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The mystery of the U-shaped relationship between happiness and age

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The mystery of the U-shaped relationship between happiness and age.

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Abstract

In this paper we address the puzzle of the relationship between age and happiness. Whilst the majority of psychologists have concluded there is not much of a relationship at all, the economic literature has unearthed a possible U-shape relationship with the minimum level of satisfaction occurring in middle age (35 to 50). In this paper, we look for a U-shape in three panel data sets, the German Socioeconomic Panel (GSOEP), the British Household Panel Survey (BHPS) and the Household Income Labour Dynamics Australia (HILDA). We find that the raw data supports a weak U-shape in the case of the BHPS and the HILDA, but not for the GSOEP and in all three cases the U-shape appears strongly when standard regressors are taken into account. The U-shape disappears in all three datasets when fixed-effects are included, which can be attributed to the reduction in the bias of coefficients of variables that peak in middle-age (income, marriage, employment).

JEL-Codes: C23, C25, I31.

Key-Words: Happiness methodology, unobservables, latent variable models, age effects, cohort effects.

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1 Introduction

What is the relationship between happiness and age? Do we become more miserable as we age, or is our happiness relatively constant throughout our lives with only the occasional special event (marriage, birth, promotion, illness) temporarily raising or reducing our happiness, or do we actually get happier as life gets on and we learn to be content with what we have?

The answer to this question in the recent economic literature on the subject is that the age-happiness relationship is U-shaped[3]. This finding holds for the US, Germany, Britain, Australia, Europe, and South Africa. The stylised finding is that individuals gradually become unhappier after their 18th birthday, with a minimum around 50, followed by a gradual upturn in old age. The predicted effect of age can be quite large. For example, the predicted difference in average happiness between an 18 year old and a 50 year old from regressions can be as much as 1.5 points on a 10-point-scale.

This recent economics literature, however, conflicts with an old psychology literature that finds no happiness-age relationship (Cantril, 1965). Palmore and Luikart (1972) comment in their review; 'Several variables thought to be related to life satisfaction had little or no relationship: age, sex, total social contacts'. More recently, the psychologists Dear, et al. (2002) postulate a slight reduction in life satisfaction as people age, due to the prevalence of high life satisfaction becoming less common at higher ages. From this reading, it is clear that either the psychologists have overlooked something important for a long time or that the methodology of economists begets different answers. This paper intends to find out which it is.

[3] Recent papers on this in the economic literature include: (Bell & Blanchflower, 2007; Blanchflower, 2008; Blanchflower & Oswald, 2001; 2004; 2007; 2008; 2009; Clark, 2006; Dear, Henderson, & Korten, 2002; Di Tella, MacCulloch, & Oswald, 2001; Ferrer-i-Carbonell & Frijters, 2004; Ferrer-i-Carbonell, 2005; Gerdtham & Johannesson, 2001; Hayo & Seifert, 2003; Helliwell, 2003; Oswald, 1997; Oswald & Powdthavee, 2008; Powdthavee, 2003; Seifert, 2003; Senik, 2004; Theodossiou, 1998; Van Landeghem, 2008; Winkelmann & Winkelmann, 1998; Wolpert, 2010).

We re-examine the age-happiness relationship and delve into the methodological aspects of the problem. We essentially want to know if the U-shape that economic scholars find is an artefact or real, and what the actual relationship between age and life satisfaction is. We re-examine the age-happiness relationship in three often-used panel datasets, the German Socio Economic Panel (the GSOEP), the British Household Panel Survey (BHPS), and the Household Income Labour Dynamics Australia (HILDA), which all have an extensive set of variables on the individual level. This data-richness allows us to not only replicate the findings of other studies based on cross-sectional data, but, furthermore, allows us to explore the dynamic interplay between age, covariates, unobserved heterogeneity, and happiness.

The format of this chapter is to let the puzzle of the age-happiness relationship unfold. We first briefly review the recent literature where we summarise the main findings of others, as well as their methodology. Then we present the data we have and show that we can indeed also generate a U-shape in happiness when we run similar regressions to those in the literature. We then go through successive explanations of the U-shape, including the possibility that it is dependent on including the happiness reduction found in early adulthood (age 18 to 22), that it is an artefact of not allowing for fixed effects, or that it is a truly robust finding.

One may wonder what the age-happiness relationship has to do with economics. One main area in which it matters to economic decision making is in the utilitarian calculus of the benefits of living longer and of keeping individuals at various ages alive for longer. If it were truly the case that the very old are happier than the middle-aged, as the current status-quo in economics would have one believe, then an additional year of life of a very old person is worth more to a utilitarian than an additional year of life of a middle-aged person, and health costs should reflect this. If it were, alternatively, the case that the very old are unhappier than the middle-aged, then the utilitarian maximiser would think an additional year of a middle-aged person to be worth more than that of a very old person and would let health-care decisions reflect this.

2 Literature review

Whilst a lot of the economic literature on the age-happiness relationship is recent, there have been earlier discussions of it (see Theodossiou, 1998 for a discussion of the history of this issue). Until the early 2000s, the opinion of economists about the effect of age was still divided. Clark and Oswald (1994) found a U-shaped pattern for the UK, whilst Winkelmann and Winkelmann (1998) found no U-shape in happiness but simply a very strong negative effect of age. Easterlin and Schaefer & Macunovich, (1993) using 20 years of the US General Social Survey concluded that life satisfaction is almost flat in age, with neither a U-shape nor a negative slope. Alesina, Di Tella, & MacCulloch (2004) and van Praag, Frijters, & Ferrer-i-Carbonell (2000) even found an inverted U-shape.

Despite this early controversy, nearly all recent papers come down on the side of a U-shaped relationship between happiness and age. Blanchflower and Oswald (2001; 2004) simply state that 'Wellbeing is U-shaped in age'. Gerdtham and Johannesson (2001) also report a U-shape in age with a minimum around the age of 55. Hayo and Seifert (2003) and Seifert (2003) also report a U-shape and call the U-shaped age effect a 'typical finding in happiness regressions'. The most comprehensive study to date is Blanchflower and Oswald (2007) who combine cross-sectional data for the US, Europe, and the World Value Survey. In total, they have about 800,000 respondents in over 60 countries for which they all report a U-shape in happiness and age. Clark (2006) claims some robustness with respect to methodology for this finding when he concludes that '*Panel analysis controlling for fixed effects continues to produce a U-shaped relationship between well-being and age'*.

In order to get a feeling for the role of methodology in these findings, we reproduce in Tables 1a and 1b the main findings of the recent economic studies on the U-shape between age and happiness. Importantly, in this whole literature the existence of a U-shape is inferred from the combination of a negative coefficient on age and a positive coefficient on age-squared in a happiness regression. We show the found coefficients on age and age-squared and detail the source of the data and the estimation method. We may mention already that all the studies included in this table also use other personal variables in the same regression. The controls mainly include measures for

employment, income, partnerships, the number of children, education and, sometimes, indicators of where someone lives.

Table 1a: Life Satisfaction regression results (t-values) from recent studies

Author, date	Sample (size & name)	Coefficients - Pooled (t-value) Age	Coefficients - Pooled (t-value) Age Squared	Coefficients - Fixed Effects (t-value) Age	Coefficients - Fixed Effects (t-value) Age Squared	Dependent variable (DV) and controls
(Blanchflower & Oswald, 2009)	data from 8 European nations	OLS -0.00800	OLS 0.0000815			DV: Life Satisfaction without controls
(Blanchflower & Oswald, 2008)	data from 16 countries	Ordered Logit -0.0576 (8.85)	Ordered Logit 0.0006 (9.95)			DV: Life Satisfaction with personal controls
(Blanchflower & Oswald, 2001)	USA: General Social Survey 1972-2006	Ordered Logit (men+ women averaged) USA -0.0211 (4.39) *N* = 45,474	Ordered Logit (men+ women averaged) USA: 0.0003 (5.92) *N* = 45,474			DV: Happiness Controls: yes (specification without cohort)
(Blanchflower & Oswald, 2001)	Europe: Eurobarometer 1976-2002	Ordered Logit (men+women averaged) Eur: -0.045 (31.31) *N* = 589,446	Ordered Logit (men+women averaged) Eur: 0.00052 (10.1) *N* = 589,446			DV: Life Satisfaction Controls: yes (specification without cohort)
(Blanchflower & Oswald, 2001)	World Value Survey 1981- 2004	Ordered Logit (men+women averaged) WVS: -0.0505 (10.1) *N* = 163,852	Ordered Logit (men+women averaged) WVS: 0.0003 (5.92) *N* =163,852			DV: Life Satisfaction Controls: yes (specification without cohort)

Table 1b: Continuation of Life Satisfaction regression results (t-values) from recent studies

Author, date	Sample (size & name)	Coefficients - Pooled (t-value) Age	Coefficients - Pooled (t-value) Age Squared	Coefficients - Fixed Effects (t-value) Age	Coefficients - Fixed Effects (t-value) Age Squared	Dependent variable (DV) and controls
(Blanchflower & Oswald, 2004)	UK: Eurobarometer Survey 1975-1998	Ordered Logits - All UK: -0.0424 (2.84) *N* = 54,549	Ordered Logits - All UK: 0.0005 (15.38) *N* = 54,549			DV: Life Satisfaction Controls: yes
(Clark, 2006)	British Household Panel Survey (BHPS) waves 1 to 14	-0.075 (-25) *N* = 82,096	0.00091 (30.33) *N* = 82,096	Applied age cohorts to derive fixed effect coefficients		DV: Life Satisfaction Controls: yes
(Di Tella, et al., 2001)	Eurobarometer Survey Series 1975-1991	OLS -0.02 (20.0) *N* = 264,710	OLS 0.0002 (33.33) *N* = 264,710			DV: Life Satisfaction Controls: yes
(Powdthavee, 2005)	Statistics South Africa OHS study of 1997	-0.011 (z-stat: -2.38) *N* = 20,634	0.0001 (z stat: 2.03) *N* = 20, 634			DV: Life Satisfaction Controls: yes
(Senik, 2004)	Russian longitudinal monitoring survey (RLMS).	Ordered Probit (2) -0.050 (8.33) *N* = 17,897	Ordered Probit (2) .001 (p < .01) *N* = 17,897			DV: Life Satisfaction Controls: yes
(Winkelmann & Winkelmann, 1998)	German Socio-Economic Panel 1984-89 waves of the GSOEP	-0.098 (-9.8) *N* = 20,944	0.0012 (12) *N* = 20,944	fixed effects logit model 2 -0.118 (-3.19) *N* = 20,944	fixed effects logit model 2 -0.0001 (0.25) *N* = 20,944	DV: Binary Life Satisfaction Controls: yes

Tables 1a & 1b confirm the very strong effect that age is found to have upon life satisfaction in recent studies, and, that the effect of linear age is always negative, whilst that of age-squared is positive, indicating a U-shape. Bearing in mind that the age at which the minimum occurs is given by the negative of the coefficient of linear age divided by twice the coefficient of age-squared, it indeed appears that the majority of the studies find an age of around 55 as the age at which the minimum occurs. Tables 1a & 1b also underscore that the effects are mainly found in cross-sections when controls are added for individual socio-economic variables.

Despite the reliance in the literature on using age and age-squared in order to unearth a U-shape or not, other approaches can be taken. Wunder et al. (2009) hence include a fourth-order polynomial of age in their happiness regressions, where they find that the higher order terms are also significant and hence that the U-shape is not a perfect description of the actual relationships (they find a clear negative slope at the very high age ranges). Yet, since this paper is interested in seeing where a particular finding in the literature comes from, we will follow the convention of focussing on just a second-order polynomial (age and age-squared).

3 The Three Panel Data Sets

3.1 The GSOEP

We use the 1984-2002 waves of the German Socio-Economic Panel (GSOEP, 2008), a representative 18-year panel of the German population. The first wave (1980) included only the Federal Republic of Germany; it has included the former East Germany since 1990. We use only the information on West Germany in order to be able to abstract from the importance of the 1990 German reunification, which had a tremendous impact on the lives and satisfaction levels of East Germans (Frijters, Haisken-DeNew, & Shields, 2004). The GSOEP currently tracks about 20,000 individuals and 12,000 households. See Wunder, et al. (2009) for a detailed description of the data and summary statistics.
Life satisfaction is derived from the (0,10) answers to the question ‘How satisfied are you with your life, all things considered’?

3.1 The HILDA

The second data set we use are waves 2 to 8 from the 'Household, Income and Labour Dynamics in Australia' (HILDA) Survey[4]. This annual household–based panel survey began in 2001 (HILDA, 2008) and includes about 13,000 individuals and 7,000 households. See Watson & Wooden (2010) for further descriptions.

Life satisfaction is derived from the (0,10) answers to the question 'All things considered`, how satisfied are you with your life'?

3.3 The British (BHPS) data

We use waves 6 to 10 and waves 12 to 18 of the British Household Panel Survey[5] (BHPS). It began in 1991 and contains about 10,000 households and 25,00 individuals (BHPS, 2010). Life satisfaction is derived from the (1,7) answers to the question 'Which number best describes how satisfied or dissatisfied you are with your life as a whole'?

Appendix A provides summary statistics for all three datasets.

3.4 Is there a U-shape in the raw data?

For all analyses that follow the full regression tables are shown Appendix B, but we tell the story using graphs and summary tables in the main text. We experimented using both simple least squares (which is the dominant method in the literature) and latent-variable analyses (for cross-sectional as well as fixed-effects analyses) but we found, as in Ferrer-i-Carbonell & Frijters (2004), that there is no qualitative difference, so we choose to present the least squares results here whilst having the latent-variable results available on request.

We begin by showing a picture of the raw pooled cross-sectional relationship between age and aggregate happiness for each three datasets, with the predicted lines overlaid for least-squared regressions that include either just age or age and age-squared (Figure 1a

[4] The questionnaire for wave 1 of the HILDA panel survey did not include several important variables often used in happiness regressions (life events).

[5] The BHPS Waves 1 to 5 and 11 did not include the happiness question.

to 1c). The shown intercepts are normalised such that satisfaction at age 20 is always the same[6].

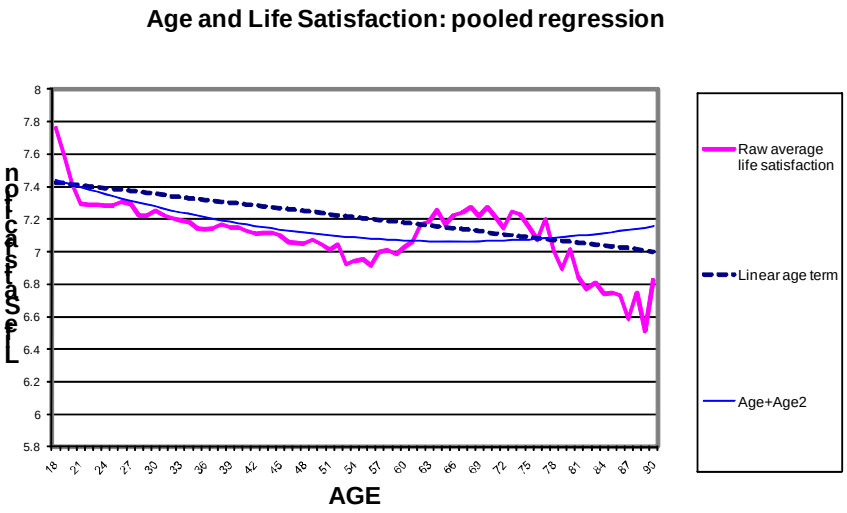

Figure 1a: Average life satisfaction by age in the GSOEP for the pooled sample

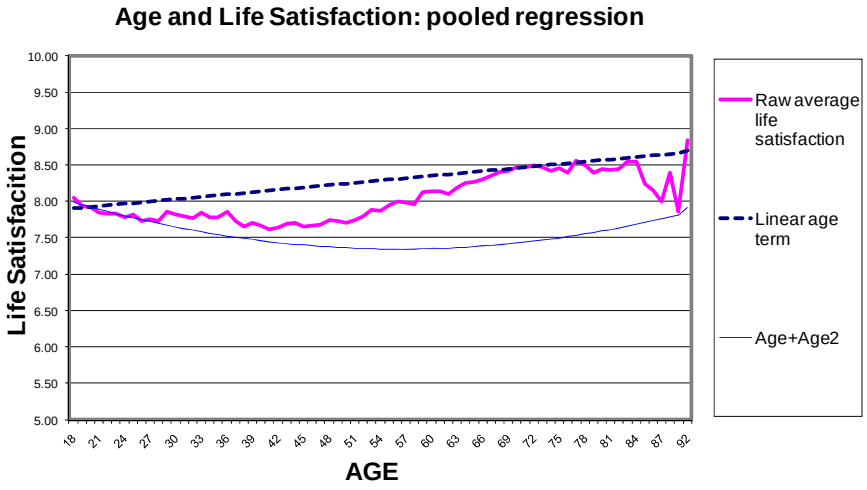

Figure 1b: Life satisfaction in the HILDA for the pooled sample

[6] Thus, the thin curved lines depict $\{Life\ Satisfaction_{(age\ 20)} + (\beta_{age} * (age-20)) + (\beta_{age2} * (age^2 - 20^2)\}$ where age runs from 18 to 92 in the GSOEP, 18 to 92 in the HILDA and 18 to 90 in the BHPS.

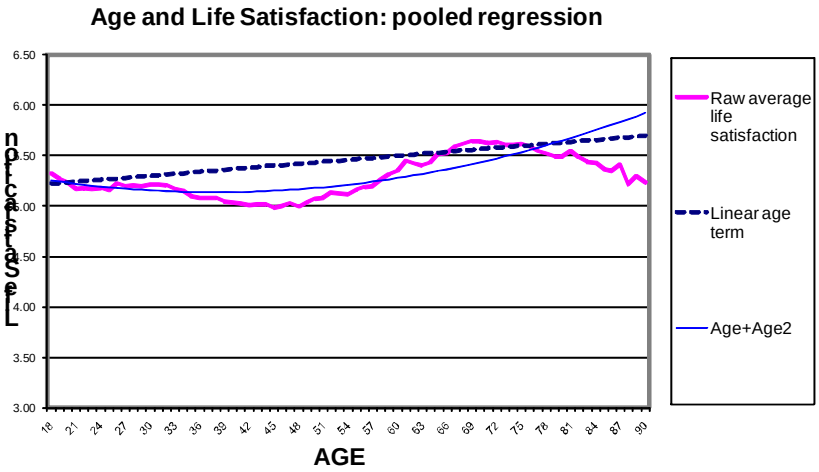

Figure 1c: Life satisfaction in the BHPS for the pooled sample

Whether the raw relation shows a U-shape or not is somewhat a matter of taste. The main relation in the GSOEP appears less to be a minimum at middle age with maximums at early and late age, but rather an almost continuous decline by age. As a result, the prediction line with just age is strongly negative, and the prediction line with age and age-squared has a minimum quite late (age about 70).

The HILDA shows arguably the 'cleanest' U-shape with a predicted minimum at age 36 and no clear happiness decrease in old age. Indeed, the linear happiness profile is quite strongly increasing by age, counter to the general profile in the GSOEP.

The BHPS has a minimum at age 38 but the raw profile has, like the GSOEP, a clear reduction at higher ages that visually conflicts with a U-shape.

In summary, the raw data is conflicted about whether there is a U-shape or not. A 'wave' is perhaps a more accurate description for both the GSOEP and the BHPS (and indeed Wunder, et al. (2009), using higher-order polynomials and splines, finds a wave for the GSOEP). The basic profiles also show where some of the statements in the psychological literature come from. The reduction in happiness at old age for Germany and Britain is for instance in line with the postulate of Dear, et al. (2002) that the elderly are less frequently very happy.

3.5 The importance of additional variables.

What if we add additional regressors to these simple specifications, akin to the norm in the literature reviewed in Table 1? Again, the full Tables are in Appendix B. Figures 2a-2c show the predicted age-happiness profiles when we successively add additional variables. What is termed the 'usual suspects' are the variables income, gender, education, number of children, marriage, employment, non-participant, and unemployed. What is termed 'usual suspects + health' adds self-reported health and indicators of wealth (regional income, assets, imputed rent). What is termed the 'kitchen sink' corresponds to the fuller specifications found in the literature by adding available life-events (divorce, death in the family, promotion, being fired, marriage in a year, pregnancy, etc.).[7]

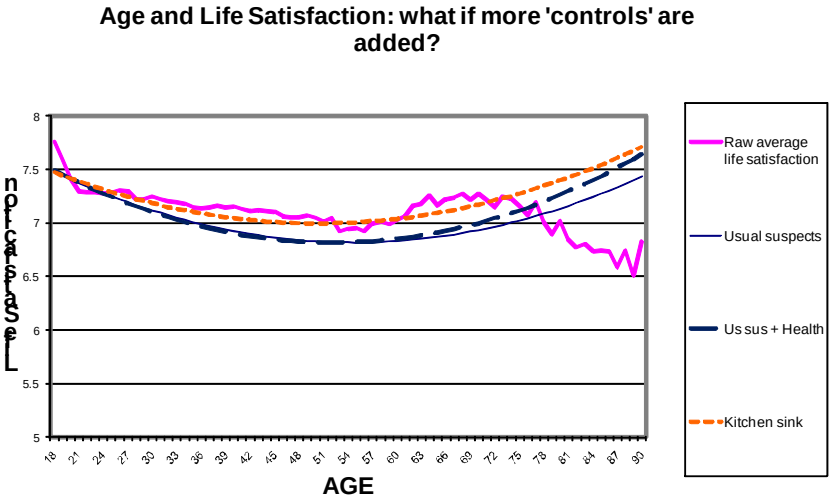

Figure 2a: Life satisfaction in the GSOEP for the pooled sample with added controls

[7] Though there is some degree of collinearity between the different events, there are a sufficiently large number of separate events to identify the separate effects. For the HILDA for instance, there are 2,083 cases of individuals becoming unemployed, 3,831 cases of pregnancy, 507 cases of divorce, and 2,968 cases of separation. The descriptive statistics in Table A1 in Appendix 1 gives the sample averages of these variables.

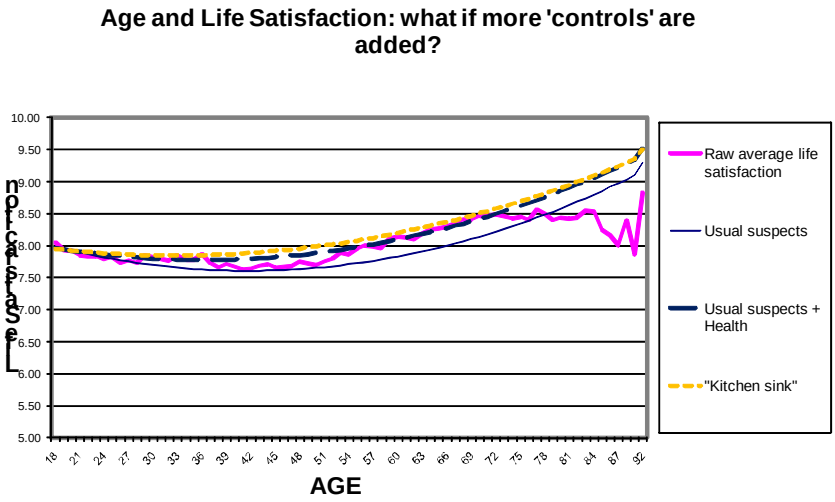

Figure 2b: Life satisfaction in the HILDA for the pooled sample with added controls

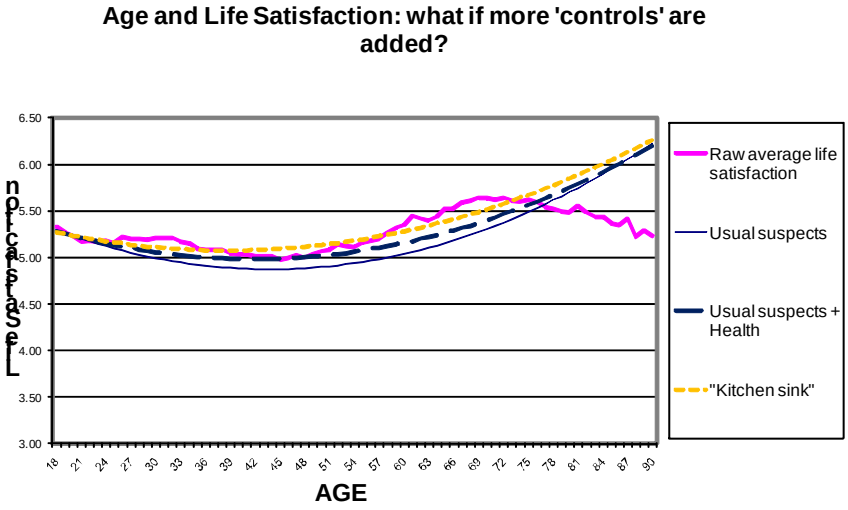

Figure 2c: Life satisfaction in the BHPS for the pooled sample with added controls

Figure 2a shows that adding the 'Usual suspects' yields a dramatic deepening of the U-shape, with the predicted happiness decline from 18 to 50 year old being about 0.63 for Germany, whereas it was only a predicted 0.34 in the prediction line in Figure 1a. Including health and wealth makes virtually no difference. When we finally throw in a large set of indicators of life events, 'Kitchen sink', (including the loss of a spouse, being fired, and birth of a child), the age at which the minimum occurs is the youngest yet, i.e. age 50, but the decline in happiness from age 18 to 50 is still 0.47.

If we turn to the HILDA results in Figure 2b, we also find that adding regressors significantly deepens the predicted U-shape. The predicted decline in happiness from age 18 to the minimum point (which is 42 with the 'Usual suspects) equals 0.37, whereas it was only 0.15 in the predicted line in Figure 1b. The 'upswing' from the minimum to the highest age point increases to 1.8, up from 0.77. Hence, even though the U-shape is slightly less pronounced as result of including regressors than it is in the GSOEP, there is a marked increase in profile.

For the BHPS results in Figure 2c, we again find that adding regressors significantly deepens the predicted U-shape. The predicted decline in happiness from age 18 to the minimum point (which is 44 with the 'Usual suspects) equals 0.42, whereas it was only 0.10 in the predicted line in Figure 1b. The 'upswing' from the minimum to the highest age point increases to 1.34, up from 1.4. Again, the profile is slightly less strong when adding health and the kitchen sink. Yet, the change in the direction of a clear U-shape is actually strongest in the BHPS, in that it experiences the greatest relative change between the downswing after adding further controls.

We can also address the question statistically by comparing the coefficient on age-square between the raw specification (just age and age-square) and the specifications with the usual suspects. In all three datasets, the coefficient on age-square increases significantly at the 1% level.[8]

Summarising, a strong U-shape pattern emerges in all three datasets when adding controls usually included in the economic happiness literature, particularly in the GSOEP and in the BHPS, but less so in the HILDA where the raw data is most supportive of a U-shape.

[8] In the GSOEP, the coefficient increases from 0.00016 to 0.00049, which is an increase significant at the 0.1% confidence levels. In the HILDA, the coefficient increases from 0.00044 to 0.00066, which is an increase significant at the 0.1% confidence levels. In the BHPS, the coefficient increases from 0.00029 to 0.00063, which is an increase again significant at the 0.1% confidence levels.

4. Explanations.

4.1. The relation is due to the very young and the very old.

A naive first-thought is that there is a particular issue with the early ages, i.e. age 18 to 22, and with high ages, i.e. those above 80. This is because the happiness decline is particularly steep for the early years and one may worry about the selectivity of those who are still alive at very high ages (they could be much happier or much less happy than others), which makes one wonder if the young are being overly optimistic about their actual levels of happiness and that the happiness of the very old is hard to tell from the selective data points in that range. To examine this possibility, Figures 3a to 3c look only at the 22-80 age range, including overlaid regression lines with the regression results in Appendix B.

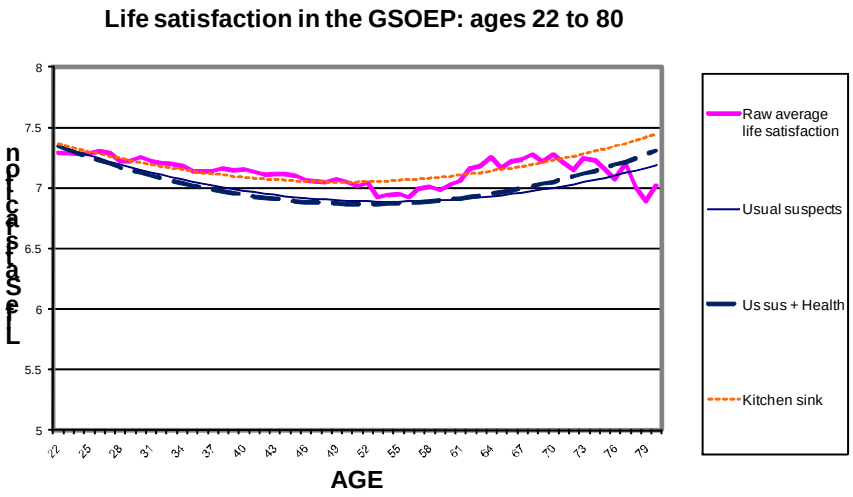

Figure 1: Life satisfaction in the GSOEP for the pooled sample for the mid-age range

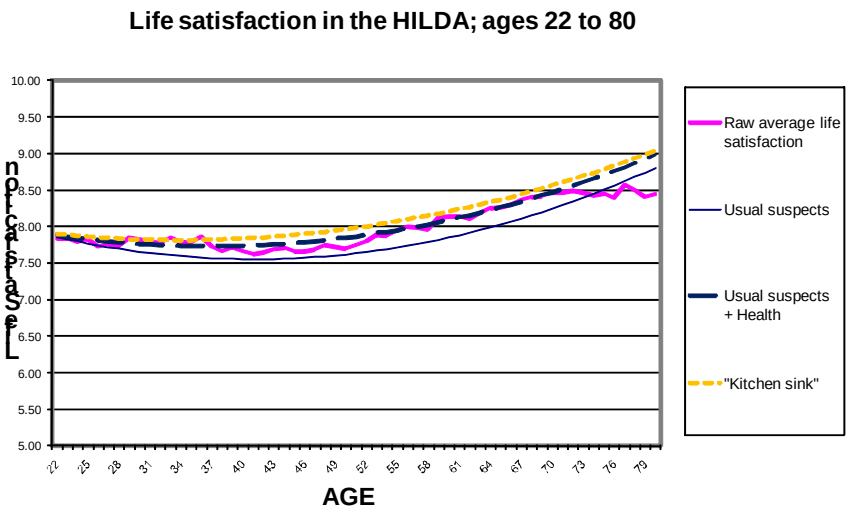

Figure 3b: Life satisfaction in the HILDA for the pooled sample for the mid-age range

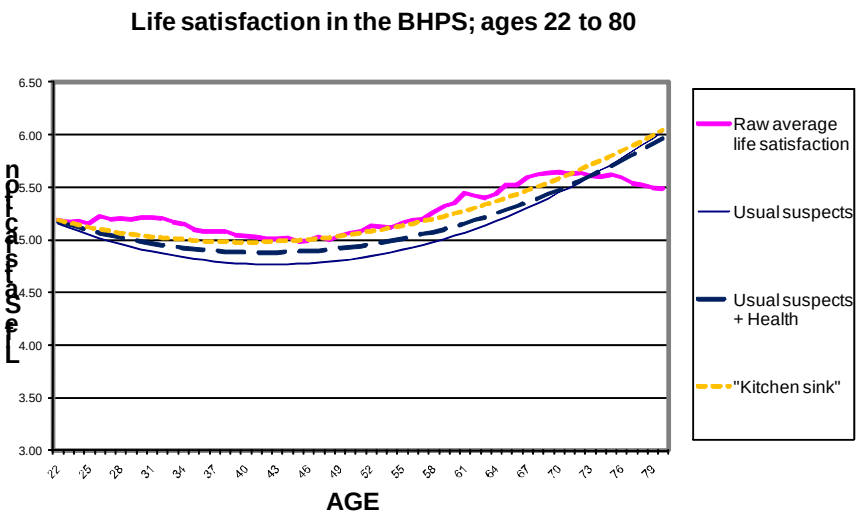

Figure 3c: Life satisfaction in the BHPS for the pooled sample for the mid-age range

If we compare Figure 3a to Figure 2a there is almost no change in the profile of the 'usual suspect' prediction line for Germany. The drop from the lowest age to the minimum is now 0.58 in Figure 3a compared to 0.66 in Figure 2a, still up from 0.34 in Figure 1a. The U-shape has hence slightly weakened, but only marginally (the coefficient on age-squared only reduced by 10%).

For the HILDA, Figure 3b shows a slightly stronger U-shape than before. The age-square coefficient underlying the 'usual suspect' lines in Figures 3b and 2b increased by almost 30%, as did the down-swing from the happiness level at the lowest age to the minimum level of predicted happiness.

For the BHPS, the increase in the U-shape profile is the most pronounced, with the relevant coefficient underlying the 'usual suspect' lines in Figures 3c and 2c increasing by 50%. The concomitant predicted downswings and upswings are also more pronounced than before.

We can thus conclude that the U-shape is certainly not an artefact of including the very young and the very old. If anything, including the very young and old reduced the U-shape for the results for the HILDA and the BHPS whilst it has little effect on the results for the GSOEP.

4.2 It is all about unobserved heterogeneity.

An important finding in the literature so far is that happiness is strongly affected by stable personality traits (see Argyle, Kahneman, Diener, & Schwarz, 1999; Ferrer-i-Carbonell & Frijters, 2004, and; Frey & Stutzer, 2002). These fixed individual traits are usually part of the error term. A stylised finding from both the economic and the psychological literature is that accounting for fixed traits has a very strong impact on the coefficients found for socio-economic variables (Clark, Frijters, & Shields, 2008; Ferrer-i-Carbonell & Frijters, 2004). A leading explanation for this is the possibility of reverse causality arising from unobserved heterogeneity. As Lyubomirsky, King, & Diener (2005) argue, the traits that make you happier also make it more likely that you will have a higher income, a job, a partner, better health, greater wealth, and a higher level of education.

Could the problem of reverse causality caused by unobserved fixed traits explain something about the U-shape? At first glance, one would think not because fixed personality traits are by design uncorrelated with age. However, personality traits can be correlated with variables that are in turn correlated with age, such as income, a job, a partner, good health and wealth. How would this work? Consider the problem in its

simplest form. Suppose for the purposes of this subsection the truth is that the following relationship holds

$$y_{it} = \alpha_1 * age^2 + x_{it}\beta + f_i + u_{it}$$
$$f_i \perp age_{it}^2, \text{cov}(f_i, x_{it}) > 0, \text{cov}(age_{it}, x_{it}) > 0. E\left[u_{it} \mid age_{it}, x_{it}, f_i\right] = 0$$

where we have for simplicity subsumed a linear age term into x_{it} and all variables are normalised to have expectation 0 implying there is no constant term either; there are individual fixed traits f_i unrelated to age-squared but related to a composite time-varying socio-economic variable called x_{it} . There is an error term, u_{it}, orthogonal to everything else. What are now the estimated coefficients if we mistakenly run a regression without accounting for fixed-effects? The asymptotic values are,

$$\rho\lim \widehat{\beta} = \beta + \frac{\text{cov}(f_i, x_{it})}{\text{var}(x_{it})} + (\alpha_1 - \rho\lim \widehat{\alpha}_1)\frac{\text{cov}(age_{it}^2, x_{it})}{\text{var}(x_{it})}$$
$$\rho\lim \widehat{\alpha}_1 = \alpha_1 + (\beta - \rho\lim \widehat{\beta})\frac{\text{cov}(x_{it}, age_{it}^2)}{\text{var}(age_{it})}$$

which shows that even though age_{it}^2 is not correlated with the omitted fixed effect, the coefficient on age_{it}^2 can nevertheless be biased when it is related to included time-varying variables that are correlated with the omitted fixed-effect. The equations become rather elaborate if we add a linear age term and a constant but the basic principle remains that a bias in the age-term can occur if the added variables are correlated with age and with the omitted fixed-effect.

Intuitively, there are two steps in the possible emergence of the bias. The first is that, as shown just above, the inclusion of fixed effects will change the coefficients of the non-age variables x_{it}. The second is that x_{it} itself changes systematically with age-squared, which leads to a bias in the estimated coefficient of age-squared.

To explore this possibility we run fixed-effect analyses on the three datasets, with the full regression results in Appendix B. Figures 4a to 4c show the predicted age-profiles for all three datasets.

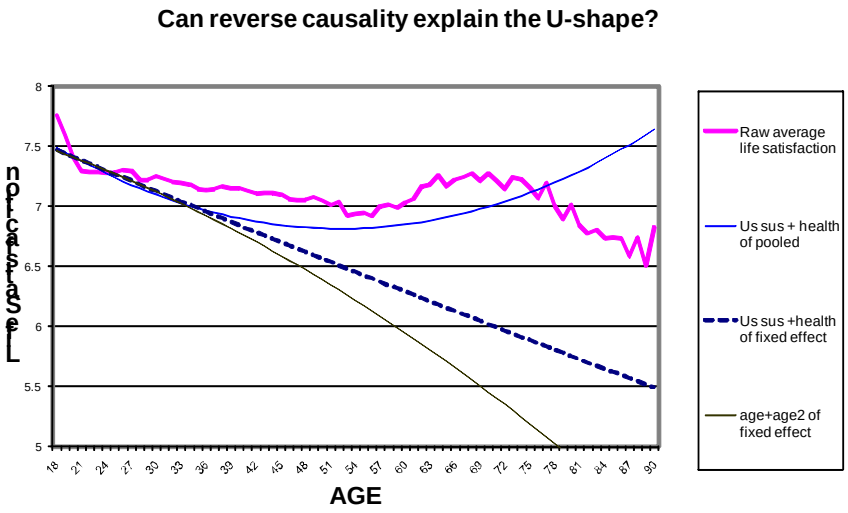

Figure 4a: Life satisfaction in the GSOEP for the balanced panel including fixed-effects

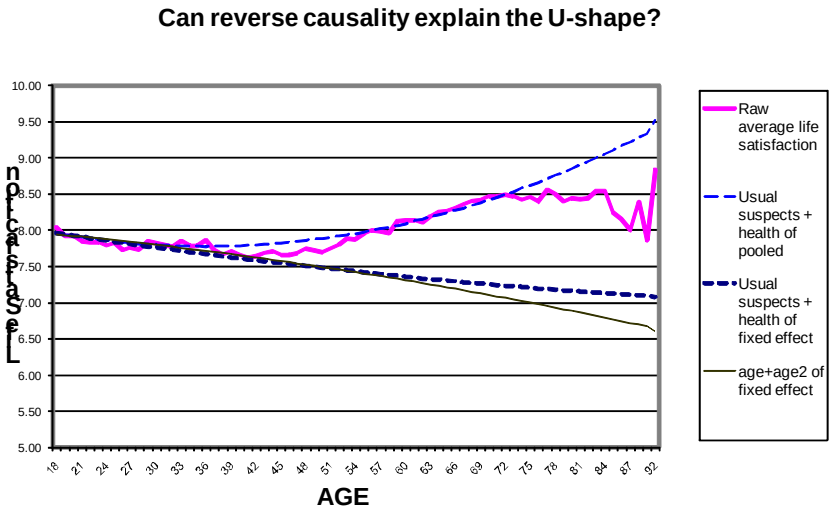

Figure 4b: Life satisfaction in the HILDA for the balanced panel including fixed-effects

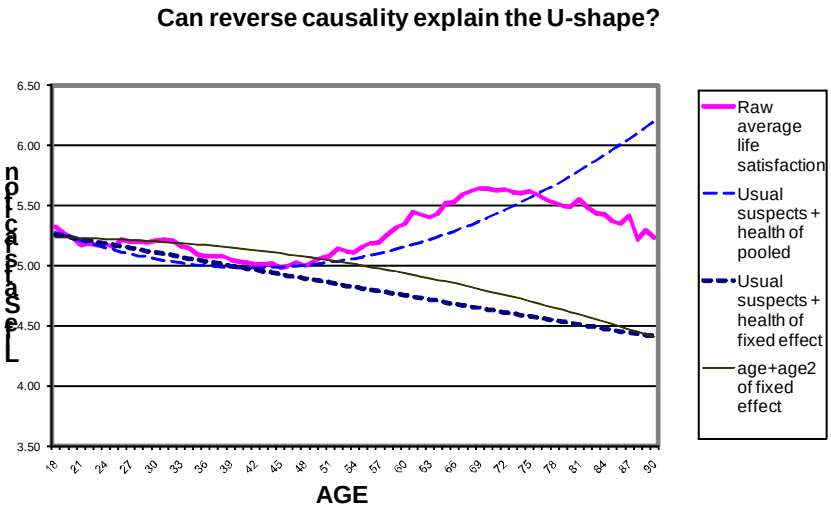

Figure 4c: Life satisfaction in the BHPS for the balanced panel including fixed-effects

The results for Figures 4a to 4c are both confirming and surprising. The graphs show the raw relationship between age and happiness and three overlaid lines. The U-shaped line is the same one seen previously in Figure 2a-2c and is the pooled regression on the entire age range with the preferred specification including health and wealth. Overlaid are two lines from fixed-effect regressions. The thick dark dashed line is the result of running the same regression as for the pooled regression but including fixed effects. The third thin solid line shows the result of just running a fixed effect regression with only age and age-squared as regressors.

As one can see in Figure 4a, the predicted U-shape apparent previously completely disappears, i.e. the age-squared coefficient becomes tiny and insignificant. Indeed, the age-squared coefficient has become significantly negative (Appendix B). It, however, replaces the U-shape by a similarly puzzling effect, which is a very strongly significant negative linear relationship. The third thin solid line, which shows the result of just running a fixed effect regression with only age and age-squared as regressors, confirms this. The U-shape reverses into an inverted U shape.

What goes for the GSOEP goes for the HILDA in Figure 4b: the fixed-effect 'usual suspect + health' prediction line no longer resembles a U-shape but becomes a linear decline. As with the GSOEP, the significantly positive coefficients on age-squared of Figures 1-3 revert into a negative coefficient (significant for the specification with other covariates).

The pattern is repeated for the BHPS; when including fixed-effects the U-shape disappears and a simple linear decline emerges, though for the BHPS the age-square coefficients are insignificant.[9]

4.3 How does the unobserved heterogeneity bias the pooled results?

The mechanism hypothesised in the previous sub-section was that fixed traits lead to a reverse causality between variables and life-satisfaction (i.e. people have high incomes and get married partially because they have high levels of happiness). The biases in the coefficients of these reverse causality variables would then lead to a bias in the age profile because those variables change systematically with age. Here we look at whether we can confirm whether those mechanisms are visible in the data.

There are two separate steps in the emergence of a bias in the age-coefficients that we can look at. The first is simply whether the coefficients of other variables changes when fixed-effects are included. Table 2 below summarises the estimates of particular coefficients when one includes fixed-effects and when one does not. The variables we show are the ones often used in economic research: employment, unemployment, marriage, income, and education. These are also the most significant variables in the 'usual suspects' category.

.

[9] The increases in the age-square coefficients between the specifications with and without age-squared are significant at the 0.1% level for all three datasets. See Appendix B.

Table 2: Coefficients on the key 5 variables (pooled & fixed effects) for the three data sets.

	OLS						OLS with Fixed Effects					
	GSOEP		HILDA		BHPS		GSOEP		HILDA		BHPS	
Specification	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
Age + Age^2												
age	-0.0217**	15.69	-0.0320**	19.0	-0.0221**	21.96	-0.0166**	6.60	-0.0076	1.02	0.0044**	1.42
age*age	0.00016**	11.63	0.0004**	25.8	0.0003**	29.00	-0.0003**	9.71	-0.0001$^+$	1.30	-0.0001**	4.61
Usual suspects												
age	-0.0541**	32.80	-0.0554**	29.6	-0.0554**	49.28	-0.00328**	11.61	-0.0173*	2.12	-0.0064$^+$	1.88
age*age	0.0005**	29.20	0.0007**	34.0	0.0006**	55.15	-0.0001**	2.22	0.00001	0.17	-0.0001$^+$	1.75
income	0.4619**	52.2	0.0805**	15.00	0.0943**	19.44	0.2414**	23.13	0.0257**	4.26	0.0164**	2.64
employed	0.0650**	4.8	0.1355**	9.27	0.2397**	27.19	0.0991**	6.69	0.0536**	2.33	0.0618**	4.63
married	0.3106**	27.9	0.4429**	36.20	-0.0033*	2.27	0.2385**	14.95	0.2056**	6.76	0.3567**	46.48
Usual suspects + health												
age	-0.0600**	36.77	-0.0403**	22.7	-0.0438**	41.01	-0.0298**	9.95	-0.0202**	2.50	-0.0127**	3.86
age*age	0.0006**	34.13	0.0006**	30.3	0.0005**	48.21	0.00006	0.74	0.00007	0.94	0.00008	0.27
income	0.4420**	45.91	0.0329**	4.77	0.0399**	5.47	0.2750**	23.67	0.0191**	3.22	0.0166**	2.7
employed	0.0791**	7.60	-0.1338**	9.20	0.0295*	2.02	0.1001**	6.75	-0.0238	1.06	0.0355**	2.77
married	0.2915**	26.50	0.3624**	30.32	-0.3063**	41.48	0.2457**	15.42	0.1963**	6.52	0.1390**	8.47
Kitchen sink												
age	-0.0454**	25.64	-0.0311**	16.0	-0.0350**	31.02	-0.0184**	5.81	-0.0033	0.40	-0.0082**	2.49
age*age	0.0005**	25.39	0.0005**	24.0	0.0005**	39.43	-0.00002**	2.40	-0.00006	0.72	0.000008	0.31
income	0.4307**	44.53	0.0309**	5.69	0.0251**	5.25	0.2585**	22.15	0.0151**	2.55	0.0060	0.98
employed	0.0688**	5.11	-0.1166**	8.00	0.0372**	4.38	0.0925**	6.24	0.0394$^+$	1.75	0.0365**	2.86
married	0.1180**	7.65	0.2514**	14.85	-0.0195**	14.27	0.0327$^+$	1.37	-0.1095**	2.84	0.2014**	22.43
N =	*176,770*		*75,529*		*153,886*		*176,770*		*75,529*		*153,886*	

Level of significance: + $p < 0.1$ * $p < 0.05$ ** $p < 0.01$

From Table 2 we can indeed see large changes in coefficients for all three datasets when including fixed-effects. For income, the coefficient drops 37% in the GSOEP (0.28 in fixed-effects compared to 0.44 in the pooled regressions), 40% in the HILDA and 58% in the BHPS. For marriage, the coefficient drops 16% in the GSOEP (0.25 in fixed-effects compared to 0.29 in the pooled regressions), 32% in the HILDA and 55% in the BHPS. Interestingly, the absolute coefficients of all these 5 variables reduce in all three datasets when including fixed effects. There is a clear change in the coefficients of variables from pooled to fixed-effects

The second step is to see if the changes in the coefficients of these non-age variables lead to a difference in the predicted age-profile. The clearest way to see if this happens is to show the predicted effect of all non-age variables in the pooled regressions versus the fixed-effects regressions. Hence, in Figures 5a to 5c we show, for all three datasets, two prediction lines. The first is from the 'usual suspects' regressions that do not include fixed effects (column 3 of Tables B1, B4, and B7 in the Appendix), and the second from the 'usual suspects' regressions that do include fixed effects (column 3 of Tables B3, B6, and B9 in the Appendix). In all cases, we let the prediction lines start at the same point at age 18 to aid the interpretation.[10]

[10] The model is *Life Satisfaction* $=\beta_{age} * age + \beta_{age2} * age^2 + x_{it}'\beta_x + e_{it}$ where e_{it} is the error term that either includes fixed-effects or not. The prediction lines shows the average over i of $x_{it}'\beta_x$ by age which uses the fact that x_{it} changes by age.

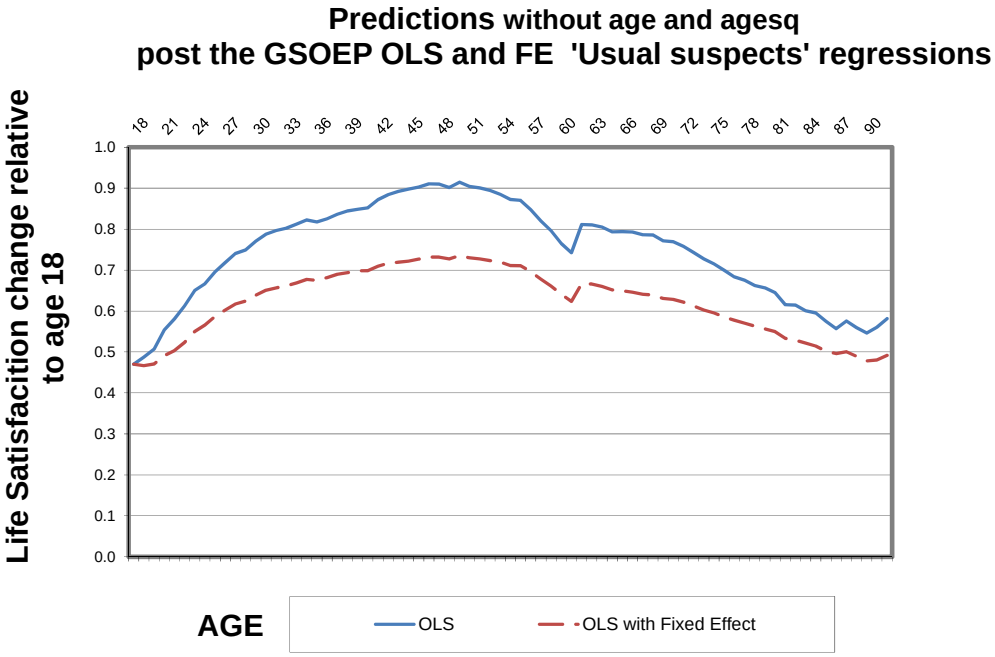

Figure 5a: Predicted happiness effects of the non-age variables in the GSOEP

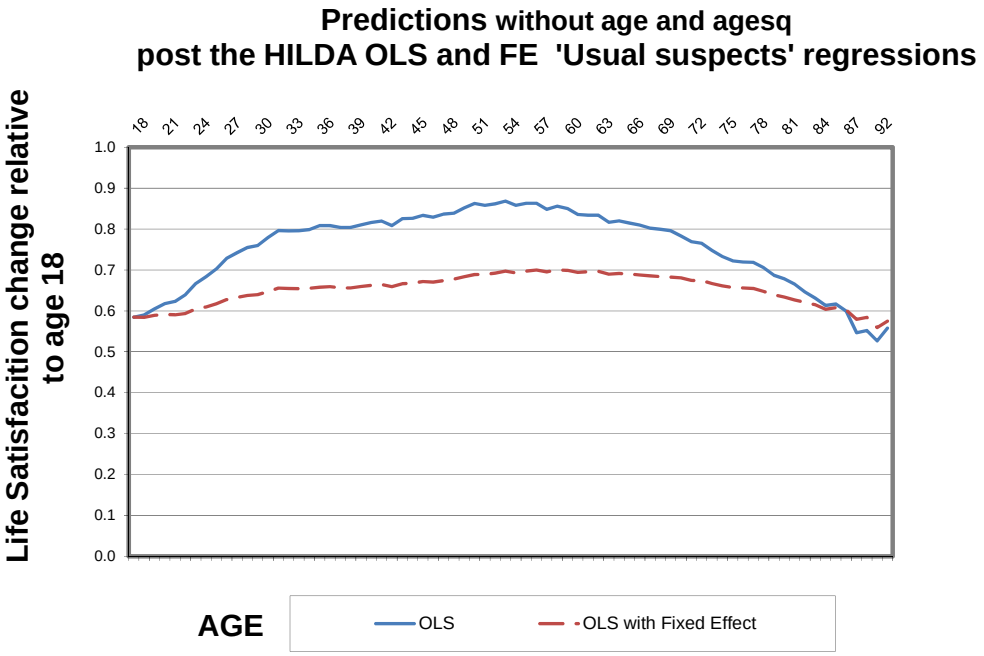

Figure 5b: Predicted happiness effects of the non-age variables in the HILDA

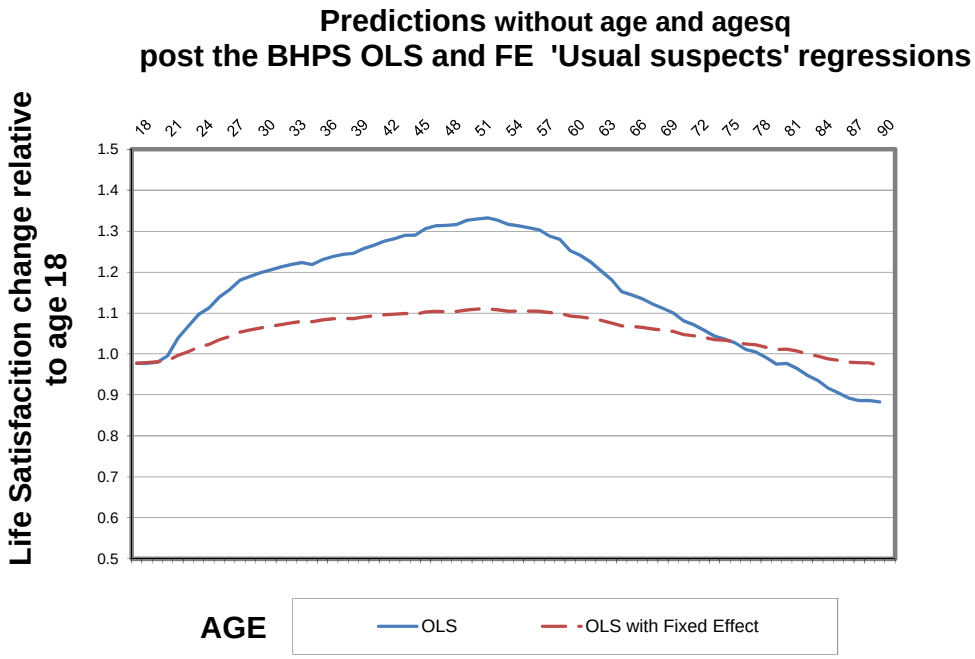

Figure 5c: Predicted happiness effects of the non-age variables in the BHPS

Looking at the results for the GSOEP in Figure 5a first, the main thing to note is that the predicted OLS line looks very much like an inverted U-shape: the increase from age 18 to the top at age 48 is about 0.32 and the subsequent decrease to age 80 is about 0.9. Since the regression coefficients of age-and age-square essentially try to fit the actual age-profiles conditional on this predicted effect from the non-age variables, this inverted U-shape forces a finding of a U-shape in the age coefficients. When including fixed-effects one can see that the inverted U-shape is much less pronounced (though not entirely gone): the increase from age 18 to the top is about 0.22 and the subsequent decrease is 0.54. This reduction in the predicted inverted U-shape from the non-age variables in turn will lead to a reduction in the U-shape found for age when including fixed-effects.

Qualitatively, the same results appear for the HILDA in Figure 5b: the reduction in the predicted happiness contribution of the non-age variables from the top to age 90 is 0.5 with the pooled regression results and only 0.35 with the fixed-effects.

The results from the BHPS in Figure 5c look very close to those of the GSOEP: the inverted U-shape of the happiness contribution of the non-age variables is much stronger

without fixed-effects than with fixed-effects. Both the upswing and the downswing are more pronounced.

Summarising, we can indeed see that the inclusion of fixed-effects reduces the coefficients of variables that themselves systematically vary by age (incomes and marriage peak in middle age) and that this in turn reduces the predicted inverted U-profile of their effects.

4.4 Robustness analyses

We here briefly mention the robustness analyses we ran (results available on request).

One robustness analysis was to re-do everything with latent-variable techniques rather than linear regressions. To this end we used ordered logits as a cross-sectional model and the recent BUC estimator from Baetschmann, Staub, & Winkelmann (2011), which is a fixed-effect conditional logit estimator. As in the main text above, the highly significant and positive effect on age-squared found in the cross-section disappeared with the inclusion of fixed-effects.

Another robustness analysis was to vary the treatment of the included health variable. Instead of including self-reported health as a continuous variable, we included each of the 5 possible health states (from very bad to very good) as separate dummy variables (as recommended by Terza, 1987). Again, this made almost no difference to the age-squared effects.

5. Conclusions and discussion.

This paper started out with the puzzling findings of other researchers of a U-shaped relationship between age and happiness. We replicated this relationship for Germany, Australia, and Britain using well-known panel datasets, the GSOEP, the HILDA, and the BHPS. The raw data in Germany is most akin to a wave, with a clear decline at high ages. The raw data in Australia looks very close to a U-shape, whilst the data for Britain again most resembled a wave. Naive regressions using only age and age-squared showed relatively weak U-shapes in all three countries with a very late minimum in Germany (around 70) and an early one for Australia (around 35). In all three cases, the age-happiness profile became a much clearer U-shape when adding commonly used socio-

economic variables. This emergence of the U-shape was not dependent on the inclusion of individuals aged 18-22 or those above 80.

The main finding was that the U-shape disappeared when using fixed-effects because of a reverse causality issue: happiness-increasing variables, like getting a job, a high income, and getting married, appear to happen mostly to middle-aged individuals who were already happy. In all three data sets, this reverse causality shows up in cross-sections as inflated coefficients for income, marriage, and getting a job. In order to fit the actual age profile of happiness, the bias in coefficients for socio-economic variables forces the predicted age profile to become U-shaped. When one controls for fixed-effects, the non-linearity all but disappears for all three data sets.

The bottom line is that the supposed happiness decline in middle age is far less of a real finding than has been proposed and that it is not the most prominent age-related feature of either the raw happiness data or the results of fixed-effect regressions. The raw data in Germany and Britain is much more supportive of a wave-pattern in happiness (a 'happiness peak' around the age of 70), whilst the main finding from fixed-effects regressions is a large and steady decrease in happiness as people get old. The reasons for such a happiness decline in panel datasets needs further study.

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Appendix A. Sample averages for the three data sets

Table A1: Sample averages from the entire GSOEP, HILDA and BHPS samples

	GSOEP		HILDA		BHPS	
	Mean	**s. d.**	**Mean**	**s. d.**	**Mean**	**s. d.**
overall life satisfaction	7.16	1.85	7.91	1.47	5.23	1.29
age	44.26	16.91	45.50	16.92	46.45	17.80
age*age	2244.67	1659.88	2356.65	1666.50	2474.85	1789.30
ln (annual household income)[11]	8.20	0.53	10.77	1.07	9.84	1.61
male (1=yes)	0.49	0.50	0.47	0.50	0.45	0.50
level of education (years)	10.93	2.46	12.82	1.80	13.26	2.40
number of children in family	0.65	0.99	0.77	1.12	0.53	0.94
married (1=yes)	0.65	0.48	0.55	0.50	0.55	0.50
employed (1=yes)	0.47	0.50	0.66	0.47	0.58	0.49
unemployed (1=yes)	0.04	0.20	0.03	0.16	0.03	0.18
average regional income	4149.99	477.88	1108.65	1113.69	10.04	0.09
own or purchasing dwelling (1=yes)	0.42	0.49	0.75	0.43	0.73	0.44
imputed rent	1484.61	2910.48	4.94	39.82	40.70	179.67
Self-reported health [12]	2.59	0.95	2.64	0.95	2.20	0.95
invalid (1=yes)	0.04	0.20	0.24	0.43	0.02	0.14
household member died (1=yes) [13]	0.01	0.08	0.11	0.31		
divorced (1=yes)	0.05	0.22	0.09	0.29	0.06	0.23
separated from partner (1=yes)	0.01	0.12	0.04	0.19	0.02	0.13
partner dead (1=yes)	0.06	0.24	0.05	0.22	0.07	0.26
just married (1=yes)	0.02	0.15	0.03	0.16		
just divorced (1=yes)	0.00	0.07	0.01	0.08		
just separated (1=yes)	0.01	0.11	0.04	0.20		
partner just died (1=yes)	0.00	0.06	0.01	0.09		
just had a baby (1=yes)	0.04	0.19	0.04	0.19	0.00	0.07
pregnant (1=yes)	0.01	0.11	0.05	0.22	0.00	0.04
just fired from job (1=yes)	0.02	0.12	0.03	0.17		
Sample Size	*176,770*		*72,108*		*153,886*	

Note: Samples include all observations with non-missing information

[11] Monetary denominations: GSOEP, Euros; HILDA, $AUD, and; BHPS, British pounds.
[12] Health is reverse coded: 1 = excellent to 5 = poor.
[13] The self-report life event variables in the GSOEP and the HILDA are not in the BHPS panel data.

Appendix B. Regression results for Figures 1-4

The tables are grouped by dataset. Tables B1-B3 relate to the GSOEP, B4-B6 relate to the HILDA, and B7-B9 relate to the BHPS. Columns 1 and 2 of Tables B1, B4, and B7 make up Figures 1a-1c. Columns 3 to 5 of Tables B1, B4, and B7 make up Figures 2a-2c. Tables B2, B5, and B8 make up Figures 3a-3c, whilst Tables B3, B6, and B9 make up Figures 4a-4c.

Table B1: The determinants of Life Satisfaction for West-Germans in the GSOEP; Pooled OLS Regression – entire sample, *N = 176,770*

	Age		**Age + Age²**		**Usual Suspects**		**Usual Suspects + Health**		**Kitchen Sink**	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	-0.0059	22.68	-0.0217	15.69	-0.0541	32.8	-0.0600	36.77	-0.0454	25.64
age*age			0.0002	11.63	0.0005	29.2	0.0006	34.13	0.0005	25.39
income					0.4619	52.2	0.4420	45.91	0.4307	44.53
male					-0.0603	6.3	-0.0719	7.60	-0.0719	7.47
education					-0.0249	13.7	-0.0227	12.47	0.0204	11.17
number of children					-0.0640	13.1	-0.0498	10.30	-0.0382	7.50
married					0.3106	27.9	0.2915	26.50	0.1180	7.65
employed					0.0650	4.8	0.0791	5.88	0.0688	5.11
non-participant					-0.0033	0.2	-0.0027	0.19	-0.0305	2.14
unemployed					-1.0076	42.3	-0.9508	40.37	-0.9225	38.37
regional income							-0.0001	11.24	-0.0001	11.15
home owner							0.0943	8.45	0.0956	8.58
asset income							0.0000	1.95	0.0000	1.87
imputed rent							0.0000	15.60	0.0000	15.23
health							-0.0228	30.42	-0.0231	30.71
invalid							-1.2427	55.93	-1.2444	56.12
family death									-0.3158	4.69
divorce									-0.2558	10.63
separated									-0.4539	11.26
partner dead									-0.0468	1.84
just married									0.4061	13.70
just divorced									0.0474	0.75
just separated									-0.4112	9.92
spouse just died									-0.9895	10.55
just had a baby									0.1354	5.65
pregnant									0.2118	5.05
just fired from job									-0.2747	7.86
constant	7.4165	602.43	7.7472	249.95	4.2642	53.5	4.8670	58.03	4.7469	56.33
R^2	0.00		0.00		0.0481		0.07		0.08	

Table 3: determinants of Life Satisfaction for West-Germans in the GSOEP; Pooled OLS Regressions – ages 22 to 80, *N = 160,332*

	Age		**Age + Age^2**		**Usual Suspects**		**Usual Suspects + Health**		**Kitchen Sink**	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	-0.0034	11.21	-0.0306	15.46	-0.07451	33.91	-0.0768	35.27	-0.0618	26.75
age*age			0.0003	13.89	0.0008	32.30	0.0008	33.73	0.0007	27.03
income					0.47509	50.35	0.4593	44.66	0.4479	43.41
male					-0.1196	11.66	-0.1208	11.92	-0.1196	11.64
education					-0.0286	15.13	-0.0248	13.07	0.0224	11.78
number of children					-0.0484	9.44	-0.0403	7.93	-0.0315	5.88
married					0.3373	29.39	0.3096	27.22	0.1531	9.61
employed					0.1442	9.86	0.1434	9.85	0.1303	8.96
non-participant					-0.0204	1.32	-0.0127	0.83	-0.0458	2.94
unemployed					-0.9302	37.63	-0.8791	35.91	-0.8539	34.21
regional income							-0.0001	12.07	-0.0001	12.01
home owner							0.1152	9.90	0.1173	10.09
asset income							0.0000	2.38	0.0000	2.33
imputed rent							0.0000	14.43	0.0000	14.18
health							-0.0233	30.01	-0.0237	30.40
invalid							-1.1565	47.22	-1.1579	47.36
family death									-0.3037	4.19
divorce									-0.2193	9.01
separated									-0.4069	10.02
partner dead									-0.0029	0.11
just married									0.3976	13.19
just divorced									0.0618	0.98
just separated									-0.3974	9.55
spouse just died									-1.0887	10.87
just had a baby									0.1538	6.38
pregnant									0.2388	5.68
just fired from job									-0.2663	7.45
constant	7.2962	502.70	7.8762	178.17	4.4076	50.67	5.0061	54.98	4.8739	53.19
R^2	0.00		0.00		0.05		0.07		0.08	

Table 4: The determinants of Life Satisfaction for West-Germans in the GSOEP; Fixed-effect Regressions – entire sample, *N = 176,770*

	Age		**Age + Age^2**		**Usual Suspects**		**Usual Suspects + Health**		**Kitchen Sink**	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	-0.0398	50.43	-0.0166	6.60	-0.0328	-11.61	-0.0298	9.95	-0.0184	5.81
age*age			-0.0003	9.71	-0.0001	-2.22	0.0000	0.74	-0.0001	2.40
income					0.2414	23.13	0.2750	23.67	0.2585	22.15
male					(omitted)		(omitted)		(omitted)	
education					-0.0017	-0.35	-0.0009	0.19	-0.0024	0.51
number of children					-0.0255	-3.9	-0.0231	3.52	-0.0102	1.52
married					0.2385	14.95	0.2457	15.42	0.0327	1.37
employed					0.0991	6.69	0.1001	6.75	0.0925	6.24
non-participant					0.0214	1.46	0.0244	1.67	0.0150	1.00
unemployed					-0.6623	-29.28	-0.6455	28.61	-0.6282	27.40
regional income							0.0000	5.31	0.0000	4.98
home owner							0.0115	0.71	0.0292	1.82
asset income							0.0000	0.64	0.0000	0.78
imputed rent							0.0000	4.26	0.0000	3.80
health							-0.0124	11.07	-0.0122	10.91
invalid							-0.7192	29.20	-0.7296	29.65
family death									-0.2978	5.24
divorce									-0.0008	0.02
separated									-0.3273	7.63
partner dead									-0.1631	3.74
just married									0.3553	13.83
just divorced									-0.0573	1.04
just separated									-0.2858	7.96
spouse just died									-0.9168	11.54
just had a baby									0.1127	5.55
pregnant									0.0541	1.37
just fired from job									-0.1769	5.88
constant	8.9180	254.02	8.4541	142.62	6.6296	58.97	6.1697	49.82	6.1589	49.54
R^2	0.00		0.00		0.0135		0.03		0.03	

Table 5: The determinants of Life Satisfaction; Pooled OLS regression results for all individuals in the HILDA; *N = 75,529*

	Age		**Age + Age^2**		**Usual Suspects**		**Usual Suspects + Health**		**Kitchen Sink**	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	0.0107	33.37	-0.0320	-18.98	-0.0554	-29.57	-0.0403	-22.72	-0.0311	-16
age*age			0.0004	25.79	0.0007	33.95	0.0006	30.26	0.0005	23.98
income					0.0805	15.00	0.0329	6.03	0.0309	5.69
male					-0.1471	-13.52	-0.1016	-9.93	-0.0981	-9.53
education					-0.0232	-7.52	-0.0582	-19.74	-0.0606	-20.6
number of children					-0.0590	-10.81	-0.0623	-12.15	-0.0600	-11.25
married					0.4496	36.20	0.3624	30.32	0.2514	14.85
employed					0.1355	9.27	-0.1338	-9.2	-0.1166	-8.00
unemployed					-0.3244	-9.36	-0.4208	-12.92	-0.3560	-10.87
regional income							0.0000	5.87	0.0000	5.2
home owner							0.1397	10.95	0.1253	9.82
imputed rent							-0.0001	-0.42	-0.0001	-0.43
health							-0.5278	-88.46	-0.5251	-88.37
invalid							-0.1073	-7.92	-0.1046	-7.76
family death									0.0110	0.68
divorced									-0.0771	-3.51
separated									-0.2947	-9.12
partner dead									0.0237	0.78
just married									0.1175	3.7
just divorced									-0.1853	-2.72
just separated									-0.4209	-15.2
spouse just died									-0.2597	-4.59
just had a baby									0.1278	3.81
pregnant									0.1382	4.88
just fired from job									-0.2875	-9.52
constant	7.4240	477.31	8.3255	217.8	8.0870	110	10.0957	135.44	10.0082	132.16
R^2	0.0151		0.0241		0.0531		0.1661		0.1745	
Adjusted R^2			0.0240		0.0530		0.1660		0.1742	

Table B5: Determinants of Life Satisfaction for Australians in the HILDA; Pooled Regressions, ages 22 to 80, *N = 65,679*

	Age		Age + Age^2		Usual Suspects		Usual Suspects + Health		Kitchen Sink	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	0.0135	35.46	-0.0417	-17.5	-0.0680	-26.69	-0.0496	-20.48	-0.0386	-14.91
age*age			0.0006	23.45	0.0008	31.09	0.0007	26.72	0.0006	21.61
income					0.0815	14.02	0.0349	5.92	0.0329	5.61
male					-0.1660	-14.52	-0.1039	-9.64	-0.0992	-9.14
education					-0.0218	-6.9	-0.0569	-18.77	-0.0589	-19.49
number of children					-0.0429	-7.66	-0.0514	-9.72	-0.0489	-8.96
married					0.4494	35.47	0.3598	29.26	0.2514	14.65
employed					0.1758	11.44	-0.1162	-7.55	-0.0995	-6.46
unemployed					-0.3029	-7.8	-0.4141	-11.32	-0.3443	-9.36
regional income							0.0000	5.47	0.0000	4.71
home owner							0.1386	10.12	0.1197	8.75
imputed rent							0.0000	0	0.0000	0.07
health							-0.5226	-83.07	-0.5206	-83.1
invalid							-0.0922	-6.51	-0.0896	-6.36
family death									0.0142	0.84
divorce									-0.0720	-3.25
separated									-0.2898	-8.93
partner dead									0.0515	1.6
just married									0.1292	3.96
just divorced									-0.1711	-2.48
just separated									-0.4360	-14.51
spouse just died									-0.2332	-3.82
just had a baby									0.1311	3.77
pregnant									0.1492	5.04
just fired from job									-0.2977	-9.12
constant	7.2676	389.98	8.4890	153.54	8.2251	94.47	10.1845	115.78	10.0494	112
R^2	0.0188		0.0269		0.0587		0.1678		0.1767	
Adjusted R2			0.0269		0.0586		0.1677		0.1764	

Table B6: The determinants of Life Satisfaction for Australians in the HILDA; Fixed-effect Regressions – entire sample, *N* = 75,529

	Age		Age + Age^2		Usual Suspects		Usual Suspects + Health		Kitchen Sink	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	-0.0167	-6.90	-0.0076	-1.02	-0.0173	-2.12	-0.0202	-2.50	-0.0033	-0.40
age*age			-0.0001	-1.30	-0.00001	-0.17	-0.00007	0.94	-0.00006	-0.72
income					0.0257	4.26	0.0191	3.22	0.0151	2.55
education					-0.0204	-1.72	-0.0198	-1.71	-0.0246	-2.11
number of children					-0.0329	-2.24	-0.0312	-2.18	-0.0436	-2.92
married					0.2056	6.76	0.1963	6.52	-0.1095	-2.84
employed					0.0536	2.33	0.0238	1.06	0.0394	1.75
unemployed					-0.1344	-3.19	-0.1422	-3.43	-0.1208	-2.91
regional income							0.0000	3.30	0.0000	2.65
home owner							0.0687	3.01	0.0640	2.83
imputed rent							-0.0001	-0.79	-0.0001	-0.62
health							-0.2694	-28.16	-0.2679	-28.13
invalid							-0.0492	-3.29	-0.0488	-3.28
family death									-0.0046	-0.33
divorce									-0.1608	-2.71
separated									-0.3479	-4.83
partner dead									-0.3512	-3.85
just married									0.1361	4.56
just divorced									-0.2707	-2.94
just separated									-0.3063	-8.45
spouse just died									-0.2326	-3.02
just had a baby									0.1338	4.79
pregnant									0.1258	4.94
just fired from job									-0.0389	-1.22
constant	8.6701	78.75	8.4827	47.34	8.5967	41.04	9.2482	44.12	9.1148	43.45
Overall R^2	0.0151		0.0175		0.0047		0.0344		0.0325	

With robust standard errors

Table B7: The determinants of Life Satisfaction for Britons in the BHPS; Pooled Regression – entire sample, *N = 153,886*

	Age		Age + Age^2		Usual Suspects		Usual Suspects + Health		Kitchen Sink	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	0.0066	35.86	-0.0221	-21.96	-0.0554	-49.28	-0.0438	-41.01	-0.0349	-31.02
age*age			0.0003	29.00	0.0006	55.15	0.0005	48.21	0.0005	39.43
income					0.0943	19.44	0.0399	8.39	0.0251	5.25
male					-0.0438	-6.66	-0.0540	-8.69	-0.0625	-9.95
education					-0.0033	-2.27	-0.0199	-14.52	-0.0195	-14.27
number of children					-0.0581	-15.27	-0.0600	-16.63	-0.0510	-13.89
married					0.3567	46.48	0.3063	41.8	0.2014	22.43
employed					0.2397	27.19	0.0295	3.48	0.0372	4.38
unemployed					-0.2823	-14.46	-0.3430	-18.55	-0.3406	-18.46
regional income							-0.1659	-5.05	-0.1606	-4.9
home owner							0.1521	18.47	0.1445	17.56
imputed rent							0.0001	5.13	0.0001	4.4
health							-0.4653	-130.81	-0.4635	130.57
invalid							-0.3415	-15.82	-0.3373	-15.66
divorced									-0.2966	-19.74
separated									-0.4714	-19.72
partner dead									-0.1139	-7.23
just had a baby									0.3748	8.39
pregnant									0.2263	3.22
constant	4.9199	537.15	5.5346	239.77	5.0476	95.85	8.2857	25.17	8.2286	25.05
R^2	0.0083		0.0137		0.0481		0.1529		0.157	
Adjusted R^2			0.0137		0.048		0.1528		0.1569	

Table B8: determinants of Life Satisfaction for Britons in the BHPS; Pooled Regressions – ages 22 to 80, *N = 138,481*

	Age		Age + Age^2		Usual Suspects		Usual Suspects + Health		Kitchen Sink	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	0.0087	39.44	-0.0373	-26.21	-0.0772	-51.31	-0.0620	-43.38	-0.0521	-34.94
age*age			0.0005	32.7	0.0009	58.5	0.0007	50.57	0.0007	42.99
income					0.1134	21.22	0.0561	10.75	0.0384	7.31
male					-0.0727	-10.56	-0.0726	-11.16	-0.0810	-12.31
education					-0.0042	-2.83	-0.0204	-14.41	-0.0198	-13.97
number of children					-0.0306	-7.76	-0.0419	-11.21	-0.0342	-9.04
married					0.3439	43.95	0.2951	39.41	0.1984	21.9
employed					0.3340	35	0.0825	8.91	0.0898	9.7
unemployed					-0.1903	-8.86	-0.2907	-14.28	-0.2903	-14.29
regional income							-0.1874	-5.45	-0.1798	-5.24
home owner							0.1539	17.38	0.1449	16.38
imputed rent							0.0001	3.86	0.0001	3.23
										-
health							-0.4629	-124.22	-0.4613	124.05
invalid							-0.3054	-13.52	-0.3019	-13.39
divorced									-0.2824	-18.68
separated									-0.4506	-18.8
partner dead									-0.0957	-5.69
just had a baby									0.3484	7.62
pregnant									0.2327	3.13
constant	4.8093	440.65	5.8274	176.68	5.1761	86.01	8.6378	25	8.5603	24.83
R^2	0.0111		0.0187		0.0599		0.1632		0.1672	
Adjusted R2			0.0187		0.0599		0.1631		0.1671	

Table 6: The determinants of Life Satisfaction for Britons in the BHPS; Fixed-effect Regressions – entire sample, *N = 153,886*

	Age		Age + Age^2		Usual Suspects		Usual Suspects + Health		Kitchen Sink	
Variable:	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
age	-0.0097	-9.65	0.0044	1.42	-0.0064	-1.88	-0.0127	-3.86	-0.0082	-2.49
age*age			-0.0001	-4.61	-0.0001	-1.75	0.00008	0.27	0.000008	-0.31
income					0.0164	2.64	0.0166	2.7	0.0060	0.98
male					(omitted)		(omitted)		(omitted)	
education					-0.0029	-0.76	-0.0016	-0.43	-0.0017	-0.47
number of children					-0.0103	-1.41	-0.0120	-1.67	-0.0099	-1.38
married					0.1430	8.58	0.1390	8.47	-0.0041	-0.24
employed					0.0618	4.63	0.0355	2.77	0.0365	2.86
unemployed					-0.1754	-7.28	-0.1968	-8.35	-0.1958	-8.33
regional income							-0.1389	-1.23	-0.1365	-1.22
home owner							0.0340	2.06	0.0340	2.08
imputed rent							0.0001	2.37	0.0001	2.24
health							-0.1995	-40.87	-0.1994	-40.9
invalid							-0.1337	-3.66	-0.1316	-3.61
divorced									-0.2244	-6.73
separated									-0.4065	-11.11
partner dead									-0.3500	-8.25
just had a baby									0.2348	7.22
pregnant									0.1158	2.28
constant	5.6756	121.91	5.3853	72.17	5.7226	69.53	7.4496	6.59	7.4777	6.64
Overall R^2	0.0083		0.0114		0.0011		0.0374		0.0353	

With robust standard errors