BEST: International Journal of Humanities, Arts, Medicine and Sciences (BEST: IJHAMS)
ISSN (P): 2348-0521, ISSN (E): 2454-4728
Vol. 5, Issue 05, May 2017, 95-110

EXPLORING PREDICTORS OF SUBJECTIVE LIFE SATISFACTION IN AN AGING ECONOMY: AN EMPIRICAL INVESTIGATION OF TAIWAN

YUAN-HO HSU

Department of Economics, Graduate Institute of Political Economy, National Cheng Kung University, Tainan, Taiwan

ABSTRACT

This paper investigates the predictors for subjective life satisfaction in an aging economy, using a cross-sectional data of Taiwan collected by East Asian Social Survey (EASS) in 2010 for empirical investigation. This paper applies ordered logistic regression methods in the empirical investigation. The predictors used for this investigation include factors related to biological domain, physical domain, socio-economic domain, and mental and psychological health domain. Three empirical models have been investigated in this paper: a model for subjective life satisfaction in general, a model with generational effect, and a model for the elder's life satisfaction in particular. The empirical results indicate that subjectively perceived income, perceived mental and physical health are significant predictors for subjective live satisfaction in all three models, whereas life course event of being divorced is harmful to life satisfaction. The fact for a person being major care-giver for disabled family member harms that person's life satisfaction significantly.

KEYWORDS: Life Satisfaction, Aging Economy, Subjective Wellbeing, Logistic Regression

INTRODUCTION

Happiness is a universal human aspiration and a major creed of modern welfare state movement. In the early development of modern society tracing back from industrial revolution to modern economic growth theories, the concern of welfare is on the provision of maximum goods to satisfy the insatiable wants of the majority in the society. In this era, the pursuit of GDP growth is one of the major objects of public policy. However, in the "post-materialism" era after 1960's, the popular concern is not just on the affluence of material life, but also on "good quality of life" and the search for suitable indicators of non-economic welfare began in the early 1970's. Various pioneering studies in international organizations (UN and OECD), public agencies and private non-government organizations in the western countries[1] endeavoured in searching social welfare indicators or measures that can cover the limitation of conventional macroeconomic indicators like GDP in giving a true account of people's current and future wellbeing. Among many of these efforts, the Organization of Economic Cooperation and Development (OECD) launched the OECD Better Life Index in 2011 that facilitates international welfare comparison.[2]

Another strand of recent development in welfare study is not on GDP but on gross national happiness (GNH).[3]

[1] See Veenhoven (1996) for a short review of this movement.

[2] OECD Better Life Index at http://www.oecdbetterlifeindex.org/ .

[3] For reference and historical development of GNH, see GNH Institute's website at http://gnh.institute/happiness-economics/happiness-economics-timeline-milestones-history.htm

GNH gives a much broader definition of happiness or well-being. In the conceptualization of happiness in GNH, a number of objective and subjective conditions are included. It attempts to measure not only of GDP, but also of net environmental impacts, the spiritual and cultural growth of citizens, mental and physical health, and the strength of the social institutions, including the corporate and political systems. However, many items in GNH measurement rely on estimation (e.g. environmental impacts) or subjective revelation (e.g. spiritual and cultural growth). The GNH Index is built from data drawn from periodic surveys that are representative by district, gender, age, rural-urban residence, income, etc. GNH Index, unlike the subjective wellbeing measures in western literatures, happiness is itself multidimensional. The GNH Index provides an overview of performances across nine domains of GNH, namely, psychological wellbeing, time use, community vitality, cultural diversity, ecological resilience, living standard, health, education, and good governance.[4]

In the western academic community, there are voluminous literatures exploring the determinants of happiness or life satisfaction. Because happiness is a subjective sensation that cannot be measured objectively, researchers in psychological studies use "subjective wellbeing" instead of happiness and try to build scales for subjective wellbeing (SWB). Diener (1984) reviewed literature on subjective wellbeing including happiness, life satisfaction, and positive affect, in three areas of measurement, causal factors, and theory. Diener et al. (1985) introduced a global life satisfaction index, the "Satisfaction with Life Scale" (SWLS). It is maintained that the SWLS is shown to have favorable psychometric properties and that the scores on the SWLS correlate with other measures of subjective well-being and with specific personality characteristics. Various further studies applied this approach in the exploration of life satisfaction (Pavot et al. 1991; Pavot and Diener 1993; Diener et al. 1994).

It is argued that happiness is the ultimate objective in life and life satisfaction is very closely related to happiness. So that various socio-economic studies use "life satisfaction" as proxy of happiness and try to relate life satisfaction with other social economic variables. This strand of study relies on survey method to collect revealed subjective life satisfaction and other data on the respondents. The empirical studies investigate the association between subjective life satisfaction and socio-economic variables, relating life satisfaction to age (Diener et al., 1999; Blanch flower and Oswald, 2008; Baird et al., 2010), income(Easterlin 1974, 2001; Mayraz et al. 2009), gender (Borges et al., 1984; Liu et al., 2013), marital status (Liu et al. 2013; Hou, 2014), household size (Hou 2014), socio-economic status (Easterlin, 1974, 2001; Headley et al. 20008), neighbourhood environment (Fernandez and Kulik, 1981; Hou, 2014), and rural-urban location (Kangiuan et al., 2010; Sørensen, 2014). Other studies relate life satisfaction to subjective perceived health (Palmore & Luikart, 1972; Michalos et al., 2000; Dolan et al. 2008), personality traits (Veenhoven, 2000; Oshio and Kobayashi, 2010), living and dietary habits (Konishi et al., 2009), mental health (), social contacts and social interaction (Ateca-Amestoy et al. 2014;), perceived social support (Young, 2006; Matsuda et al., 2014), and participation in leisure activities (Becchetti et al., 2012).

In summary, the reviewed literatures show that many factors, including biological factors, physical fitness, social relationship, family relationships, mental health, individual perception and cognition, and economic factors, are important factors associated with subjective life satisfaction.

Population aging is a global phenomenon in the 21th Century that will reshape the life of human society for the decades to come. The United Nations (2015) predicts that world's population aged 60 and over will grow by 65% between 2015 and 2030, from 901 million to more than 1.4 million. It is also predicted that almost all countries would experience a

[4] For an introduction on the composition of GNH index, see Helliwell et al. (2012), Case Study: Bhutan.

substantial growth in the numbers of old aged persons in 2015-2030, with that the developing regions will have a faster pace in aging.[5] Though there are various studies investigating the factors associate with life satisfaction, there is not much study relating population aging and life satisfaction of people in the aging economy in particular. Among the limited existing literatures, for example, Chou and Chi (1999) tried to identify the predictive variables of life satisfaction in Chinese elderly people based on a longitudinal data of Hong Kong. They concluded that younger elderly persons with less financial strain, better social support, fewer somatic complaints and more education reported a higher level of life satisfaction three years later.

Taiwan has become an aging economy since 1993. The pace of population aging in Taiwan has been accelerated in the past two decades. It is expected that Taiwan would become "aged economy" in 2018 and "super aged economy" in 2025. The effect of demographic aging on economic growth, saving, social welfare systems has been widely studies (see, for example, Hsu, 2017), how the effect of aging affects life satisfaction in an aging society has not been fully explored. For the existing study, Chen (2001) used Taiwan as an object of investigation and examined how the effects of major life events in the aging process, such as retirement, deterioration of health, loss of spouse, and so on, may affect the elderly's life satisfaction. Chen's study was conducted with a longitudinal survey carried out in Taiwan in 1989 and 1993. The data does not cover the phase of accelerated demographic aging in Taiwan. To examine the effects of aging on life satisfaction in Taiwan, the use of a more recent data that covers the aging eras in Taiwan would be desirable. This paper uses a cross-sectional data collected in 2010, which is the middle point of the "aging" and "aged" era in Taiwan, and wish this new data set could real some facts about the aging society.

OBJECTIVES OF THE STUDY

Demographic aging is an inevitable global demographic phenomenon for the developing and developed world in the coming decades. It has been said that the developing world is growing old before it grows rich and that many countries are failing to introduce policies which address the requirements of a rapidly aging population. Therefore, one needs a model society that is in an interim between the developing and developed economy so that this model economy can act as a mirror for the developing economies in conceiving economic and social welfare policies to promote the "quality of life" for the aging developing economy. Taiwan is an appropriate candidate for this purpose. Therefore, the current paper uses Taiwan as an object of investigation and wants to investigate the effect of population aging on people's subjective life satisfaction and explores factors that affect life satisfaction in the aging Taiwan. This paper uses a cross-sectional survey data to explore the predictors of subjective life satisfaction for people of all ages in general and for the active-aged elders, aged 60-75, in particular.

DATA

This paper uses the 2010 East Asian Social Survey (EASS) data[6] for Taiwan in the empirical study. The EASS is a biennial social survey project that serves as a cross-national network of four General Social Survey type surveys in East Asia, the Chinese General Social Survey (CGSS), the Japanese General Social Survey (JGSS), the Korean General Social

[5] United Nations (2015). *World Population Aging Highlights*, p.1.

[6] The full name of the survey data is "East Asian Social Survey (EASS), Cross-National Survey Data Sets: Health and Society in East Asia, 2010." See Iwai et al. (2010).

Survey (KGSS), and the Taiwan Social Change Survey (TSCS). The data set results from this survey is distributed by the East Asia Social Survey Data Archive (EASSDA).[7]

Table 1: Frequency and Distribution on General Happiness

General Happiness	Frequency	Percent	Cumulated Distribution
very unhappy	27	2.39	2.39
unhappy	84	7.43	9.81
Not happy, nor unhappy	97	8.58	18.39
happy	724	64.01	82.4
very happy	199	17.6	100
Total	1,131	100	

Table 2: Age Distribution of the Respondents

Age by Group	Frequency	Percent	Cumulated Distribution	Ages 60-75	Frequency	Percent	Cumulated Distribution
age1819	35	3.09	3.09	60	19	8.12	8.12
age2024	113	9.99	13.09	61	28	11.97	20.09
age2529	81	7.16	20.25	62	25	10.68	30.77
age3034	110	9.73	29.97	63	11	4.7	35.47
age3539	92	8.13	38.11	64	18	7.69	43.16
age4044	86	7.6	45.71	65	11	4.7	47.86
age4549	109	9.64	55.35	66	17	7.26	55.13
age5054	98	8.66	64.01	67	14	5.98	61.11
age5559	92	8.13	72.15	68	18	7.69	68.8
age6064	101	8.93	81.08	69	12	5.13	73.93
age6569	72	6.37	87.44	70	11	4.7	78.63
age7074	48	4.24	91.69	71	9	3.85	82.48
age7579	43	3.8	95.49	72	9	3.85	86.32
age8084	30	2.65	98.14	73	4	1.71	88.03
age85up	21	1.86	100	74	15	6.41	94.44
				75	13	5.56	100
Total	**1,131**	**100**		**Total**	**234**	**100**	

This study uses the survey results of “EASS Cross-National Survey Data Sets: Health and Society in East Asia” which was collected in 2010. This survey was conducted with face-to-face interview using self-enumerated questionnaire. This survey is specified on health related issues such as medical service accessibility and service utilization, but it also collects useful socio-economic and environmental information, like income, social connection, and general happiness. The officially response rate for Taiwan is 49.48% (4,052 initial sample size; 2,005 respondents). However, many respondents reserve their answers to some privacy sensitive questionnaires, such as "How much is your total household income?" or "What is your earning from job?" As a result, the number of total valid respondents collapses to 1131.

The survey asked the respondents to indicate their “General Happiness” in five scales, from very happy to vary unhappy. Of the valid survey responses, the proportion of people who responds with “very happy” and “happy” counts for more than 80% of the whole respondents and 64% of people respond with “happy” (Table 1). Of the age distribution of the respondents, the young-aged (age less than 35) counts approximately 30% of the survey, whereas the old-aged (age 65 and

[7] Available at: http://www.eassda.org/modules/doc/index.php?doc=intro

plus) counts only for 13%. Most of the respondents in this survey are middle to late-middle aged people (left part of Table 2). This paper defines the "active-aged" people as those who are aged 60 to 75 and are in general capable of doing independent daily activities and participating in social activities. For the "active-aged" group, the respondents aged 60-65 counts approximately 50% of the survey and people with age between 70 and 75 counts less than 20% of respondents (right part of Table 2).

METHODS

The Theoretical Model Setup

Step to e et al. (2014) claim that subjective wellbeing can be distinguished from three perspectives: evaluative wellbeing (or life satisfaction), hedonic wellbeing (feelings of happiness, sadness, anger, stress, and pain), and eudemonic wellbeing (sense of purpose and meaning in life). Based on the literature review conducted in Section I, this paper builds the empirical model for subjective life satisfaction with four groups of factors, namely, factors related to biological domain, physical domain, socio-economic domain, and mental health and psychological domain. The first domain factors are those that cannot be intervened (such as sex or age) or cannot be intervened by policy in short period of time (such as education level). The general theoretical model is given as

$$H_i = f(D1_i, D2_i, D3_i, D4_i, X_i) \tag{1}$$

where subscript *i* denotes the respondents *i*. In equation (1), H represents the subjective happiness; D1 represents the factors in the first (biological) domain; D2, D3, and D4 represent factors in the other three domains respectively. *X* represents potentially omitted factors or random exogenous disturbances to life satisfaction. This paper then uses the 2010 EASS survey data and puts the data in empirical investigation.

The Empirical Estimation Methods: the Ordered Logistic Regression

This paper applies ordered logistic regression in the empirical investigation of factors predicting subjective life satisfaction in Taiwan. In the ordered logit model, there is an observed ordinal variable, *Y*, and this *Y* is a function of another continuous latent variable (Y^*) that is yet to be measured. The continuous latent variable Y^* has various threshold points (τ_i) and the value of the observed variable Y depends on particular threshold of Y*.

Let M be the number of categories of the observed variable. For example, in this study the subjective life satisfaction (*Y*) takes 5 values ($M = 5$), so that

$$\begin{aligned}
&Y_i = 1 \quad if\ Y_i^* \le \tau_1 \\
&Y_i = 2 \quad if\ \tau_1 < Y_i^* \le \tau_2 \\
&Y_i = 3 \quad if\ \tau_2 < Y_i^* \le \tau_3 \\
&Y_i = 4 \quad if\ \tau_3 < Y_i^* \le \tau_4 \\
&Y_i = 5 \quad if\ \tau_4 < Y_i^*
\end{aligned} \tag{2}$$

The Continuous Latent Variable Y^* is given by

$$Y_i^* = \sum_{k=1}^{K} \beta_k X_{ki} + \varepsilon_i = Z_i + \varepsilon_i, \quad \varepsilon_i \sim iid(0,1) \tag{3}$$

The Ordered Logit Model Estimates Z_i in Equation (3), Where

$$Z_i = \sum_{k=1}^{K} \beta_k X_{ki} = E\left(Y_i^*\right) \tag{4}$$

The β_i's and τ_i's are parameters that need to be estimated. Given those estimated parameters, one can then use the estimated M-1 cut-off terms (τ_i) to estimate the probability that Y_i will take on a particular value. The formulas are

$$P\left(Y_i > j\right) = \frac{E(X_i\beta - \tau_j)}{1 + \left[E(X_i\beta - \tau_j)\right]}, \quad j = 1, 2, ..., M-1 \tag{5}$$

Using the estimated value of *Z* and the assumed logistic distribution of the disturbance term, the ordered logit model can be used to estimate the probability that the unobserved variable Y^* falls within the various threshold limits.

RESULTS AND DISCUSSIONS

The empirical works investigates three settings to explore factors predicting life satisfaction in the aging economy of Taiwan. In the first experiments, this study tries to identify factors that explain subject life satisfaction for the aging economy in general. In the second setting, the study explores generational effect on subjective life satisfaction; in the third model setting, this study focuses only one the aged group and explores factors predicting life satisfaction for the elderly. Table 3 reports the empirical results of this study.

Table 3: Estimation Outputs; Dependent Variable: Subjective Life Satisfaction

		(1)	(2)	(3)	(4)
Dependent variable	Variable explanations	Baseline Model	Baseline plus Subj. Eval.	Generational Effect Model	The Elders' Model
Happy	General happiness; 5 pt scale; 1: Very unhappy, 5: Very happy				
Predictors					
ages	Age by group (from 1 to 16); 18-19, 20-24, 25-29,30-34, 35-39, 40-44, 45-49, 50-54, 55-69, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90up	0.0586** (0.0260)	0.0685** (0.0287)		
age1834	Generation aged 18-34			1.818* (0.972)	
age3549	Generation aged 35-49			1.725* (0.894)	
age5064	Generation aged 50-64			1.765** (0.836)	
age65up	Generation aged 65 & over			1.668** (0.774)	
age6074	The elders aged 60-74				0.0399 (0.0470)
Female	Female	0.0318 (0.145)	0.157 (0.163)	0.183 (0.165)	-0.172 (0.466)
degree	Highest education	0.0720	-0.0559	0.145	-0.0800

	level; 0: No formal qualification, 1: Elementary school, 2:Junior high, 3:High school, 4:Junior college, 5:University, 6: Graduate school	(0.0615)	(0.0674)	(0.124)	(0.182)
divorce	Divorced or being separated (having intention to divorce); 1: Yes, 0: No	-0.799** (0.341)	-0.806** (0.370)	-0.883** (0.380)	-1.173 (1.353)
unemployed	Unemployed and looking for a job; 1: Yes, 0: No	-0.619** (0.291)	-0.462 (0.306)	-0.479 (0.308)	-0.460 (0.779)
livfamily	Living with family member(s), either with spouse, parents, spouse's parents, or own siblings,; 1: Yes, 0: No	0.281 (0.289)	0.170 (0.299)	0.154 (0.301)	-0.843 (0.773)
hinc	Total household income; pt scale; 10 pt scale, from None or less than NT$20,000 (1) to more than NT$140,000 (10)	0.124*** (0.0318)	-0.0132 (0.0362)	-0.0135 (0.0372)	-0.0117 (0.0891)
relative-hinc	Subjective household income compared; 5 pt scale; 1: Far below average, 3: average, 5: Far above average		0.549*** (0.123)	0.550*** (0.124)	1.097*** (0.328)
urban-rural	Self-assessment of community type; 5 pt scale; 1: A big city, 2: The suburbs or outskirts of a big city, 3: A town or a small city, 4: A country village, 5: A farm or home in the country		-0.0209 (0.0684)	-0.0291 (0.0687)	0.180 (0.180)
subjective physical health	Subjective health condition; 5 pt scale. 1: excellent, 5: poor		-0.394*** (0.0828)	-0.388*** (0.0831)	-0.382* (0.221)
Subjective mental health	Mental health: Felt downhearted and depressed; 5 pt scale; 1: all of the time, 5: none of the time		0.811*** (0.0918)	0.799*** (0.0927)	1.348*** (0.289)
Attaining life goal	Impossible for R to reach the goals; 5 pt scale; 1: strongly agree, 5: strongly disagree		0.394*** (0.0848)	0.405*** (0.0853)	0.267 (0.185)
trust	People can be trusted; 4 pt scale; 1: People can almost always be trusted, 4: You almost always cant be too careful in dealing with		0.312*** (0.0944)	0.320*** (0.0945)	0.284 (0.249)

	people				
topbot	Social position, top-bottom self-placement 10 pt scale; 1: lowest, 10: highest		-0.00369 (0.00812)	-0.000242 (0.00784)	-0.0199 (0.0133)
support_emot	Emotional support from kin and non-kin. Interaction of V49, "How often R's kin listened to R's personal problems or concerns," and v52 "How often R's non-kin listened to R's personal problems or concerns"; the respondent answered "Very often" or "often". 1: Yes, 0: No		0.424*** (0.161)	0.430*** (0.162)	-0.768* (0.434)
support_fin_kin	How often R's kin provided R with financial support; 6 pt scale; 1: Very often, 2: Often, 3: Sometimes, 4: Seldom, 5: Not at all, 6: Do not have such needs, 7: No such persons available		-0.0121 (0.0185)	-0.0159 (0.0186)	-0.249* (0.130)
env_safety	Neighborhood environment: Safety; 5 pt scale; 1: Strongly agree, 5: Strongly disagree		-0.0423 (0.0793)	-0.0527 (0.0801)	0.353 (0.237)
env_facilities	Neighborhood environment: Adequate public facilities; 5 pt scale; 1: Strongly agree, 2: Agree, 3: Neither agree nor disagree, 4: Disagree, 5: Strongly disagree		-0.149 (0.0942)	-0.153 (0.0947)	0.0665 (0.242)
env_pollution	Neighborhood either has very severe air, water, or noise pollution; 1: Yes, 2: No		-0.192 (0.247)	-0.216 (0.250)	-0.706 (0.671)
giver	Major care giver for family member who is disabled or need long-term care; 1: Yes, 0: No		-0.506** (0.237)	-0.507** (0.239)	-1.590** (0.662)
dietary_alcoh	How often R drink alcoholic drinks; 5 pt scale; 1: Daily, 2: Several times a week, 3: Several times a month, 4: Several times a year or less often, 5: Never		-0.130 (0.0820)	-0.129 (0.0828)	-0.370* (0.195)
physical_acty	How often R do physical activity; 5 pt		-0.0798 (0.0536)	-0.0745 (0.0540)	0.0372 (0.121)

	scale; 1: Daily, 2: Several times a week, 3: Several times a month, 4: Several times a year or less often, 5: Never				
Degree#1 834	Interaction term of degree with generation aged 18-34			-0.329* (0.176)	
Degree#3 549	Interaction term of degree with generation aged 35-49			-0.265 (0.167)	
Degree#5 064	Interaction term of degree with generation aged 50-64			-0.215 (0.159)	
cutting point1		-2.519*** (0.505)	-0.150 (0.949)	0.904 (1.191)	0.982 (4.365)
cutting point2		-0.906** (0.458)	1.849** (0.937)	2.908** (1.182)	4.543 (4.366)
cutting point3		-0.188 (0.452)	2.801*** (0.941)	3.866*** (1.187)	5.831 (4.373)
cutting point4		3.081*** (0.469)	7.045*** (0.975)	8.152*** (1.223)	10.50** (4.469)
Observations		844	844	844	145

Notes: 1. Standard errors in parentheses; 2. *** p<0.01; ** p<0.05; * p<0.1.

Estimation Results

A General Model for Life Satisfaction

In the first stage of exploration, this paper uses biological information of the respondents, including ages, sex, education attainment, divorced (including being separated), unemployment, living with family, and household income as predictors for the respondents' subjective happiness. The results are as shown in the column labelled "(1) Baseline Model." The results indicate that subjective happiness relates positively and significantly to ages and household income. That is, increase in wages or household income leads to higher subjective satisfaction to the respondents. The adverse events of divorce and unemployment have significant negative impacts on subjective life satisfaction. Education attainment leads to higher subjective life satisfaction (SLS) but its effect is insignificant. Female tend to have higher SLS in this basic model and the effect is also insignificant. Living with family members signifies a close tie to the kin and has positive correlation with SLS, yet the effect is not statistically significant. In summary, the signs of correlation for the predictors in this model coincide with the existing literature, though they are not all statistically significant.

Given this preliminary result, the study proceeds to expand the explanatory variables set. The expanded model incorporates additional variable based on the theoretical setting narrated in equation (1). In the expanded model this paper puts subjective perceived health, subjective income status, living arrangement, living environment, location of living, social connection and social support, dietary habit and habit of physical activities, and family cohesion factors of care giver to family member who needs long-term cares. In Table 3 the column labelled "(2) Baselines plus Subj. Eval." reposts the estimation outputs of this extended model.

Surprisingly, the sign for education attainment has reversed from positive to negative, comparing to that of the baseline model, though its effect is still insignificant. The sign of household income also turns to negative and the effect

becomes insignificant. However, the subjectively perceived relative income has positive and significant correlation with subjective life satisfaction at 1% significance level. Other significant predictors for life satisfaction are: divorce, self-perceived health condition, self-evaluated mental health condition, self-evaluated emotional support from kin and non-kin, personal traits on whether people can be trusted, personal future perspective, and whether the person is major care-giver for family member. Among these significant predictors, divorce, as in the simple model, has significant adverse impact on SLS. Moreover, people with better self-perceived physical and mental health and strong emotional support from family and friends tend to have higher life satisfaction. Besides, those who hold bright life perspective reveal high subjective life satisfaction. Finally, family bond that makes the respondent to act as a major care-giver for the disabled family member has strong negative impacts on life satisfaction.

Some interesting yet insignificant results obtained from this model are: (1) People with low socio-economic status tend to have higher life satisfaction; (2) People receive financial support from the kin frequently tend to have less life satisfaction; (3) People live in big city tend to have higher life satisfaction than those live in the rural area; (4) A neighbourhood with less air, noise, or water pollution, more adequate public facilities, and better neighbourhood security tend to raise people's life satisfaction; (5) Unemployment has adverse effect on life satisfaction; (6) People who take alcoholic drink often tend to have higher subjective life satisfaction; (7) Frequent physical activity correlates to higher subjective life satisfaction; (8) Female tend to be happier than the male; and (9) People living with family members tend to have higher subjective life satisfaction. Note that these empirical results though interesting yet are not statically significant.

Model (2) adds extra explanatory variables to the baseline model (1). That is, the assumption is that model (1) is nested on model (2). A likelihood-ratio test of this assumption has LR chi2 (15) = 262.37 (Prob > chi2 = 0.00), so that we conclude that model (1) is nested on model (2). As a result, this paper explores happiness determination using the framework of Model (2).

One of the assumptions underlying ordered logistic regression is that the relationship between each pair of outcome groups is the same. If the relationship between all pairs of groups is the same, there is only one set of coefficients. Otherwise, one would need different models to describe the relationship between each pair of outcome groups. The Brant test (Brant, 1990) of parallel regression assumption has chi2 (69) = 75.89 (Prob > chi2 = 0.27). The Brant test result indicates that Model (2) has not violated the proportional odds assumption, so that one can use model (2) for further inference.

Generational Effects on Subjective Life Satisfaction

This investigation examines the generational effect on subjective life satisfaction. Generation can be classified based on age of the respondents. This paper classifies the respondents into four generational cohorts: the young generation (people aged 18-34), the early-middle age generation (people aged 35-49), the late-middle age (people aged 50-64), and the old-aged generation (people aged 65 and over). In this generational effect investigation regression, the variables "ages" in model (2) has been replaced with these 5 age groups. The young and middle aged groups receive more education then the generation of their parent. This generational education attainment difference may make some difference for the subjective life satisfaction. So, in the generational regression model this paper adds three age-education interaction terms for the working-age groups (age 18-34, 35-49, and 50-64). The column in Table 3 labelled "(3) Generational Effect Model" illustrates the empirical results of this regression. For the age effects, life satisfaction increase with age in every age group, except that the effects on the late-middle age and old-age group are statistically more significant than that of the young and

early-middle age group. Compare the signs of coefficients of other variables in this regression with that of model (2), one notice that the values of coefficients have changed a little bit but the signs do not change. However, the generation-education interaction term reveals some interesting information. The coefficient of age-education interaction term for the young age generation is statistically significant at 10% significance level and correlates negatively with subjective life satisfaction. This result signals some information for the aging economy and deserves further discussion.

Factors Predicting Life Satisfaction of the Elderly

The last exercise in this paper is to explore factors affecting life satisfaction of the elderly. In this exercise the objects of investigation are the respondents with age 60 and over, up to 75. The expected average life expectancy in Taiwan is 80 for both sexes. People aged 60-75 can be considered physically healthy for performing daily life activities. In this model setting the regression was conducted with information related to people aged 60-75. The last column in Table 3 labelled "(4) The Elders' Model" reports the regression results. Unlike other models in this paper, age effect is not a significant predictor for life satisfaction of the elders, though they are still positively correlated. The respondents' attitude to people ("People can always be trusted") and views of one's life goals ("It is impossible for me to reach the goals") also become insignificant predictors for happiness of the elders. The set of significant predictors for life satisfaction includes subjective household income compared with others, subjective physical and mental health, emotional support from kin and non-kin, financial support from kin, major family care-giver for family members who needs long-term care, and alcoholic drinking habit. The two predictors of subjective relative household income and major care-giver are significant predictors, like that in the other model. However, the coefficients estimated in this model are higher than that in the other models. Alcoholic drink habit and frequently financial support from kin are significant predictors for the elders' model whereas in the other model they are insignificant. More often the elderly receives financial support from one's kin, the less happy the elderly would be. This implies that heavy reliance on kin's financial assistance leads to feeling of financial deprivation which reduces subjective life satisfaction.

Predicted Probabilities of Selected Predictors

Since this paper aims to explore determinants of life satisfaction in the aging economy, this section illustrates the predicted probabilities of aging transition on subjective life satisfaction and the imposition of major care-giver' role on life satisfaction. Table 4 reports the predicted probability of subjective life satisfaction by ages. Table 5 reports the predicted probabilities of major care giver for disabled family member for the elder group (model (4)) and the whole survey (model (2)).

Table 4: Predicted Probability of Subjective Life Satisfaction by Ages

Ages	Very Unhappy	P>|z|	Unhappy	P>|z|	Neither Happy, nor Unhappy	P>|z|	Happy	P>|z|	Very happy	P>|z|
1	0.0106	0.00	0.0559	0.00	0.0997	0.00	0.7580	0.00	0.0757	0.00
2	0.0100	0.00	0.0528	0.00	0.0950	0.00	0.7620	0.00	0.0802	0.00
3	0.0094	0.00	0.0498	0.00	0.0905	0.00	0.7654	0.00	0.0849	0.00
4	0.0088	0.00	0.0470	0.00	0.0861	0.00	0.7682	0.00	0.0899	0.00
5	0.0083	0.00	0.0443	0.00	0.0819	0.00	0.7704	0.00	0.0951	0.00
6	0.0078	0.00	0.0418	0.00	0.0778	0.00	0.7720	0.00	0.1006	0.00
7	0.0073	0.00	0.0394	0.00	0.0739	0.00	0.7730	0.00	0.1064	0.00
8	0.0069	0.00	0.0372	0.00	0.0701	0.00	0.7733	0.00	0.1125	0.00

9	0.0065	0.00	0.0350	0.00	0.0665	0.00	0.7731	0.00	0.1189	0.00
10	0.0061	0.00	0.0330	0.00	0.0631	0.00	0.7723	0.00	0.1255	0.00
11	0.0057	0.00	0.0311	0.00	0.0598	0.00	0.7709	0.00	0.1325	0.00
12	0.0054	0.00	0.0293	0.00	0.0566	0.00	0.7688	0.00	0.1399	0.00
13	0.0050	0.00	0.0276	0.00	0.0536	0.00	0.7662	0.00	0.1476	0.00
14	0.0047	0.00	0.0260	0.00	0.0507	0.00	0.7630	0.00	0.1556	0.00
15	0.0045	0.00	0.0245	0.00	0.0480	0.00	0.7592	0.00	0.1639	0.00
16	0.0042	0.01	0.0230	0.00	0.0454	0.00	0.7547	0.00	0.1727	0.00

Table 5: Predicted Probabilities of Major Care giver for Disabled Family Member

	The elders aged 60-75 only			**Whole sample**		
	Major care Giver	**Predicted Probability**	**P>|z|**	**Major care Giver**	**Predicted Probability**	**P>|z|**
Very unhappy	No	0.000507	0.383	No	0.0055	0.001
	Yes	0.002159	0.395	Yes	0.0092	0.004
Unhappy	No	0.014533	0.051	No	0.0339	0
	Yes	0.059018	0.137	Yes	0.0550	0
Neither happy, nor unhappy	No	0.044491	0.006	No	0.0567	0
	Yes	0.151507	0.045	Yes	0.0868	0
Happy	No	0.801259	0	No	0.7855	0
	Yes	0.750804	0	Yes	0.7747	0
Very happy	No	0.139212	0	No	0.1184	0
	Yes	0.036512	0.121	Yes	0.0743	0

All the predicted probabilities in Table 4 are significant at 99% confidence interval. The probability of being very unhappy is 1% given that ages = 1 (age 18-19) and the rest of predictors are set to their mean values. The probability of being very happy is 7.6% given that ages = 1 (age 18-19) and the rest of predictors are set to their mean values. Given that the rest of predictors are set to their mean values, the predicted probability of being very happy for age =10 (age 60-64) is 12.6%. It is observed from this table that the predicted probability of being very unhappy decreases with ages and being vary happy increases with ages.

For the whole valid survey respondents in this study, the predicted probability of being very unhappy is 0.5% given that this person is not a family care-giver and that the rest of predictors are set to their mean values (Table 5, right columns). However, if this person changes his role from non-care-giver to care-giver, the predicted probability of being very unhappy increased to 0.9%. For a non-care-giver, the predicted probability of being very happy is 11.84%. However, if he becomes a major care-giver, the predicted probability of being very happy drops to 7.43%. For the aged group, given that the rest of predictors are set to their mean values, for a non-care-giver the predicted probability of being happy is 80.1%. However, if he/she is a major care-giver, the predicted probability of being happy drops 75.1%. In summary, the predicted probability of being happy would drop for person who is major care-giver of the disabled family member. The drop in predicted probability would be more severe in the aged group model than that of the general model.

CONCLUSIONS

This study explores predictors for subjective life satisfaction in the aging economy of Taiwan. The empirical investigation for this paper has been conducted with the data collected from 2010 East Asian Social Survey. In the face-to

face survey, a questionnaire requests the respondents to reveal his/her subjective evaluation of happiness in five scales. Ordered logistic regression is used for the analysis of this cross-sectional survey data. In the theoretical model setup, this paper considers four broad sets of predictors for the investigation of happiness prediction. The candidates for the predictors include factors related to biological domain, physical domain, socio-economic domain, and mental and psychological health domain. Three empirical models have been investigated in this paper: a model for subjective life satisfaction prediction in general, a model with generational effect, and a model for the elder's life satisfaction prediction in particular.

Common findings from these models are that perceived relative income, compared with other families, and perceived mental and physical condition relate significantly to subjective life satisfaction. Better perceived economic and health condition leads to higher life satisfaction. A person being a major care-giver of for family member who is disabled or needs long-term is harmful to the subjective life satisfaction of that person. The negative impact of this care-givers role to life satisfaction is severe in the elderly model than in the model in general. The experience of being divorced or separated from be-loved is harmful to life satisfaction.

Ages are important predictors in the general model and generational model; it is not a significant predictor in the old-age group model, though in this model life satisfaction increases with increases in age, the same as that in the other two models. It is perceivable that knowledge and wisdom accumulates as age increased, so that the ability to adapt to life change increased as well. This increased adaptability to life reduces anxiety and worriment in life, so that life satisfaction increased.

In the generational model, the young generation with higher education tends to display disgruntle for life. This reveals the stressful life of young generation in the early stage of career development. In the early career, the educated young person is full of career plan and self-expectations. The stressful working environment, high life and income expectation, and not so good job performance all together enhances the conflicts between idea and reality. Policy aims to help the young generation's career development would be helpful in promoting the young generation's life satisfaction.

In the elder's model, the elderly tends to get higher life satisfaction with drinking habit. Alcohol drinking provides a sense of relief and disassociation from reality. In everyday life, people who wish to change their mental and emotional status may drink. For the elderly who are in a sense of isolation, i.e., who have poor support networks, decreased mobility, and limited access to transportation may turn to alcohol. This may explain why those who habitually drinking alcohol get better feeling of life. However, this empirical result may also indicate that the society needs to implement a system to take care of the needs of the isolated elderly.

Another noticeable empirical result is that the role of being a major care-giver for family member harms the person's life satisfaction. In the conventional society, every family member shares the responsibility of taking care of ill or disabled member. However, in aging economy the fertility rate has declined and the life expectancy for people has extended. This demographic transition implies that the future size of family would shrink and the prevalence of old-aged disability would increase. The traditional family function in taking care of the disabled family member or the frail elderly is becoming fragile. This implies that a comprehensive social support system, including mental and physical health care, long-term care, and family care-giver relief system should be conceived for the aging society.

REFERENCES

1. Baird, B. M., Lucas, R. E., & Donnellan, M. B. (2010). Life Satisfaction Across the Lifespan: Findings From two

Nationally Representative Panel Studies. *Social Indicators Research*, 99 (2), 183-203.

2. Blanchflower, D.G., and A.J. Oswald. (2008). Is well-being U-shaped over the life cycle? *Social Science & Medicine* 66: 1733–1749.
3. Borges, M. A., Levine, J. R., & Dutton, L. J. (1984). Men's and Women's Ratings of Life Satisfaction by Age of Respondent and Age Interval Judged. *Sex Roles*, 11, (3-4).
4. Deaton, Angus (2008). "Income, Health, and Well-Being around the World: Evidence from the Gallup World Poll." *Journal of Economic Perspectives*, 22(2): 53-72.
5. Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment, 49*, pp. 71-75.
6. Diener, E., Sandvik, E., Seidlitz L., Diener, M. (1993). The relationship between income subjective well-being: Relative or absolute? *Social Indicators Research*, 28, 195-223.
7. Diener, Ed (1984). Subjective Well-Being. *Psychological Bulletin*. Vol. 95, No. 3, pp. 542-575.
8. Dolan, P., Peasgood, T., & White, M. (2008). Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. *Journal of Economic Psychology*, 29(1), 94–122.
9. Easterlin, R. A. (1974). Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In David P.A. and Reder M.W (Eds.) *Nations and Households in Economic Growth*. Essays in honour of Moses Abramowitz. New York: Academic Press.
10. Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The Economic Journal*, 111(473), 465–484.
11. Fernandez, R. M., & Kulik, J. C. (1981). A Multi-level model of Life Satisfaction: Effects of Individual Characteristics and neighbourhood composition. *American Sociological Review*, 46 (6), 840-850.
12. Headley, B., Muffels, R., & Wooden, M. (2008). Money Does Not Buy Happiness: Or does it? A Re-assessment based on the combined effects of Wealth, Income, and Consumption. *Social Indicator Research*, 87 (1), 65-82.
13. Helliwell, John, Richard Layard and Jeffrey Sachs (2012). *World Happiness Report* (PDF). Columbia University Earth Institute.
14. Helliwell, John, Richard Layard and Jeffrey Sachs (2017). *World Happiness Report 2017*. New York: Sustainable Development Solutions Network.
15. Hou, F. (2014). Keep Up with the Joneses or Keep on as Their Neighbours: Life Satisfaction and Income in Canadian Urban Neighbourhoods. *Journal of Happiness Studies*. October 2014, Volume 15, Issue 5, pp 1085-1107.
16. Hsu, Yuan-Ho (2017). "Population Aging, Labor Force Participation, and Economic Growth." *Journal of Business & Economic Policy*. Vol. 4, No. 1.
17. Johnson, Freddie L., Martha J. Foxall, Elizabeth Kelleher, Elizabeth Kentopp, Elizabeth A. Mannlein, Ernestine

Cook (1988). Comparison of Mental Health and Life Satisfaction of Five Elderly Ethnic Groups. *Western Journal of Nursing Research*. Vol 10, Issue 5, pp. 613 – 628.

18. Kangiuan, L. V., Wang, J., & Wei, L. V. (2010). Study on the Residents Satisfaction Degree in the Urban and Rural Fringe in China - Based on Structural Equation Model. J*ournal of Cambridge Studies*, 5, 2-3.
19. Konishi, Fumiko, Linlin Sun, Yasuo Kimura (2009). Physical condition and fitness, living habits, dietary habits, subjective health in association with life satisfaction among elderly people. *Japanese Journal of Health Education and Promotion.* 2009, Vol.17, No.1, p.14.
20. Lee, G. R. (1988). Marital Satisfaction in Later Life: The Effects of Nonmarital Roles. *Journal of Marriage and the Family*, 50 (3), 775-783.
21. Liu, Huijun, Shuzhuo Li, and Marc. W. Feldman (2017). "Gender in Marriage and Life Satisfaction under Gender Imbalance in China: The Role of Intergenerational Support and SES." *Social indicators research* 114.3 (2013): 915–933. PMC. Web. 8 May 2017.
22. Matsuda, Terumi, Akira Tsuda, Euiyeon Kim, and Ke Deng (2014). Association between Perceived Social Support and Subjective Well-Being among Japanese, Chinese, and Korean College Students. *Psychology*, 2014, 5, 491-499.
23. Mayraz, Guy, Gert G. Wagner, and Jürgen Schupp (2009). Life Satisfaction and Relative Income: Perceptions and Evidence. IZA Discussion Paper No. 4390. Available at SSRN: https://ssrn.com/abstract=1489213
24. Michalos, A. C., Zumbo, B. D., & Hubley, A. (2000). Health and the Quality of Life. *Social Indicators Research*, 51, 245-286.
25. Oshio, T., & M. Kobayashi. (2010). Income inequality, perceived happiness, and self-rated health: Evidence from nationwide surveys in Japan. *Social Science & Medicine* 70: 1358–1366.
26. Palmore, E., & Luikart, C. (1972). Health and Social Factors Related to Life Satisfaction. *Journal of Health and Social Behaviour*, 13 (1), 68-80.
27. Pavot, W. G., & Diener, E. (1993). Review of the Satisfaction with Life Scale. *Psychological Assessment*, 5, 164-172.
28. Pavot, W. G., Diener, E., Colvin, C. R., & Sandvik, E. (1991). Further validation of the Satisfaction with Life Scale: Evidence for the cross-method convergence of well-being measures. *Journal of Personality Assessment*, 57, 149-161.
29. Sørensen, Jens F. L. (2014). Rural–Urban Differences in Life Satisfaction: Evidence from the European Union, *Regional Studies*, 48:9, 1451-1466.
30. Steptoe, Andrew et al. (2014). Subjective wellbeing, health, and ageing. *The Lancet*, Vol. , Issue 9968, pp. 640 – 648.
31. Veenhoven, R. (1996). The Study of Life Satisfaction. Chapter 1 in: Saris, W.E., Veenhoven, R., Scherpenzeel, A.C. & Bunting B. (eds). *A Comparative Study of satisfaction with Life in Europe*. Eötvös University Press, 1996,

ISBN963 463 081 2, pp. 11-48.

32. Veenhoven, R. (2000). The four qualities of life. *Journal of Happiness Studies* 1: 1–39.