PART I

Chapter 7

Subjective well-being valuation

Subjective well-being (SWB) valuation is a newly developed method that differs from other non-market valuation methods as values are based on how non-market goods impact on self-reported measures of well-being such as life satisfaction. In other words, the values are based on experienced utility rather than decision utility. Much less is known about the limitations and biases of this nascent SWB valuation approach than RP and SP methods that have a much longer history of research and applications in economics. But overall, the SWB approach offers a promising new way of valuing non-market goods, and as future research and applications unfold time will tell if this promise holds.

7.1. Subjective well-being

The last decade has witnessed an exponential growth in research on subjective well-being, also referred to as happiness (MacKerron 2012; Mackie and Smith, 2015), and, to a lesser extent, on subjective well-being valuation (Welsch and Kuhling, 2009; Ferreira and Moro, 2010). In parallel, using subjective well-being measures to appraise policies, inform policy design and monitor progress has become increasingly popular in the public policy sphere (Fujiwara and Campbell, 2011; Dolan et al., 2011; OECD, 2013; Tinkler, 2015; Fujiwara and Dolan, 2016).

Subjective well-being (SWB) refers to self-reported measures of personal well-being, usually collected via surveys. Based on Diener (2005), the OECD (2013) offers a broad definition of SWB, encompassing both evaluative and experienced elements: "good mental states, including all of the various evaluations, positive and negative, that people make of their lives, and the affective reactions of people to their experiences". Expanding on this definition, there are three key dimensions of SWB:

- *Evaluative subjective well-being (or life satisfaction)*. This dimension is a self-evaluation of one's life according to some positive criterion (Kahneman et al., 1999). It can be measured on an aggregate level as a single-item (e.g. life as a whole; this is captured in for example Cantril's Ladder, where the top rung represents the best possible life and the bottom rung represents the worst possible life [OECD, 2013]) or instead split into distinct life domains in a multiple-item scale (e.g. Cummings, 1996, proposed seven domains of life satisfaction: material well-being, health, productivity, intimacy, safety, community, and emotional well-being). For example: "All things considered, how satisfied are you with your life as a whole?" with responses being measured on numeric scales, such as, for example, 0 to 10. Typically, this is measured over long periods of time – for example once per year in annual surveys.

- *Eudaimonic subjective well-being*. This dimension refers to the process of achieving a flourishing and worthwhile life where one's true potential is realised (Waterman, 1993; Ryan & Deci, 2001). It relates to intrinsic aspirations, self-realisation, personal growth, and sense of purpose and meaning in life, in other words, to what people perceive is important in life. It attempts to capture Aristotelian theories of well-being within a self-reported approach. For example: "Overall, to what extent do you feel that the things you do in your life are worthwhile?" or "Does your life have meaning and purpose?" As with evaluative well-being, eudaimonic well-being tends to get measured periodically in annual surveys.

- *Momentary subjective well-being* (or affect). This dimension measures feelings, affect or mood at a particular point in time (MacKerron and Mourato, 2013). It is highly influenced by recent events or news and can change quickly. It encompasses both positive emotions (e.g. happiness, joy and contentment) as well as negative ones (e.g. anxiety, anger, worry) (Tinkler, 2015). Traditionally, momentary measures of SWB have been elicited using the Positive and Negative Affect Schedule (PANAS, Watson et al., 1988), a widely-used psychometric scale to measure mood. However, there is evidence to suggest that positive

and negative affect are not mutually exclusive and can be experienced at the same time. Alternatively, simple single-day measures, eliciting feelings on the day, or on the day before, are also commonly used. For example: "How happy are you right now?", or "How anxious were you yesterday?'" Perhaps the most comprehensive way to measure affect is by taking numerous responses from people over a day and tracking this over a period of time, such as a week, month or year. This is known as the Experience Sampling Method (ESM) and has been facilitated by the use of mobile technologies.

These dimensions of SWB are conceptually distinct but interrelated. Momentary SWB is a real-time assessment of a person's feelings at a point in time, while life satisfaction provides a similar evaluation but over a longer period of time, involving a recollection of multiple events and emotions. Sense of purpose (eudaimonic well-being) can be measured in relation to either a momentary situation or a life evaluation, but is more commonly estimated in relation to the latter. By way of analogy, evaluative and eudaimonic well-being provide snapshots of people's lives akin to something like a photography whilst momentary well-being is like an ongoing video recording of life. Correlations between the three measures have been found to be significant but small: for example, 0.13 between life satisfaction and eudaimonic well-being, 0.23 between life satisfaction and positive affect, 0.14 between eudaimonia and positive affect, and -0.39 between positive and negative affect (OECD, 2013). The various measures therefore seem to capture different underlying phenomena.

The influential Stiglitz Commission (Stiglitz et al., 2009) argued that all three measures of SWB are useful for policy, as a way of assessing society's progress, and should therefore be regularly and separately measured, via large-scale surveys undertaken by official statistical offices. In line with this recommendation, in 2010, as part of the UK Government National Well-being Programme, the UK Office for National Statistics started collecting data on all three key dimensions of personal SWB (Box 7.1). In the same year, the HM Treasury published supplementary Green Book guidance on using the subjective well-being for valuing non-market goods in cost-benefit analysis (Fujiwara and Campbell, 2011). In 2013, the OECD published a set of extensive and detailed guidelines on how to measure subjective well-being (OECD, 2013), with the aim of encouraging national statistical offices to start collecting SWB information. By 2015, 32 out of 34 OECD countries had started to collect SWB measures (Mackie and Smith, 2015). In the USA, the National Academy of Sciences published a report that reviewed SWB applications in the United States and provided guidance for future measurement efforts in official government surveys (Stone and Mackie, 2013). At about the same time, SWB questions started to be included in the American Time Use Survey (Stone and Mackie, 2013). But despite this progress in developing official measures, non-official sources of SWB data remain the most commonly used for international analysis. Collection of SWB measures by national statistical offices worldwide is very recent and still lacks international consistency. The largest and most widely used international SWB data sets, providing information on a number of aspects of SWB, are Gallup's World Poll (covering 160 countries) and World Values Survey (covering almost 100 countries), as well as the European Social Survey and the Eurobarometer covering European countries. SWB data has also been collected in several waves of the annual Latin America Barometer survey (Latinobarómetro), covering 18 countries in the region.

Meanwhile, in the academic arena, research interest and publications in subjective well-being (or more commonly referred to as happiness) have enjoyed extraordinary growth, particularly from 2000 onwards (Box 7.2). That year coincided also with the foundation of the *Journal of Happiness Studies*. But, even excluding publications in this journal, the growth in

SWB-related publications has been remarkable. Moreover, SWB articles started to be published in some of the most prestigious journals in economics such as the *Journal of Economic Literature*, the *Journal of Economic Perspectives, the Economic Journal,* and the *Journal of Political Economy* (MacKerron, 2011).

Finally, it should be noted that *subjective* well-being is not synonymous with the broader concept of well-being but can be interpreted as a subset of it (Mackie and Smith, 2015; Milner-Gulland et al., 2014). When measuring overall well-being, there are many other important variables. The OECD (2011) *How's life? Measuring well-being* report presents a widely accepted empirical framework for measuring these multiple aspects of well-being, considering both objective and subjective aspects, under the headings of material conditions (e.g. income, jobs, housing) and quality of life (e.g. health, education, social capital, environmental quality, security and SWB). This is similar to an earlier well-being framework developed by Gough and McGregor (2007) that encompassed three conditions: meeting objective needs, freedom to pursue goals, and quality of life (including SWB). Agarwala et al. (2015) reviews a number of additional empirical frameworks to measure overall well-being.

Along similar lines, in the academic literature, SWB has been described as one of three possible accounts of well-being (Parfit, 1984; Dolan et al., 2011):

● *Objective lists* refer to the fulfilment of basic material, psychological and social human needs and rights. Typically these are identified "exogenously"; that is, proposed by experts or the logical extension of a theory of, or body of ideas about, well-being. Sen's (1999) capability approach is an example of this account and expresses well-being as ultimately determined by the capability of people to enjoy opportunities afforded by freedom from e.g. political oppression, malnutrition and illiteracy;

● *Preference satisfaction* is the well-being account associated with neo-classical economic theory. It is based on the premise that we can infer well-being (or its close relative, utility) from people's preferences and choices (Parfit, 1984). As such, the preference satisfaction account is widely used and is behind economic appraisal techniques, such as cost-benefit analysis;

● *Mental states* correspond to people's self-reports about their own well-being and is therefore what was called subjective well-being above, including life satisfaction, affect and eudaimonic well-being. It is popular not just in social sciences such as psychology but also, increasingly, in economics.

The links between these various accounts of well-being are not easy to map out as they ultimately refer to different constructs. Peasgood (2008) measured the three types of well-being for the same population and noted that, for some people, there were large differences between the various accounts. In terms of SWB and preference satisfaction, the two accounts that are of the most interest here, SWB is often described as an "experienced utility" measure, which is related to how people feel about their life and circumstances, in contrast with the traditional, preference-based concept of "decision" or "expected utility, which is based on what people want (Kahneman et al., 1997; Kahneman and Sugden, 2005). MacKerron (2011) argues, however, that the differences between the two approaches are deeper than simply being prospective and retrospective versions of the same equivalent metric. In many instances, the two conceptualisations may coincide, when the things people want are also the ones that make them happy, but this is not always the case. For Kimball and Willis (2006) utility reflects people's choices, while happiness is how the feel about their choices. In their perspective, SWB can be seen as an argument of the utility function, that can

be traded-off against other dimensions of utility. For a review of the similarities and differences between the subjective well-being and the preference satisfaction approach, see MacKerron (2011).

Box 7.1. **Subjective well-being questions used by the UK Office for National Statistics**

In April 2011, the UK Office for National Statistics (ONS) introduced four new subjective well-being questions to its Annual Population Survey, the United Kingdom's largest household survey. The questions cover the three core elements of SWB and use a 0-10 scale:

*Life satisfaction*: Overall, how satisfied are you with your life nowadays?

Eudaimonic well-being: Overall, to what extent do you feel the things you do in your life are worthwhile?

Affect: Overall, how happy did you feel yesterday? (positive)

Overall, how anxious did you feel yesterday? (negative)

Tinkler (2015) reports on the results of these SWB measures by age:

Figure 7.1. **Average subjective well-being in the United Kingdom**
By age group (2012-13)
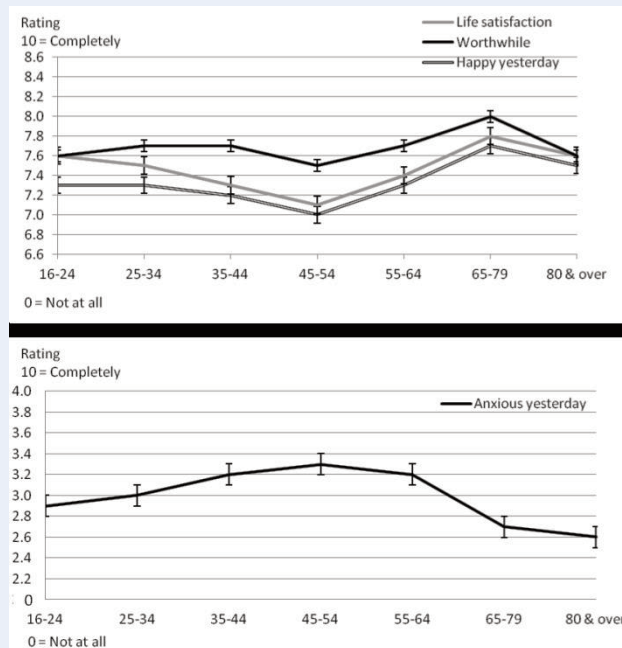
*Source:* Annual Population Survey (ONS).

The results illustrate the well-documented U-shaped relationship between SWB and age: SWB is found to be higher amongst the younger and older segments of the population and is at its lowest amongst 45-54 year olds, which are also those with the highest levels of anxiety. Interestingly, eudaimonic well-being (sense of purpose) is higher than the other two measures, for all ages, and the dip in the middle years is less pronounced. In all cases, SWB starts declining again beyond 79 years, despite diminishing levels of anxiety.

Box 7.2. **The growth of subjective well-being (happiness) studies**

Using publications in the Web of Science, Kullenberg and Nelhans (2015) analysed the number of papers published from 1960 to 2013, using the terms "happiness", "subjective well-being", "life satisfaction" or "positive affect". Figure 7.2 depicts the results.

Figure 7.2. **Published articles in absolute numbers**

Search term results, (left y-axis), compared with Web of Science total per year (right y-axis)

$$y = 35155x + 23126$$
$$R^2 = 0.9818$$
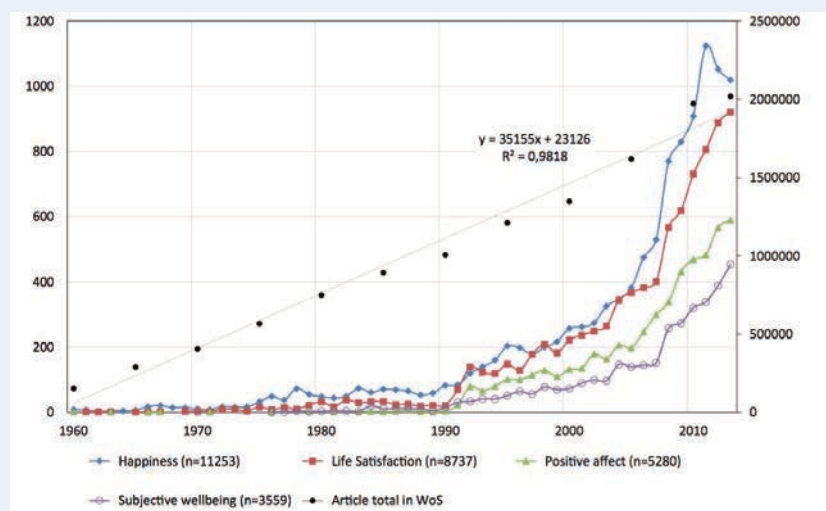
Source: Kullenberg and Nelhans (2015).

The graph shows SWB (or happiness) to be a rapidly growing field of research, when compared with the linear growth in all Web of Science studies: some 36 % of all articles were published very recently, between 2010 and 2013. While studies using the broad "happiness" terminology and "life satisfaction" are the most common, there has been a significant increase, in more recent years, in research on "positive affect" and "subjective well-being". Studies in the field come from a range of scientific disciplines, including biology, neuroscience, medicine, psychiatry, psychology, sociology and economics.

Kullenberg and Nelhans (2015) conclude that SWB or happiness studies have gained a high enough publication frequency to be recognised as an autonomous field of research, in its own right, producing meaningful patterns and regularities.

7.2. Subjective well-being and the environment

Most existing research has focused on the measurement and determinants of the life satisfaction (LS) measure of SWB. In comprehensive reviews of the literature, Dolan et al. (2008) and MacKerron (2011) find that unemployment, commuting, ill health, divorce/ separation and widowhood can all be shown to negatively affect LS; while income, marriage, trust, friendships, group membership, democracy and belief in God are positive influences. There is overwhelming evidence of the existence of a U-shaped relationship with age with younger and older respondents being happiest; while the effect of having children is mixed.

A number of studies have looked at the relationship between LS and environmental variables. This includes for example studies on noise (van Praag and Baarsma, 2005;

Weinhold, 2013; Lawton and Fujiwara, 2015), climate (Rehdanz and Maddison 2005; Frijters and van Praag, 1998), air pollution (e.g. MacKerron and Mourato, 2009; Brereton et al., 2008; Ferreira and Moro, 2010; Rehdanz and Maddison, 2008; Welsch, 2002, 2006, 2007; Levinson, 2009; Luechinger, 2009), species diversity (Rehdanz, 2007), drought (Caroll et al., 2009) natural capital (Engelbrecht, 2009; Vemuri and Costanza, 2006), connectedness with nature (Skianis, 2012), nature views (Kaplan, 2001), and green spaces (Mourato et al., 2010). The signs of the estimated relationships are mostly in the expected direction with pollution, noise and extreme climates having a detrimental effect on LS, and green spaces, nature views, connectedness with nature and species diversity having a positive effect.

In contrast, substantially less in known about eudaimonic well-being (Skianis, 2012; OECD, 2013). Of the three SWB conceptualisations, eudaimonia is by far the less studied and more work is needed to assess its validity and reliability. Despite the lack of research, inclusion of a stronger eudaimonic dimension in research and policy making is thought to be important and beneficial. Many public policies and individual behaviours are arguably aimed at enhancing opportunities for people to flourish, to be fulfilled and to achieve a sense of meaning and purpose in life, rather than pursuing pleasure per se. Eudaimonia therefore covers an important element of subjective well-being that is not covered by the other conceptualisations. A good example relates to having children which is found to have a negligible or mildly negative correlation with LS, as well as a low level of positive affect, but which is associated with a much higher sense of meaning and purpose in life (Mackie and Smith, 2015).

A notable exception to the scarcity of evidence on eudaimonia is the work of Skianis (2012). Using a specially designed survey instrument applied to almost 4 200 secondary school students in Greece and the United Kingdom, he performed a structured comparison of LS measures and eudaimonic well-being, with particular focus on estimating the relationship with the natural environment. He found some common determinants of both SWB dimensions: health, self-esteem and reading for school are common positive determinants; while involvement with electronic media appears to be detrimental to both. Interestingly, exposure to nature is a significant determinant of pupils' well-being, increasing not only life satisfaction, but also offering opportunities for personal growth and expressiveness. Additionally, students with stronger awareness of global problems such as climate change and species extinction, and deep respect for nature's unique value (moralistic values) exhibit higher levels of eudaimonia; while students benefitting from a green neighbourhood, proximity to an area of outstanding natural beauty, and less local environmental problems appear to have higher life satisfaction. Skianis concludes that focusing solely on LS provides an incomplete picture of the links between SWB and affiliation to nature.

Momentary subjective well-being (affect) has been more commonly evaluated in the psychology literature. The gold standard for the measurement of affect is the Experience Sampling Method (ESM), which collects assessments of activities and emotions at several points in a day in real time. Traditionally, the ESM involved respondents carrying cumbersome electronic devices to record their emotions and thus had low applicability and response rates. But in recent years, fuelled by technological developments that facilitate the collection of instant SWB data via mobile smartphone devices and apps, there has been an incipient but growing body of research on momentary subjective well-being (for reviews see MacKerron, 2011; Stone and Mackie, 2013; OECD, 2013). Alternatively, data can be gathered via the reconstruction of emotions from experiences recorded earlier in the day (Day Reconstruction Method – DRM). Responses from ESM and DRM have been found to be closely correlated. Momentary SWB is typically correlated with a similar set of covariates as LS,

although the relative importance of some variables is different (Boarini et al., 2012). There is, however, very scant evidence on the relationship between affect and the natural environment. A notable exception is MacKerron and Mourato (2013)'s novel iphone-based ESM study presented in Box 7.3.

Box 7.3. **Mappiness: Analysing momentary happiness in space and time**

In 2010, MacKerron and Mourato (2013) developed a novel iPhone app, called Mappiness, to investigate links between momentary SWB and environmental factors, in space and time. The app collects geo-located information on activities and company, as well as instant subjective well-being measurements, in real-time, with unprecedented power and precision: the accuracy of the outdoor location is within 100 m in over 90% of cases.

Study participants in this state-of-the-art ESM study use their own mobile devices (iPhones). They are beeped at random moments during the day, and asked to report on their subjective well-being and immediate context: companionship, activity and location. The app collects longitudinal data, which enables all time-invariant confounding factors at the individual level to be controlled for. The combination of GPS (satellite) geo-location and real-time SWB measures is a novel addition. Although the study is limited to iPhone users, it has nevertheless the largest sample ever achieved by an ESM study: the MacKerron and Mourato (2013) article is based on more than 500 000 responses from over 18 000 respondents across the United Kingdom. The study is on-going with so far, over 66 500 participants from various countries.

The results show that momentary well-being is significantly higher in natural environments. On average, respondents were found to be happiest outdoors. High energy pursuits, such as sports, running and exercise, were associated with a 6% increase in happiness, while more contemplative activities, such as nature watching, were linked with a 3% increase in happiness. When outdoors, higher happiness levels were associated with higher temperatures; unsurprisingly rain and wind were linked to lower happiness. Habitats such as marine and coastal margins, mountains, moorlands and heaths, and coniferous woodlands were found to be linked with significantly higher happiness levels than urban habitats. As an example, the predicted happiness of a person who is outdoors, birdwatching, with friends, in heathland, on a hot and sunny Sunday early afternoon is approximately 26 scale points (on a 0-100 scale) higher than that of someone who is commuting, on his own, in a city, in a vehicle, on a cold, grey, early weekday morning.

A particular strength of SWB evaluation measures is that it does not require respondents to be aware or understand the causal pathway by which a particular change might affect their well-being, focusing simply on the outcomes (OECD, 2013). And being based on experienced utility, it does not require respondents to immerse themselves in hypothetical situations and predict how they would behave or feel, and so it might provide more accurate insights into how people adapt to, and experience, real life circumstances (Fujiwara and Dolan, 2014). This is related to the phenomenon of hedonic adaptation or habituation, where people adapt or partially adapt to changes in their life, so that impacts on SWB are only transient (Mackie and Smith, 2015). People are typically unable to accurately predict their levels of adaptation ex-ante using preference-based methods. Moreover, SWB data is now extensively available, in large data sets, making it a cost-effective evaluation (Fujiwara and Campbell, 2011).

Amongst the key limitations of the approach is the fact that a large number of SWB analyses have used observational cross-sectional data and therefore capture only correlations rather than causal links (due to possible omitted variable bias and sample selection bias). Reverse causality might also occur, where a reciprocal relationship exists between SWB and the variable of interest (e.g. outdoor activity could increase LS, but also be more likely to be pursued by happier people). Better measures could use panel data or an experimental setting where treatments are randomly assigned, to capture causal relationships (Fujiwara and Campbell, 2011). Hedonic adaptation, mentioned above, can also be a concern in some circumstances. Specifically, the potential to habituate to bad circumstances and the moral hazard associated with the "happy slave" phenomenon, has been an obstacle to the use of SWB in development work (MacKerron, 2011). Additionally, there are also numerous possible biases associated with the measurement technique and scales used to capture SWB, problems associated with accurately recollecting past events and emotions, survey context effects, response scale effects, as well as broader conceptual problems associated with the validity of making cardinal assessments of well-being, and interpersonal comparisons, as is the case with this approach. For a detailed analysis of the validity and reliability of SWB assessments, see OECD (2013), Mackie and Smith (2015), Stone and Mackie (2013), Fujiwara and Campbell (2011), Fujiwara and Dolan (2016), or MacKerron (2011).

7.3. Subjective well-being valuation

Subjective well-being data provides a new and alternative way to value non-market changes. That is, one can estimate monetary welfare measures based on people's self-reported well-being. This has become known as the Subjective Well-being Valuation approach (Frey et al., 2004a; Frey et al., 2009; Welsch, 2009; Fujiwara and Dolan, 2016; HM Treasury, 2018). Given a change in the determinant of interest, say environmental quality, the approach works by calculating the change in income that would produce a SWB impact of equivalent size.

This new method of monetary valuation could potentially be a useful complement to revealed and stated preference methods, as it does not require assumptions about rationality regarding people's preferences and choices, is not subject to the same types of biases affecting some of those techniques (for example, hypothetical bias), and does not require individuals to be conscious of the levels or effects of the parameters being valued (Welsch and Kuhling, 2009).

One of the key assumptions required in order to use SWB data for non-market valuation is that SWB is a direct measure of individual welfare. Hence, by observing SWB one can

estimate direct monetary measures of welfare change associated with a non-market change using a direct utility (as measured by SWB) function, as long as income is one of the determinants included. With few exceptions (e.g. Powdthavee and Van den Berg, 2011), researchers have mostly used only one of the three subjective well-being dimensions described above, i.e. life satisfaction, for monetary valuation.

Following Fujiwara and Campbell (2011), consider the following direct SWB function:

$$SWB(Q, M, X) \tag{7.1}$$

where Q is the non-market good (e.g. air quality), M is income and X represents other determinants of SWB. The value associated with a welfare-increasing change in the provision of the non-market good from 0 to 1 is estimated as:

$$SWB(Q^0, M^0, X^0) = SWB(Q^1, M^1 - CS, X) \tag{7.2}$$

where CS is the Hicksian compensating surplus measure of welfare associated with the change. Empirically, the SWB function can be estimated as:

$$SWB_i = \alpha + \beta_M M_i + \beta_Q Q_i + \beta_X X_i + \varepsilon_i \tag{7.3}$$

where α is a constant, β_M, β_Q and β_X are the coefficients associated with the determinants of SWB, ε is the error term and the i represents the individual. Equation [7.3] can also be estimated using experimental data from randomised trials or field experiments, but here the focus is on observational data. In this respect, the SWB function can be estimated with either cross-sectional data or panel data, using a range of multivariate statistical methods. Some authors treat the SWB data as being cardinal, while others relax this assumption and use statistical models to analyse the ordered data. A critical assumption is that there is a causal link between the two variables of interest (Q_i and M_i) and SWB (Dolan et al., 2008; Fujiwara and Dolan, 2016); that is β_Q and β_M are unbiased estimates.

Measures of welfare change can then be uncovered from the marginal rates of substitution between the non-market good and income, specifically using the ratio of the non-market good and the income coefficients from model [7.3]:

$$CS = \beta_Q / \beta_M \tag{7.4}$$

Equation [7.4] can be interpreted as the amount of money that would be required to keep SWB constant in absence of the non-market good (for goods that provide positive well-being). The income term is typically modelled in log form, $\ln(M_i)$, in order to account for the diminishing marginal utility of income. In this case, the welfare value measure is calculated as (where M^0 is the status quo level of income for the individual, usually assumed to be the sample average level of income):

$$CS = M^0 - exp^{\left[\ln(M^0) - \frac{\beta_Q}{\beta_M} \right]} \tag{7.5}$$

The SWB valuation method was first proposed by Ferrer-i-Carbonell and Van Praag (2002) in an application to the valuation of health. Since then the SWV method has been used most frequently in the valuation of environmental changes to do, for example, with air quality, noise, climate change or droughts (van Praag and Baarsma, 2005; Carroll et al., 2009; MacKerron and Mourato, 2009; Rehdanz and Maddison, 2008; Welsch, 2002, 2006, 2007). For a review of environmental valuation applications, see Welsch and Kuhling (2009) and Ferreira and Moro (2010). But interest in the application of SWV is growing in other areas as well: for example, employment (Clark and Oswald, 2002); terrorist attacks (Frey et al., 2004a); health (Ferrer-i-Carbonell and Van Praag, 2002; Groot and van den Brink, 2006); macroeconomic events (Blanchflower and Oswald, 2004); corruption (Welsch, 2008); crime (Cohen, 2008);

social relationships (Powdthavee, 2008); adult learning (Dolan and Fujiwara, 2012); housing quality (Fujiwara, 2014); and cultural activities and events (Fujiwara, 2013a; Fujiwara et al., 2014) and heritage sites (Bakhshi et al., 2015). In the UK, new tools such as the Social Value Bank (*http://socialvaluebank.org*), have also been developed to facilitate the measuring of social impact using SWB valuation methods based on large scale existing national SWB survey data (Trotter et al., 2014). Created in 2014, the Social Value Bank uses SWB valuation to value over 70 different social outcomes (e.g. employment, health, financial comfort, access to the internet, relief from depression, keeping fit, membership of a social group, gardening, good neighbourhood, homelessness, etc.).

Early attempts at valuation using the SWB approach have been widely criticised for originating values that were unrealistically large. For example, MacKerron and Mourato (2009) found that a small 1% increase in NO_2 levels was equivalent to a 5.3% drop in income; Frey et al. (2007) found that the value of reducing terrorist activity in Northern Ireland to the same level as in the Republic of Ireland was equivalent to 41% of personal income; Clark and Oswald (2002) estimated the value of employment to be an implausibly high GBP 276 000 per year to an individual, in addition to their wage income; Frey and Stutzer (2005) estimated that Paris residents valued reducing terrorism levels to the level experienced elsewhere in France at 14% of their income; and Powdthavee (2008) found that an increase in the level of interactions with friends and relatives from "less than once a month" to "most days" was worth GBP 85 000 a year.

The overestimation problem could be due to a number of reasons such as unrepresentative samples, and the influence of extreme outliers in the data. But the key problem is thought to be in the estimation of Q_i and M_i. An upward bias in the coefficient on Q_i and/or a downward bias in the coefficient on M_i would lead to a high value, but a lot of focus has been aimed at the difficulty of estimating the marginal utility of income. The income coefficient can be downward biased for a wide range of reasons: endogeneity, measurement error and because many of the channels through which income affects subjective well-being are controlled for in equation [7.3]. This results in an over-estimation of welfare values, as the income coefficient appears in the denominator of the valuation equation ratio (see equation [7.4]). This issue is discussed in more detail in the following section.

7.3.1. *Advantages and limitations of the SWB valuation approach*

Subjective well-being valuation has a number of limitations but also several advantages when compared with traditional preference-based non-market valuation approaches. Here the most important pros and cons are discussed.

Limitations

Income coefficient underestimation. As noted above, perhaps the largest problem associated with using the SWB valuation method is the inability of SWB models to *accurately estimate the income coefficient*, which has been found to be substantially biased downward, because of measurement error, endogeneity, reverse causality and parametric restrictions (Fujiwara and Campbell, 2011). Undervaluation of the income coefficient leads, in turn to an overestimation of welfare values (see equation [7.4]). In an early attempt at comparing preference-based contingent valuation and subjective well-being valuation, Dolan and Metcalfe (2008) found large differences between the two methods with the SWB valuation approach producing significantly larger values (GBP 19 000 vs GBP 245), on a study of the value of an urban regeneration project.

It is typical to assume that statistical models of the determinants of SWB identify causal relationships; that is, for example, the finding that income is a significant explanatory variable in a SWB regression is taken as evidence that income increases well-being. However, in many studies, the associations estimated between the explanatory regressors and the well-being variable cannot be interpreted as causal effects. This is because SWB may itself determine some of the explanatory variables (reverse causality). For example, there is some evidence to suggest that happier people may be healthier, earn more money and be more likely to get married (Fujiwara and Campbell, 2011). Moreover, there may be omitted variables in the model that affect both the dependent and the independent variables. In order to be able to make causal inferences from SWB models, more sophisticated statistical or other research design methods are needed.

Non-use value estimation. It is not clear how to use the SWB valuation approach to measure *non-use values*. As such the approach, as things stand, does not offer any obvious advantages in what is arguably the most difficult area in non-market valuation. It is of course conceptually feasible that one could use subjective well-being to capture non-use values if, for example, finding out about an oil spill reduced people's SWB. If it were possible to identify behaviours or experiences that reflect non-use values, one could try to measure the subjective well-being associated with these behaviours and in turn, calculate monetary value equivalents. Examples of such behaviours include donations to good causes that one is not likely to benefit from directly. But clearly, where related financial behaviours exist one does not need SWB valuation as one can simply observe the behaviours (e.g. the level if donations). And in most policy-relevant cases, there are no observable behaviours for non-use values.

Valuing future policies and marginal changes. Because SWB is based on experienced utility, it also poses limitations when attempting to estimate the *impact of future policy changes*. Valuing future changes would have to rely on observing similar changes that have already occurred at some point in the past.

Moreover, SWB is arguably better suited to measure large changes that clearly impact on subjective well-being, than *marginal changes*, whose impact might be impossible to detect due to the bounded nature of the SWB scales (e.g. 0-10) (Fujiwara and Campbell, 2011). Researchers have experimented with wider scales, say from 0 to 100, but this raises the issue of whether respondents can accurately pinpoint their level of SWB in such detailed scales.

Selecting between the various SWB dimensions. While stated and revealed preference methods typically use money as a measuring unit, there is more than one subjective well-being measure that can be used (life satisfaction, eudaimonic well-being and momentary well-being) and it is *not clear which measure should be used for which purpose* (Dolan et al., 2011; Powdthavee and Van Den Berg, 2011). Different types of SWB will have different determinants. For example, life satisfaction is more strongly correlated with income than momentary happiness, that might be more correlated with the type of activity being undertaken or the company one is with at the time. It is conceivable that some policies may affect one type of well-being but not another, and hence a decision needs to be made as to what measure of well-being is relevant to what type of policy.

Moreover, it may be impossible to fully separate out the three key dimensions of well-being identified above: Seligman (2011) finds that mood determines around 70% of the life

satisfaction reported on average, with less than 30% being determined by how well people judge their life to be going.

Measurement issues. Finally, SWB metrics also have their own *measurement challenges* as noted above. For example, measures such as life satisfaction involve a retrospective judgement of one's life and it is well known that people have imperfect recollection of past experiences (Kahneman and Krueger, 2006). The SWB scores may also be influenced by arbitrary contextual factors like the weather or the performance of football teams on the day of the interview (Schwarz and Strack, 1999). SWB responses may also be influenced by the order in which they appear in a survey. The commonly used single-item measures of SWB (e.g. to measure overall life satisfaction) are opaque and do not allow the researcher to investigate if and how the various dimensions of life were accounted for and aggregated by respondents.

To compound the problems, narrow scales (e.g. 1-5) may not be broad enough to be able to reflect all that is important to our lives (Loewenstein and Ubel, 2008). Moreover, evidence shows that people adapt relatively quickly to change, both positive and negative (e.g. unemployment, disability, pay rise, marriage) in what was called the phenomenon of "hedonic adaptation". Therefore, changes in policy may not be reflected in the level of SWB (Loewenstein and Ubel, 2008). But as already noted above, this could also be seen as a positive feature of the SWB approach (more on this point below).

Advantages

Despite these issues, the SWB valuation approach offers solutions to many of the problems faced in preference-based valuation methods and also offers new avenues for valuation research.

Values based on actual experience. The SWB valuation approach is based on actual rather than hypothetical experiences, which is an attractive feature for policy makers. This means that it is possible to assess how policy outcomes actually impact on people's lives in the lived experience. Whilst preference-based approaches rely on how people predict they are going to feel about a non-market outcome, SWB values are based on real experience capturing issues such as adaptation in real life situations. This is advantageous as numerous studies have shown that people are often unable to predict how an outcome will really impact on their lives, especially in complex policy areas such as the environment (Loewenstein and Adler, 1995; Read and van Leeuwen, 1998; Wilson and Gilbert, 2003). This leads to interesting policy implications: for example, Fujiwara and Dolan (2014) show that SWB data may provide a better representation of how people are affected by health conditions than stated preference methods that are used as part of measuring Quality Adjusted Life Years (QALYs). Relatedly, the SWB approach can potentially capture the effect of changes that people may either not be consciously aware of, or fail to attribute to particular causes or policies.

Rationality assumptions. Whilst preference-based valuation methods rely on a strict set of rationality assumptions (such as completeness and transitivity) in order to be assured that preference is measuring welfare, since the SWB approach directly measures welfare these types of assumptions are not necessary. All that is required is that people can accurately state their level of well-being (Stutzer and Frey, 2010; van den Berg and Ferrer-i-Carbonell, 2007).

Difficult-to-value outcomes.   The SWB approach might be useful to estimate values for non-market changes that may be particularly difficult to be directly valued with willingness to pay approaches, such as health and those involving community benefits, spiritual benefits, equality and distributional issues and so on. Relatedly, the SWB approach is better suited to valuing non-marginal non-market changes. Use of stated preference methods is usually restricted to measuring small changes such as the risk of a significant outcome happening rather than the whole outcome itself. This is due mainly to problems associated with asking people their willingness to pay for hypothetical life-changing events in a survey. Since in the SWB valuation approach people are not asked to state their willingness to pay, large events and significant changes from the status quo can be valued: for example, drought (Carroll et al., 2009), rather than the risk of drought.

Survey biases.   Whilst, as discussed above, the context and environment can bias or affect SWB responses, this is also true of stated preference methods. Problems such as strategic bias and hypothetical bias are eliminated and the SWB approach is probably less sensitive to contextual influences such as priming effects, because willingness to pay is not elicited (Fujiwara and Campbell, 2011; Stutzer and Frey, 2010). Importantly, SWB valuation also eliminates "focussing illusion" issues (Schkade and Kahneman, 1998), since respondents *typically* are not asked about the value of a particular policy change the "importance" of which then dominates their thinking during the survey process, but that value is instead inferred *ex post* from the econometric analysis.

Cost-effectiveness.   Where the SWB valuation approach can be employed using national pre-administered data sets it represents a highly cost and resource effective method for valuing non-market changes because the data already exist on which to perform the analysis and do not need to be collected through primary data collection. In this respect, the SWB valuation approach is similar to revealed preference methods which can also be conducted without primary data collection.

7.3.2. New developments

Improved ways of modelling income

In the last few years the methodology for SWB valuation has evolved and some promising solutions involving instrumental variables for the income variable (e.g. Luechinger, 2009; Fujiwara, 2013b) have been developed, to account for the problems of selection bias, reverse causality and measurement error that produced biased estimates of the causal effect of income on life satisfaction.

More accurate estimation of the effect of income on SWB using instrumental variables could lead to larger income coefficients and, in turn, to more realistic welfare values estimated using SWB valuation. A promising development is the three-stage SWB valuation procedure proposed by Fujiwara (2013b), using lottery wins (an exogenous income windfall) as an instrument for income: i) in the first stage, a SWB model is estimated; ii) in the second stage, a separate income regression model is estimated using data on lottery wins as an instrumental variable (Gardner and Oswald, 2007) in a two-stage least squares model framework to derive a robust causal estimate of the impact of income on SWB; iii) and in the final stage the results from the two models are used to derive unbiased monetary values. Other suggested ways to improve the estimation of income effects involve including relative

income in the SWB equation, as well as controlling for other factors that are related to income, such as hours of work and commuting time (Fujiwara and Campbell, 2011).

In a more recent comparison study, Fujiwara and Dolan (2012) found that estimates of the value of an adult learning course that improved life satisfaction, estimated using both contingent valuation and SWB valuation approaches, were similar (GBP 947 and GBP 754, respectively) and also alike to the real market price of similar courses. To control for problem of endogeneity of the income variable, the authors used an instrumental variable model, where income was instrumented by whether a person has a mortgage and whether their spouse is employed. But such attempts at comparing SWB valuation and stated preference valuation are rare, and still mostly in the grey literature. More research work is needed to establish the degree of comparability between both approaches and the conditions under which SWB valuation might be a suitable method to use.

Of course, the values obtained using the SWB approach do not have to necessarily coincide to those obtained using the traditional preference-based valuation approaches. As explained above, both valuations are derived from a different theoretical measure of well-being: preference-based methods are based on decision utility, used in purchasing decisions, i.e. what people would be prepared to pay for an improvement; while subjective well-being valuation is based on experienced utility, i.e. people's actual experiences. For example, Fujiwara (2014) shows that while "lack of space" is often cited as a key factor behind the decision to move house, it does not however, seem to affect life satisfaction, i.e. the actual life experience of living in a particular house. People's preferences and experiences can diverge, and consequently so can values based on preference and experiences, and it is to a certain extent an empirical matter which is most relevant for a particular policy.

Anchoring vignettes

A potentially promising way in which SWB valuation could be used to measure non-use values is through a so-called "anchoring vignette" study (King et al., 2004; MacKerron, 2012). In such studies, respondents are presented with a hypothetical event, pertaining to themselves or a third person, and asked questions about how this event might affect SWB. In the case of non-use values, this could involve a short scenario describing a hypothetical individual donating money to a non-use policy, say the conservation of the rare Iberian lynx. The respondent is then asked to imagine what impact this policy might have on the SWB (e.g. life satisfaction) of the hypothetical individual. While this approach presents a potential way of dealing with non-use values, it also brings the SWB approach into the realms of hypothetical scenarios and so risks facing the same sorts of problems as stated preference methods.

Anchoring vignettes are increasingly being used in well-being and health research, although it has yet to be applied to the measurement of non-use values. For example, Kapteyn et al. (2011) compared self-reported satisfaction with incomes in the Netherlands and the USA and used vignettes to anchor the effect of cultural differences in responses. More recently, Bakhshi et al. (2015) adopted the vignette approach to determine and value the effect of visiting a large museum in London, the National History Museum, on life satisfaction (i.e. a use value). The approach adopted was a *first-person vignette,* where the hypothetical scenario referred to the individual or respondent themselves (rather than a third person). Specifically, respondents were asked to imagine a situation where they were able to visit the museum more frequently and were asked what their level of life satisfaction would be, holding all other factors in their lives constant. The visit frequency was varied

randomly across the sample. The vignette study was used to derive estimates of the impact of museum visits on life satisfaction and, given the estimated impact of income on life satisfaction (estimated separately, using a standard LS regression), the value of these visits. The value of a visit was estimated to be GBP 40, using this approach.

The vignette-based SWB approach study therefore offers another way of possibly deriving values for events or changes, based on life satisfaction impacts. It tentatively suggests a way to estimate non-use values using SWB data. Moreover, the vignette approach could also be used to measure the effect of future events or changes, i.e. respondents could be presented with a scenario which reflected some future change. As noted above, this is not dissimilar from the valuation scenario in a stated preference survey which describes some policy change of interest.

Hybrid SWB-contingent valuation approach

A persistent problem in contingent valuation (CV) studies is that estimates of WTA (willingness-to-accept) typically far exceed that of WTP (willingness-to-pay), which violates the underlying theory of economic preference satisfaction (Hausman, 2012). In a recent study estimating the value of cultural institutions in the United Kingdom, Bakhshi et al. (2015) proposed a novel hybrid SWB-CV valuation approach. The hybrid contingent/well-being valuation approach takes the hypothetical setting of stated preference methods and combines it with the underlying theory of SWB, offering an alternative approach to valuing public goods when compensatory measures (i.e. WTA) are of interest. Specifically, Bakhshi and colleagues asked respondents directly how much monetary compensation they would require if they were not able to visit a cultural institution for one year due to a hypothetical closure, such that their life satisfaction would remain unaffected. Crucially, compensation was only offered to those who previously indicated that their life satisfaction would decrease if the institution were temporarily closed. The study finds that the hybrid SWB-CV willingness to accept approach, based on life satisfaction and combining elements of both methods, delivers plausible values, where WTA values were similar to WTP values for entry to the cultural institutions. See Box 7.4 for further details.

Box 7.4. Hybrid SWB-CV approach

Bakhshi et al. (2015) elicit the value of avoiding the closure of a cultural institution for one year using a hybrid SWB-CV approach, via a one-off cash compensation. The study addresses the well-known WTP-WTA disparity (Horowitz and McConnell, 2002; Shogren et al., 1994) by assessing whether constraining the WTA scenario by setting it explicitly in the context of changes in life satisfaction produces reasonable WTA values relative to an equivalent WTP measure. The hypothesised mechanism for this is that respondents are asked explicitly to think about the WTA question within the framework of economic theory, i.e. they are compensated directly for changes in their welfare, in this case life satisfaction. Importantly, compensation is only offered for those that say their life satisfaction would be negatively affected in the first place, from the institutional closure.

Willingness-to-accept compensation questions are sometimes used in CV, but – despite the Bateman et al. (2002) example – typically respondents are not asked for compensation in terms of well-being or life satisfaction impacts, but simply asked for compensation for the change of interest. Elements of the hybrid approach are also similar in some respects to the work by Lau et al. (2013), who asked survey participants in the United Kingdom and

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> ### Box 7.4. **Hybrid SWB-CV approach** *(cont.)*
>
> Hong Kong, China their WTP to re-create the experience of feeling [a certain type of mood] for one hour. The moods included happiness, love, fear, sadness and so on (where for negative moods, respondents were asked WTP to avoid the mood). Respondents were asked to equate a specific feeling of well-being to a monetary figure.
>
> Two case studies were used by Bakhshi and colleagues: a study of London's Natural History Museum, and a study of Tate Liverpool, each involving the hypothetical closure of each institution for one year. The authors define this mostly as a use value and an option value, as closure would prevent access and future access to the institution but not, say, on-going research and conservation. The question used in the National History Museum survey was the following:
>
> *For this next question, please imagine that the Natural History Museum had to close to the public for one year for vital maintenance work. No one would be able to visit any parts of the Museum during this period. Other museums would remain open as usual. Now don't worry, there are no plans for the museum to close! But we would like you to think about what your life would be like if it did close for one year. How would the closure affect your level of life satisfaction?*
>
> - *The closure would have very little effect on my life satisfaction*
> - *The closure would reduce my life satisfaction*
> - *The closure would increase my life satisfaction*
>
> If the respondent selected option 2 then they were asked the following question:
>
> *Now imagine the following situation. Suppose that in order to compensate you for not being able to visit the Natural History Museum during one year, you were given a cash compensation. How much money would you have to receive, as a one-off payment, to give you the same life satisfaction that you have now (not better nor worse, but just the same) during this period until the Museum re-opened? Think about this for a moment please.*
>
> WTA values were elicited using a payment card with values ranging from GBP 0 to GBP 150.
>
> The hybrid contingent-well-being valuation approach was found to provide plausible values per visit of GBP 6.89 and GBP 7.13 for the Natural History Museum and the Tate Liverpool, respectively. These figures were comparable to equivalent WTP values.
>
> Although WTP has now become the preferred monetary elicitation method in the CV literature, it is acknowledged that there are times when WTA is warranted, for example when property rights are such that respondents believe they have some intrinsic right to the good or service in question (culture is arguably a good example of such a case). In such cases, the hybrid approach grounded also in the theory of SWV can potentially deliver plausible WTA values.

7.3.3. *Concluding thoughts*

Subjective well-being valuation is a newly developed method that differs from other non-market valuation methods as values are based on how non-market goods impact on self-reported measures of well-being such as life satisfaction. In other words, the values are based on experienced rather than decision utility. Much less is known about the limitations and biases of this nascent SWB valuation approach than revealed and stated preference methods that have a much longer history of research and applications in economics. But overall, the SWB approach offers a promising new way of valuing non-market goods. Future research and applications will tell if this promise holds.

References

Adler, M. (2012), *Well-Being and Fair Distribution: Beyond Cost-Benefit Analysis*, Oxford University Press, Oxford.

Agarwala, M. et al. (2015), "Assessing the relationship between human well-being and ecosystem services: A review of frameworks", *Conservation and Society*, Vol. 12(4), pp. 437-449, *http://dx.doi.org/10.4103/0972-4923.155592*.

Araña, J.E., C.J. Leon and M.W. Hanemann (2008), "Emotions and decision rules in discrete choice experiments for valuing health care programmes for the elderly", *Journal of Health Economics*, Vol. 27, pp. 753-769, *http://dx.doi.org/10.1016/j.jhealeco.2007.10.003*.

Bakhshi, H. et al. (2015), *Measuring Economic Value in Cultural Institutions,* Arts and Humanities Research Council, *www.ahrc.ac.uk/documents/project-reports-and-reviews/measuringeconomicvalue/*.

Bateman, I.J. et al. (2011), *Chapter 22: Economic Values From Ecosystems, National Ecosystem Assessment*, Final report to United Nations Environment Programme (UNEP)/World Conservation Monitoring Centre (WCMC), *www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/04/economic-values-ecosystems.pdf*.

Bateman, I.J. et al. (2008), "Learning design contingent valuation (LDCV): NOAA guidelines, preference learning and coherent arbitrariness", *Journal of Environmental Economics and Management*, Vol. 55, pp. 127-141, *http://dx.doi.org/10.1016/j.jeem.2007.08.003*.

Bateman, I.J. et al. (2002), *Economic valuation with stated preference techniques: A manual*, Edward Elgar, Cheltenham, *www.e-elgar.com/shop/economic-valuation-with-stated-preference-techniques?___website= uk_warehouse*.

Bateman, I.J. et al. (2011), "Economic analysis for ecosystem service assessments", *Environmental and Resource Economics*, Vol. 48, pp. 177-218, *http://dx.doi.org/10.1007/s10640-010-9418-x*.

Blanchflower, D.G. and A.J. Oswald (2004), "Well-being over time in Britain and the USA", *Journal of Public Economics*, Vol. 88, pp. 1359-1386, *http://dx.doi.org/10.1016/S0047-2727(02)00168-8*.

Boarini, R. et al. (2012), "What Makes for a Better Life? The Determinants of Subjective Well-Being in OECD Countries – Evidence from the Gallup World Poll", *OECD Statistics Working Papers*, No. 2012/03, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k9b9ltjm937-en*.

Brereton, F., J.P. Clinch and S. Ferreira (2008), "Happiness, geography and the environment", *Ecological Economics* 65(2): pp. 386-396.

Carroll, N., P. Frijters and M. Shields (2009), "Quantifying the costs of drought: New evidence from life satisfaction data", *Journal of Population Economics*, Vol. 22, pp. 445-461, *http://dx.doi.org/10.1007/s00148-007-0174-3*.

Clark, A.E. and A.J. Oswald (2002), "A simple statistical method for measuring how life events affect happiness", *International Journal of Epidemiology*, Vol. 31, pp. 1139-1144, *https://doi.org/10.1093/ije/31.6.1139*.

Clark, A.E. and A.J. Oswald (1996), "Satisfaction and comparison income", *Journal of Public Economics*, Vol. 61, pp. 359-381.

Cohen, M.A. (2008), "The effect of crime on life satisfaction", *Journal of Legal Studies*, Vol. 37, 37, Issue S2, pp. S325-S353.

Diener, E. (2005), "Guidelines for national indicators of subjective well-being and ill-being", *Journal of Happiness Studies*, Vol. 7, pp. 397-404, *http://dx.doi.org/10.1007/s10902-006-9000-y*.

Dolan, P., R. Layard and R. Metcalfe (2011), "Measuring subjective well-being for public policy: recommendations on measures", *Special Paper* No. 23, Centre for Economic Performance, London School of Economics and Political Science, London, *http://cep.lse.ac.uk/pubs/download/special/cepsp23.pdf*.

Dolan, P. and R. Metcalfe (2008), "Comparing willingness to pay and subjective well-being in the context of non-market goods", *Discussion paper* No. 890, Centre for Economic Performance, London School of Economics, London, *http://cep.lse.ac.uk/pubs/download/dp0890.pdf*.

Dolan, P., T. Peasgood and M. White (2008), "Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being", *Journal of Economic Psychology*, Vol. 29, pp. 94-122, *http://dx.doi.org/10.1016/j.joep.2007.09.001*.

Engelbrecht, E.-J. (2009), "Natural capital, subjective well-being, and the new welfare economics of sustainability: Some evidence from cross-country regressions", *Ecological Economics,* Vol. 69(2), pp. 380-388, *http://dx.doi.org/10.1016/j.ecolecon.2009.08.011*.

Ferreira, S., A. Akay, F. Brereton, J. Cunado, P. Martinsson, M. Moro and T.F. Ningal (2013), "Life Satisfaction and Air Quality in Europe", *Ecological Economics,* Vol. 88, pp. 1-10, *http://dx.doi.org/10.1016/ j.ecolecon.2012.12.027.*

Ferreira, S. and M. Moro (2010), "On the use of subjective well-being data for environmental valuation", *Environmental and Resource Economics*, Vol. 46(3), pp. 249-273, *http://dx.doi.org/10.1007/s10640-009-9339-8.*

Ferrer-i-Carbonell, A. and B. van Praag (2002), "The subjective costs of health losses due to chronic diseases. An alternative model for monetary appraisal", *Health Economics*, Vol. 11, pp. 709-722, *http:// dx.doi.org/10.1002/hec.696.*

Fleurbaey, M. and D. Blanchet (2013), *Beyond GDP: Measuring Welfare and Assessing Sustainability*, Oxford University Press, Oxford.

Fleurbaey, M. et al. (2013), "Equivalent income and fair evaluation of health care", *Health Economics*, Vol. 22, pp. 711-729, *http://dx.doi.org/10.1002/hec.2859.*

Frey, B.S., S. Luechinger and A. Stutzer (2004a), "Valuing public goods: The life satisfaction approach", *Institute for Empirical Research in Economics University of Zurich Working Paper Series 184, www.econ.uzh.ch/ static/wp_iew/iewwp184.pdf.*

Frey, B.S., S. Luechinger and A. Stutzar (2004b), "Calculating tragedy: Assessing the costs of terrorism", *CESIFO Working Paper* No. 1341, *www.cesifo.de/pls/guestci/download/CESifo%20Working%20Papers%202004/ CESifo%20Working%20Papers%20November%202004/cesifo1_wp1341.pdf.*

Frey, B.S., S. Luechinger and A. Stutzar (2009), "The life satisfaction approach to environmental valuation", *Discussion Paper* No. 4478, Institute for the Study of Labor, Bonn, *http://ftp.iza.org/dp4478.pdf.*

Frijters, P. and B.M.S. van Praag (1998), "The effects of climate on welfare and well-being in Russia", *Climatic Change,* Vol. 39, pp. 61-81.

Fujiwara, D. (2013a), "Museums and Happiness", *Happy Museum Research Paper, http://happymuseum project.org/happy-museums-are-good-for-you-report-publication/museums-and-happiness/.*

Fujiwara, D. (2013b), "A general method for valuing non-market goods using well-being data: three-stage well-being valuation", *CEP Discussion Paper* No 1233, Centre for Economic Performance, London, *http:// eprints.lse.ac.uk/51577/1/dp1233.pdf.*

Fujiwara, D. (2014), *The social impact of housing providers*, HACT, Legal & General, Plus Dane Group, London.

Fujiwara, D. and D. Campbell, (2011), *Valuation Techniques for Cost Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches*, HM Treasury, London, *www.gov.uk/ government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf.*

Fujiwara, D. and P. Dolan (2012), "Valuing Adult Learning: Comparing Well-being Valuation to Contingent Valuation", *BIS Research Paper* 85, UK Department for Business, Innovation and Skills, London, *www.gov.uk/government/uploads/system/uploads/attachment_data/file/34598/12-1127-valuing-adult-learning-comparing-well-being-to-contingent.pdf.*

Fujiwara, D. and P. Dolan (2014), "Valuing mental health. How a subjective wellbeing approach can show just how much it matters", UK Council for Psychotherapy, *https://docs.wixstatic.com/ugd/ 9ccf1d_b3cfc47c5b2043ec92b32f558d15d97f.pdf.*

Fujiwara, D. and P. Dolan (2016), "Happiness-Based Policy Analysis", Chapter 10 in Adler, M.D. and M. Fleurbaey (eds.) (2016) *The Oxford Handbook of Well-Being and Public Policy,* Oxford University Press.

Fujiwara, D., L. Kudrna and P. Dolan (2014), "Quantifying and valuing the well-being impacts of culture and sport", *Department for Culture Media and Sport Research Paper*, Department for Culture Media and Sport, London, *www.gov.uk/government/uploads/system/uploads/attachment_data/file/304899/ Quantifying_and_valuing_the_well-being_impacts_of_sport_and_culture.pdf.*

Fujiwara, D., R. Lawton and S. Mourato (2015), *The health and well-being benefits of public libraries*, Report for the Arts Council England, Arts Council England, London, *www.artscouncil.org.uk/sites/default/ files/download-file/The%20health%20and%20well-being%20benefits%20of%20public%20libraries.pdf.*

Gardner, J. and A.J. Oswald (2007), "Money and mental well-being: A longitudinal study of medium-sized lottery wins", *Journal of Health Economics*, Vol. 26, pp. 49-60, *http://dx.doi.org/10.1016/j.jhealeco.2006.08.004.*

Gough, I. and J.A. McGregor (eds.) (2007), *Well-being in Developing Countries: From Theory to Research*, Cambridge University Press, Cambridge.

Groot, W. and H.M. van den Brink, (2006), "The compensating income variation of cardiovascular disease", *Health Economics Letters*, Vol. 15, pp. 1143-1148, *http://dx.doi.org/10.1002/hec.1116.*

HM Treasury (2018), *The Green Book: Central Government Guidance on Appraisal and Evaluation*, HM Treasury, London, *www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf*.

Lawton, R. and D. Fujiwara (2015), "Living with aircraft noise: Airport proximity, aviation noise and subjective wellbeing in England", *Transportation Research Part D: Transport and Environment* 42: pp. 104-118.

Levinson, A. (2009), "Valuing public goods using happiness data: The case of air quality", *NBER Working Paper No. 15156*, National Bureau of Economic Research, Cambridge, MA, *www.nber.org/papers/w15156*.

Loewenstein, G. and D. Adler (1995), "A bias in the prediction of tastes", *The Economic Journal*, 105(431), pp. 929-937.

Luechinger, S. (2009), "Valuing air quality using the life satisfaction approach", *Economic Journal,* Vol. 119(536), pp. 482-515.

Kahneman, D. (1986), "Comments", in Cummings, R., D. Brookshire, and W. Schulze (eds.), (1986) *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method*, Rowman and Allenheld, Totowa.

Kahneman, D. and A.B. Krueger (2006), "Developments in the measurement of subjective well-being", *Journal of Economic Perspectives*, Vol. 20, pp. 3-24, *http://dx.doi.org/10.1257/089533006776526030*.

Kahneman, D., P.P. Wakker and R. Sarin (1997), "Back to Bentham? Explorations of experienced utility", *Quarterly Journal of Economics*, Vol. 112, pp. 375-405.

Kahneman, D. and R. Sugden (2005), "Experienced Utility as a standard of policy evaluation", *Environmental and Resource Economics*, Vol. 32, pp. 161-181, *http://dx.doi.org/10.1007/s10640-005-6032-4*.

Kahneman, D., E. Dienerand and N. Schwarz (1999), *Well-being: The foundation of hedonic psychology*, Russell Sage Foundation, New York.

Kaplan, R. (2001), "The Nature of the View from Home: Psychological Benefits", *Environment and Behavior*, Vol. 33(4), pp. 507-542.

Kapteyn, A. et al. (2011), "Anchoring vignettes and response consistency", *SSRN Scholarly Paper No. ID 1799563*, Social Science Research Network, Rochester, *www.rand.org/content/dam/rand/pubs/working_papers/2011/RAND_WR840.pdf*.

Kimball, M. and R. Willis (2006), "Happiness and Utility", paper presented at the Macroeconomics and Individual Decision Making (Behavioural Macroeconomics) Conference, 4 November 2016, Yale University, *www.econ.yale.edu/ shiller/behmacro/2006-11/kimball-willis.pdf*.

King, G. et al. (2004), "Enhancing the validity and cross-cultural comparability of measurement in survey research", *The American Political Science Review,* Vol. 98(1), pp. 191-207, *https://doi.org/10.1017/S000305540400108X*.

Kullenberg, C. and G. Nelhans (2015), "The happiness turn? Mapping the emergence of "happiness studies" using cited references", *Scientometrics*, Vol. 103(2), pp. 615-630, *http://dx.doi.org/10.1007/s11192-015-1536-3*.

Lau, H.P.B., M.P. White and S. Schnall (2013), "Quantifying the Value of Emotions Using a Willingness to Pay Approach", *Journal of Happiness Studies*, Vol. 14, pp. 1543-1561, *http://dx.doi.org/10.1007/s10902-012-9394-7*.

Loewenstein, G. and P.A. Ubel (2008), "Hedonic adaptation and the role of decision and experience utility in public policy", *Journal of Public Economics*, Special Issue: Happiness and Public Economics, Vol. 92, pp. 1795-1810, *http://dx.doi.org/10.1016/j.jpubeco.2007.12.011*.

Loewenstein, G. and J.S. Lerner (2003), "The role of affect in decision making", in Davidson, R.J., K.R. Scherer and H.H. Goldsmith (eds.) (2003), *Handbook of Affective Sciences*, Oxford University Press, Oxford.

MacKerron, G. (2012), "Happiness economics from 35 000 feet", *Journal of Economic Surveys*, Vol. 26(4), pp. 705-735, *http://dx.doi.org/10.1111/j.1467-6419.2010.00672.x*.

MacKerron, G. and S. Mourato (2009), "Life satisfaction and air quality in London", *Ecological Economics*, Vol. 68, pp. 1441-1453, *http://dx.doi.org/10.1016/j.ecolecon.2008.10.004*.

MacKerron, G. and S. Mourato (2013), "Happiness is greater in natural environments", *Global Environmental Change*, Vol. 23(5), pp. 992-1000, *http://dx.doi.org/10.1016/j.gloenvcha.2013.03.010*.

Mackie, C. and C. Smith, (2015), "Conceptualizing subjective well-being and its many dimensions – implications for data collection in official statistics and for policy relevance", *Statistics in Transition*, Vol. 16(3), pp. 335-372.

Milner-Gulland, E.J. et al. (2014), "Accounting for the impact of conservation on human well-being", *Conservation Biology*, Vol. 28(5), pp. 1160-1166, *http://dx.doi.org/10.1111/cobi.12277*.

Mitchell, R.C. and R.T. Carson (1989), *Using Surveys to Value Public Goods: The Contingent Valuation Method*, Resources for the Future, Washington, DC.

Mourato, S. et al. (2010), *Economic Analysis of Cultural Services*, Background Report to the UK NEA Economic Analysis Report, UNEP-WCMC, Cambridge, *http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=xAcO6D5e0UI%3D&tabid=82*.

NEA (UK National Ecosystem Assessment), (2011), *National Ecosystem Assessment Technical Report*, UK National Ecosystem Assessment, UNEP-WCMC, Cambridge, *http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx*.

OECD (2013), *OECD Guidelines on Measuring Subjective Well-being*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264191655-en*.

OECD (2011), *How's life? Measuring well-being, OECD Publishing*, Paris, *http://dx.doi.org/10.1787/9789264121164-en*.

Peasgood, T. (2008), Measuring Well-Being for Public Policy, *PhD thesis*, Imperial College London, London.

Plott, C.R. (1996), "Rational individual behavior in markets and social choice processes: The discovered preference hypothesis", in Arrow, K. et al. (eds.) (1996), *Rational Foundations of Economic Behavior*, Macmillan, London.

Powdthavee, N. (2008), "Putting a price tag on friends, relatives, and neighbours: Using surveys of life satisfaction to value social relationships", *Journal of Socio-Economics*, Vol. 37, pp. 1459-1480, *https://doi.org/10.1016/j.socec.2007.04.004*.

Powdthavee, N. and B. van den Berg (2011), "Putting different price tags on the same health condition: Re-evaluating the well-being valuation approach", *Journal of Health Economics*, Vol. 30 (5), pp. 1032-1043, *https://doi.org/10.1016/j.jhealeco.2011.06.001*.

Pretty, J. et al. (2011), *Chapter 23: Health Values from Ecosystems*, National Ecosystem Assessment. Final Report to United Nations Environment Programme (UNEP)/World Conservation Monitoring Centre (WCMC), *www.cbd.int/financial/values/unitedkingdom-health.pdf*.

Read, D. and B. van Leeuwen (1998), "Predicting hunger: The effects of appetite and delay on choice". *Organizational Behavior and Human Decision Processes*, 76(2), pp. 189-205.

Rehdanz, K. (2007), "Species diversity and human well-being: A spatial econometric approach," *Working paper FNU-151*, Hamburg University and Centre for Marine and Atmospheric Science, Hamburg, *www.fnu.zmaw.de/fileadmin/fnu-files/publication/working-papers/FNU151.pdf*.

Rehdanz, K. and D. Maddison (2005), "Climate and happiness", *Ecological Economics*, Vol. 52, pp. 111-125, *http://dx.doi.org/10.1016/j.ecolecon.2004.06.015*.

Rehdanz, K. and D. Maddison (2008), "Local environmental quality and life-satisfaction in Germany", *Ecological Economics* 64: pp. 787-797.

Ryan, R.M. and L.E. Deci (2001), "On happiness and human potentials: A review of research on hedonic and eudaimonic well-being", in Fiske, S. (ed.), *Annual Review of Psychology*, 52, Annual Reviews Inc., Palo Alto, *https://doi.org/10.1146/annurev.psych.52.1.141*.

Schkade, D.A. and D. Kahneman (1998), "Does living in California make people happy? A focusing illusion in judgments of life satisfaction", *Psychological Science*, Vol. 9, pp. 340-346.

Seligman, M. (2011), *Flourish: A new understanding of happiness and well-being and how to achieve them*, Nicholas Brealey Publishing, London.

Skianis, V. (2012), *The influence of nature on secondary school students' subjective well-being in England and Greece*, PhD Thesis, London School of Economics and Political Science, London, *http://etheses.lse.ac.uk/753/1/Scalvini_Muslims_embrace_value.pdf*.

Stone, A. and C. Mackie (eds.) (2013), *Measuring Happiness, Suffering, and Other Dimensions of Experience*, National Academy of Sciences, Washington, DC, *www.nap.edu/read/18548/chapter/1*.

Stutzer, A., and B.S. Frey (2010), "Recent Advances in the Economics of Individual Subjective Well-Being", *IZA Discussion Paper* 4850.

Tinkler, L. (2015), "The Office for National Statistics experience of collecting and measuring subjective well-being", *Statistics in Transition*, Vol. 16(3), pp. 373-396.

Trotter, L., J. Vine, M. Leach and D. Fujiwara (2014), "Measuring the Social Impact of Community Investment: A Guide to using the Wellbeing Valuation Approach", HACT.

van den Berg, B. and A. Ferrer-i-Carbonell (2007), "Monetary Valuation of Informal Care: The Well-Being Valuation Method", *Health Economics* 16: pp. 1227-44.

van Praag, B.M.S. and B.E. Baarsma (2005), "Using happiness surveys to value intangibles: The case of airport noise", *Economic Journal*, Vol. 115, pp. 224-246, *http://dx.doi.org/10.1111/j.1468-0297.2004.00967.x*.

Vemuri, W.A. and R. Constanza (2006), "The role of human, social, built, and natural capital in explaining life satisfaction at the country level: Toward a National Well-being Index (NWI)", *Ecological Economics,* Vol. 58 (1), pp. 119-133, *http://dx.doi.org/10.1016/j.ecolecon.2005.02.008*.

Waterman, A.S. (1993), "Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia), and hedonic enjoyment", *Journal of Personality and Social Psychology*, Vol. 64(4), pp. 678-691.

Watson, D., L.A. Clark and A. Tellegen (1988), "Development and validation of brief measures of positive and negative affect: The PANAS scales", *Journal of Psychology*, Vol. 54(6), pp. 1063-1070.

Weinhold, D. (2013), "The Happiness Reducing Costs of Noise Pollution", *Journal of Regional Science,* Vol. 53(2), pp. 292-303, *http://dx.doi.org/10.1111/jors.12001*.

Welsch, H. (2009), "Implications of happiness research for environmental economics", *Ecological Economics*, Vol. 68, pp. 2735-2742, *http://dx.doi.org/10.1016/j.ecolecon.2009.06.003*.

Welsch, H. (2008), "The welfare costs of corruption", *Applied Economics*, Vol. 40, pp. 1839-1849, *http://dx.doi.org/10.1080/00036840600905225*.

Welsch, H. (2007), "Environmental welfare analysis: A life satisfaction approach", *Ecological Economics*, Vol. 62, pp. 544-551, *http://dx.doi.org/10.1016/j.ecolecon.2006.07.017*.

Welsch, H. (2006), "Environment and happiness: Valuation of air pollution using life satisfaction data", *Ecological Economics*, Vol. 58, pp. 801-813, *http://dx.doi.org/10.1016/j.ecolecon.2005.09.006*.

Welsch, H. (2002), "Preferences over prosperity and pollution: Environmental valuation based on happiness surveys", *Kyklos*, Vol. 55, pp. 473-494, *http://dx.doi.org/10.1111/1467-6435.00198*.

Welsch, H. and J. Kuhling (2009), "Using happiness data for environmental valuation: Issues and applications", *Journal of Economic Surveys*, Vol. 23(2), pp. 385-406, *http://dx.doi.org/10.1111/j.1467-6419.2008.00566.x*.

Wilson, T.D. and D.T. Gilber (2003), "Affective forecasting", *Advances in Experimental Social Psychology*, 35, pp. 345-411.

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