Logit Analysis of Residents' Life Satisfaction Based on Big Data

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ABSTRACT
Based on six waves of pooled cross-sectional survey data from the second (1990) wave to the seventh (2018) wave of the World Values Survey (WVS) database, this paper uses the statistical software Stata to conduct an ordinal logit analysis on the collated data with reference to the Life Satisfaction Approach. The relationship between income and happiness of Chinese residents was examined, and the impact of subjective powerlessness on residents' happiness was investigated.
The research in this paper finds that subjective income level has a significant positive effect on residents' life satisfaction, and this positive effect decreases over time. Subjective powerlessness has a significant negative effect on life satisfaction. The findings of this paper suggest that the average subjective well-being of Chinese residents has declined and then increased over the past three decades.

Keywords: *Income, Subjective Well-Being, Life Satisfaction, Pooled Cross-Sectional Data*

1. INTRODUCTION

Back in the eighteenth century, Adam Smith, the father of classical economics, pointed out that a society cannot be truly prosperous and happy if a high percentage of its members live in poverty and hardship [1].

The economist Easterlin proposed the famous Easterlin paradox in 1974: although people of high income tend to be happier than people of low income, the long-term average happiness of society remains the same even if per capita income increases [2]. This idea has sparked academic debates and research for decades. On the one hand, Clark and Oswald (1994) [3] and Frey and Stutzer (2000) [4] pointed out that the association between income and subjective well-being is weak and that an increase in income does not necessarily lead to higher personal well-being, and Easterlin made the same point in 1995 [5] and 2001 [6]. On the other hand, a growing number of studies suggest that the Easterlin paradox exaggerates the constancy of happiness in the long run [7], and Hagerty and Veenhoven (2003) [8] show that in most affluent societies, happiness increases moderately and significantly in the long run. There is evidence that an increase in material standards produces higher levels of happiness, and Diener (1995) [9] points out that this finding is particularly true in the case of low per capita income.

Over the past forty years of reform and opening up, China has achieved brilliant results. Data from the National Bureau of Statistics show that the per capita disposable income of Chinese residents increased by more than 8% from 2014 to 2019, reaching 10.1% in 2014. While these changes boost economic prosperity, they can also create insecurity and a weakened sense of control over life, resulting in the anomie mentality [10].

According to the results of the survey by XiaoKang magazine, Chinese residents considered health to be the most important factor affecting happiness in 2020, followed by harmonious family relationships, income and wealth, "a good marriage", "social safety and security", and "good social situation" and so on.

The main ideas of this paper are as follows: firstly, this paper select appropriate variables to establish a regression model; secondly, this paper will use the statistical software Stata to analyze the data and explain the regression results; finally, this paper will conclude with a summary and discussion. In this paper, subjective well-being and life satisfaction are used in the same sense.

2. STUDY DESIGN

2.1 Model and Methodology

This paper uses the Life Satisfaction Approach to measure the relationship between income and happiness in China. The individual empirical model of this paper is as follows:

$$LS_{it} = \alpha_{it} + \alpha_1 Inc_{it} + \sum_{k=1}^{n} \beta_k X_{kit} + \xi_{it} \quad (1)$$

In the model:

LS represents life satisfaction of individual i at time t, which is used to measure the subjective well-being of the individual.

Inc represents income level (personal subjective evaluation).

X represents other factors affecting well-being (age, health status, gender, employment status, marital status, subjective powerlessness, etc.).

ξ represents error term.

Since the data on happiness are ordinal and larger values represent higher sense of happiness, this paper uses the empirical model to analyze the data. We use the whole China as the object of focus and using the ordinal logit model to analyze the cross-sectional data and the pooled cross-sectional data of the whole country.

2.2 Data and variables

This paper studies the subjective well-being of Chinese residents by analyzing data from the World Values Survey (WVS). The WVS database on the subjective well-being of Chinese residents cover a total of 28 years from 1990 (wave 2) to 2018 (wave 7), which is the longest nationwide database containing the happiness of Chinese people over time. This paper summarizes the description of core variables and the results are shown in Table 1.

Table 1. Definition and measurement of core variables

Variable	Definition	Measurement
Life Satisfaction	Satisfaction with life	ten-point scale: 1 represents very dissatisfied, 10 represents very satisfied
Income	Subjective income level	ten-point scale: 1 represents the lowest level, 10 represents the highest level
Health	Subjective health status	five-point scale: 1 represents very poor, 2 represents poor, 3 represents fair, 4 represents good, 5 represents very good
Gender	Gender	1=male, 0=female
Age	Age	The year of the questionnaire minus the year of birth of the respondent
Marital Status	Dummy variable	1=having a partner，0=having no partner
Employment Status	Dummy variable	1=with work ，0=without work
Subjective Powerlessness	Lack of control over life	ten-point scale: 1 represents having entire control of life, 10 represents having no control of life

2.3 Descriptive Statistics and Theoretical Hypotheses

Table 2 describes some of the core variables in each wave of the survey. There into, subjective powerlessness increases from 3.924 (in 1990) to 4.198 (in 1995) and then decreases, which is opposite to the trend of residents' subjective well-being generally.

Table 2. Descriptive statistics of core variables

Variable/Wave	All samples N=9341	Wave 2 N=942	Wave 3 N=1451	Wave 4 N=844	Wave 5 N=1362	Wave 6 N=1932	Wave 7 N=2810
Life Satisfaction (ten-point scale)	7.0480	7.4330	6.8500	6.5400	6.7800	6.8970	7.4090
	(2.1900)	(1.8970)	(2.4090)	(2.4730)	(2.3960)	(1.9680)	(2.0330)
Subjective Income Level (ten-point scale)	4.3640	3.2230	4.8530	5.9720	3.9460	4.4310	4.1670
	(1.9710)	(1.7150)	(1.8400)	(2.0580)	(1.8590)	(1.8630)	(1.8410)
Subjective Powerlessness (ten-point scale)	3.9060	3.9240	4.1980	3.8220	3.7590	3.8420	3.8910
	(2.2510)	(2.1120)	(2.6030)	(2.5360)	(2.3700)	(1.9900)	(2.1020)

The table presents the mean values of the core variables, with standard errors in parentheses

The following hypotheses are proposed in this paper:

Hypothesis 1: There is a significant positive effect of individual subjective income level on life satisfaction and this effect decreases over time.

Hypothesis 2: There is a significant negative effect of subjective powerlessness on life satisfaction.

3. RESULTS OF THE EMPIRICAL ANALYSIS

3.1 Analysis Results of the Country

Since the WVS is a ten-point scale for measuring life satisfaction, this paper adopts the ordinal logit model. We use the statistical software Stata to analyze the cross-sectional data of each wave from wave 2 to wave 7 and the pooled cross-sectional data of the full sample separately, focusing on the relationship between residents' subjective income level and subjective well-being when analyzing the whole country. Table 3 presents the effects of each variable on subjective well-being. The coefficients of health, gender, age, age square, marital status and employment status are not presented in the table due to space limit.

Table 3. Coefficients of ordinal logit model for each wave nationwide

Variable/Wave	(1) All samples Model 1	(2) All samples Model 2	(3) Wave 2	(4) Wave 3	(5) Wave 4	(6) Wave 5	(7) Wave 6	(8) Wave 7
Subjective Income Level (ten-point scale)	0.1345***	-0.0024	-0.0052	0.2956***	0.1064***	0.2088***	0.1352***	0.0767***
	(0.0104)	(0.0332)	(0.0339)	(0.0285)	(0.0304)	(0.0279)	(0.0228)	(0.0195)
The coefficients of health, gender, age, age square, marital status and employment status are not presented								
Subjective Powerlessness (ten-point scale)	-0.3981***	-0.3965***	-0.4576***	-0.2594***	-0.3337***	-0.3167***	-0.4864***	-0.5064***
	(0.0099)	(0.0099)	(0.0335)	(0.0203)	(0.0287)	(0.0237)	(0.0251)	(0.0206)
D3(year dummy variable, wave3=1)	-0.7430***	-2.0504***						
	(0.0775)	(0.1896)						
D4(year dummy variable, wave4=1)	-1.1605***	-1.4366***						
	(0.0911)	(0.2346)						
D5(year dummy variable, wave5=1)	-0.7865***	-1.5908***						
	(0.0764)	(0.1709)						
D6(year dummy variable, wave6=1)	-0.8553***	-1.2703***						
	(0.0712)	(0.1603)						
D7(year dummy variable, wave7=1)	-0.2713***	-0.4660***						
	(0.0678)	(0.1488)						
D3#income (cross product)		0.3112***						
		(0.0432)						
D4#income (cross product)		0.1094**						
		(0.0457)						
D5#income (cross product)		0.2265***						
		(0.0427)						
D6#income (cross product)		0.1314***						
		(0.0394)						
D7#income (cross product)		0.0796**						
		(0.0379)						
Sample size	9341	9341	942	1451	844	1362	1932	2810

*** p<0.01, ** p<0.05, * p<0.1, Standard errors are indicated in parentheses

In Table 3, we use pooled logit model for full-sample model 1 and full-sample model 2. The year dummy variable Di (i=3,4,5,6,7) is added to both model 1 and model 2, and model 2 adds the cross product term of wave number and subjective income level to model 1. The results show that subjective income level has a significant positive effect on life satisfaction in general in model 1. In model 2, the coefficient of the cross product term has a tendency to decrease gradually, indicating that the effect of income on individual subjective well-being has weakened over time. Therefore, hypothesis 1 is proved.

From the results of each wave and the full-sample model, the coefficient of the ordinal logit model of subjective powerlessness is always negative, which indicates that the psychology of anomie has a negative effect on the individual subjective well-being. Therefore, hypothesis 2 is confirmed.

Table 4 presents part of odds ratios in each wave. The odds ratios of subjective income level are generally greater than 1, which further validates hypothesis 1. The odds ratios of subjective powerlessness are smaller than 1 in all waves, which proves hypothesis 2.

Limited by space, odds ratios of other variables are not shown in the table.

Table 4. Part of odds ratios in each wave nationwide

Variable/Wave	(1) Wave 2	(2) Wave 3	(3) Wave 4	(4) Wave 5	(5) Wave 6	(6) Wave 7
Subjective Income Level (ten-point scale)	0.9948	1.3439***	1.1123***	1.2322***	1.1448***	1.0798***
	(0.0337)	(0.0383)	(0.0338)	(0.0344)	(0.0261)	(0.0211)
Subjective Powerlessness	0.6328***	0.7715***	0.7162***	0.7286***	0.6149***	0.6026***
	(0.0212)	(0.0157)	(0.0206)	(0.0173)	(0.0154)	(0.0124)
Sample size	942	1451	844	1362	1932	2810

*** p<0.01, ** p<0.05, * p<0.1, Standard errors are indicated in parentheses

3.2 Robustness Test

In the robustness test, we first select the variable happiness in WVS for validation, and the regression model used is the ordinal logit model. Happiness is classified into four levels in the questionnaire: not at all happy, not very happy, quite happy, and very happy, and we use 1 to 4 to represent the level of happiness respectively, where larger values represent higher levels of happiness. The results of the test are generally consistent with the conclusions above when life satisfaction is used as the dependent variable. The effect of subjective income level on happiness is generally positive.

In addition, we use the regression model substitution method for further validation. The dependent variable selected is life satisfaction, which is consistent with the analysis in the main body of this paper. The results of the linear regression model are basically consistent with the results of the ordinal logit model in structure.

Limited by space, this paper will not show the results specifically.

4. CONCLUSION AND PROSPECT

The paper concludes as follows: the average subjective well-being of Chinese residents has experienced a decline followed by an increase over the past three decades. The study shows that there are many factors that affect the subjective well-being of Chinese residents, and among the factors explored in the full sample data of this paper, subjective income level, health, employment, age, marriage, and subjective powerlessness all significantly affect the life satisfaction of Chinese residents. Subjective income level has a significant positive effect on residents' happiness, and an increase in subjective income level helps to promote happiness.

Of course, there are certain limitations and unsolved issues in this paper. Since this paper does not include lagged terms, and the data are not time series data obtained from long-term tracking, it cannot conclude that there exists a causal relationship between subjective income level and subjective well-being. Besides, this paper considers a limited number of variables and does not examine the effects of factors such as environmental quality, urban-rural migration, and national policy changes. Therefore, more variables should be considered for measurement in future studies.

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