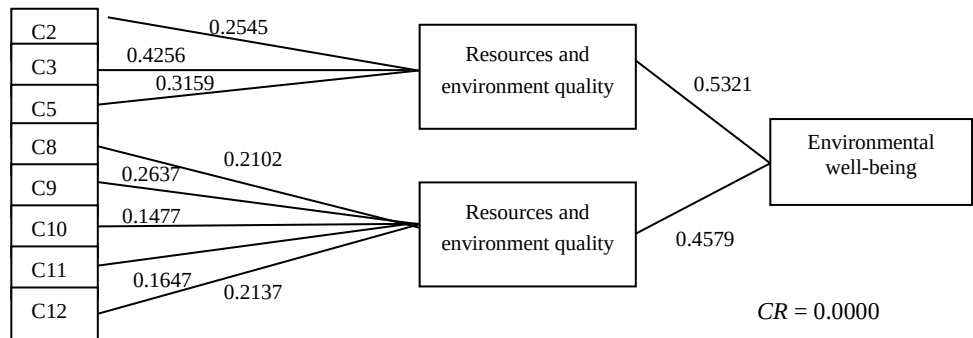


Figure 6. Causal model of cultural well-being (n=22)

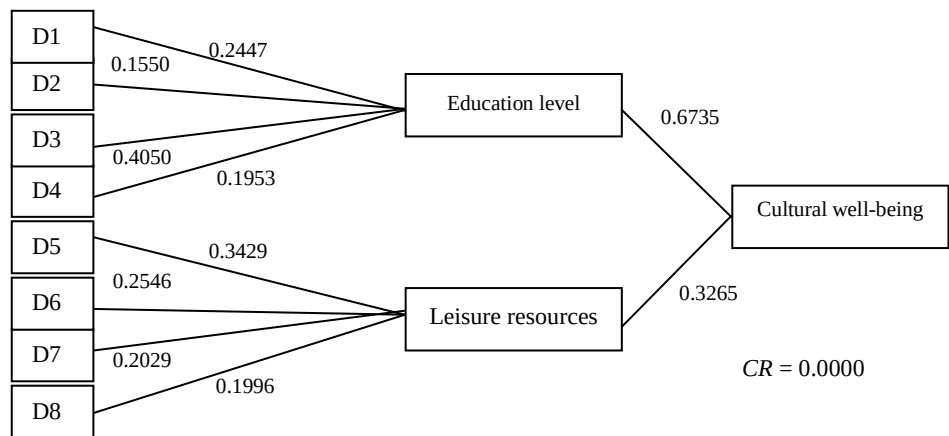


Figure 7. Causal model of social well-being (n=20)

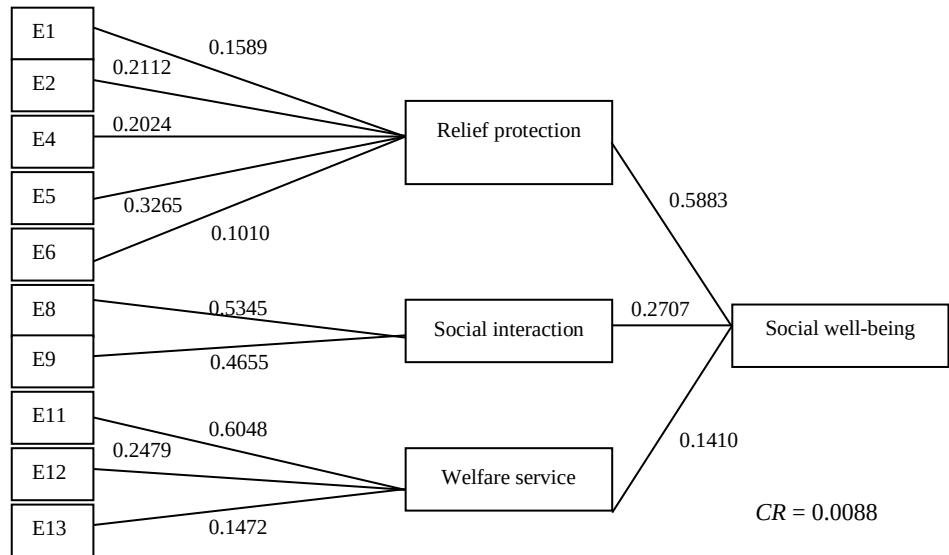
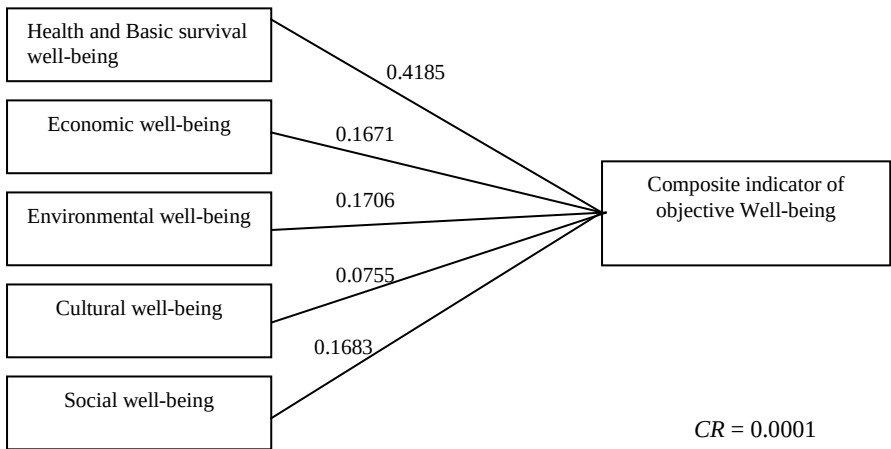


Figure 8. Causal model of objective well-being (n=22)



3.3.2. Principal Component Analysis

There is no denying that the AHP is a good approach to make the qualitative indicators can be measured. However, this approach has difficulty in reflecting the relationship between indicators, so in this step we introduced the Principal Component Analysis (PCA) to compensate for this limitation of AHP. The PCA is a multivariate statistical method for selecting the major factor from the objective data based on the variance to the target of an evaluation (Jolliffe, 2002). Regarding this principle of the PCA, first of all, we made transformation of 46 dimensionless indicators (the indicators of national level were not included) through weighted treatment by the following formulas:

$$Z_i^* = W_i Z_i \quad (i=1, 2, 3, \dots) \quad (7)$$

Where Z_i^* is the new data for each indicator to be transformed by the weighted treatment, W_i is the weight for each indicator obtained from the AHP in last step, Z_i is the dimensionless indicator data without weighting. Then the PCA analysis based on covariance and involving three basic steps was made to this new database (there is a new corresponding data from 31 provinces in China mainland during 2004-2008 for each indicator), and these steps were shown by the example of the 'Health', a sub-classification from health and basic survival well-being:

(1) Principal component extraction. According to the principle of multivariate statistical analysis, if the contribution rate of the first k principal components reaches 85%, it shows that these k components contains the basic information of

all indicators. The contribution rate of variance here means the relative importance of each major component (Jolliffe, 2002). In order to make each principal component extracted reflects one single quality to the greatest extent, we did the extraction for each sub-classifications of life domains. From the extraction by SPSS 15.0 on computer, we got two major components for health, and they contain 87.06% of information of this part.

(2) Computing score for every major component. In this stage, initial principal component analysis, eigenvalue and contribution rate were taken into account to get an expression for each major component. For the start, the eigenvectors were computed by the following formula:

$$a_{jl} = \sqrt{\frac{\mu_{jl}}{\lambda_l}} \quad (j=1, 2 \dots p; l=1, 2 \dots k) \tag{8}$$

Where μ_{jl} is the initial loading value of the j-th indicator corresponding to the l-th factor (**Table 3** shows the initial loading values of ‘Health’), while λ_l is the eigenvalue corresponding to the first factor. Second, we got the expressions of two major components or facts for ‘Health’ as follows:

$$F_1=0.392W_{a1}Z_{a1}+0.533W_{a2}Z_{a2}+0.503W_{a3}Z_{a3}+0.555W_{a4}Z_{a4} \tag{9}$$

$$F_2=0.839W_{a1}Z_{a1}-0.217W_{a2}Z_{a2}-0.493W_{a3}Z_{a3}+0.065W_{a4}Z_{a4} \tag{10}$$

Table 3. Component Matrix (Health)

	Component	
	1	2
1(A1)	.643	.745
2(A2)	.876	-.193
3(A3)	.826	-.438
4(A4)	.912	.058

Third, the evaluation score of ‘Health’ can be computed by this formula as follows:

$$Y_{HOWB}=0.6737F_1+0.1970F_2 \tag{11}$$

Where ‘0.6737’ and ‘0.1970’ are the contribution rate of variance corresponding to these two components respectively.

Then, we could get the evaluation score of another sub-classification of Health and basic survival well-being by the same steps. Meanwhile, these two score together is the score of Health and basic survival well-being.

Through the approach and procedures above-mentioned we have got the score of each life domain, then the total scores of well-being of every province in China mainland was computed through the following formulas indirectly:

$$Y_{HOWB\&SUOWB} = 0.429W_{a1}Z_{a1} + 0.316W_{a2}Z_{a2} + 0.241W_{a3}Z_{a3} + 0.387W_{a4}Z_{a4} + 0.175W_{a5}Z_{a5} + 0.183W_{a6}Z_{a6} + 0.300W_{a7}Z_{a7} + 0.226W_{a8}Z_{a8} + 0.232W_{a9}Z_{a9} + 0.121W_{a10}Z_{a10} + 0.207W_{a11}Z_{a11} + 0.154W_{a12}Z_{a12} \quad (12)$$

$$Y_{ECOWB} = 0.707W_{b1}Z_{b1} + 0.472W_{b2}Z_{b2} + 0.388W_{b3}Z_{b3} + 0.418W_{b4}Z_{b4} + 0.265W_{b5}Z_{b5} + 0.510W_{b6}Z_{b6} + 0.315W_{b7}Z_{b7} + 0.313W_{b8}Z_{b8} \quad (13)$$

$$Y_{ENOWB} = 0.021W_{c1}Z_{c1} + 0.236W_{c2}Z_{c2} + 0.535W_{c3}Z_{c3} + 0.112W_{c4}Z_{c4} + 0.276W_{c5}Z_{c5} + 0.328W_{c6}Z_{c6} + 0.063W_{c7}Z_{c7} + 0.263W_{c8}Z_{c8} \quad (14)$$

$$Y_{COWB} = 0.435W_{d1}Z_{d1} + 0.331W_{d2}Z_{d2} + 0.402W_{d3}Z_{d3} + 0.263W_{d4}Z_{d4} + 0.254W_{d5}Z_{d5} + 0.430W_{d6}Z_{d6} + 0.237W_{d7}Z_{d7} + 0.406W_{d8}Z_{d8} \quad (15)$$

$$Y_{SOOWB} = 0.292W_{e1}Z_{e1} + 0.290W_{e2}Z_{e2} + 0.304W_{e3}Z_{e3} + 0.242W_{e4}Z_{e4} + 0.416W_{e5}Z_{e5} + 0.214W_{e6}Z_{e6} + 0.707W_{e7}Z_{e7} + 0.566W_{e8}Z_{e8} + 0.150W_{e9}Z_{e9} + 0.117W_{e10}Z_{e10} \quad (16)$$

$$Y_{OWB} = 0.418Y_{HOWB\&SUOWB} + 0.167Y_{ECOWB} + 0.170Y_{ENOWB} + 0.075Y_{COWB} + 0.168Y_{SOOWB} \quad (17)$$

3.4. Results

By the process above, namely ACP-PCA approach, we got the score of objective well-being for 30 provinces of China mainland during 2004-2008 (owing to the lack of some data, the score of wellbeing for Xizhang Aut.Reg was not computed and did not participate in the final ranking). See in **Table 4** for the final results.

From the results in our research, we could find that the inequalities of objective well-being between different provinces and between different regions in China mainland are prominent issues due to the economic inequalities that are long-standing here. Moreover, this kind of regional disparity especially exists between the Western and Eastern area in China.

4. Conclusion and Discussion

Through constructing the comprehensive concept of well-being, this study is an attempt to compose objective well-being and subjective well-being together. In addition, it introduces the public policy-oriented perspective to the well-being study, which is reflected in the concept of well-being, the framework of indicators system, and the criteria in selecting indicators. Furthermore, according to the different disadvantages of subjective weighting approach and objective weighting approach, namely AHP and PCA respectively, this research adopts a synthesized method into the evaluation of objective well-being. So through this study, we gain experience in constructing the composite well-being index for a developing country. Obviously, since the concept of quality of life is multi-dimensions and involves many indicators, this paper only accomplished the task in evaluation of the objective part of well-being, the subjective well-being should be complemented next as well as the international comparison that is not included in this research.

Table 4. The score of objective well-being for every provinces of China mainland (2004-2008)

Objective well-being from China mainland (2004-2008)										
Provinces in China mainland	2004	Rank	2005	Rank	2006	Rank	2007	Rank	2008	Rank
Beijing	0.3899	1	0.3824	1	0.3965	1	0.3719	1	0.3782	1
Tianjin	0.2634	3	0.2689	3	0.2775	3	0.2786	3	0.2803	3
Heibei	0.1604	16	0.1685	13	0.1708	15	0.1635	17	0.1683	17
Shanxi	0.1723	11	0.1768	11	0.1828	11	0.1755	12	0.1833	11
Inner Mongolia Aut.Reg	0.1577	18	0.1630	17	0.1723	13	0.1682	14	0.1740	14
Liaoning	0.1902	8	0.2029	7	0.2071	8	0.1991	8	0.2080	7
Jilin	0.1886	9	0.1918	9	0.1949	10	0.1915	9	0.1946	10
Heilongjiang	0.1671	12	0.1744	12	0.1775	12	0.1789	11	0.1773	12
Shanghai	0.3274	2	0.3358	2	0.3428	2	0.3497	2	0.3500	2
Jiangsu	0.2102	6	0.2223	6	0.2323	6	0.2282	6	0.2336	6
Zhejiang	0.2398	4	0.2574	4	0.2622	4	0.2582	4	0.2602	4
Anhui	0.1347	26	0.1396	26	0.1503	24	0.1405	25	0.1494	26
Fujian	0.1846	10	0.1915	10	0.1982	9	0.1911	10	0.1992	9
Jiangxi	0.1446	23	0.1543	21	0.1570	23	0.1555	21	0.1648	19
Shandong	0.1908	7	0.1990	8	0.2110	7	0.2054	7	0.2054	8
Henan	0.1450	21	0.1511	23	0.1583	22	0.1545	22	0.1577	21
Hubei	0.1621	13	0.1661	14	0.1716	14	0.1642	16	0.1669	18

Table 4. The score of objective well-being for every provinces of China mainland (2004-2008) (cont.)

Objective well-being from China mainland (2004-2008)										
Provinces in China mainland	2004	Rank	2005	Rank	2006	Rank	2007	Rank	2008	Rank
Hunan	0.1456	20	0.1548	20	0.1625	20	0.1565	20	0.1641	20
Guangdong	0.2244	5	0.2308	5	0.2351	5	0.2308	5	0.2366	5
Guangxi Zhuang Aut.Reg	0.1449	22	0.1536	22	0.1593	21	0.1479	23	0.1518	25
Hainan	0.1602	17	0.1617	19	0.1634	19	0.1712	13	0.1754	13
Chongqing	0.1472	19	0.1621	18	0.1658	18	0.1648	15	0.1722	15
Sichuan	0.1307	27	0.1341	27	0.1398	27	0.1393	26	0.1522	22
Guizhou	0.1024	30	0.1115	30	0.1121	30	0.1037	30	0.0996	30
Yunnan	0.1096	29	0.1170	29	0.1198	29	0.1215	29	0.1296	28
Shaanxi	0.1426	24	0.1440	24	0.1465	25	0.1444	24	0.1525	23
Gansu	0.1294	28	0.1329	28	0.1319	28	0.1263	28	0.1306	29
Qinghai	0.1361	25	0.1397	25	0.1458	26	0.1358	27	0.1386	27
Ningxia Hui Aut.Reg	0.1618	15	0.1649	15	0.1697	16	0.1625	18	0.1717	16
Xinjiang Uygur Aut.Reg	0.1621	14	0.1645	16	0.1696	17	0.1567	19	0.1530	22
Xizhang Aut.Reg	—	—	—	—	—	—	—	—	—	—

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