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Clémence Bussière, Nicolas Sirven, Philippe Tessier

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Clémence Bussière[1], Nicolas Sirven[2], Philippe Tessier[3]*

1. LEDi (EA7467), Université de Bourgogne. 2 boulevard Gabriel, BP 26611, 21066 DIJON cedex

2. EHESP, 15 Avenue du Professeur Léon Bernard, 35043 Rennes & IRDES, 117 bis Rue Manin, 75019 Paris.

3. SPHERE (UMR INSERM 1246), Université de Nantes, Université de Tours. Institut de Recherche en Santé 2 (IRS2), 22 boulevard Bénoni Goullin, 44200 Nantes

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Corresponding author: Philippe Tessier
Institut de Recherche en Santé 2 (IRS2), 22 boulevard Bénoni Goullin, 44200 Nantes. Phone: +33 (0)2-53-00-91-27. E-mail address: philippe.tessier@univ-nantes.fr

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1. Introduction

Subjective Well-Being (SWB), or people's sense of wellness—how they feel in and think about their life—has long been considered in healthcare analysis (e.g. Gill, 1984). It is nowadays increasingly advocated as a relevant criterion for the assessment of healthcare programs and general public policies (Diener and Seligman, 2018; Dolan et al., 2011; Layard, 2005; OECD, 2013). Measures of SWB, which provide cognitive and affective evaluations of their life by the individuals (Diener et al., 2009), may usefully complement the usual health-related quality of life tools and quality of care metrics to inform about the consequences of illness and healthcare (Lee et al., 2013; Mukuria and Brazier, 2013). Besides, these measures better reflect the experience of patients than the preferences of the public over hypothetical health states on which relies Quality-Adjusted Life-Years (Dolan, 2008; Dolan and Fujiwara, 2014). Although the boundaries of SWB are rather large (Skevington and Böhnke, 2018), it is widely acknowledged that it encompasses three distinct yet overlapping components (Stone et al., 2013): evaluative well-being (life satisfaction), experienced well-being (positive and negative affect) and eudemonic well-being (sense of purpose and meaning in life). Progresses in the measurement of SWB has led to a fast-growing literature exploring its determinants such as health, income, labour force status and major life events, among others (Clark, 2018; Diener et al., 2018).

A noticeable part of the empirical literature on SWB studies its relationship with age. In cross-sectional settings, a frequent finding is that of a U-shaped association between SWB and age, such that SWB decreases since early adulthood, reaches its lowest level around 45-55, and increases afterwards (Blanchflower and Oswald, 2008; Clark and Oswald, 2006; Graham and Ruiz Pozuelo, 2017; Stone et al., 2010). However, the use of panel data and fixed effects models suggests that the U-curve flattens when the analysis considers age as a time-varying rather than a cohort effect (Frijters and Beatton, 2012; Wooden and Li, 2014). Still, it remains unclear how ageing individuals could maintain their SWB while facing progressive declines in health over time (Case and Deaton, 2003; Easterlin, 2006). A potential though understudied explanation is that the individuals adapt to this natural decline so that the contribution of health for their well-being changes over time. In other words, life priorities may

change with age (Schafer et al., 2013). Frijters (2000) indeed found that people tend to ascribe less importance to those areas of their life with which they are less satisfied. Similarly, several studies showed that SWB increases over the years for individuals with chronic health problems, such as disability (Oswald and Powdthavee, 2008), chronic pain (McNamee and Mendolia, 2014), or functional limitations (de Hond et al., 2019). However, few studies explored the possibility that adaptation to the progressive alteration of health over time may be a process affecting all individuals, not only those facing chronic conditions. To do so, they typically used longitudinal datasets. Anonymous (2017) used panel data for women newly diagnosed with breast cancer in a French hospital. They found that women adapt to illness by giving greater weight over time to the social dimension of life satisfaction. Two studies made use of large panel datasets on the general population, though they do not explicitly address the issue of adaptation. They applied a domain-of-life approach whereby life satisfaction is regressed on measures of satisfaction with various life domains. Bonsang and Klein (2012) found significant positive interaction terms between age and satisfaction with health in men between 50 and 70 in the German Socio-Economic Panel. For Americans aged 18 and above, Bardo (2017) found that the contribution of satisfaction with health for life satisfaction increases throughout the lifetime, and somewhat stabilizes from about 70. These studies focused on life satisfaction, while available evidence suggests that the importance of life domains may be sensitive to the form of SWB (Dolan et al., 2017). For instance, Kahneman and Deaton (2010) showed that life satisfaction rises with income, whereas above a certain level of income experienced well-being does not increase anymore. We shall follow the seminal contribution of Stiglitz et al. (2009), stating that since "[SWB] encompasses different aspects […], each of them should be measured separately, to derive a more comprehensive appreciation of people's lives." We shall also follow their recommendation that SWB should be analysed from the standpoint of the general population.

The objective of this study is to investigate the dynamics of the contribution of health to various forms of SWB in ageing adults. Using four waves of longitudinal data from SHARE (*Survey of Health, Ageing, and Retirement in Europe*) between 2007 and 2015, we examine whether and how the relationship between health and SWB may change over time and we test whether the changes differ

according to the form of SWB (evaluative, experienced or eudemonic). Our analyses are mainly exploratory since we do not test for an a priori specific pattern of change, although we assume that an increasing SWB with aging could be explained, in part, by a hedonic adaptation process implying a lowering over time of the contribution of health to well-being.

This research contributes to the literature in many ways. First, we concur with and expand the analysis of SWB in its various dimensions, adding some evidence about the changing influence of health on evaluative, experienced and eudemonic well-being. Exploring how the various components of SWB may complement each other is in line with recommendations on the type of information that might be required for the production of relevant indicators of social progress (Stiglitz et al., 2009, 2018). Second, we decompose the influence of "age" on SWB between a cohort and a time fixed effect in a panel data model. We thus provide additional evidence that the contribution of health to SWB may change as time goes by for individuals born at different periods. This issue is largely understudied, though it deserves consideration since averaging out the effects of the determinants of SWB over the lifespan for different generations may produce misleading results and recommendations (Lin et al., 2015), for instance when trying to identify ways to promote successful ageing. Third, the scope of our results is rather large since we address (i) general health issues (using a combination of various health variables) rather than specific illnesses, (ii) amongst individuals aged 50 onwards living in the community, and (iii) in ten European countries. Fourth, our study eventually provides insightful, original information for the normative debate on the way health should be valued for economic evaluation and priority setting in healthcare purposes.

The paper is organised as follows. Section 2 proposes a general formal framework of adaptation to health decline with age that highlights how detecting changes in the value of health to SWB will be useful to unveil this phenomenon. In section 3, we describe our data, measures, and estimation strategy. The results are presented in section 4 and discussed in section 5. Section 6 concludes.

2. A general framework of adaptation to health decline with ageing

Studies that explored the possibility of adaptation to health conditions are mostly interested in 'hedonic adaptation' which corresponds to a weakening over time in the subjective response to a constant or repeated stimulus (Frederick and Loewenstein, 1999). It is typically studied by estimating a habituation function which captures an increase over time in SWB after the onset of a chronic condition (de Hond et al., 2019; McNamee and Mendolia, 2014; Oswald and Powdthavee, 2008). Our approach to adaptation differs in some respects. First, we study adaptation in a broader sense as a form of 'response shift' (Sprangers and Schwartz, 1999) that is, a change in how much health matters for SWB. In doing so, we define and examine the type of change that could reflect hedonic adaptation, i.e. that may participate to attenuate the fall in SWB due to health decline. Second, we do not restrict our attention to the consequences of chronic health conditions, but rather address the issue of adaptation/response shift due to the alteration of health with ageing. To set our approach, consider the following simple framework where a person's i SWB (evaluative, experienced or eudemonic) is represented by the function W_i:

$$W_i = W_i(x_1, \dots, x_h, \dots, x_j, z_1, \dots, z_a, \dots, z_k) \quad (1)$$

In equation (1), SWB depends on the individuals' realizations in various life domains (x_j) such as income, occupational status, marital status for instance, on health (denoted x_h which may be interpreted as a composite measure of health) and on a set of personal characteristics (z_k) such as age (z_a) among others. Most studies about the determinants of SWB assume that it is a linear combination of the contributions of the life domains and of personal characteristics. Typically, assuming cross-sectional data, this amounts to estimate the following equation:

$$W_i = \alpha + \sum_j \beta_j . x_j + \sum_k \beta_k . z_k + \varepsilon_i \quad (2)$$

Where α, the β_j and β_k are parameters to estimate and ε_i is an error term. Equation (2) allows for a direct effect of age on SWB. To account for the possibility of changes in the contribution of health to SWB (response shift), one may estimate W as follows:

$$W_i = \alpha + \sum_j \beta_j . x_j + \sum_k \beta_k . z_k + \beta_{ha} x_h . z_a + \varepsilon_i \quad (3)$$

Where $x_h . z_a$ is an interaction term combining age and health. We interpret $\beta_{ha} < 0$ as a type of response shift consistent with hedonic adaptation since it represents a way to reduce the fall in SWB due to the alteration of health as one ages, all other things equal. This interpretation of adaptation as leading to re-weight the contribution of the domains of life to SWB is found in the study of Powdthavee (2009) and the theoretical model of adaptation of Bradford and Dolan (2010). Some psychological theories of ageing may support this re-weighting. For instance, the socioemotional selectivity theory (Carstensen et al., 2003, 1999) asserts that as their time horizon shortens due to their age, the individuals give priority to events that bring them increasingly greater emotional satisfaction. This could lead them to ascribe less importance to their declining health as they age, thereby maintaining their SWB over time. Equation 3 can be modified to obtain a more general model of adaptation to ageing:

$$W_i = \alpha + \sum_j \beta_j . x_j + \sum_k \beta_k . z_k + \sum_j \beta_{ja} x_j . z_a + \varepsilon_i \quad (4)$$

In equation 4, the contribution of all life domains can vary with age. Adaptation to changes in health might lead the individuals to revise the weights of other life domains (Powdthavee, 2009), thus modifying the relative contribution of health to SWB. The estimation of a relative weight may be sensitive to the set of life domains considered. For this reason, our main analysis focuses on changes in the absolute contribution of health to SWB. Nevertheless, we allow for varying weights for all dimensions of life in our robustness checks. Some studies estimated models like equation 4, but they did not include the possibility of changes in the weight of health (Lin et al., 2015; Movshuk, 2011).

In what follows, we use equation 3 (main analysis) and 4 (robustness checks) to determine whether and how the contribution of health to SWB changes with age (response shift) and whether it changes in a way suggesting hedonic adaptation to health decline due to ageing ($\beta_{ha} < 0$). We also examine whether the conclusion reached differs depending on the measure of SWB.

3. Materials and methods

3.1. Source and sample

Our empirical analyses use four waves of SHARE (http://www.share-project.org/) between 2007 and 2015. SHARE is a cross-national European cohort of individual data on health, socioeconomic status and social and family relationships of respondents aged 50 or over (Börsch-Supan et al., 2013). SHARE version 6.6 provided 288,736 observations. Individuals were discarded from the analysis if they were less than 50 years old, or nursing home residents. We also excluded individuals surveyed at waves 1 and 3 because the questionnaires did not collect the required information about SWB. A total of 152,130 respondents were thus selected in 10 countries among the four regular panel waves (waves 2, 4, 5 and 6). Of these, 12% was discarded because of missing data; individuals were then kept if at least two observations were available (longitudinal dimension). The final longitudinal sample is comprised of 111,573 observations (unbalanced panel) corresponding to between 14,394 and 36,198 individuals per wave (table 1). The balanced sample consists of 7,606 respondents over four waves (30,424 observations). Respondents mean age is 66 (min 50, max 103, sd 9.3), and 54% are women. No ethical approval was required for this study as the SHARE data are anonymous and publicly available for research.

--- Table 1 should be here ---

3.2. Variables

We employ four dependent variables. Evaluative well-being was assessed using a single question asking the respondents, "On a scale from 0 to 10 where 0 means completely dissatisfied and 10 means completely satisfied, how satisfied are you with your life?". Experienced well-being refers to positive and negative affectivity that do not represent opposite symmetric sides. Both are required to obtain a complete picture of experienced well-being (Stone et al., 2013; Watson and Tellegen, 1985). The SHARE survey does not contain any validated tool to assess this component of SWB. An often-employed strategy consists in constructing proxy measures by aggregating together the answers to questions referring to various feelings or emotions (Dolan et al., 2017; Steptoe et al., 2015). We follow the approach by Fisher and Sousa-Poza (2008) who employed factor analysis to construct measures of positive and negative affectivity using questions from the mental health part of SHARE. According to Watson et al. (1988 p. 1063) who developed the Positive and Negative Affect Scale (PANAS), "High PA [Positive Affect] is a state of high energy, full concentration, and pleasurable engagement […]. In contrast, Negative Affect (NA) is a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness". From SHARE survey we selected questions that may proxy some of the feelings included in the PANAS. To construct a measure of positive affect, we employ four questions with dichotomous answers indicating whether one was able to enjoy doing various things recently, is able to concentrate on reading, is able to concentrate on entertainment and has hopes for the future. Having hopes is a positive emotion that may be interpreted as the predominance of positive over negative future feelings (Staats and Stassen, 1985). Negative affect was assessed using a combination of dichotomous answers to questions determining whether, during the last month, one feels guilty or self-blaming, irritable, has cried or felt she would rather be dead, and felt sad or depressed. The obtained proxy measures may be disputable because some of the items we selected are not feelings but are expected to be correlated with them. To get further insights about the measures, in robustness checks we report the estimates for each item separately. Finally, we considered eudemonic well-being which is about developing one-self and realizing one's potential through the fulfillment of certain

psychological needs (Vanhoutte, 2014). The Share survey provides this measure of well-being through the CASP-12 questionnaire. This latter explores four needs (Control, Autonomy, Self-realization and Pleasure) that together form a measure of eudemonia in the old age (Hyde et al., 2003; Wiggins et al., 2008). The CASP-12 is made of 12 questions that determine to what extent each of the four aspects of life is fulfilled by using four-item Likert response scales labelled “Often”, “Sometimes”, “Rarely” and “Never” and scored from 1 to 4 respectively. Summing the scores of the 12 questions gives rise to a global index ranging from 12 to 48, such that a higher score corresponds to higher eudaimonia. The CASP-12 contains a dimension of pleasure that may be interpreted as related to experienced well-being, but the wording of the items clearly evokes pleasure as fulfilment rather than as happiness (Vanhoutte and Nazroo, 2014).

A widespread measure of health in the literature on SWB is self-rated health (SRH). SHARE includes a broad range of health measures among which a measure of SRH whereby general health is assessed on a five-item ordinal scale ranging from "poor" to "excellent". A concern with this variable is that it may induce reporting heterogeneity related to individual characteristics such as age, gender or country, for instance. To reduce the potential bias in reporting, one can use objective health measures (grip strength and cognitive function tests) which capture specific aspects of health. Another possibility is to 'instrument' SRH, that is to regress SRH on a wide array of health measures, either declarative (limitation in daily activities, ADL, IADL, long-term illness, number of chronic diseases) or objective (as already mentioned). Since the regressors retained are much less subject to reporting bias than SRH only, the predicted values of SRH would give a weighted sum much closer to the respondents’ latent ‘true’ and multidimensional health status (Jürges, 2007). The predicted SRH is thus our main health measure in this study. More precisely, to limit the number of interaction terms and to facilitate interpretation, we use a dummy variable to indicate poor SRH (Table A1, online appendix).

Additional covariates were retained as the usual determinants of SWB. They include the following dummy variables: living alone; being retired (not working) at the time of the survey; social participation over the last 12 months (done voluntary or charity work; attended an educational or

training course; gone to a sport, social or other kinds of club; taken part in activities of a religious organization); subjective financial situation (making-ends-meet with difficulties). This latter measure is more consistent over time than objective income in SHARE as its definition does not vary between countries.

3.3. Empirical strategy

Given that both health and SWB may be influenced by unobserved individual characteristics, such as stable personality traits or genetic profile for instance, we regressed SWB on health and other covariates in a fixed-effects (FE) panel data model, and we included interaction terms combining the poor health variable with a measure of time. Formally, we estimate the following equation:

$$y_{it}^{j} = \alpha h_{it} + \gamma d_t \times h_{it} + \beta X_{it} + \delta d_t + c_i + \varepsilon_{it} \qquad (5)$$

Where y_{it}^{j} is the $j = 1, \dots, 4$ SWB measure for individual i at time t; h_{it} is the measure of poor predicted SRH; X_{it} encompasses variables in four domains of life (living alone, being retired, social participation, and financial difficulties); d_t is the time fixed effect, i.e. a set of dummy variables for each wave of the survey; c_i stands for the individual fixed effect, ε_{it} is the error term with the usual assumptions, and α, γ, β, and δ are the parameters to estimate. The FE model decomposes the effects of 'age' into two components: first, the effect of ageing, i.e. the time that separates someone from her/his year of birth, is captured by d_t; second, the cohort effect (the year of birth), is captured by c_i. The FE estimator applied to equation (5) thus makes it impracticable to include age in the models (Frijters et al., 2004). Note that d_t captures the effect of age and that of period specific attributes not controlled for. We interpret it mainly as an age effect because age rises between waves whereas the changes in unobserved period specific variables are unpredictable. However, strong period-specific effects might potentially override an age-effect and make it difficult to identify.

We assume that the four dependent variables are cardinal although some measures of SWB may be more naturally interpreted as ordinal. Research have shown that relaxing this assumption makes little difference, though available evidence is restricted to life satisfaction (Cubí-Mollá et al., 2014; Ferrer-i-Carbonell and Frijters, 2004). The FE estimator requires the variables in equation (5) to be time-demeaned before OLS are applied, so that the individual fixed effect is netted out. The coefficients then represent the within change in the average behaviour. All variables are transformed as z-scores (i.e. standardized) before the FE procedure to allow comparisons between the various estimations.

Estimates in the FE model could be biased if the core assumptions of strict exogeneity and exogeneous sample attrition are violated. Both issues come from model misspecification. In the first case, the use of 'instrumented' SRH (Predicted) or objective health measures helped reduce the bias. In the second case, it may be that respondents drop out of the survey for specific reasons, thus leading to an unbalanced sample. Heckman's correction is a simple way to tackle this issue (Heckman, 1979). We computed a probability to take part in the four waves considered for each individual, at each wave, as a function of individual attributes (age, sex, education level) and interviewers' comments (whether the respondent showed good will, asked for clarifications, understood most questions, took part in SHARE for the first time). The inverse Mill's ratio was then plugged in equation (5) amongst the X_{it}.

We performed three analyses as robustness checks. First, we rerun all analyses substituting predicted poor SRH with alternative measures: i) poor SRH (not predicted) and ii) two objective measures, grip strength and the result of a cognitive test respectively. Second, we estimate all models with interaction terms combining all individual life domains (i.e. dummy variables for having social interaction, living in couple, being retired, having financial difficulties) with time, which corresponds to a general model of adaptation to ageing (equation 4). Finally, we estimated models for each of the items used to assess positive and negative affect and for the four dimensions of the CASP-12 (eudemonic well-being).

In what follows, we interpret 'importance' or 'weight' as representing the contribution of health to SWB inferred from FE regressions of SWB measures. This inferred importance may differ from that

obtained by asking the individuals for importance ratings of various life domains (e.g. Hsieh, 2005). In the latter case, importance relates to the respondents' internal standard of well-being, which does not allow to study whether it varies with forms of SWB.

4. Results

4.1. Descriptive statistics

Figure 1 depicts the evolution over time of the four measures of SWB and predicted poor SRH by birth cohort. There are some differences between cohorts in both the baseline levels and the evolution with age of SWB. At the first wave, the oldest individuals have a lower SWB except for life satisfaction. The time trends for life satisfaction are roughly similar, whatever the birth cohort. Between the first and the last wave, satisfaction with life rises for all cohorts. SWB may have been impacted by the consequences of the 2008 Great Recession (Deaton, 2012) as suggested by the marked kink in the trends for life satisfaction between 2011 and 2013 whatever the cohort. Regarding eudaimonia and positive affect, the trends are roughly monotonous but differences between birth-cohorts suggest they are non-linear and not compatible with a U-shape curve over the lifespan. These forms of SWB increase or stabilize over time for the youngest cohorts and decrease with age for the oldest ones. Negative affect rises with time for all cohorts then decreases after 2011. Again, this might be partly attributable to the 2008 financial crisis. As expected, predicted poor health is more frequent in the oldest cohorts, and it increases with age.

--- Figure 1 should be here ---

Table 2 presents some descriptive statistics of the main variables, as well as the decomposition of the within and between variances. Overall, the means of variables seem to show a relatively good level of SWB. For instance, the average score of life satisfaction in our sample is around 8 (on the 0-10 scale where 10 represents the highest level) which is on top of those reported in the Gallup World Poll data,

a repeated cross-sectional survey over more than 150 countries and territories, on a 0-10 ladder of life over the entire age distribution in European countries (Exton et al., 2015). The between and within standard deviations are almost close to each other for these variables, with measures of SWB being a little more volatile between individuals than within over time.

--- Table 2 should be here ---

4.2. Estimates from main models

The results from our main analysis –the estimation of a FE model per measure of SWB– are provided in table 3. A higher score for negative affect indicates lower well-being, which may partly explain the sign differences in the estimates compared with the other measures. The estimations show that having financial difficulties and predicted poor health are significantly associated with lower SWB whatever the measure. Social participation is associated with higher life evaluation and eudaimonia, and it increases positive and negative affectivity. Living alone reduces all forms of SWB, but the eudemonic one and being retired harms life satisfaction while it is associated with higher eudemonic well-being.

--- Table 3 should be here ---

Since the estimated coefficients in table 3 are z-scores, and that all regressors are dummy-coded, we can compare the impact of health on the various measures of well-being and with the impact of other life domains. The effect of poor health is of a broadly similar magnitude for all SWB measures, except for that of positive affectivity for which it is sensibly smaller. Poor health is nevertheless the main regressor of positive affectivity, but it comes after financial difficulties for life satisfaction and eudemonic well-being and after living alone for negative affect. The 'pure' effect of age on SWB is captured by the time dummies for which most coefficients are significant. Controlling for various life domains, overall life satisfaction and eudemonic well-being increase with age over the period under

consideration, although the rise in life satisfaction is temporarily reduced in 2013. Positive affectivity seems somewhat stable over the period while negative affectivity exhibits rise then fall.

--- Figure 2 should be here ---

Our main interest lies in determining whether and how ageing changes how much health matters for SWB. We explore this by examining the coefficients for the interaction terms combining health and time. The F-statistics corresponding to the tests for structural change (Chow tests, table 3) suggest that all models differ depending on time/age. Most interaction terms combining poor health with wave are significant for all measures of SWB. However, the patterns of change vary with the component of SWB. They are represented graphically in figure 2 that shows that life satisfaction behaves differently from eudemonic and experienced well-being. While the impact of poor health on satisfaction with life decreases between the first and last waves – though non monotonically –, it increases for all other measures of SWB. The most striking change concerns positive affectivity for which at wave 6 the influence of poor health has almost doubled in comparison with wave 2 (going from an estimated coefficient of -0.084 to -0.151, the sum of -0.084 and -0.067 in table 3). Besides, whereas at the baseline the effect of poor health is the greatest on life satisfaction, at wave 6 it is eudemonic well-being that is the most affected by bad health with a coefficient of -0.196 (sum of -0.122 and -0.074). However, the contribution of health to life satisfaction does not decrease steadily (figure 2 and table 3). It follows the kink in the trends of the raw data (figure 1) in that its importance drops at wave 5 then rises slightly, but it does not recover its initial level. As stated earlier, this may be due to the wave dummies that, besides that of age, capture the effect of unobserved period-specific factors such as the consequences of the 2008 financial crisis for instance.

Figure 3 depicts the effect of poor health on SWB by birth cohort. For the eudemonic and experienced (both positive and negative) measures, those born between 1920 and 1930 exhibit more pronounced changes in the importance of health for SWB as they get older compared to younger cohorts. For life satisfaction, the changes for this oldest cohort run in opposite directions from those observed for the younger cohorts and become similar to those of other forms of well-being. This indicates that the

changes with age in the relationship between health and life satisfaction are not linear. This may also be the case, though to a lesser extent, for positive and negative affect for which the youngest cohort (those born in the 1960's) exhibits trends different from those of older cohorts.

--- Figure 3 should be here ---

4.3. Robustness checks

The robustness analyses are presented in table A2 (online appendix). Changing the health measure and allowing for the re-weighting of all the life domains leads to results qualitatively similar to those of our main analysis. Allowing for changes in the importance of all life domains lead to some substantial changes when considered in combination with SRH. For instance, the interaction terms between time and health are no more significant for life satisfaction. With predicted SRH, allowing for changes in all life domains weights did not change the coefficients for health and for the interaction between health and time. We found significant interaction terms for other life domains than health (results not shown), which may explain why there are changes in some of the coefficients for the time fixed effects. The age effects on SWB are of the same sign than for the main analysis, though they are weakened for positive affectivity and of an increased magnitude for eudemonic well-being. Finally, we estimated separate models for the items of the positive and negative affect measures and for each dimension of the CASP-12. Concerning the latter, although the signs of the time fixed effects vary between the dimensions, the estimated coefficients for the interaction terms all show an increasing importance of health with time/age whatever the dimension of eudaimonia, which is consistent with our main analysis (table A3, online appendix). Table A4 (online appendix) reports the estimations for the items of the aggregated measures of positive and negative affect. As for our main analysis, they indicate an increase in the importance of poor health with age, whatever the measure of positive affect. Regarding negative affect, the results suggest that our finding of an increased importance of health with age is mostly explained by the item of thoughts of death and, to a lesser extent, by those of

irritability and sadness. By contrast, feelings of guilt and tearfulness show no significant change with age.

5. Discussion

5.1. Main results

The main original finding of this research on Europeans aged 50 onwards is that the contribution of health to SWB changes over time in ways that depend on the cohort of birth and, most notably, of the aspect of SWB considered. An additional finding is that few of the changes in the importance of health are consistent with the assumption of hedonic adaptation to a declining health. These results are summarized in table 4.

--- Table 4 should be here ---

Consistent with the literature (Cubí-Mollá et al., 2014; Dolan et al., 2008; Ngamaba et al., 2017; Ryff, 2017; Steptoe et al., 2015), we found health to be strongly correlated with all measures of SWB. Yet, we observed differences between the measures in terms of changes over time in their association with health. Specifically, we found somewhat similar patterns of changes with age for eudemonic and experienced well-being on one hand and a different trend for life satisfaction on the other hand. In addition, we found support for the assumption of hedonic adaptation to health decline with age, only in life satisfaction for individuals under 80.

In our sample, the importance of health for life satisfaction slightly decreases over time for those above 50 and less than 80. This is at odds with some studies showing an increasing contribution of health to life satisfaction between 50 and 70 (Bardo, 2017; Bonsang and Klein, 2012). This could be due to these studies explaining life satisfaction by measures of satisfaction with health rather than SRH. For instance, assessments of satisfaction with health could be more sensitive to the comparison with same-aged individuals than SRH. Our findings for life satisfaction are consistent with hedonic adaptation since, all other things equal, lowering the importance of poor health may contribute to maintaining SWB over time all other things equal. They also seem to be in line with Frijters (2000) who found that people progressively give less importance to these areas of life with which they are

less satisfied. Besides, they may be interpreted as in accordance with the psychological socioemotional selectivity theory that has been invoked to explain the increase of SWB in older adults (Lin et al., 2015; Steptoe et al., 2015) since they could be indicative of the prioritization of positive aspects of life over negative ones (Löckenhoff and Carstensen, 2004). However, for those individuals aged 80 and above the importance of health strengthens over time (table 4). This indicates that even if hedonic adaptation to health decline as we interpret it occurs in life satisfaction, it may not last permanently. This result may be consistent with studies that found a late-life decline in life satisfaction (Hansen and Slagsvold, 2012).

The association between health and eudemonic and experienced well-being becomes stronger as one ages (except for the youngest cohort for experienced well-being). Although this evidence seems to run counter the idea of hedonic adaptation to health decline with age, it may not necessarily be surprising. First, although the potential differences between measures of SWB have long been overlooked, some studies evidenced differences in their determinants (Dolan et al., 2017; Kahneman and Deaton, 2010; Knabe et al., 2010). Second, the discrepancies we observed regarding the evolution of the importance of health reflect the differences in the trends of SWB data. Third, SWB is known to be shaped by social comparison, that is by assessments made in comparison with similar individuals (Clark, 2018). Hence, SWB may also be influenced by health as compared with that of same-aged individuals (relative health). Relative health might not affect all forms of SWB equally, because it evokes more a cognitive rather than an affective assessment. This could explain why the contribution of health to SWB decreases with age only for life satisfaction in our sample. Finally, the different trend in the impact of poor health on the life satisfaction of the oldest old as compared to younger cohorts is puzzling. One potential explanation could be that the interpretation of SRH changes with age. For instance, it has been shown that the link between physical health and SRH weakens with age (Idler and Cartwright, 2018). We may hypothesize than as one approaches end of life, the interpretation of SRH shifts from a mainly functional one to a more probability of survival oriented one. This could justify why SRH becomes more important for the life satisfaction of the oldest old and why the negative impact of poor health on eudemonic and experienced SWB is stronger in the oldest cohort.

5.2. Limitations and perspectives

Our study has some limitations that provide avenues for further research. First, we do not consider the possibility of reverse causality between health and SWB. Studies indicated that a high SWB may be beneficial for both health and survival (Diener et al., 2017; Steptoe, 2019). For instance, the differences between the youngest cohorts and the oldest one we observed for life satisfaction could be due in part to a selection effect if the probability of survival – and thus to continue participation to the SHARE survey – is associated with SWB. Furthermore, empirical observations suggest that the effect of SWB on health may increase with age (Diener et al., 2017). Future research should try to tackle this issue using recursive dynamic panel data methods. Second, the period over which the SWB measures were collected included that of the 2008 financial crisis that is known to have impacted – at least temporarily – the individuals' SWB. This might have temporarily redirected the individuals' attention between their various life domains and may thus have complicated the identification of changes in the health-SWB relationship given that our time dummies capture both the effect of age and that of unobserved period-specific factors. A simple solution would be to try to replicate our results on different periods. Third, we restricted our analyses to absolute changes in the coefficients for health, although we introduced the possibility of changes for other life domains in our robustness analyses. The relative importance of health may change differently than the estimated coefficient for health. However, as we mentioned earlier, this relative importance would be sensitive to the set of domains of life considered. Besides, our robustness checks indicate that allowing for changes in the contribution of other life domains do not contradicts our main analysis. Fourth, the SHARE survey does not provide explicit measures of positive and negative feelings, which led us to select questions to serve as proxy for experienced well-being. The obtained constructs may not be as reliable than validated measures. Specifically, our findings regarding negative affectivity are sensitive to the item under consideration which suggests either that our construct is invalid or that the importance of the various

items does not converge. Our findings might thus not be generalizable to alternative measures of negative affect. Finally, the changes in the importance of health could be a 'pure' consequence of aging independent of the decline in health. Our empirical approach does not allow to disentangle these two possibilities, but this does not invalidate the finding that the contribution of poor health to SWB changes with aging in ways specific to the form of SWB.

6. Conclusion

To the best of our knowledge, this research is the first that addresses the possibility that SWB adapts to the natural decline in health with ageing. Its main contribution is to employ a large European survey dataset to provide evidence that the contribution of health to the SWB of older adults varies non-linearly over time and differently depending on the component of SWB, except for the oldest old. Besides, we found little support for hedonic adaptation, restricted to the life satisfaction of individuals of less than 80. This might lead to re-interpret previous evidence of hedonic adaptation to health problems. Using SHARE data, de Hond et al. (2019) showed that there is adaptation for long-standing functional limitations such that their impact on life satisfaction lessens as time passes. As the authors note, "Interestingly, this adaptation occurs while the health of the respondents deteriorates" (de Hond et al., p. 186). Our findings suggest that the reverse explanation could also be invoked whereby the individuals adapt partly because their health deteriorates with ageing, whether they are facing a chronic condition or not. However, our analyses suggest that eudemonic and experienced well-being do not adapt and that, on the contrary, poor health hits these forms of SWB harder as one gets older. Future research could explore whether our findings are sensitive to the specific measures of SWB we employed and potential explanations for why the contribution of health might vary in opposite directions depending upon the form of SWB except for the oldest old.

Our study should provide insightful, original information for the normative debate about how measures of SWB could be used to inform policy decision making and, more specifically, about the value that should be ascribed to health for the practice of economic evaluation in healthcare. For instance, cost-utility analysis that uses Quality-Adjusted Life-Years (QALYs) to represent the

effectiveness of healthcare typically assumes that a QALY is of equal value regardless of the age of the individual. According to our analyses, not only does the value of health, as determined from measures of SWB, may change with age, but it can do so differently depending on the measure of SWB from which it is inferred. Specifically, findings caution against the use of mean estimations over the lifespan to determine the value of health. They also caution against the use of the various forms of SWB interchangeably in public policy analysis and economic evaluations of healthcare.

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Figure 1. Trends of measures of SWB and health over time, by birth cohort

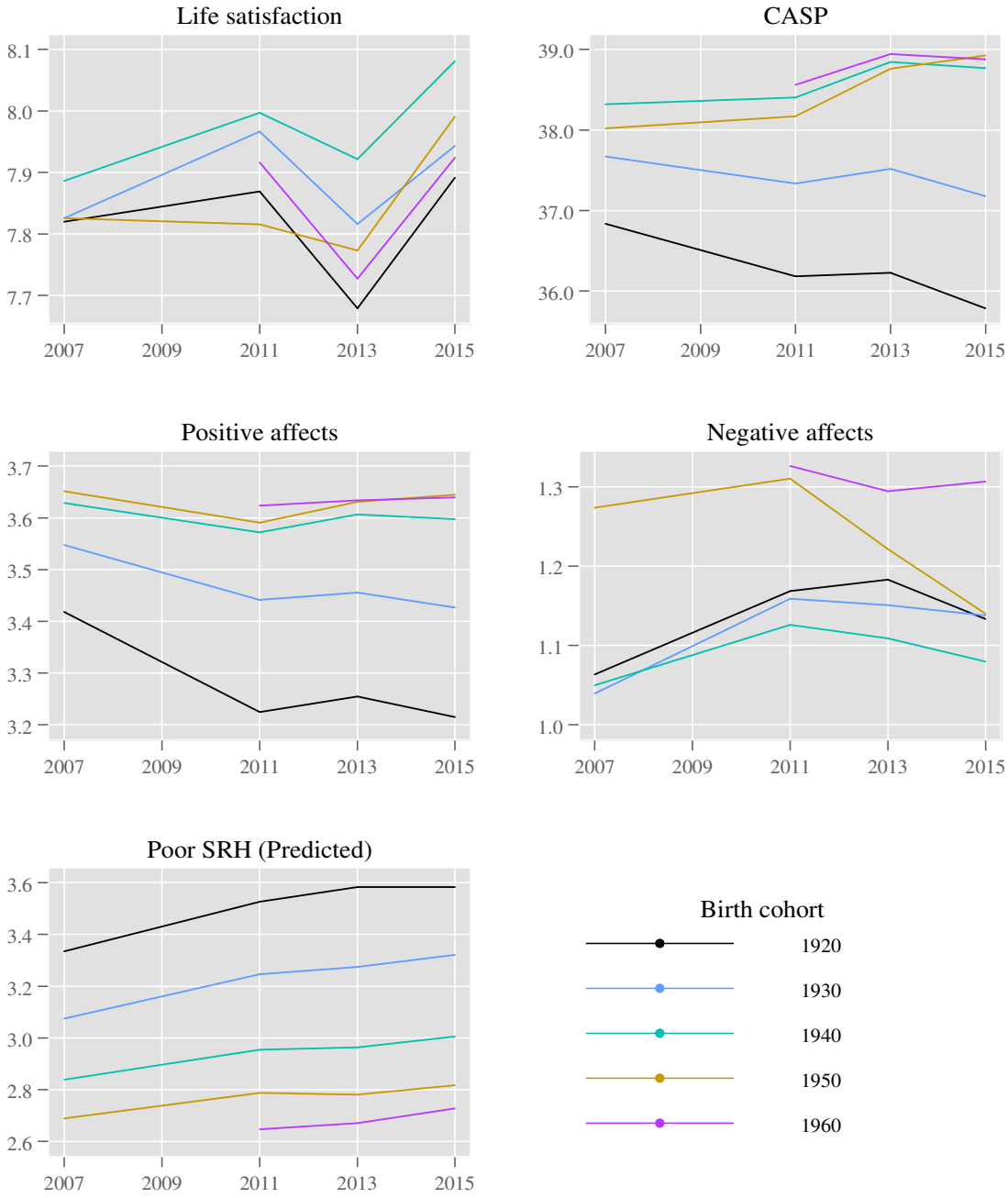

Figure 2. Effect of health shocks (predicted poor self-reported health) on SWB over time

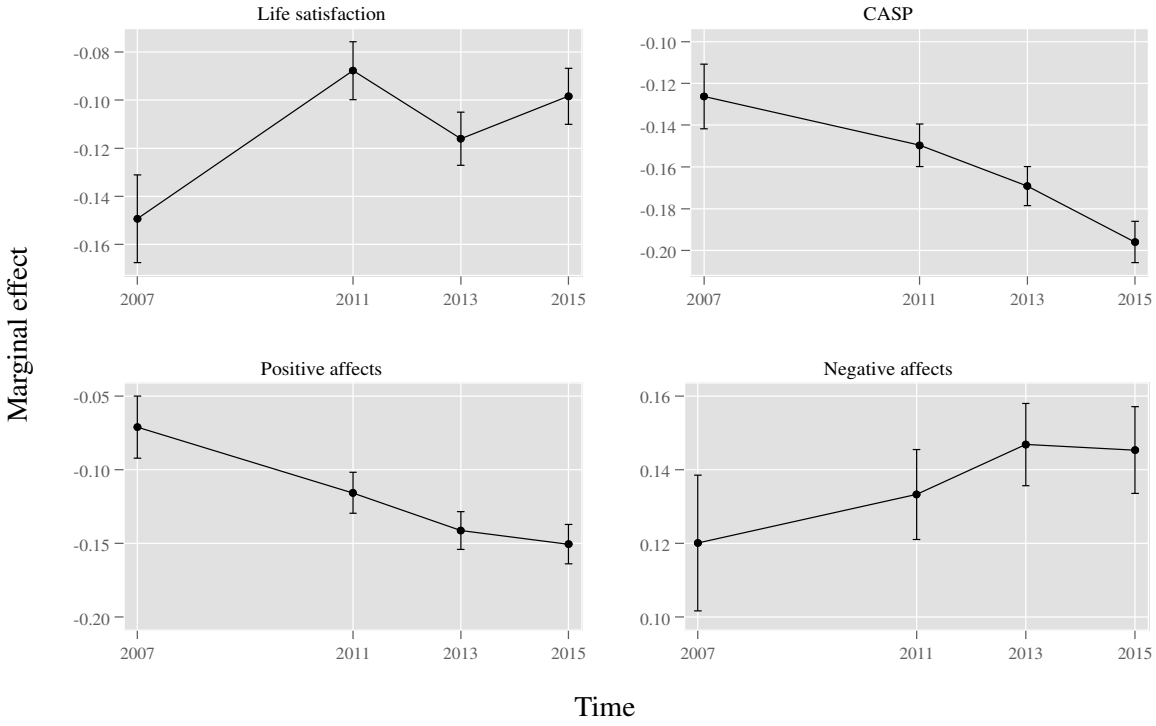

Figure 3. Effect of health shocks on SWB over time by birth cohort

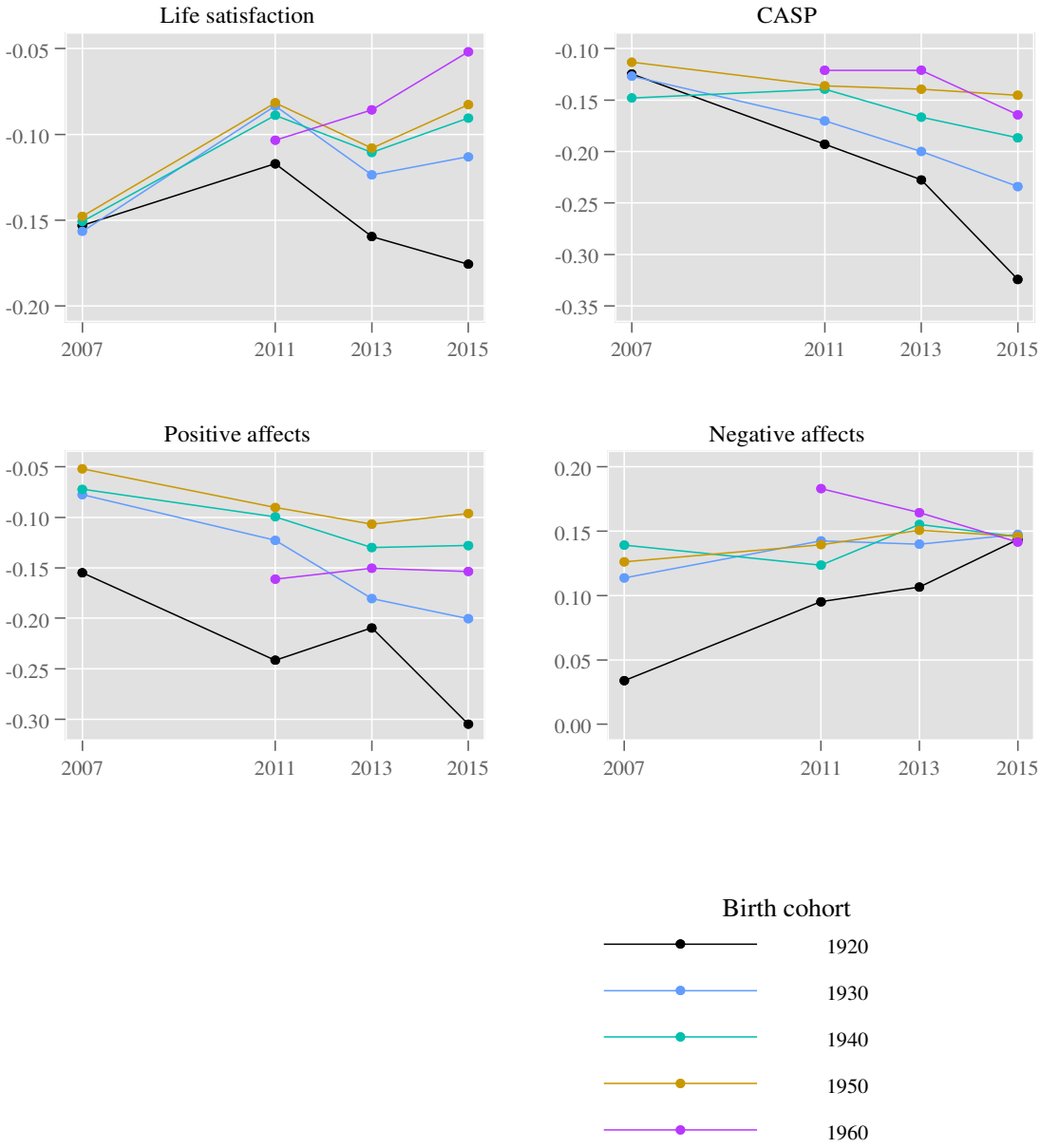

Table 1. Sample's description

Country	Wave 2	Wave 4	Wave 5	Wave 6	Total
Austria	668	3,380	3,386	2,695	10,129
Belgium	1,936	3,840	4,387	3,982	14,145
Czech Republic	1,215	3,661	4,037	3,867	12,780
Denmark	1,680	1,969	3,329	3,084	10,062
France	1,506	3,674	3,693	3,032	11,905
Germany	1,271	1,309	3,811	3,696	10,087
Italy	1,858	2,545	3,261	3,143	10,807
Spain	1,480	2,710	4,219	3,980	12,389
Sweden	1,781	1,692	3,372	3,256	10,101
Switzerland	999	2,941	2,703	2,525	9,168
Total	14,394	27,721	36,198	33,260	111,573

Table 2. Variance decomposition of main variables

Variable		Mean	Std. Dev.	Min	Max
Life satisfaction	Overall	7.905	1.622	0.000	10.000
	Between		1.361	0.000	10.000
	Within		0.923	0.905	13.905
CASP	Overall	38.253	5.903	12.000	48.000
	Between		5.210	15.000	48.000
	Within		2.881	17.503	56.253
Positive affects	Overall	3.564	0.782	0.000	4.000
	Between		0.607	0.000	4.000
	Within		0.511	0.564	6.314
Negative affects	Overall	1.160	1.264	0.000	5.000
	Between		1.051	0.000	5.000
	Within		0.725	-2.174	4.910
Poor SRH (Predicted)	Overall	2.973	0.645	1.383	5.003
	Between		0.574	1.598	4.831
	Within		0.310	1.331	4.428

Note: N = 111,573 obs (41,258 individuals over 4 waves).

Table 3. Fixed-effects models for the measures of Subjective Well-Being

Dependent variables	Life satisfaction	CASP12	Affect	
			Positive	Negative
Health				
Poor SRH (predicted)	-0.140***	-0.122***	-0.084***	0.116***
Health x Time	(-17.55)	(-17.97)	(-9.06)	(14.33)
Poor SRH (predicted) x Wave 2	Ref.	Ref.	Ref.	Ref.
Poor SRH (predicted) x Wave 4	0.053***	-0.028***	-0.032***	0.017**
	(6.31)	(-3.92)	(-3.26)	(2.03)
Poor SRH (predicted) x Wave 5	0.024***	-0.047***	-0.058***	0.031***
	(2.89)	(-6.69)	(-5.95)	(3.65)
Poor SRH (predicted) x Wave 6	0.042***	-0.074***	-0.067***	0.029***
	(4.84)	(-10.14)	(-6.70)	(3.36)
Individual features (Xit)				
Living alone	-0.127***	-0.000	-0.074***	0.127***
	(-8.03)	(-0.00)	(-4.04)	(7.93)
Retired (not at work)	-0.025**	0.030***	0.002	0.004
	(-2.13)	(3.01)	(0.15)	(0.34)
Social participation	0.046***	0.071***	0.042***	0.021***
	(5.92)	(10.84)	(4.71)	(2.74)
Difficulties in making-ends-meet	-0.155***	-0.244***	-0.065***	0.053***
	(-18.51)	(-34.58)	(-6.76)	(6.33)
Time fixed effects				
Wave 2	Ref.	Ref.	Ref.	Ref.
Wave 4	0.101***	0.006	-0.064***	0.029***
	(11.51)	(0.74)	(-6.27)	(3.29)
Wave 5	0.019**	0.041***	-0.035***	0.006
	(2.04)	(5.28)	(-3.32)	(0.62)
Wave 6	0.126***	0.036***	-0.040***	-0.035***
	(13.43)	(4.50)	(-3.75)	(-3.65)
Inverse Mill's Ratio	-0.015	-0.006	-0.101***	0.002
	(-1.22)	(-0.65)	(-7.35)	(0.19)
N	111,572	111,572	111,572	111,572
Chow test (p-value)	0.000	0.000	0.000	0.001

Note: Panel FE estimates. * p<.1, ** p<.05, *** p<.01. t statistics in parentheses.

Table 4. Summary results of the main analysis (FE models for SWB)

Component of SWB	Relationship with heath	Evolution of the relationship with health according to age*
Evaluative		
Life satisfaction	+	- then + (>80 years old)
Experienced		
Positive affectivity	+	+ (except youngest birth cohort)
Negative affectivity	-	+ (except youngest birth cohort)
Eudemonic		
CASP 12 scale	+	+

* a sign '+' (resp. '-') indicates that the importance of health for SWB increases (resp. decreases) with age