Does Happiness Increase in Old Age? Longitudinal evidence from 20 European Countries.

August 2021

Christoph Becker[1], Stefan T. Trautmann[1,2]

[1] Alfred-Weber-Institute for Economics, University of Heidelberg. Adress: Bergheimer Str. 58, 69115 Heidelberg, Germany.

[2] Corresponding author. Alfred-Weber-Institute for Economics, University of Heidelberg; and Department of Economics, Tilburg University. Address: Bergheimer Str. 58, 69115 Heidelberg, Germany. E-mail: trautmann@uni-heidelberg.de, Tel.: 0049-6221-542952.

Abstract

Keeping track of self-reported and objective measures of well-being and happiness is an important topic in research and in policy making. Of particular interest is how happiness develops over the life cycle. Several studies indicate that happiness follows a U-shape over the life cycle: Happiness decreases after the teenage years until reaching its nadir in middle age. A similar number of studies views the U-shape critically, stating that it is the result of the wrong controls or the wrong model. In this paper, we compare the different approaches in the literature, tracing the happiness of European citizens 50 and older over multiple waves. Consistent with the U-shape, we find that happiness increases after the age of 50, irrespective of the specification used. Our results are robust when controlling for differences across countries, gender, and when taking selection effects due to mortality into account.

JEL Classification: I3, I31, J1, J14

Keywords: Happiness, U-shape, Ageing, SHARE, Midlife

Declarations

Funding: Analyses and work on this draft funded by the University of Heidelberg. The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

Conflicts of interest: Not applicable.

Availability of data and material: Data is provided free for scientific use. Researchers need to apply here: http://www.share-project.org/data-access.html.

Code availability: Analyses have been conducted in Stata 17. Replication package (without the data) is available upon request.

Authors' contributions: Both authors contributed equally to the paper.

Acknowledgements

This paper uses data from SHARE Waves 1, 2, 4, 5, 6, and 7 (DOIs: 10.6103/SHARE.w1.710, 10.6103/SHARE.w2.710, 10.6103/SHARE.w4.710, 10.6103/SHARE.w5.710, 10.6103/SHARE.w6.710, 10.6103/SHARE.w7.711, see Börsch-Supan et al. (2013) for methodological details.

We thank Andrew Oswald and David Blanchflower for their helpful comments and insights.

1 Introduction

Economists have long been engaged in measuring the welfare and prosperity of societies. Mainly, this allows for practical applications: How well does the economy of a society perform? In which areas should additional fund be invested? In the past, the prime economic measure of welfare was the gross domestic product. However, as often criticized, the GDP does not measure crucial elements of the economy such as care work, housework, or other forms unpaid work. This was already recognized by Simon Kuznets, one of the major contributors to the concept of GDP: "the welfare of a nation can scarcely be inferred from a measure of national income." (Kohler and Chaves 2003) Different approaches have aimed to reconcile these problems by measuring welfare more broadly. Two of the most prolific examples are the UN's Human Development Index (HDI), suggested and developed by economists such as Mhabub ul Haq and Amartya Sen, and the Happy Planet Index (HPI). Another approach is to measure the individual happiness of members of a society (Deaton 2018). This can be done in multiple ways, the most common methods being self-reported happiness or life-satisfaction, measures of positive and negative affect, or indirect measures, such as the number of antidepressants consumed.

A substantial amount of work has been devoted to study how happiness measured in such ways develops over the course of the lifetime. This allows insight into how happiness evolves alongside important life events, such as changes in employment status, getting married, having children, but also ageing in general. Studies in economics often find that happiness decreases from the teenage years to middle age, only to increase afterwards (and then to fall again in very high age). This dip in middle age is referred to as the U-shape of happiness and has been reported for a variety of countries (Bell and Blanchflower 2020; Blanchflower 2021; Blanchflower and Oswald 2008; Gerdtham and Johannesson 2001; Gwozdz and Sousa-Poza 2010; Stone et al. 2010). This would indicate that people experience a low point of happiness around the age of 45-50. This dip is usually found to be comparable in magnitude to events such as getting divorced or losing employment (Blanchflower 2021; Blanchflower and Graham 2020). Taken together, this literature gives a persuasive reason to focus on this happiness dip as a researcher or policy maker. This is reflected in the attention this literature has received outside of academic research, reflected for example in articles in the *Economist* (2010) or the German weekly newspaper *Die Zeit* (2021), and many others.

At the same time, the U-shape of happiness has been contested by numerous other studies. Critique includes using the wrong controls (Glenn 2009; Morgan and O'Connor 2020), the wrong statistical model (Frijters and Beatton 2012; Ulloa et al. 2013), looking only at selected countries (Deaton 2008), and not accounting for cohort effects (Ulloa et al. 2013). This critique in turn has produced many replies, indicating that the U-shape exists, even when accounting for these critiques (Blanchflower and Graham 2020; Blanchflower and Oswald 2009; Clark 2019). A further criticism is that a lot of evidence on the U-shape stems from cross-sectional data (Galambos et al. 2020; Ulloa et al. 2013), although some studies confirming the U-shape based on longitudinal data exist (Cheng et al. 2017; Clark and Oswald 2006; Galambos et al. 2020; Van Landeghem 2012). Looking at cross-sections might produce a U-shape because events can affect disparate age groups differently. Crucially, there seems to be no clear consensus in the literature on which statistical tools should be used to estimate the relationship between age and happiness.

In this paper, we try to add to this debate by providing an account based on a large European database. We use SHARE (Survey of Health, Age and Retirement in Europe) data, which includes people 50 and upwards. Accordingly, we study if happiness increases after middle age, the right branch of the U-shape. SHARE is a multi-wave panel; hence we add to the literature by providing further evidence for longitudinal data. We use different specifications and control sets based on previous literature to provide a detailed account of the age-happiness relation in old age for 20 European countries. Our results indicate support for the second half of the U-shape of happiness; that is happiness increases with age after midlife. Congruent with other studies we also find that happiness starts to deteriorate at high age (Gwozdz and Sousa-Poza 2010). These results are generally robust to the specification used, as well as to using different subsets of the sample to account for country, gender or selection effects due to mortality. Some countries do not or not clearly exhibit a positive relation between age and happiness. However, these results might in part be driven by lack of sufficient observations for the individual countries.

2 Methodology

2.1 Data

We use waves 1 to 7 of the SHARE Release 7.0.0 (Survey of Health, Age and Retirement in Europe) database (Börsch-Supan 2018a, 2018b, 2018c, 2018d, 2018e, 2018f; Börsch-Supan et al. 2013), except for wave 3. Wave 3 of SHARE (SHARELIFE) focused solely on past life events and does not include our target variables. SHARE is a database intended to be used to study the effects of ageing over the life-course of European citizens aged 50 and older, managed by the Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy. The cross-national panel database provides extensive data on health and socio-economic status. We merge data over the above-mentioned six waves in order to track respondents over the course of the different interviews. In total, the merged data set has 102,759 individual observations. Theses waves interviewed the respondents from 2004 to 2017, spanning 13 years and 20 countries. During this time some participants left the study (due to death or other reasons), while others joined (especially because later waves include additional countries).

2.2 Measuring Happiness

Measuring happiness, well-being or life satisfaction is crucial to our research question. How happy, well or satisfied people are with their life can depend on multiple domains, such as employment, relationships, physical and mental health, financial situation or the fulfillment of goals and desires (Easterlin 1974; Frey and Stutzer 2002). Accordingly, one can elicit broad measures of happiness (the simplest would be to ask respondents directly "How happy are you with your life?") or measures that zoom into specific domains. While there have been attempts to provide a unified, targetable index of happiness (such as Bhutan's Gross National Happiness or the Happy Planet Index), there is no consensus how to best measure happiness best. In our study, we utilize three measures to map respondents' well-being: a simple single-item question regarding life satisfaction, the CASP-12 multi-item quality of life scale; and the EURO-D depressive symptoms scale. In the following, we discuss the three measures in more detail.

Our first measure, *Life satisfaction*, measures a general, subjective feeling about the quality of life. It is extracted by a single-item question in which respondents indicate on a scale from 0 (low satisfaction) to 10 (high satisfaction) how satisfied they are with their life. This scale has acceptable reliability and validity (Beckie and Hayduk 1997; Pavot and Diener 1993) and relates meaningfully to various health and psychosocial measures (Kim et al. 2021)

Second, the CASP-12, *quality of life* scale, which is designed to capture quality of life in old age (Hyde et al. 2003). Participants indicate for twelve statements whether they apply on a scale from 1 (often) to 4 (never). The twelve questions concern four dimensions of quality of life, control, autonomy, pleasure, and self-realization, resulting in an aggregate index ranging from 12 (low quality of life) to 48 (high quality of life). Hence, the CASP-12, relates more closely to affective measures or to the concept of *eudemonia*, where happiness follows from activity and control over one's life (see Aristoteles' Nicomachean Ethics, e.g. in Ameriks and Clarke, 2000). We normalize it such that it ranges from 0 (low quality of life) to 10 (high quality of life).

Our third and last measure is the EURO-D depression score (Prince, Reischies, et al. 1999), which was designed to capture depressive symptoms among older people. It has been demonstrated to provide a valid comparison of depressive symptoms across European countries (Castro-Costa et al. 2008; Prince, Beekman, et al. 1999). The EURO-D depression score is generated from questions on 12 dimensions: Depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness. The answers to these questions result in an aggregate index ranging from 0 (not depressed) to 12 (very depressed). We normalize it such that it ranges from 0 (very depressed) to 10 (not depressed) and call it *Lack of depressive symptoms*, such that higher values of this index are comparable to higher values in the other two measures.

Table A1 in the appendix provides an overview over the specific questions asked for these three measures. In the following sections, we address these three measures collectively as measures of *happiness*, unless specified otherwise.

2.3 Controls

Different events and choices in a person's life can influence the experienced level of happiness and life satisfaction (such as marrying, finding a better job, becoming a parent). If one wants to isolate the pure effect of ageing on happiness, one might want to control for such factors. On the other hand, these events are an inherent part of ageing. For example, many people become parents neither early nor very late in life. Controlling for such life events might thus lead to underestimating how happiness changes over the life course. If many, if not most, of the important life events of a respondent are controlled for in their own variables, the effect of age is bound to become insignificant. As of yet, there appears to be no general agreement which set of controls should be included when analyzing happiness and life satisfaction in the literature.

Easterlin and Schaeffer (1999), Hellevik (2017) and Clark (2019) stressed the importance of controlling for cohort effects. Laaksonen (2018) showed that different controls sets can influence whether one obtains a U-shape (or any other specific form) in the first place. On the other hand, Frijters and Beatton (2012) favor fixed effects models that would exclude most controls. Finally, a number of studies (Blanchflower 2021; Blanchflower and Oswald 2009) have shown, that the U-shape can be obtained even without using any controls at all. More importantly, if and which controls are used should depend on the underlying research question: Specifications *with* controls can capture the pure effect of ageing, while abstracting from life events. Specifications *without* controls allow to estimate the overall trajectory of happiness over the life course (Blanchflower and Graham 2020).

In order to accommodate the above outlined approaches, we conduct our analyses in the following ways: First, without any controls. Second, using a set of controls to account for cohort and country effects, as well as factors such as gender, income, health and marriage. Third, we use a fixed effect specification. One further concern can be the presence of selection effects: If less happy respondents are more likely to die early, they might disproportionally drop out of the panel, leading to a spurious positive correlation between age and happiness. Previous studies have indicated that different measures of happiness correlate positively with life expectation (Guven and Saloumidis 2014; Kim et al. 2021; Lee and Singh 2020). That is, older people could be happier, simply because their unhappier contemporaries are likely to die earlier and thus drop out of the pool of respondents. We control for this in three ways: First, we test whether we find evidence for such selection effects. Second, as we find such effects to be present (see section 3.2), we control for respondents that participated in all waves. This gives us a primary indication if selection effects might be present. Third, we conduct our main analysis for both, the full sample of all respondents and a subsample of respondents participating in all waves, thus excluding selection effects.

For the analyses including controls, we use the following variables from the SHARE data set as controls: Relationship status (1 if the respondent is married or in a registered partnership, 0 otherwise), gender (1 if female, 0 if male), age (of the respondent at the time of the interview), age squared, self-assessed physical health, and a dummy variable indicating the country of residence of the respondent to control for cultural differences. Further, we include the level of education according to the international classification of education ISCED-97 and brackets for the average monthly household income, which represent country-specific 25^{th}, 50^{th}, and 75^{th} percentiles of the reported household incomes from previous waves. This allows us to compare the effects of higher incomes across countries more easily. Additionally, we include a

dummy variable for the birth cohort (which always covers a decade: 1910-1919, 1920-1929, etc.) and, as mentioned, a dummy variable for respondents that were present in all waves (subsequently called *all waves*), to account for selection effects.

2.4 Models and Hypotheses

According to the previous sections, we estimate the following three panel GLS models to test our research question. The observations of one participant in the different waves form a panel, standard errors are clustered on the level of the individual respondent.

$$M_{i,t} = \beta_0 + \beta D' + \gamma {X_{i,t}}' + u_{i,t} \quad (1)$$

$$M_{i,t} = \beta_0 + \beta_1 Age_{i,t} + \beta_2 {Age_{i,t}}^2 + \gamma X'_{i,t} + u_{i,t} \quad (2)$$

$$M_{i,t} = \beta_1 Age_{i,t} + \beta_2 {Age_{i,t}}^2 + \gamma X'_{i,t} + \alpha_i + u_{i,t} \quad (3)$$

Equation (1) is a panel regression using dummies for different age categories (using random effects), (2) is a panel regression including terms for age and ages squared (using random effects) and (3) specifies a fixed effects model. $M_{i,t}$ refers to our three happiness measures, *life satisfaction*, the *CASP-12* index, and the *EURO-D lack of depressive symptoms* index, respectively (for individual $i = 1, \dots, N$ and wave $t = 1,2,4,5,6,7$). D is a vector of dummies quantifying age tuples starting from 54 (based on the literature of Blanchflower and Oswald 2009, 54-55, 56-57, and so on), respondents of younger age than that form the reference category (a total of 23,710 out of 253,341 observations fall in this category). $Age_{i,t}$ and ${Age_{i,t}}^2$ refer to the age and the squared age of respondent *i* at time *t*. $X_{i,t}$ is a vector of time-varying (e.g. often household income) and time-invariant (e.g. usually gender) personal controls (see section 2.3), α_i is the time-invariant personal effect of respondent *i* and $u_{i,t}$ is an individual error term. As discussed, models are run both with and without controls, namely the vector $X_{i,t}$.

All three model specifications test the same underlying hypothesis: Does happiness follow the second half of the U-shape? Based on the literature, we also assume that happiness deteriorates in very high age. As our sample includes only respondents of age 50 and upwards, this would imply a positive coefficient for age and a negative one for age squared (as happiness tends to fall for high age). In other words, we test:

Hypothesis 1: The coefficients of the dummy variables β in model (1) are positive for lower ages, then close to zero and finally negative.

Hypothesis 2: The age coefficients β_1 are positive and the age-squared coefficients β_2 are negative in models (2) and (3) (implying a concave shape, which would indicate that happiness increases after middle age and drops towards the end of life).

Furthermore, we try to strengthen these hypotheses by running a series of robustness checks. First, as mentioned in section 2.3, one important concern studying happiness and old age is the presence of selection effects. In order to see if this concern is well-founded in our data set, we run the following panel probit models:

$$\Pr(Y = 1)_{i,t+1} = \beta_0 + \beta M_{i,t} + \gamma X'_{i,t} + u_{i,t} \qquad (4)$$

Where $\Pr(Y = 1)_{i,t+1}$ is the probability that respondent *i* dies between wave *t* and wave *t+1* (*Y=1*), $M_{i,t}$ refers again to our three happiness measures, $X_{i,t}$ is the same vector of control variables and $u_{i,t}$ is an individual error term. If more happy people (according to our measures) are indeed less likely to die, we expect β to be negative. As discussed in section 2.3, we then take this into account for subsequent analyses. Additionally, our full set of controls also contains the *all waves* dummy variable. This allows us to capture any level effects caused by selection.

Second, we look whether our results differ if we perform some additional robustness checks. We run the regressions interacting the aforementioned *all waves* dummy with the age and age squared variables. This provides further insight into the role of selection effects for the shape of the age-happiness relation. We also check if the age-happiness relation differs between male and female respondents, as well between countries. Research has shown, that the happiness of women and men differs (Laaksonen 2018), and that the U-shape might be specific to some countries (Deaton 2008). However, these control variables can only capture a level difference, not an overall different happiness-age pattern. Hence, we run our analyses again for men and women, as well as the different countries, separately.

3 Results

3.1 Summary Statistics

Table 1 provides an overview over key variables in our data set, the number of respondents per wave; percentages of female and married respondents; the average age; and our three variables on happiness and life satisfaction. The number of respondents increases over the waves, as further countries and more respondents were added. At the same time, other respondents

dropped out of the survey due to attrition, noticeable in the drop in wave 7. Figure 1 shows the share of the various birth cohorts over the different waves, indicating that e.g. most respondents in the 1930-1939 birth cohort dropped out of the survey at one point. Figure 2 shows the number of living respondents relative to those that died before the wave was conducted, giving an overview over how the sample evolved over time. Respondents that do not drop out of the survey are interviewed again in subsequent waves, which overall leads to the average age of respondents increasing slightly over the waves.

Table 1 shows how the different measures for happiness and life satisfaction remained mostly stable on average over the waves. Before estimating the relationship between age and happiness, we can look at the raw answers to the different questions by age. Figure 3 shows, as an example, the mean reported happiness over age for the three different measures for wave 2 (wave 1 did not include the life satisfaction question, see appendix Figures A1-A5 for the other waves). As the figure indicates, happiness seems indeed to increase with age starting from a low point in middle age in the raw data, before dropping strongly at high age

TABLE 1: Summary statistics of key variables.

	Wave 1	Wave 2	Wave 4	Wave 5	Wave 6	Wave 7
N	23505	27478	45576	50488	50827	44961
Female	53%	54%	55%	54%	55%	55%
Married	76%	76%	72%	73%	72%	71%
Age	61.08	61.87	62.82	63.74	64.77	66.47
SD	(7.50)	(7.32)	(7.39)	(7.45)	(7.52)	(7.34)
Life satisfaction (0-10)	.	7.56	7.55	7.61	7.67	7.67
	.	(1.77)	(1.84)	(1.80)	(1.76)	(1.77)
CASP quality of life (0-10)	7.06	7.02	7.05	7.32	7.07	7.11
	(1.68)	(1.71)	(1.76)	(1.69)	(1.72)	(1.73)
Euro-D no depression (0-10)	8.12	8.15	7.92	8.11	8.05	8.10
	(1.85)	(1.87)	(1.88)	(1.82)	(1.85)	(1.85)

Notes: The values in rows four to seven report means, standard deviation in brackets.

FIGURE 1: Distribution of birth cohorts in the different waves.

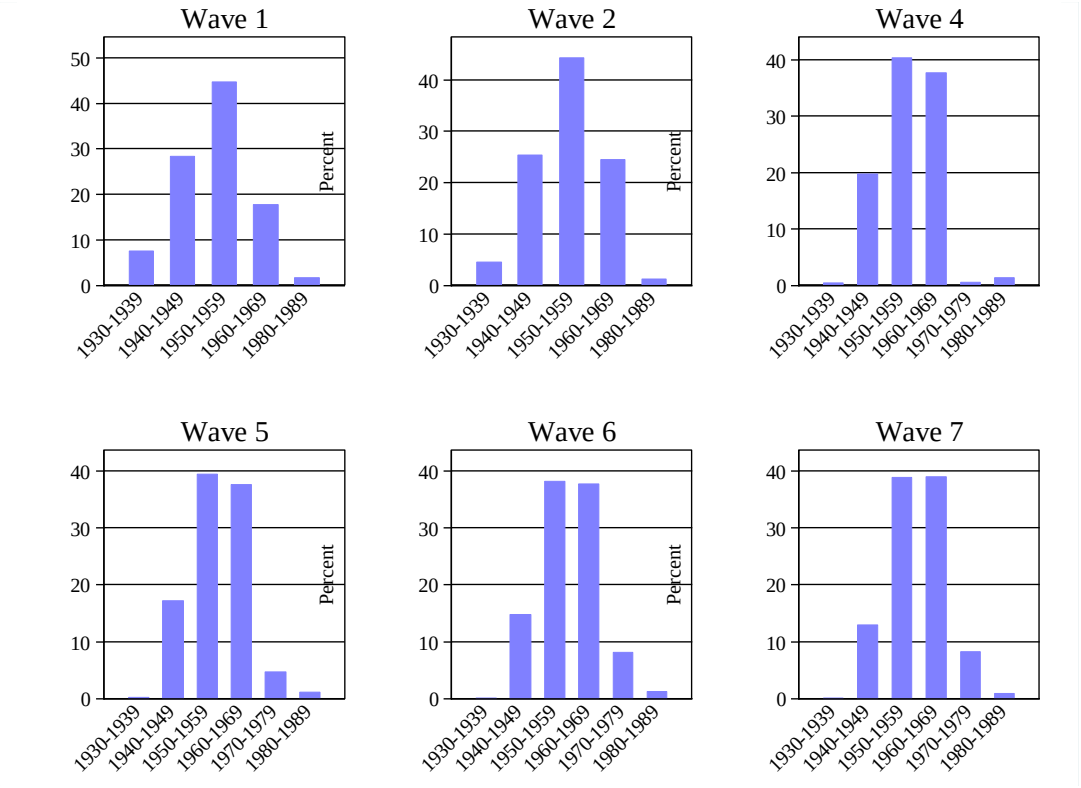


FIGURE 2: Number of living and deceased respondents in the different waves.

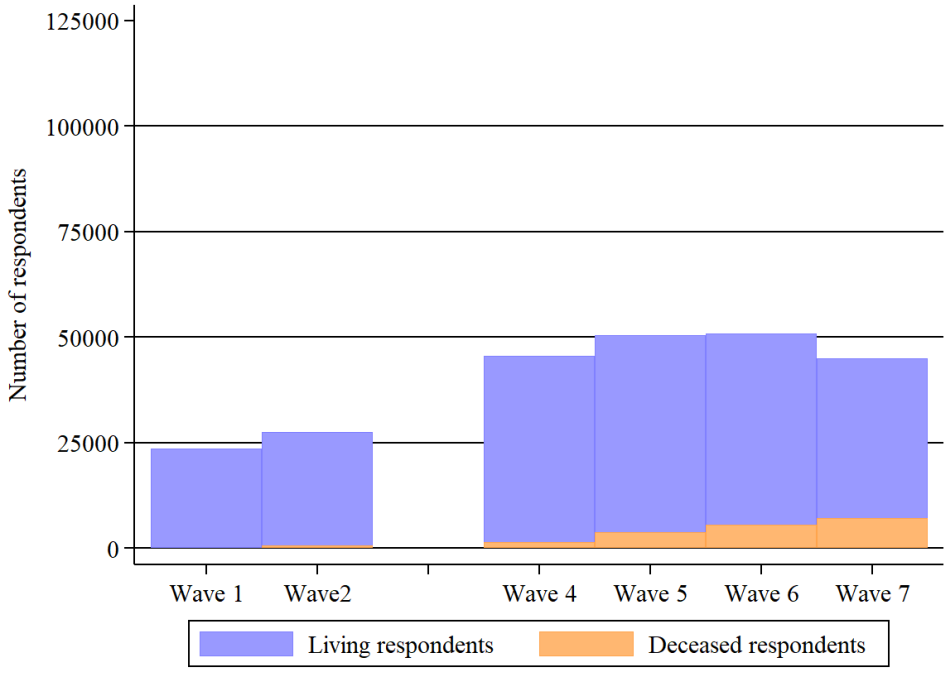
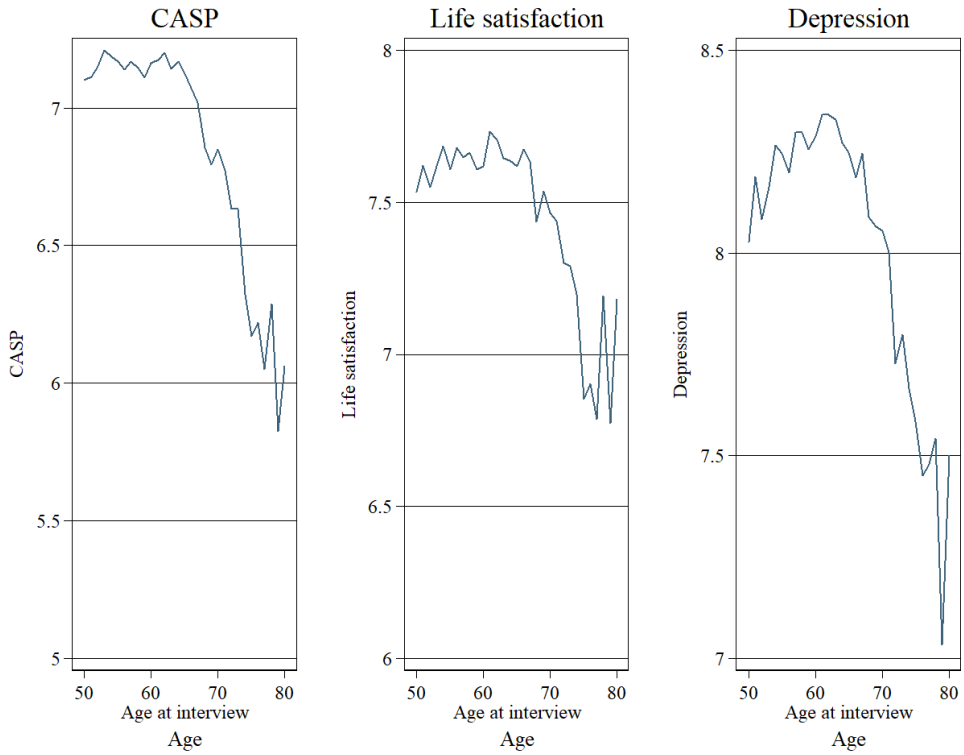


FIGURE 3: Raw values of the three happiness measures for wave 2.

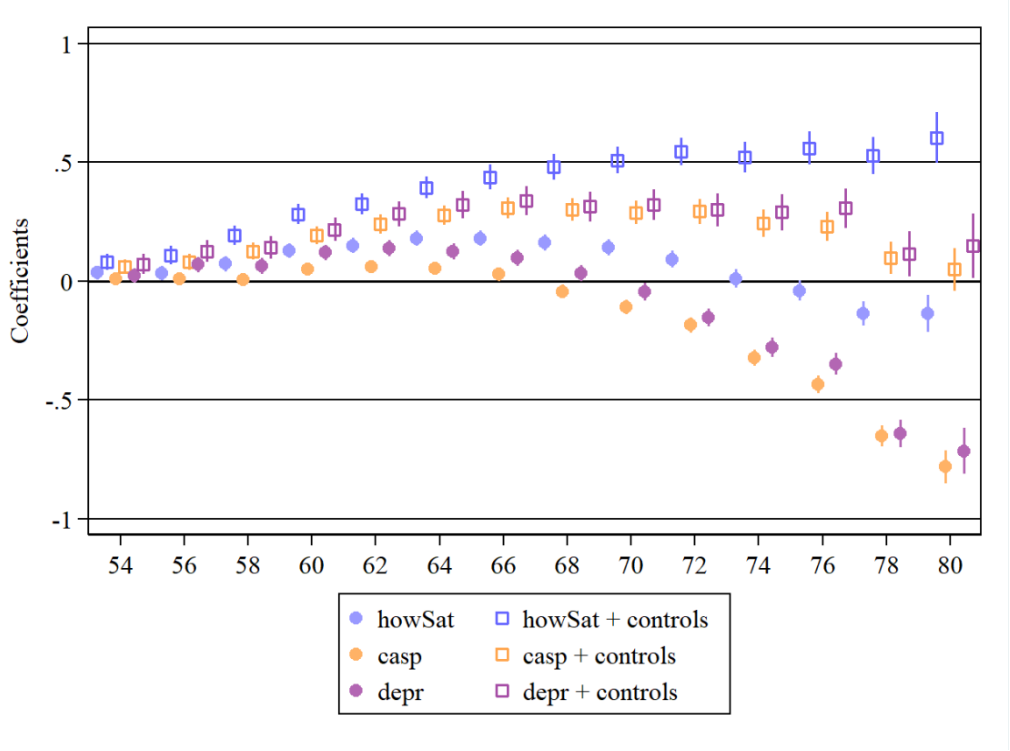


3.3 Age and Happiness

3.3.1 Main findings

Next, we estimate the relationship between the happiness measures and age. First, we are considering model (1), the panel regression model using age dummies. Figure 4 depicts the coefficients of the age dummies plotted against age for all respondents. The implied happiness increases for all three measures starting with middle age, only to decrease in old age (the latter is a common finding in other studies, see e.g. Blanchflower and Oswald, 2008 or Deaton, 2008). Including controls makes this even more pronounced, with the strong dip at old age becoming much less noticeable. A majority of the coefficients for the age dummies is highly significant (at $p<0.001$, see Table A4 in the appendix for further details and tables S1-S3 in the online supplement for the full regression) and follow the predicted path: Earlier age dummies are positive, while later ones are either negative (for the no controls set) or positive but smaller and ultimately not significant (for the control set).

FIGURE 4: Coefficients of the age dummies of model (1).



Note that while the effect sizes of the dummies variables appear to be small (ranging from close to 0 to around 0.5), their size is similar to the results of other studies (Blanchflower 2021; Blanchflower and Graham 2020). Furthermore, such effect size are usually comparable to that of important life events, such as getting divorced, losing a job, or losing a loved one (Blanchflower 2021; Blanchflower and Graham 2020). In our study for example, the effect of being married or in a registered partnership contributes between 0.125 and 0.457 to the happiness measures. These findings indicate a positive correlation between happiness and age with a decrease at high age. We find evidence in support of hypothesis 1.

Result 1: The coefficients of the dummy variables β in model (1) are positive after middle age, and close to zero and negative for higher age. Happiness increases with age, but falls or flattens towards high age.

These results are corroborated by the results of the random effects model (2), as well as the fixed effects model (3). Both indicate an increase of all three measures over age that slows down, the older the respondents are. Table 2 displays the age and age squared coefficients for these models (the full regression tables are provided in tables S4-S9 in the online supplement). As we test multiple hypotheses here on the same data set, a concern might be that the obtained significant results are suffering from multiple hypothesis testing. Table 2 thus also displays the

z- and t-statistics for the two models. As these statistics show, our results are highly significant. Furthermore, the results obtained from the fixed effects model are overall remarkably close to the ones from the random effects model. This would suggest, at least for our data, that the using either model leads to valid results. Overall, we thus find evidence for hypothesis 2.

Result 2: The age coefficients β_1 are positive and significant and the age-squared coefficients β_2 are negative and significant in models (2) and (3). We find a concave shape for the age-happiness relation, indicating that happiness increases after middle age and drops towards the end of life.

TABLE 2: Coefficients of the random and fixed effects models.

		Random effects		Fixed effects	
		No controls	Controls	No controls	Controls
Life satisfaction	Age	0.161***	0.114***	0.154***	0.189***
		(18.45)	(9.13)	(12.54)	(10.70)
	Age²	-0.00125***	-0.000702***	-0.00111***	-0.00129***
		(-18.45)	(-7.23)	(-11.80)	(-9.50)
CASP-12	Age	0.226***	0.161***	0.220***	0.216***
		(28.93)	(14.82)	(21.92)	(14.42)
	Age²	-0.00189***	-0.00119***	-0.00172***	-0.00163***
		(-30.98)	(-14.08)	(-22.07)	(-14.17)
EURO-D Lack of depressive symptoms	Age	0.264***	0.162***	0.225***	0.272***
		(28.19)	(10.97)	(19.40)	(11.42)
	Age²	-0.00217***	-0.00119***	-0.00207***	-0.00196***
		(-29.61)	(-10.32)	(-20.13)	(-10.76)

Notes: z-statistics (of the random effects model) and t-statistics (of the fixed effects model) in parentheses.

3.3.2 Gender differences

As the previous models indicate overall similar results in the both the random effects and the fixed effects regression, in the following we use the random effects specification for the sake of brevity. Looking at men and women separately, the results of the dummy regressions in Figure 5 already indicate that the age-happiness relation follows a comparable path for both genders (see tables S10-S15 in the online supplement for the full regressions). Table 3 shows the coefficients and z-statistics for the random effects model (2) (see tables S16-S21 in the

online supplement for the full regressions). In general, we obtain similar results for both men and women, with minor differences. We run the same regression with interaction terms (see Table A2 in the appendix). None of the interaction terms are here significant. It seems that the observed gender differences constitute a level effect, rather than altering the age-happiness relation altogether.

FIGURE 5: Coefficients of the age dummies of model (1) for men and women, all respondents.

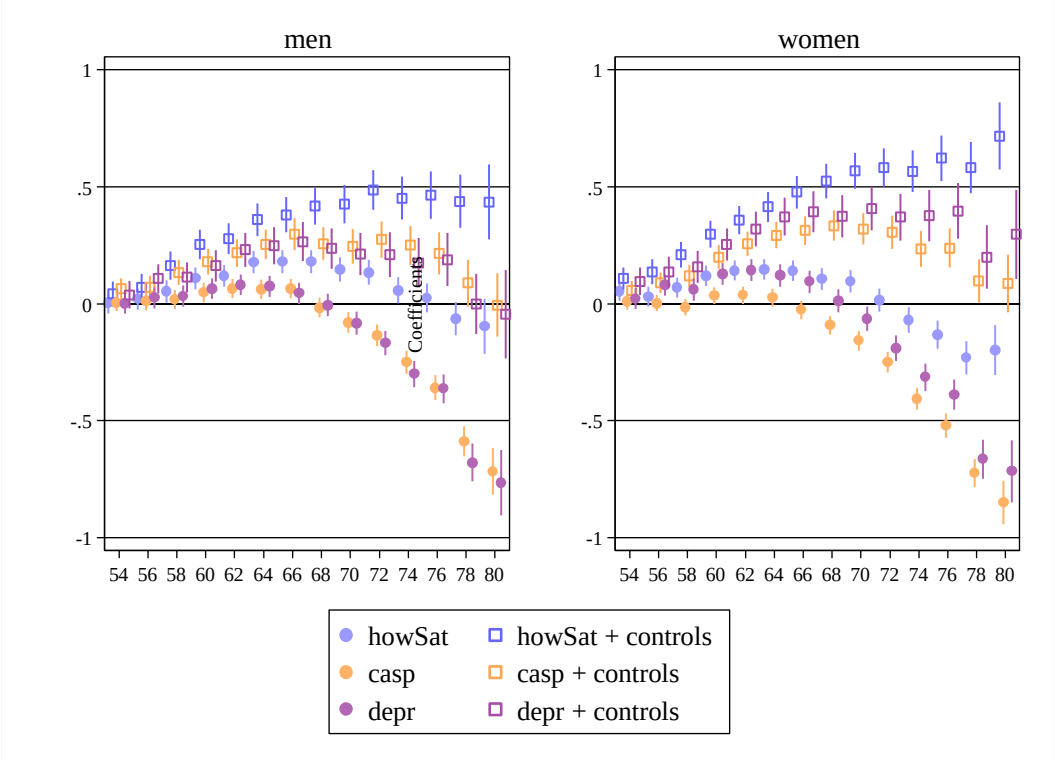


TABLE 3: Coefficients of the random effects model for men and women.

		Men		Women	
		No controls	Controls	No controls	Controls
Life satisfaction	Age	0.139***	0.120***	0.164***	0.109***
		(10.99)	(6.60)	(13.64)	(6.40)
	Age²	-0.00106***	-0.000777***	-0.00131***	-0.000649***
		(-10.78)	(-5.51)	(-13.95)	(-4.86)
CASP-12	Age	0.216***	0.150***	0.224***	0.170***
		(18.95)	(9.30)	(20.98)	(11.54)
	Age²	-0.00179***	-0.00111***	-0.00190***	-0.00125***
		(-20.13)	(-8.89)	(-22.78)	(-10.92)
EURO-D Lack of depressive symptoms	Age	0.240***	0.164***	0.266***	0.158***
		(18.85)	(8.02)	(20.03)	(7.56)
	Age²	-0.00199***	-0.00124***	-0.00220***	-0.00113***
		(-19.91)	(-7.77)	(-21.14)	(-6.94)

Notes: z-statistics in brackets.

3.3.3 Country differences

Next, we turn to the differences between the countries of the SHARE data set. For an overview over all age and age squared coefficients of the random effects model, see Table A3 in the appendix (full dummy regressions in tables S22-S41 in the online supplement). For the dummy regression plots for the 20 individual countries see, Figure A6 in the appendix (full dummy regressions in tables S42-S61 in the online supplement). Evidence from the random effects model here is mixed, with some countries not observing a significant correlation between age and happiness at all (or only for some of the happiness measures used). Still, for all countries and measures for which a significant correlation is observed, the positive trend for happiness with age and the negative with age squared is obtained. Notably, however, the random effects and dummy regressions do not always agree in terms of the significance level. Belgium (panel 2 in Figure A6) for example exhibits a positive relation between age and happiness for *life satisfaction* and the *CASP-12*, while the corresponding coefficients in the random effects regression fail to reach significance.

Of course, conducting the analysis for each country separately with the full control set additionally atomises the data. This is only exacerbated by different countries having differing sample sizes in the data set to begin with. As measures such as the question on *life satisfaction* appear in many questionnaires, our results could be complemented by studying larger national data sets. Alternatively, future waves of SHARE might include further data to answer the question if the observed insignificances are caused here by a lack of data points or by some countries not exhibiting a positive relation between age and happiness.

3.4 Selection effects

One major concern in the interpretation of the age effects shown in the previous sections is the presence of selection effects due to respondents dying depending on their happiness. Running the panel probit regressions of the likelihood to die before a given wave on the different happiness measures (model 4), we find indeed evidence of a selection effect. The regression coefficients for all three happiness measures are negative and mostly highly significant ($p<0.01$ for life satisfaction, $p<0.05$, $p<0.001$ for lack depressive symptoms, see Table A4 in the appendix). The likelihood of dying before a given wave decreases by 0.0389, 0.0438 and 0.0602 percentage points for each point on the scales of life satisfaction, CASP-12, and EURO-D lack of depressive symptoms, respectively (see Table A5 for marginal effects). We additionally find that respondents with a higher monthly income and better physical health status are less likely to die. In the preceding section, the full control set also included the *all waves* dummy for respondents that were present in all waves. The coefficients for this dummy are positive (Life satisfaction: 0.0524 [2.99], CASP: 0.121 [6.62], Lack of depressive symptoms: 0.0781 [3.97], z-statistics in square brackets, random effects regression).

However, these coefficients can only account for a level effect between respondents that took part in al waves and those that dropped out of the sample at one point. To test if selection affects the shape of the happiness-age relation, we run our analyses for the subset of respondents that participated in all waves. Note that in the latter subset we also drop respondents that did not die between the waves, but either dropped out due to other reasons, or only joined the panel during the later waves. Past studies highlighted the fact that cross-sectional studies do not follow respondents over the life cycle and might thus have limited explanatory power (Galambos et al. 2020; Hudomiet et al. 2021; Ulloa et al. 2013): Accordingly, this subset represents the most stringent subset of respondents, specifically those for which we can track happiness over all waves.

Figure 4 show the dummy coefficients of model (1) for the no attrition subset[1]. Looking at this subset, the obtained relationship between happiness and age emerges again, but loses part of its significance (in terms of the number of significant age dummies), as can be seen especially in the right panel of Figure 4. However, once we introduce controls, the dummy coefficients cease to be significant (see tables S62-S64 in the online supplement for the full regression). However, these results might in part be driven by the sharp decrease in observations once controls are used in the already strict no attrition subsample.

FIGURE 4: Coefficients of the age dummies of model (1), *no attrition* subsample.

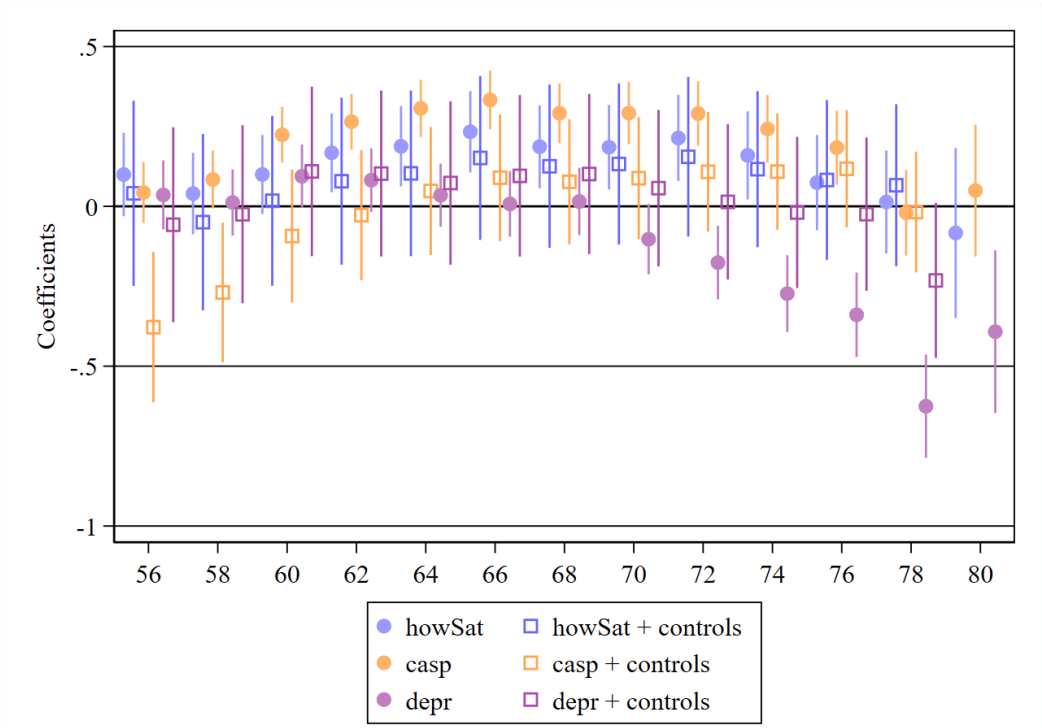


Table 4 depicts the age and age squared coefficients of the random and fixed effects models (see tables S65-S70 in the online supplement for the full regression). The estimated coefficients are here all highly significant and fit our predictions. Comparing Table 2 to Table 4 shows that the coefficients are comparable in sign and size across the full sample and the no attritions subsample. We take this as further indication that selection effects are in place, but do not account for the observed correlation between happiness and age. Taken the findings of this section together, there is clear evidence that while selection effects play a role, they seem to so in the form of a level effect, rather than influencing the shape of the age-happiness relation. Notably, these results differ from the recent study of Hudomiet et al. (2021), which reports a

[1] Figure 4 omits the first age dummy. The coefficients of this dummy were insignificant and their rather large standard errors distorted the scale of the graph.

decline in subjective well-being in U.S. data a soon as attrition due to mortality is accounted for.

As a further robustness check, we run the regressions again, this time interacting the aforementioned *all waves* dummy with the age and age squared variables (see Table A5 in the appendix). These interactions effects, as well as the *all waves* dummy itself are in most cases insignificant. However, the coefficients for age and age squared still exhibit the same pattern in our main analysis. A notable exception is the CASP-12: Including the interaction effects here renders the *all waves* dummy itself significant, but *negative*. The interaction effects with age and age squared are significant, and are also positive and negative, respectively. In other words, even in this exception, respondents that took part in all waves exhibit the same age-happiness pattern as in the main analysis. If anything, the pattern emerges even stronger here.

TABLE 4: Coefficients of the random and fixed effects models, *no attrition* subsample.

		Random effects		Fixed effects	
		No controls	Controls	No controls	Controls
Life satisfaction	Age	0.160***	0.165***	0.151***	0.171***
		(5.89)	(3.36)	(5.36)	(3.33)
	Age²	-0.00119***	-0.00118**	-0.00110***	-0.00127***
		(-5.75)	(-3.25)	(-5.12)	(-3.34)
CASP-12	Age	0.218***	0.321***	0.207***	0.336***
		(9.80)	(7.09)	(9.16)	(7.20)
	Age²	-0.00161***	-0.00225***	-0.00149***	-0.00237***
		(-9.41)	(-6.75)	(-8.54)	(-6.91)
EURO-D Lack of depressive symptoms	Age	0.222***	0.206***	0.217***	0.231***
		(8.83)	(3.63)	(8.49)	(3.84)
	Age²	-0.00182***	-0.00156***	-0.00178***	-0.00175***
		(-9.36)	(-3.74)	(-9.01)	(-3.96)

Notes: z-statistics in brackets.

4 Discussion

Attempts to measure happiness and well-being over the life cycle have found varying results. The U-shape of happiness is a controversial finding in this branch of research. We complement

this ongoing discourse by providing evidence for the second half of the U-shape: Happiness in the SHARE data set increases with age, with the increase flattening or turning into a decrease towards the end of life. Our findings are robust when accounting for differences due to selection effects, and generalize across countries and genders, although some countries do not exhibit a significant relation between age and happiness. Selection effects are at work, with happier respondents being more likely to be alive at the time the next wave is elicited. However, these differences do not seem to influence the overall shape of the age-happiness relation.

Importantly, our age-happiness relation is consistently obtained using different approaches that have been used by both, proponents and opponents of the happiness dip in middle age alike. Additionally, the happiness-age relationship does not only hold for measures of subjective well-being (life satisfaction), but also for affective/eudemonic (CASP-12) and mental health measures (EURO-D lack of depressive symptoms). We are thus confident that our trajectory is meaningful and robust for a substantial amount of European countries.

Naturally, we can make no predictions about the trajectory of the happiness-age relation under the age of 50, as the SHARE data set only provides data for older Europeans. However, as other studies have indicated, there is support for the overall U-shape in various European countries (Blanchflower 2021). We find nevertheless that happiness increases after middle age, compared to other studies finding a decrease after middle age (Easterlin 2006; Kassenboehmer and Haisken-DeNew 2012; Mroczek and Spiro 2005). In part, our results are also in line with previous studies, indicating an increase of happiness after 50 (Morgan and O'Connor 2017) or an upward profile for affective measures (Mroczek and Kolarz 1998). Our results strengthen the position that people go through a period of decreased happiness (relative to happiness at older age) around the midpoint of their life. For policy makers intent on targeting happiness as a relevant measure, this implies considering why this dip occurs and how it can be alleviated.

Going forward, it is important to highlight that proving or disproving the U-shape of happiness, or as in our case components of it, should not be a goal in itself. While knowing the average path happiness takes over the course of a human life is important, even more so is understanding why a particular shape is obtained (Galambos et al. 2020; Lachman 2015; Morgan and O'Connor 2020). Past research has highlighted the positive effects of marriage (Grover and Helliwell 2019), parenthood (Nelson et al. 2013), social networks in general (Becker et al. 2019), income (up to a degree) (Easterlin 1974), social support (Siedlecki et al. 2014) and health (Bussière et al. 2021), amongst others. A next step could be trying to pin down exactly which underlying factors drive the U-shape in happiness.

References

Ameriks, K., & Clarke, D. M. (2000). *Aristotle: Nicomachean Ethics*. Cambridge University Press.

Becker, C., Kirchmaier, I., & Trautmann, S. T. (2019). Marriage, parenthood and social network: Subjective well-being and mental health in old age. *PloS one*, *14*(7), e0218704.

Beckie, T. M., & Hayduk, L. A. (1997). Measuring Quality of Life. *Social Indicators Research*, *42*, 21–39. https://doi.org/10.1023/A:1006881931793

Bell, D. N., & Blanchflower, D. G. (2020). The U-shape of Happiness in Scotland. *National Bureau of Economic Research*, (No. w28144).

Blanchflower, D. G. (2021). Is happiness U-shaped everywhere? Age and subjective well-being in 145 countries. *Journal of Population Economics*, *34*(2), 575–624.

Blanchflower, D. G., & Graham, C. L. (2020). *The Mid-Life Dip in Well-Being: Economists (Who Find It) Versus Psychologists (Who Don't)!* National Bureau of Economic Research.

Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Social Science & Medicine*, *66*(8), 1733–1749.

Blanchflower, D. G., & Oswald, A. J. (2009). The U-shape without controls: A response to Glenn. *Social Science & Medicine*, *69*(4), 486–488.

Börsch-Supan, A. (2018a). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 1. Release version: 7.0.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w1.700

Börsch-Supan, A. (2018b). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 2. Release version: 70.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w2.700

Börsch-Supan, A. (2018c). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 4. Release version: 7.0.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w4.700

Börsch-Supan, A. (2018d). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5. Release version: 7.0.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w5.700

Börsch-Supan, A. (2018e). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6. Release version: 7.0.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w6.700

Börsch-Supan, A. (2018f). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 7. Release version: 7.0.0. *SHARE-ERIC*. https://doi.org/10.6103/SHARE.w7.700

Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., et al. (2013). Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, *42*(4), 992–1001. https://doi.org/10.1093/ije/dyt088

Bussière, C., Sirven, N., & Tessier, P. (2021). Does ageing alter the contribution of health to subjective well-being? *Social Science & Medicine*, *268*(113456).

Castro-Costa, E., Dewey, M., Stewart, R., Banerjee, S., Huppert, F., Mendonca-Lima, C., et al. (2008). Ascertaining late-life depressive symptoms in Europe: an evaluation of the survey version of the EURO-D scale in 10 nations. The SHARE project. *International Journal of Methods in Psychiatric Research*, *17*(1), 12–29. https://doi.org/10.1002/mpr.236

Cheng, T. C., Powdthavee, N., & Oswald, A. J. (2017). Longitudinal evidence for a midlife nadir in human well-being: Results from four data sets. *The Economic Journal*, *127*(599), 126–142.

Clark, A. E. (2019). Born to be mild? Cohort effects don't (fully) explain why well-being is U-shaped in age. In *The Economics of Happiness* (pp. 387–408). Springer.

Clark, A. E., & Oswald, A. J. (2006). The curved relationship between subjective well-being and age. *halshs-00590404*.

Deaton, A. (2008). Income, health, and well-being around the world: Evidence from the Gallup World Poll. *Journal of Economic Perspectives*, *22*(2), 53–72.

Deaton, A. (2018). What do self-reports of wellbeing say about life-cycle theory and policy? *Journal of Public Economics*, *162*, 18–25.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In *Nations and households in economic growth* (pp. 89–125). Elsevier.

Easterlin, R. A. (2006). Life cycle happiness and its sources: Intersections of psychology, economics, and demography. *Journal of Economic Psychology*, *27*(4), 463–482.

Easterlin, R. A., & Schaeffer, C. M. (1999). Income and subjective well-being over the life cycle. *The Self and Society in Aging Processes. New York: Springer Publishing Co*.

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature*, *40*(2), 402–435.

Frijters, P., & Beatton, T. (2012). The mystery of the U-shaped relationship between happiness and age. *Journal of Economic Behavior & Organization*, *82*(2–3), 525–542.

Galambos, N. L., Krahn, H. J., Johnson, M. D., & Lachman, M. E. (2020). The U shape of happiness across the life course: Expanding the discussion. *Perspectives on Psychological Science*, *15*(4), 898–912.

Gerdtham, U.-G., & Johannesson, M. (2001). The relationship between happiness, health, and socio-economic factors: results based on Swedish microdata. *The Journal of Socio-Economics*, *30*(6), 553–557.

Glenn, N. (2009). Is the apparent U-shape of well-being over the life course a result of inappropriate use of control variables? A commentary on Blanchflower and Oswald (66: 8, 2008, 1733–1749). *Social Science & Medicine*, *69*(4), 481–485.

Grover, S., & Helliwell, J. F. (2019). How's life at home? New evidence on marriage and the set point for happiness. *Journal of Happiness Studies*, *20*(2), 373–390.

Guven, C., & Saloumidis, R. (2014). Life satisfaction and longevity: Longitudinal evidence from the German Socio-Economic Panel. *German Economic Review*, *15*(4), 453–472.

Gwozdz, W., & Sousa-Poza, A. (2010). Ageing, health and life satisfaction of the oldest old: An analysis for Germany. *Social Indicators Research, 97*(3), 397–417.

Hellevik, O. (2017). The U-shaped age–happiness relationship: real or methodological artifact? *Quality & Quantity*, *51*(1), 177–197.

Hudomiet, P., Hurd, M. D., & Rohwedder, S. (2021). The age profile of life satisfaction after age 65 in the US. *Journal of Economic Behavior & Organization*, *189*, 431–442.

Hyde, M., Wiggins, R. D., Higgs, P., & Blane, D. B. (2003). A measure of quality of life in early old age: The theory, development and properties of a needs satisfaction model (CASP-19). *Aging & Mental Health*, *7*(3), 186–194. https://doi.org/10.1080/1360786031000101157

Kassenboehmer, S. C., & Haisken-DeNew, J. P. (2012). Heresy or enlightenment? The well-being age U-shape effect is flat. *Economics Letters*, *117*(1), 235–238.

Kim, E. S., Delaney, S. W., Tay, L., Chen, Y., Diener, E. D., & Vanderweele, T. J. (2021). Life satisfaction and subsequent physical, behavioral, and psychosocial health in older adults. *The Milbank Quarterly*, *99*(1), 209–239.

Kohler, G., & Chaves, E. J. (2003). *Globalization: critical perspectives*. Nova Publishers.

Laaksonen, S. (2018). A research note: Happiness by age is more complex than U-shaped. *Journal of Happiness Studies, 19*(2), 471–482.

Lachman, M. E. (2015). Mind the gap in the middle: A call to study midlife. *Research in Human Development*, *12*(3–4), 327–334.

Lee, H., & Singh, G. K. (2020). Inequalities in Life Expectancy and All-Cause Mortality in the United States by Levels of Happiness and Life Satisfaction: A Longitudinal Study. *International Journal of Maternal and Child Health and AIDS, 9*(3), 305.

Morgan, R., & O'Connor, K. J. (2017). Experienced life cycle satisfaction in Europe. *Review of Behavioral Economics*, *4*(4), 371–396.

Morgan, R., & O'Connor, K. J. (2020). Does the U-shape Pattern in Life Cycle Satisfaction Obscure Reality? A Response to Blanchflower. *Review of Behavioral Economics*, *7*(2), 201–206.

Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: a developmental perspective on happiness. *Journal of Personality and Social Psychology*, *75*(5), 1333.

Mroczek, D. K., & Spiro, A. (2005). Change in life satisfaction during adulthood: findings from the veterans affairs normative aging study. *Journal of Personality and Social Psychology*, *88*(1), 189.

Nelson, S. K., Kushlev, K., English, T., Dunn, E. W., & Lyubomirsky, S. (2013). In Defense of Parenthood: Children Are Associated With More Joy Than Misery. *Psychological Science*, *24*(1), 3–10. https://doi.org/10.1177/0956797612447798

Novotny, R. (2021). Älter werden: Das Beste kommt noch. *ZEIT*. https://www.zeit.de/2021/05/aelter-werden-glueck-zufriedenheit-leben-philosophie

Pavot, W., & Diener, E. (1993). The Affective and Cognitive Context of Self-Reported Measures of Subjective Well-Being. *Social Indicators Research*, *28*(1), 1–20. https://doi.org/10.1007/BF01086714

Prince, M. J., Beekman, A. T. F., Deeg, D. J. H., Fuhrer, R., Kivela, S.-L., Lawlor, B. A., et al. (1999). Depression symptoms in late life assessed using the EURO–D scale. Effect of age, gender and marital status in 14 European centres. *British Journal of Psychiatry*, *174*(04), 339–345. https://doi.org/10.1192/bjp.174.4.339

Prince, M. J., Reischies, F., Beekman, A. T. F., Fuhrer, R., Jonker, C., Kivela, S.-L., et al. (1999). Development of the EURO–D scale – a European Union initiative to compare symptoms of depression in 14 European centres. *British Journal of Psychiatry*, *174*(04), 330–338. https://doi.org/10.1192/bjp.174.4.330

Siedlecki, K. L., Salthouse, T. A., Oishi, S., & Jeswani, S. (2014). The Relationship Between Social Support and Subjective Well-Being Across Age. *Social Indicators Research*, *117*(2), 561–576. https://doi.org/10.1007/s11205-013-0361-4

Stone, A. A., Schwartz, J. E., Broderick, J. E., & Deaton, A. (2010). A snapshot of the age distribution of psychological well-being in the United States. *Proceedings of the National Academy of Sciences*, *107*(22), 9985–9990.

The U-bend of life. (2010). *Economist*. https://www.economist.com/christmas-specials/2010/12/16/the-u-bend-of-life

Ulloa, B. F. L., Møller, V., & Sousa-Poza, A. (2013). How does subjective well-being evolve with age? A literature review. *Journal of Population Ageing*, *6*(3), 227–246.

Van Landeghem, B. (2012). A test for the convexity of human well-being over the life cycle: Longitudinal evidence from a 20-year panel. *Journal of Economic Behavior & Organization*, *81*(2), 571–582.

Appendix

Tables

TABLE A1: Survey questions for well-being and mental health measures

Measure	Question
Life satisfaction	On a scale from 0 to 10 where 0 means completely dissatisfied and 10 means completely satisfied, how satisfied are you with your life?
CASP-12[a]	How often, if at all, have you experienced the following feelings and thoughts over the past four weeks:
Control	How often do you think your age prevents you from doing the things you would like to do?
	How often do you feel that what happens to you is out of your control?
	How often do you feel left out of things?
Autonomy	How often do you think that you can do the things that you want to do?
	How often do you think that family responsibilities prevent you from doing what you want to do?
	How often do you think that shortage of money stops you from doing the things you want to do?
Pleasure	How often do you look forward to each day?
	How often do you feel that your life has meaning?
	How often, on balance, do you look back on your life with a sense of well-being?
Self-Realization	How often do you feel full of energy these days?
	How often do you feel that life is full of opportunities?
	How often do you feel that the future looks good for you?

TABLE A1 (cont.): Survey questions for well-being and mental health measures

EURO-D[b]	Earlier we talked about your physical health. Another measure of health is your emotional
Depression	health or well-being that is, how you feel about things that happen around you.
Pessimism	In the last month, have you been sad or depressed?
Suicidality	What are your hopes for the future?
Guilt	In the last month, have you felt that you would rather be dead?
Sleep	Do you tend to blame yourself or feel guilty about anything[c]?
Interest	Have you had trouble sleeping recently?
Irritability	In the last month, what is your interest in things[d]?
Appetite	Have you been irritable recently?
Fatigue	What has your appetite been like[e]?
Concentration	In the last month, have you had too little energy to do the things you wanted to do?
	How is your concentration? For example, can you concentrate on a television program, film or radio program?
Enjoyment	Can you concentrate on something you read?
Tearfulness	What have you enjoyed doing recently?

[a]Index generated from questions on 4 different dimensions. The total score ranges from 12 (low quality of life) to 48 (high quality of life). The response options for each item are: 1. Often, 2. Sometimes, 3. Rarely, and 4. Never.

[b]Index generated from questions on 12 different dimensions. The total score ranges from 0 (not depressed) to 12 (very depressed). The responses are coded as: 0. No indication and 1. There is indication of the respective dimension.

[c]If the answer is unclear the follow-up question is: So, for what do you blame yourself?

[d]If the answer is unclear the follow-up question is: So, do you keep up your interests?

[e]If the answer is unclear the follow-up question is: So, have you been eating more or less than usual?

TABLE A2: Coefficients with interaction terms for the *female* dummy (probit, random effects).

	howSat: Plain	Controls	casp: Plain	Controls	depr: Plain	Controls
Female	-0.657	0.796	-0.164	-0.0220	-1.377*	0.269
	(-1.18)	(1.27)	(-0.33)	(-0.04)	(-2.37)	(0.39)
Age	0.147***	0.128***	0.222***	0.162***	0.244***	0.178***
	(11.65)	(7.89)	(19.39)	(11.26)	(19.23)	(9.82)
Female#age	0.0243	-0.0260	0.00643	-0.00156	0.0240	-0.0292
	(1.39)	(-1.32)	(0.41)	(-0.09)	(1.31)	(-1.35)
Age sq.	-0.00112***	-0.000823***	-0.00183***	-0.00120***	-0.00202***	-0.00132***
	(-11.38)	(-6.51)	(-20.52)	(-10.72)	(-20.27)	(-9.38)
Female#age sq.	-0.000243	0.000217	-0.000101	0.0000124	-0.000200	0.000247
	(-1.79)	(1.42)	(-0.83)	(0.09)	(-1.39)	(1.46)
N	229217	164125	237198	160296	211647	131913
R2	0.000979	0.0230	0.00335	0.0378	0.00523	0.0473

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A3: Coefficients of the random effects model for different countries, z-statistics in brackets.

		Life satisfaction	CASP	Lack of depressive symptoms
AUT (N = 5159)	Age	0.155***	0.191***	0.200***
		(3.54)	(5.05)	(3.98)
Austria	Age²	-0.00105**	-0.00146***	-0.00147***
		(-3.06)	(-4.99)	(-3.75)
BEL (N = 7913)	Age	0.0379	0.0451	0.0627
		(1.21)	(1.27)	(1.32)
Belgium	Age²	-0.000132	0.0000133	-0.000451
		(-0.54)	(0.05)	(-1.22)
CHE (N = 3686)	Age	0.0933*	0.154***	0.183***
		(2.32)	(4.00)	(3.58)
Switzerland	Age²	-0.000548	-0.00119***	-0.00135***
		(-1.75)	(-3.98)	(-3.39)
CZE (N = 7156)	Age	0.139**	0.254***	0.178***
		(2.73)	(6.43)	(3.35)
Chech Republic	Age²	-0.000795*	-0.00194***	-0.00130**
		(-2.03)	(-6.39)	(-3.14)
DEU (N = 7524)	Age	0.261***	0.133***	0.215***
		(5.66)	(3.55)	(4.10)
Germany	Age²	-0.00165***	-0.000910**	-0.00150***
		(-4.61)	(-3.14)	(-3.75)
DEN (N = 4734)	Age	0.0709	0.203***	0.125*
		(1.62)	(5.88)	(2.31)
Denmark	Age²	-0.000414	-0.00147***	-0.000872*
		(-1.19)	(-5.40)	(-2.05)
ESP (N = 6560)	Age	0.184***	0.107*	0.238***
		(3.85)	(2.39)	(4.15)
Spain	Age²	-0.00134***	-0.000855*	-0.00190***
		(-3.59)	(-2.44)	(-4.24)
EST (N = 6178)	Age	0.136**	0.181***	0.140**
		(3.10)	(5.08)	(3.03)
Estonia	Age²	-0.000662	-0.00135***	-0.000934*
		(-1.94)	(-4.92)	(-2.56)
FRA (N = 6367)	Age	0.131**	0.188***	0.139**
		(3.01)	(4.58)	(2.68)
France	Age²	-0.000866*	-0.00148***	-0.000933*
		(-2.55)	(-4.60)	(-2.29)
GRC (N = 5087)	Age	0.0201	0.0839	0.222
		(0.16)	(0.87)	(1.29)
Greece	Age²	0.000216	-0.000748	-0.00168
		(0.22)	(-1.00)	(-1.25)

TABLE A3 (cont.): Coefficients of the random effects model for different countries, z-statistics in brackets.

HRV (N = 2579)	Age	-0.0786	-0.0273	Insufficient observations
		(-0.62)	(-0.27)	
Croatia	Age²	0.000703	0.000140	
		(0.71)	(0.18)	
HUN (N = 2694)	Age	-0.0679	0.306***	Insufficient observations
		(-0.59)	(3.41)	
Hungary	Age²	0.000870	-0.00242***	
		(0.96)	(-3.43)	
ISR (N = 3166)	Age	0.0718	-0.0421	0.158
		(0.43)	(-0.29)	(0.64)
Israel	Age²	-0.000628	0.0000850	-0.00143
		(-0.46)	(0.07)	(-0.71)
ITA (N = 7068)	Age	0.105*	0.130**	0.0993
		(2.20)	(2.93)	(1.63)
Italy	Age²	-0.000778*	-0.000820*	-0.000817
		(-2.13)	(-2.40)	(-1.74)
LUX (N = 1847)	Age	-0.0206	-0.0699	0.153
		(-0.20)	(-0.80)	(1.08)
Luxembourg	Age²	0.000517	0.000862	-0.000988
		(0.62)	(1.25)	(-0.88)
NLD (N = 5592)	Age	0.228***	0.227***	0.109
		(4.40)	(3.49)	(1.50)
The Netherlands	Age²	-0.00169***	-0.00169***	-0.000655
		(-4.24)	(-3.32)	(-1.15)
POL (N = 5377)	Age	0.153	0.0958	0.496**
		(1.61)	(1.19)	(2.71)
Poland	Age²	-0.00106	-0.000641	-0.00379**
		(-1.43)	(-1.03)	(-2.66)
PRT (N = 1854)	Age	-0.112	-0.0117	-0.0331
		(-0.75)	(-0.12)	(-0.23)
Portugal	Age²	0.000981	0.000176	0.000457
		(0.83)	(0.22)	(0.40)
SVN (N = 4508)	Age	0.0486	0.175***	0.133*
		(0.88)	(3.79)	(1.99)
Slovenia	Age²	-0.000326	-0.00168***	-0.00110*
		(-0.76)	(-4.69)	(-2.10)
SWE (N = 5306)	Age	0.220***	0.262***	0.263***
		(4.01)	(5.91)	(3.90)
Sweden	Age²	-0.00149***	-0.00188***	-0.00190***
		(-3.60)	(-5.64)	(-3.75)

TABLE A4: Correlation between happiness measures and death, dependent variable is probability of dying between waves (probit).

	Life satisfaction	Quality of life (CASP-12)	Lack of depressive symptoms
Life satisfaction	-0.0398**		
	(0.009)		
CASP-12		-0.0438*	
		(0.023)	
Lack of depressive symptoms (EURO-D)			-0.0602***
			(0.000)
Male or female (0-1, 1 = female)	-0.434***	-0.452***	-0.448***
	(0.000)	(0.000)	(0.000)
Income brackets			
[1]Average monthly income per hh, low to mid bracket	0.147*	0.157*	0.206**
	(0.041)	(0.036)	(0.002)
[2]Average monthly income per hh, mid to high bracket	0.150*	0.161*	0.192**
	(0.047)	(0.039)	(0.006)
[3]Average monthly income per hh, more than high bracket	-0.122	-0.115	-0.112
	(0.162)	(0.202)	(0.164)
Education			
[1] Primary school	-0.0343	-0.0892	-0.0873
	(0.810)	(0.536)	(0.503)
[2] Lower secondary school	-0.0105	-0.0358	-0.0430
	(0.944)	(0.813)	(0.754)
[3] Upper secondary school	-0.130	-0.150	-0.141
	(0.397)	(0.335)	(0.315)
[4] Post-secondary non-tertiary education	-0.0288	-0.0841	-0.0515
	(0.879)	(0.665)	(0.767)
[5] First stage tertiary education	-0.170	-0.182	-0.172
	(0.283)	(0.256)	(0.236)
[6] Second stage tertiary education	-0.470	-0.497	-0.438
	(0.331)	(0.311)	(0.326)

TABLE A4 (cont.): Correlation between happiness measures and death, dependent variable is probability of dying between waves (probit).

Health			
[1] Fair	-0.663***	-0.670***	-0.588***
	(0.000)	(0.000)	(0.000)
[2] Good	-1.043***	-1.053***	-0.926***
	(0.000)	(0.000)	(0.000)
[3] Very good	-1.084***	-1.126***	-0.973***
	(0.000)	(0.000)	(0.000)
[4] Excellent	-0.978***	-0.965***	-0.883***
	(0.000)	(0.000)	(0.000)
Married	-0.0648	-0.0724	-0.0842
	(0.305)	(0.266)	(0.146)
Constant	-3.052***	-3.058***	-2.423***
	(0.000)	(0.000)	(0.000)
N	159116	155461	126934

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A5: Coefficients with interaction terms for the *all waves* dummy (probit, random effects).

	howSat: Plain	Controls	casp: Plain	Controls	depr: Plain	Controls
All waves	-0.0207	-1.661	-0.308	-4.770**	1.579	-1.217
	(-0.02)	(-1.07)	(-0.40)	(-3.28)	(1.82)	(-0.68)
Age	0.157***	0.108***	0.231***	0.164***	0.270***	0.154***
	(16.88)	(8.33)	(27.70)	(14.51)	(26.68)	(9.96)
All waves#age	0.00253	0.0562	-0.0131	0.132**	-0.0489	0.0434
	(0.09)	(1.22)	(-0.55)	(3.05)	(-1.81)	(0.82)
Age sq.	-0.00123***	-0.000651***	-0.00196***	-0.00122***	-0.00222***	-0.00112***
	(-17.00)	(-6.43)	(-30.10)	(-13.83)	(-28.01)	(-9.24)
All waves#age sq.	0.0000504	-0.000453	0.000347	-0.000872**	0.000410	-0.000355
	(0.23)	(-1.33)	(1.89)	(-2.73)	(1.95)	(-0.91)
N	229217	164125	237198	160296	211647	131913
R2	0.00111	0.0230	0.00507	0.0381	0.00533	0.0473

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figures

FIGURE A1: Raw values of the three happiness measures for wave 1.

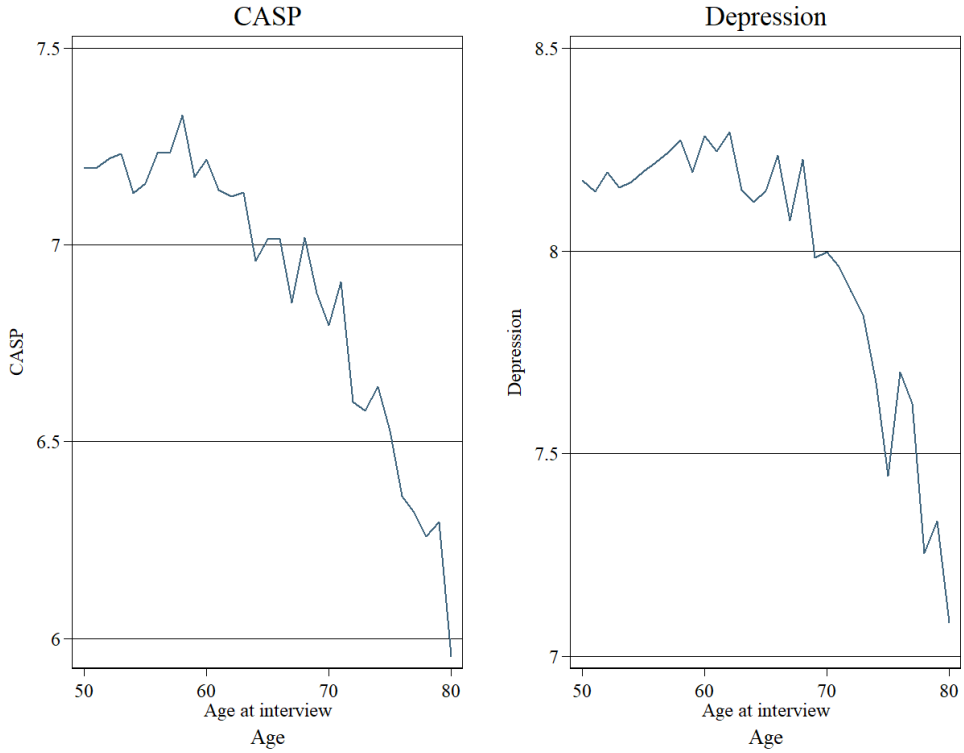


FIGURE A2: Raw values of the three happiness measures for wave 4.

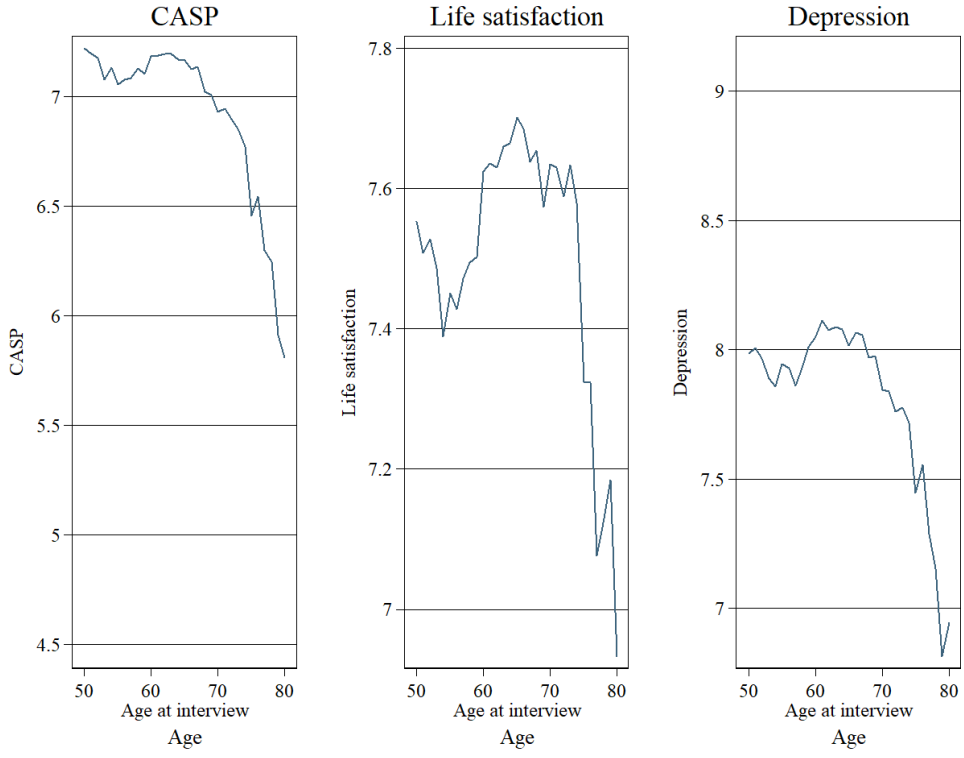


FIGURE A3: Raw values of the three happiness measures for wave 5.

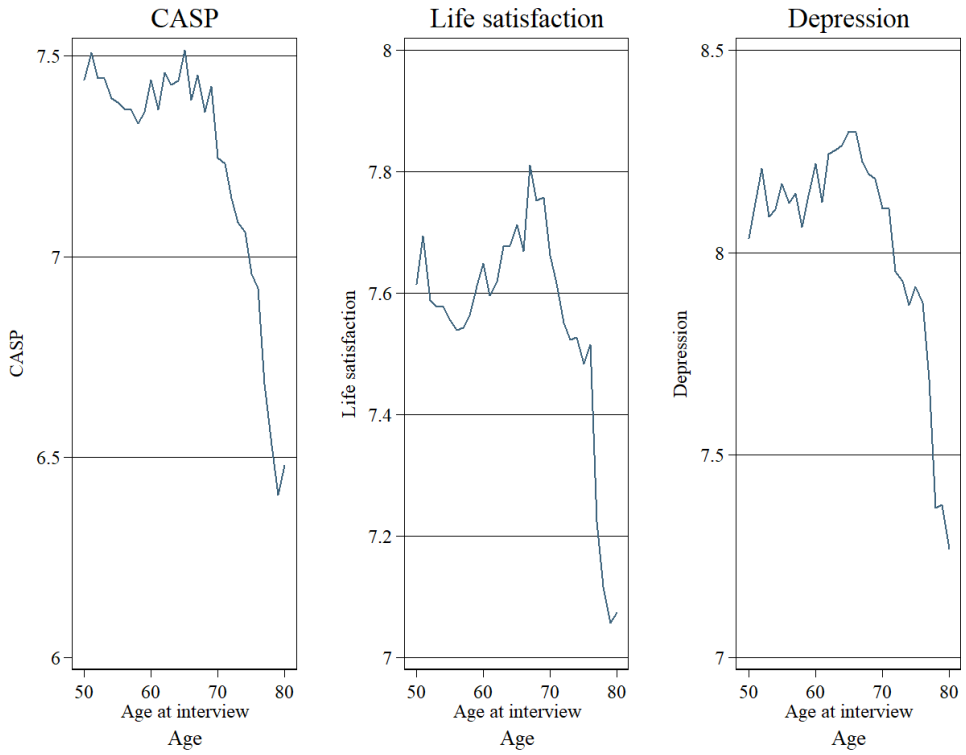


FIGURE A4: Raw values of the three happiness measures for wave 6.

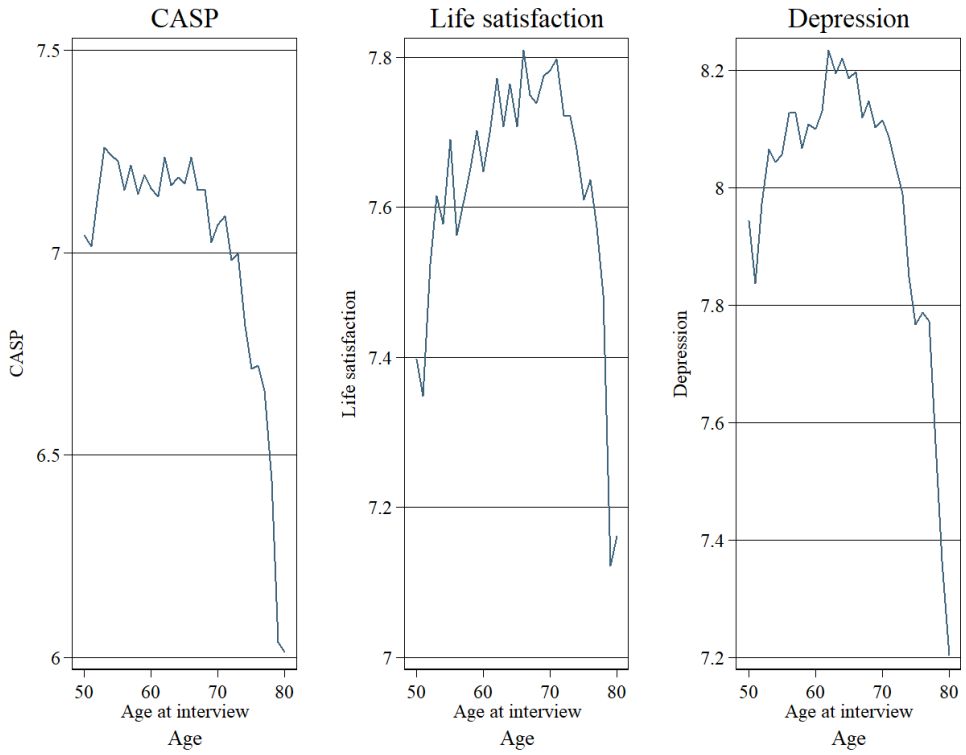


FIGURE A5: Raw values of the three happiness measures for wave 7.

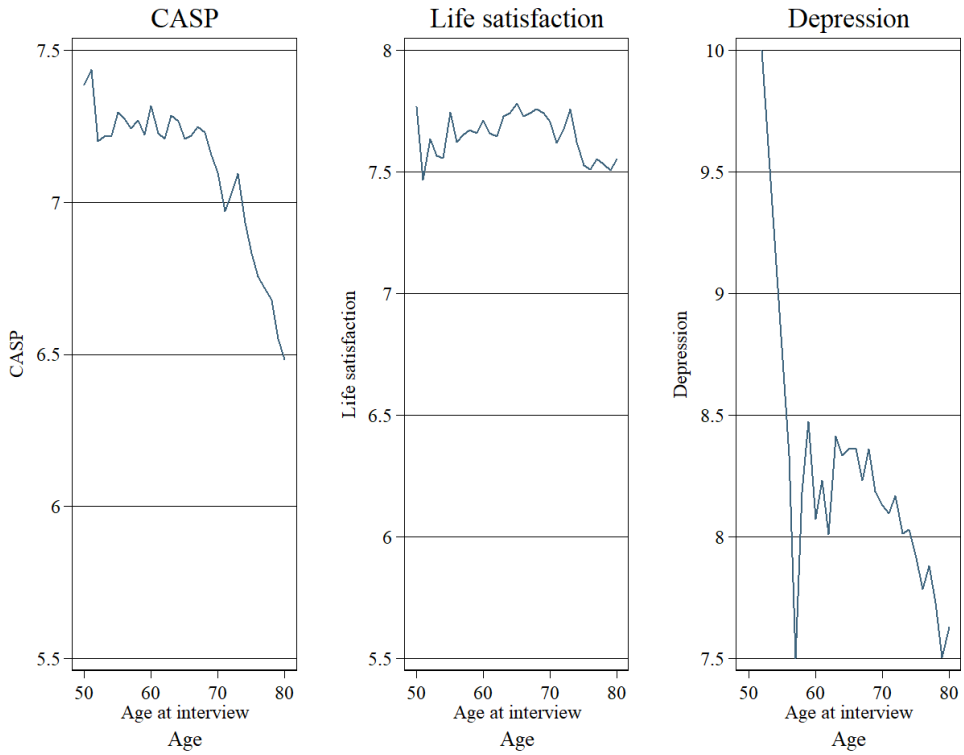


FIGURE A6: Coefficients of the age dummies of model (1) for the different countries.