The U-shaped relationship between happiness and age: Evidence using World Values Survey data

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Abstract

The paper retests the U-shaped relationship between happiness and age using the cross-classified multilevel regression procedure and the World Values Survey data. The analysis accounts for period and cohort effects. The results reconfirm the pattern that happiness is U-shaped in the life course. That is, happiness decreases from a high-point in young adulthood, reaches a low-point in midlife, and thereafter increases to arrive at another high-point in old age. The results show that the high-point of happiness in old age is lower than the high-point of happiness in young adulthood. That happiness does not return to its initial high-point after it drops to a low-point in midlife is perhaps another stylized fact in the relationship between happiness and age.

Keywords: Happiness; age; U-shaped relationship; multilevel regression

JEL Classification: I31; J10

1. INTRODUCTION

Earlier studies found that happiness exhibited a U-shaped pattern with age. The pattern held for studies that used cross-section data (Clark and Oswald 1994; Blanchflower and Oswald 2008; Blanchflower 2010; Stone et al. 2010; Steptoe et al. 2015) and panel data (de Rhee and Alessie 2011; Frijters and Beatton 2012; McAdams et al. 2012; Van Landeghem 2012; Wunder et al. 2013; Schwandt 2016; Cheng et al. 2017). The regularity of such finding meant the following stylized fact: happiness decreases from a high-point in young adulthood, reaches a low-point in midlife, and increases thereafter to arrive at another high-point in old age. The pattern is intriguing because no theory states that happiness is convex in the life course (Diener et al. 1999; Argyle 2001).

The U-shaped relationship between happiness and age remains controversial. One issue in the debate is that the observed pattern is the outcome of an omitted variable, a problem that is typical in studies that use cross-section data. The argument goes that the analyses in such instances do not lead to conclusive findings because age can also stand for an underlying factor like the cohort effect. One solution is to introduce more controls in the analysis like dummy variables for the different cohorts. Yet, such course of action is arguably an arbitrary approach to the problem because there is actually no unambiguous procedure for determining the intervals to use for the cohorts.

The appropriate information to use for an analysis of the relationship between happiness and age is the panel data. In this case, however, the problem concerns the simultaneous control for age, period, and cohort effects (Mason and Fienberg 1985; Glenn 2005). The

effect of age on happiness is not easy to isolate when age is a linear expression of both period and cohort. Of course, the panel fixed effect procedure is a possible solution. But I point out that there are limited prospects for panel analysis because longitudinal data that include information on happiness and age are not common.

Given the above scenarios, I argue that making use of the available data to search for more evidence that happiness is U-shaped with age is a sensible direction to pursue. Thus, I construct a pseudo panel and apply the multilevel cross-classified regression procedure in the analysis. In the end, I get an age-specific effect on happiness net of period and cohort effects. Deaton (1985; see also Easterlin and Shaeffer 1999) introduces the idea of a pseudo panel, but Yang (2008; see also Yang and Land 2013) is the first to apply it to study the relationship between happiness and age using United States data. This paper, however, is the first to my knowledge to apply the procedure to a large set of countries, and so it presents the general direction of happiness in the life course across societies.

There are four sections in this paper. Section 2 presents the methodology. It explains the construction of the pseudo panel and discusses the data. Section 3 presents the results. The last section is the conclusion.

2. METHOD

2.1. Empirical Framework

How do happiness and age relate in the life course? The answer in this paper comes from

a multilevel cross-classified regression analysis of data in a pseudo panel format. Yang (2008; Yang and Land 2013) argues that the procedure avoids the identification problem that is usual in analyses that put age, period, and cohort on the same level of estimation (Mason and Fienberg 1985; Glenn 2003). Moreover, the procedure uses a complicated error structure to account for the cross-level heterogeneity and for the correlated nature of residuals due to the non-independence of data.

More specifically, I estimate the following regression model

$$H_{i(nm)k} = \pi_{0(nm)k} + \pi_{1(nm)k}X_{i(nm)k} + \pi_{2(nm)k}X^2_{i(nm)k} + \pi_{3(nm)k}Z_{i(nm)k} + \varepsilon_{i(nm)k} \quad (1)$$

where $H_{i(nm)k}$, $X_{i(nm)k}$, and $Z_{i(nm)k}$ are, respectively, happiness, age, and socioeconomic profile of a person *i* in period *n,* cohort *m*, and country *k*. The setup recognizes a 3-level structure in the data—that is, individuals (Level 1) belong to periods and cohorts (Level 2) and to countries (Level 3). The intercept, $\pi_{0(nm)k}$, gives the mean of happiness for period *n*, cohort *m,* and country *k*. The terms $\pi_{1(nm)k}$, $\pi_{2(nm)k}$, and $\pi_{3(nm)k}$ are the parameters of interest. The last item, $\varepsilon_{i(nm)k}$, is the standard residual term.

In this paper, the intercept of Equation (1) takes a random effects setup to account for the nesting of data at Levels 2 and 3. That is,

$$\text{period and cohort:} \quad \pi_{0(nm)k} = \beta_{00k} + u_{0(n)\,k} + u_{0(m)k} \quad (2a)$$

$$\text{country:} \quad \beta_{00k} = \alpha_{000} + v_{00k} \quad (2b)$$

In Equation (2a), the country-level mean of happiness is β_{00k} given period and cohort. The period and cohort random effects are $u_{0(n)k}$ and $u_{0(m)k}$, respectively. Equation (2b) shows α_{000} is the grand mean of happiness. The country random effect is v_{00k}. The rest of the parameters in Equation (1) are set constant.

Putting Equations (2a) and (2b) into Equation (1) obtains

$$H_{i(nm)k} = \alpha_{000} + \pi_{1(nm)k}X_{i(nm)k} + \pi_{2(nm)k}X^2_{i(nm)k} + \pi_{3(nm)k}Z_{i(nm)k} + \text{error} \qquad (3)$$

where "error" is equal to ($u_{0(n)k} + u_{0(m)k} + v_{00k} + \varepsilon_{i(nm)k}$). Yang (2008; Yang and Land 2013) asserts that a setup like Equation (3) avoids the age-period-cohort identification problem because it accounts for period and cohort in the analysis. As such, period and cohort affect happiness in an indirect fashion in Level 2 through the variance components.

Bell (2014) suggests the inclusion of a cohort covariate in Equation (2a) as a control for cohort differences from the grand mean; that is, $\pi_{0(nm)k} = \beta_{00k} + \beta_{01k}\,\text{Cohort}_{mk} + u_{0(n)k} + u_{0(m)k}$. Yang and Land (2013), in contrast, put period and cohort covariates in Equation (2a) as controls for between period and cohort differences from the grand mean; that is, $\pi_{0(nm)k} = \beta_{00k} + \beta_{01k}\,\text{Cohort}_{mk} + \beta_{02k}\,\text{Period}_{nk} + u_{0(n)k} + u_{0(m)k}$. In this paper, though, I do not assume that Equation (2a) requires a period or cohort covariate or both period and cohort covariates. Rather, I first check whether covariates are necessary or not. But, I include a country-level covariate, M, to control for differences in the country-level variations; that is, the set up in Equation (2b) above becomes $\beta_{00k} = \alpha_{000} + \alpha_{001}\,M_k + v_{00k}$ (Yang 2006; Yang and Land 2013).

2.2. Data and Dataset Construction

The raw data come from the 3rd to the 6th waves of the World Values Survey (WVS). The combined data represents about 90 percent of the world's average population for the period 1995 to 2014. The dataset I ended up using includes 240,699 observations from 95 economies, of which 42 are upper-income, 46 are middle-income, and 7 are low-income societies.

The proxy measure I use for happiness is "life satisfaction," which refers to how good enough life turns out for a person at a particular point in time. The information is a personal appraisal or judgment and not an observer's or another person's evaluation. In making such evaluation then the person weighs the discrepancy between aspirations in different life domains (e.g., home, work, etc.) and achievements with respect to the same life domains (Andrews and Withey 1976; Campbell et al. 1976; Michalos 1985). The information is in effect a "net" self-assessment of well-being.[1]

The data for life satisfaction are responses to the WVS query: '*All things considered, how*

[1] The literature says that happiness exhibits good validity and reliability properties. For validity, studies find a high correlation between the personal appraisal about happiness and, say, success in careers (Diener et al. 2002) or in other life domains like family life (Lyubomirsky et al. 2005), engagement in their society (Guven 2011), good health (Weinman et al. 2008), longevity (Danner et al. 2001), or smiling (Ekman et al. 1990). There is also a high correlation between the personal appraisal about happiness and the appraisal of spouse, relatives, and friends (Costa and McCrae 1988; Sandvik et al. 1993). For reliability, studies find that the reports about happiness at different points in time are stable and consistent as long as no extraordinary life events occur between periods (Andrews and Withey 1976; Diener and Larsen 1984; Costa and McCrae 1988; Ehrhardt et al. 2000; Schimmack and Oishi 2005). Thus, all things the same, a person who is happy at time t is also happy at time t+1.

satisfied are you with your life as a whole these days?' These responses take the integer values between 1 (i.e., completely dissatisfied) and 10 (i.e., completely satisfied). In this paper, I assume that I can treat the data as cardinal numbers.

In this paper, the key covariates in the analysis are age, period, and cohort. "Age" is in actual years. The range of age is 15 to 69.[2] I argue that a 69 age cutoff pre-empts a cubic relationship between happiness and age that manifests when the range extends to, say, the 80s or the 90s (de Rhee and Alessie 2011; Frijters and Beatton 2012; McAdams et al. 2012; Van Landeghem 2012; Wunder et al. 2013; Schwandt 2016). Indeed, studies find that the level of happiness falls again after the 70s because age-related problems like health deterioration and personal insecurity set in to dominate the evaluations of life.

"Period" is about the effect of a situation or incident on everyone regardless of their age. In this paper, period refers to the WVS survey years: 1995 to 1998 for the 3rd wave, 1999 to 2004 for the 4th wave, 2005 to 2009 for the 5th wave, and 2010 to 2014 for the 6th wave. I argue that a 20-year timeframe is long enough to see whether a period trend exists or not.

"Cohort" is about an initial condition or event that a particular group shares and defines them as they age. In this paper, cohort refers to the birth year of an individual as indicated in the WVS. I set 1930 to 1996 as the range of cohort. I argue that this cohort timeframe

[2] I use both period and cohort to determine the age of a person or both period and age to determine the cohort of a person whenever the information is missing in the raw data. I exclude entries that do not report information for age and birth year.

is long enough to see whether a cohort trend exists or not.

Of course, the regression analysis also includes covariate for the socioeconomic profile: gender, marital status, education, work, and income. “Gender” takes a value of 1 if male or 2 if female. “Marital status” takes the value of 1 if married, 2 if ex-married (i.e., divorced, separated, or widowed/er), and 3 if single. “Education” covers the following status: 1 if zero or limited education, 2 if completed primary-level education, 3 if completed secondary-level education, and 4 if completed tertiary-level education. “Work” covers the following status: 1 if employed, 2 if not in the labor force, and 3 if unemployed. “Income” is a self-categorization of income status as a proxy measure for the actual income. I recode the raw data from decile rankings to quintile rankings to increase the number of observations for each category and to enhance the robustness of results. The highest category of each socioeconomic profile is the reference status.

I use two covariates for the Level 3 component of the model. The first is gross domestic product per capita (GDP), which is available from the World Development Indicators. The other is the mean of life satisfaction during a survey year (c.f., Inglehart et al. 2008), which controls for norm effects in a particular society. I also use the latter metric as a robustness check on the results.

Lastly, the construction of the pseudo panel in this paper falls in the tradition of Deaton (1985) and Easterlin and Shaeffer (1999). In particular, I construct the pseudo panel using the following settings: a person of a particular age (Level 1) is nested in both period and cohort (Level 2) and nested in a country (Level 3). I consider two sets of groupings given

no ex ante information on what the appropriate intervals are for the periods and for the cohorts. More specifically, I define the following: 1-year interval for both period and cohort; then 2-year interval for the period and 5-year interval for the cohort. Bell (2014), for instance, uses a similar approach for period and cohort intervals.

3. RESULT

3.1 Descriptive Results

Figure 1 contains two panels. The left panel shows graphs of the deviations of happiness from the mean of happiness in 1-year intervals for age, period, and cohort, respectively. The right panel shows graphs of the deviations of happiness from the mean of happiness in 5-year intervals for both age and cohort and in 2-year intervals for period. Notice that the pairings across the panels exhibit similar trends.

Both top diagrams in Figure 1 show that happiness is convex across the life course (1-year interval: b = -0.039, b^2 = 0.0004, both $p < 0.01$; 5-year interval: b = -0.135, b^2 = 0.0090, both $p < 0.01$). The diagrams illustrate that the high-point of happiness in old age is lower than the high-point in young adulthood. As Section 3.2 explains in detail, the pattern suggests that people reevaluate their goals and readjust their outlooks in life, and so they also redefine what happiness means as they age. The pattern further suggests that there is no complete adjustment to the experience of a low-point of happiness in midlife.

Next, in terms of periods, the two middle diagrams in Figure 1 describe a volatile pattern

of happiness between 1995 and 2014. The test results, however, indicate that there is no linear trend between happiness and period in this 20-year timeframe (1-year interval: b = 0.011, p = 0.64; 2-year interval: b = 0.042, p = 0.40). Further test reveals that the volatile pattern of happiness relates to intervals of economic volatility (1-year interval: r = 0.499, $p < 0.05$; 2-year interval: r = 0.447, p = 0.195), with crises periods in 1997-1998 ($\overline{\Delta M}$ = -0.167), in 2001-2002 ($\overline{\Delta M}$ = -1.423), in 2007-2008 ($\overline{\Delta M}$ = -0.562), and in 2013-2014 ($\overline{\Delta M}$ = -0.320). In addition, the trends show recoveries in happiness during episodes of economic stability.

The lower two diagrams in Figure 1 show the trends in happiness for the different cohorts. Their patterns suggest that the earlier cohorts report lower happiness than the more recent ones do. In addition, the patterns suggest that the cutoff point for each group is around the mid-1960s: people born before the mid-1960s report lower happiness than those born after the mid-1960s. In fact, test results indicate that a linear trend for happiness exists across the cohorts but the coefficient is small in size (1-year interval: b = 0.011, $p < 0.01$; 5-year interval: b = 0.055, $p < 0.01$). Even so, a linear association between happiness and cohort reinforces the U-shaped pattern of happiness with age (c.f., Van Landeghem 2012 and Cheng et al. 2017).

[INSERT FIGURE 1 HERE]

3.2 Empirical Results

Table 1 is a summary of the regression analysis. The initial regression in Column 1 does

not include the covariates for the socioeconomic profile and the random effects setup at Level 2. Nevertheless, it still confirms the convex relationship between happiness and age. Column 1 also indicates that the variance components explain most of the variations at Level 2 but not at Level 3. This finding revises the description in Section 3.1 about a possible linear trend for the cohort; but, at the same time, it also points out that a country-level covariate is necessary to control for the variations in happiness between countries.[3]

Columns 2 to 5 in Table 1 present results that are consistent with the baseline finding. Relative to Column 1, though, Columns 2 to 5 indicate that a period or a cohort covariate in the random effects setup at Level 2 does not lead to much more interesting results. Columns 2 and 3, in particular, reveal that the alternative period covariates are statistically not significant. The same conclusion applies to Columns 4 and 5 that use alternative formats of a cohort covariate. Nonetheless, Columns 2 to 5 indicate that there are large variations between happiness and country-level context. I think a more important finding in Columns 2 to 5 is that the non-relevance of both period and cohort covariates do not undermine the initial conclusion in Column 1 of a convex path of happiness across the life course.

Next, Column 6 includes GDP per capita as a country-level covariate in the random effects setup at Level 3 but excludes both period and cohort covariates in the random effects setup at Level 2. The result is only slightly better than Column 1. Interestingly, though, the coefficient on GDP per capita is consistent with the Easterlin paradox, which states that the long-run relationship between happiness and income is practically zero

[3] The appendix contains the results of a regression analysis using a 2-level multilevel regression procedure.

(Easterlin 1974; see latest description in Easterlin 2015, 2016). The estimate in Column 6 in particular implies that each unit of growth in income could raise the mean of happiness by 0.004 point. All the same, Column 6 establishes that a U-shaped path of happiness across the life cycle does exist.

The last two columns include the socioeconomic profile covariates. The results are all consistent with the literature on how the socioeconomic profile relates to happiness. I just briefly describe the findings for completeness in the presentation.

Accordingly, the results in Columns 7 and 8 confirm that the mean of happiness is lower for males relative to females, for individuals with limited education attainment relative to those with complete education, and for those in the lower income quintiles relative to the higher income quintile. Correspondingly, the mean of happiness is higher for the married (lower for the ex-married) relative to the non-married and also for individuals with jobs or not interested in employment relative to the unemployed.

The more interesting findings in Columns 7 and 8 concern the covariates in the random effects setup at Level 3. Clearly, the result for GDP per capita in Column 7 is consistent with the result in Column 6. Once again, the large variations between happiness and country-level context remain. This result suggests that GDP per capita is not an ideal covariate but it is good enough to control for some of the country-level variations. In Column 8, the results indicate that the variations between happiness and country-level context are fully accounted for in the analysis. Interestingly, this finding in Column 8 implies that there is a norm effect in happiness—that is, the country-level happiness can

affect the individual-level happiness (c.f., Clark 2003). In any case, both Columns 7 and 8 lead to the same conclusion: happiness is U-shaped with age.[4]

Lastly, using the results for age and age-squared, I obtain a turning point of happiness in the mid-40s, which is consistent with the literature. The predicted mean of happiness at the trough is 6.44, which is 0.46 below the first peak of happiness in the age range of 15-19. The second peak of happiness in the late 60s reaches a predicted mean of 6.62, which is again below the first peak of happiness in the age range 15-19 by 0.28. Briefly, Table 2 reveals that happiness does not return to its initial high-point after it drops to a low-point in midlife. This pattern suggests no complete recovery in happiness after a midlife low-point.

[INSERT TABLES 1 AND 2 HERE]

Is happiness U-shaped with age? The evidence in this paper is quite clear: there is a U-shaped relationship between happiness and age. I point out that the evidence validates the findings of studies that use cross-section data in the analysis like Blanchflower and Oswald (2008), Blanchflower (2010), Stone et al. (2010), and Steptoe et al. (2015) and those that use pseudo panel data in the analysis like Yang (2008) and Yang and Land (2013). I further point out that the evidence is consistent with the findings of studies that use panel data in the analysis like de Rhee and Alessie (2011), Frijters and Beatton (2012), McAdams et al. (2012), Van Landeghem (2012), Wunder et al. (2013), Schwandt

[4] Grouping countries into "Western and rich countries" and "other countries" lead to the same conclusion as well. Details are available from the author.

(2016), and Cheng et al. (2017).

Nonetheless, like Blanchflower and Oswald (2008) and Schwandt (2016), I point out that the evidence does not actually explain why the U-shaped relationship between happiness and age exists at all. I thus rely on other studies for such an explanation.

Appropriately, I find the claim that the mismatches between aspirations and achievements underpin the path of happiness across the life course to be the most convincing explanation (Schwandt 2016; see also Mason and Faulkenberry 1978, Michalos 1985, and Andrews 1981). The interpretation is that a decrease in happiness occurs because the purported mismatches intensify as people age and reach their peak in midlife, which is also the stage in life when the concerns for material things and social comparisons are most intense (Belk 1985; Plagnol 2011; Brown et al. 2014). People learn from their life experiences in due course, and so they revise and realign aspirations to fit their situations. At the same time, people redefine happiness as they age from, say, one that is ideal to one that is much more realistic or sensible given their personal contexts (Mogilner et al. 2011; McMahon and Estes 2012; Oishi et al. 2013). These changes in disposition help people not only in dealing with their life disappointments (Campbell et al. 1976) but also in coping with their life challenges (Carstensen 1995; Lawton 1996). In the end, people are able to deal with their situations much more effectively. Equally important, too, is that in time people become much more open and accepting of their life circumstances, especially after midlife (Ryff 1995; Brassen et al. 2012). If so, the increase in happiness in the post-midlife period occurs because the aforementioned mismatches become smaller and/or become not as relevant to people as before. Indeed, the U-shaped relationship between

happiness and age that the evidence in Table 1 confirms is just a manifestation of the changes in and the concomitant evaluations of well-being as people live their lives.

4. CONCLUSION

This paper revisited the notion that happiness exhibits a U-shaped path in the life course. The analysis used a multilevel cross-classified regression procedure to analyze a pseudo panel that was constructed using data from the World Values Survey. The analysis found that happiness is indeed convex with age—that is, broadly, happiness initially fell from a high-point in young adulthood, then reached a low-point in midlife, and rose thereafter to arrive at another high-point in old age. The analysis found the low-point of happiness to be in the mid-40s. In addition, the analysis also found that, at least with the data used for the study, the high-point of happiness in old age was lower than the high-point of happiness in young adulthood. This latter finding meant that happiness did not return to its initial high-point after a low-point in midlife. It suggested that there was no complete recovery in happiness after the experience of a low-point in midlife.

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Table 1: Results of multilevel cross-classified regression analysis

	Model 1	s.e.	Model 2	s.e.	Model 3	s.e.	Model 4	s.e.
Constant	7.3643	0.13	-56.837	36.0	7.0451	0.23	-9.4726	24.5
Age	-0.0349	0.00	-0.0351	0.00	-0.0351	0.00	-0.0265	0.01
Age-squared	0.0003	0.00	0.0003	0.00	0.0003	0.00	0.0003	0.00
Gender: male								
Education: no school								
primary								
secondary								
Marital: married								
ex-married								
Work: employed								
not labor force								
Income: quintile 1								
quintile 2								
quintile 3								
quintile 4								
Period, 1-year interval			0.0320	0.02				
Period, 2-year interval					0.0598	0.04		
Cohort, 1-year interval							0.0084	0.01
Cohort, 5-year interval								
GDP per capita, means								
Happiness, means								
Variance Components:								
Residual	4.8304	0.01	4.8334	0.01	4.8334	0.01	4.8304	0.01
Intercept: country	0.9297	0.10	0.9429	0.10	0.9411	0.10	0.9337	0.10
Intercept: birth cohort	0.0005	0.00	0.0005	0.00	0.0005	0.00	0.0004	0.00
Intercept: survey period	0.1663	0.09	0.1108	0.08	0.1191	0.08	0.1442	0.09
Intraclass correlation:								
Country	0.1569		0.1601		0.1597		0.1580	
Birth cohort	0.0001		0.0001		0.0001		0.0001	
Survey period	0.0281		0.0188		0.0202		0.0244	
Age turning point:	54.2		54.1		54.1		41.2	

Table 1 *continued…*

	Model 5	s.e.	Model 6	s.e.	Model 7	s.e.	Model 8	s.e.
Constant	7.6562	0.30	3.8727	0.36	5.3102	0.36	2.2108	0.10
Age	-0.0387	0.00	-0.0349	0.00	-0.0668	0.00	-0.0673	0.00
Age-squared	0.0003	0.00	0.0003	0.00	0.0007	0.00	0.0007	0.00
Gender: male					-0.1065	0.01	-0.1051	0.01
Education: no school					-0.3172	0.02	-0.3150	0.02
primary					-0.1771	0.01	-0.1776	0.01
secondary					-0.1048	0.01	-0.1067	0.01
Marital: married					0.2856	0.01	0.2861	0.01
ex-married					-0.2030	0.02	-0.2038	0.02
Work: employed					0.4008	0.02	0.3996	0.02
not labor force					0.4338	0.02	0.4312	0.02
Income: quintile 1					-1.5281	0.02	-1.5058	0.02
quintile 2					-1.1008	0.02	-1.0867	0.02
quintile 3					-0.6217	0.02	-0.6142	0.02
quintile 4					-0.1927	0.02	-0.1907	0.02
Period, 1-year interval								
Period, 2-year interval								
Cohort, 1-year interval								
Cohort, 5-year interval	-0.0190	0.02						
GDP per capita, means			0.4094	0.04	0.3608	0.04		
Happiness, means							0.9424	0.01
Variance Components:								
Residual	4.8304	0.01	4.8304	0.01	4.5336	0.01	4.5366	0.01
Intercept: country	0.9280	0.10	0.6338	0.07	0.6438	0.07	0.0305	0.00
Intercept: birth cohort	0.0004	0.00	0.0004	0.00	0.0004	0.00	0.0005	0.00
Intercept: survey period	0.1778	0.10	0.0771	0.05	0.0443	0.04	0.0002	0.00
Intraclass correlation:								
Country	0.1563		0.1147		0.1233		0.0067	
Birth cohort	0.0001		0.0001		0.0001		0.0001	
Survey period	0.0299		0.0125		0.0085		0.0001	
Age turning point:	60.1		54.3		46.5		46.5	

Notes:

1. The proxy measure for happiness is life satisfaction. The raw data come from the 3rd to the 6th waves of the World Values Survey. Reference status: female for gender, college-level schooling for education, single for marital status, unemployed for work, and 5th quintile for income.
2. Level 1 is the person. Level 2 is the cross-classified categories of period and cohort. Level 3 is the country. In the table, "s.e." means standard error.
3. Model 1 is the baseline. Models 2 to 6 are alternative specifications. Model 7 and 8 show the full regression analyses. Model 8 is the robustness test for Model 7. The results are qualitatively the same even when the analyses exclude data from the low-income societies.
4. The appendix presents results for a 2-level multilevel regression procedure (i.e., no cross-classified categories).

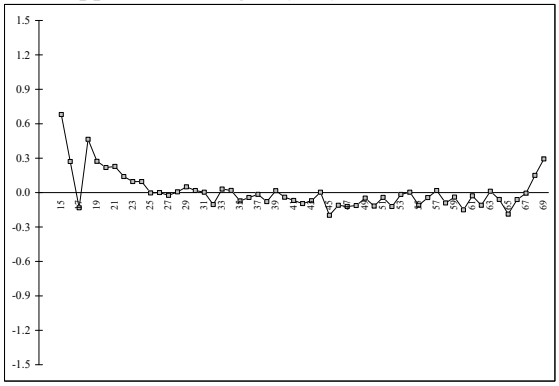
Table 2: Predicted mean of happiness, by age group

Range of Age	Estimate 1	Estimate 2
15-19	6.9003	6.9008
20-24	6.6918	6.6922
25-29	6.5797	6.5795
30-34	6.5611	6.5613
35-39	6.4945	6.4944
40-44	6.4838	6.4835
45-49	6.4388	6.4391
50-54	6.4604	6.4607
55-59	6.4714	6.4715
60-64	6.4849	6.4850
65-69	6.6215	6.6212
Difference b/w values:		
(15-19) – (40-44)	0.4165	0.4173
(15-19) – (45-49)	0.4615	0.4617
(15-19) – (50-54)	0.4399	0.4401
(15-19) – (65-69)	0.2788	0.2796

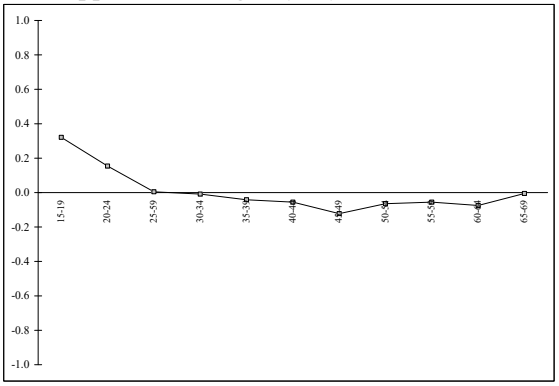
Note:
Figures are estimates using the results in Models 7 and 8 in Table 1. Each row presents the mean for the specified range of age.

Figure 1: Deviation of happiness from the mean of happiness, by age, period, and cohort

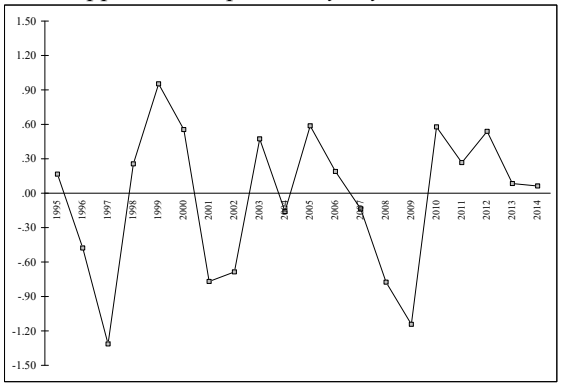
A1: Happiness and age, by 1-year interval



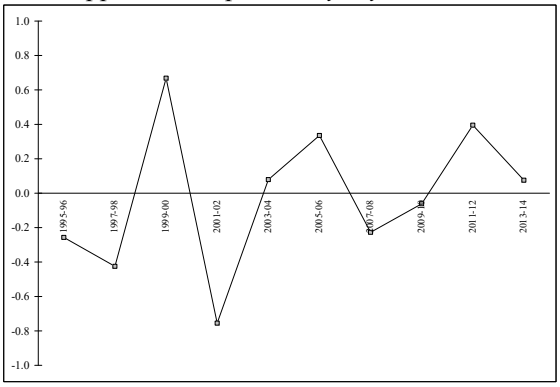
B1: Happiness and age, by 5-year interval



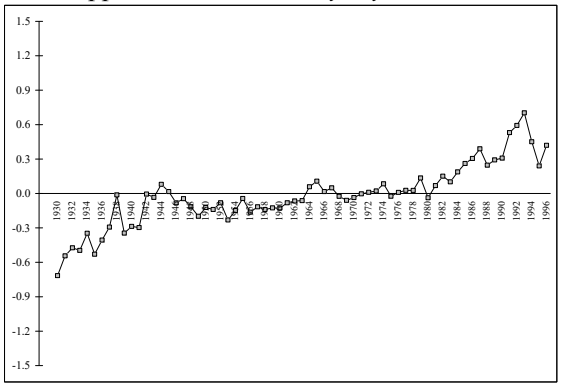
A2: Happiness and period, by 1-year interval



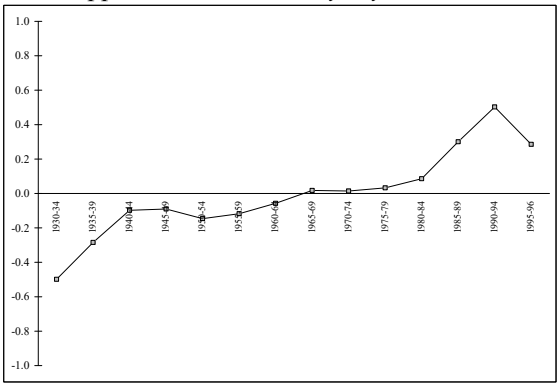
B2: Happiness and period, by 2-year interval



C1: Happiness and cohort, by 1-year interval



C2: Happiness and cohort, by 5-year interval



APPENDIX

The results in Table 1.1 below are comparable to the results in Table 1 in the main text: happiness is U-shaped with age and its low-point is in the mid-40s. Like Table 1 in the main text, Models I to IV in Table 1.1 below indicate large variations at the country level. Like in the main text, the estimate for the coefficient of GDP per capita is consistent with the Easterlin paradox (Model III); and there is a "norm effect" in happiness (Model IV).

A more important point from Table 1.1 is the following: the results of a 2-level multilevel specification are also useful for analyses of the relationship between happiness and age. Put differently, the results of analyses that do not focus on age, cohort, and period need not obtain misleading estimates.

Table 1.1: Results of 2-level multilevel regression analysis

	Model I	s.e.	Model II	s.e.	Model III	s.e.	Model IV	s.e.
Constant	7.3910	0.08	3.7555	0.35	5.232	0.35	2.1953	0.10
Age	-0.0347	0.00	-0.0347	0.00	-0.066	0.00	-0.0664	0.00
Age-squared	0.0003	0.00	0.0003	0.00	0.001	0.00	0.0007	0.00
Gender: male					-0.106	0.01	-0.1056	0.01
Education: no school					-0.317	0.02	-0.3145	0.02
primary					-0.177	0.01	-0.1763	0.01
secondary					-0.105	0.01	-0.1059	0.01
Marital: married					0.286	0.01	0.2863	0.01
ex-married					-0.203	0.02	-0.2040	0.02
Work: employed					0.401	0.02	0.4002	0.02
not labor force					0.434	0.02	0.4337	0.02
Income: quintile 1					-1.528	0.02	-1.5013	0.02
quintile 2					-1.100	0.02	-1.0814	0.02
quintile 3					-0.621	0.02	-0.6104	0.02
quintile 4					-0.192	0.02	-0.1872	0.02
GDP per capita, means			0.4260	0.04	0.372	0.04		
Life satisfaction, means							0.9414	0.01
Variance Components:								
Residual	4.8311	.01	4.8311	0.01	4.5342	0.01	4.5343	0.01
Intercept: country	1.0639	.11	0.6792	0.07	0.6733	0.07	0.0306	0.00
Intraclass correlation:								
Country	0.1805		0.1233		0.1293		0.0067	
Age turning point:	54.3		54.3		46.6		46.6	

Notes:

1. The proxy measure for happiness is life satisfaction. The raw data come from the 3rd to the 6th waves of the World Values Survey. Reference status: female for gender, college-level schooling for education, single for marital status, unemployed for work, and 5th quintile for income.
2. Level 1 is the person. Level 2 is the country. In the above table, "s.e." means standard error.
3. Model I is the baseline. Models III and IV show the full regression analyses. Their counterparts in Table 1 in the main text are Columns 7 and 8, respectively. Model IV is the robustness test for Model III.