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UTILITY AND HAPPINESS

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ABSTRACT

Psychologists have developed effective survey methods of measuring how happy people feel at a given time. The relationship between how happy a person feels and utility is an unresolved question. Existing work in Economics either ignores happiness data or assumes that felt happiness is more or less the same thing as flow utility. The approach we propose in this paper steers a middle course between the two polar views that "happiness is irrelevant to Economics" and the view that "happiness is a sufficient statistic for utility."

We argue that felt happiness is not the same thing as flow utility, but that it does have a systematic relationship to utility. In particular, we propose that happiness is the sum of two components: (1) elation–or short-run happiness–which depends on recent news about lifetime utility and (2) baseline mood–or long-run happiness–which is a subutility function much like health, entertainment, or nutrition. In principle, all of the usual techniques of price theory apply to baseline mood, but the application of those techniques is complicated by the fact that many people may not know the true household production function for baseline mood.

If this theory is on target, there are two reasons data on felt happiness is important for Economics. First, short-run happiness in response to news can give important information about preferences. Second, long-run happiness is important for economic welfare in the same way as other higher-order goods such as health, entertainment, or nutrition.

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1. Introduction

On first impression, *"utility"* and *"happiness"* seem to refer to the same concept. However, over the last century, economists and psychologists respectively have developed technical meanings for the words *"utility"* and *"happiness"* that refer to logically distinct concepts.

The success of the Ordinalist Revolution of Lionel Robbins (1932) and of John Hicks and R. G. D. Allen (1934)—codified as "Revealed Preference" by Paul Samuelson (1938, 1947)[2]—has fixed the meaning of "*utility*" for more than a half-century of economists as a representation of an individual's preferences over alternatives. The practice of Economics has made this concept of utility immensely valuable in thousands of applications.

In the aftermath of the Cognitive Revolution, the success of Hedonic Psychology—exemplified in the volume edited by Daniel Kahneman, Ed Diener and Norbert Schwarz (1999)—has fixed the scientific meaning of "*happiness*" within Psychology as the overall goodness or badness of an individual's felt experience at any point in time. To be more explicit, operationally, psychologists define current happiness as how people answer questions such as "*On a scale from one to seven, where one is extremely unhappy and seven is extremely happy, how do you feel right now?*" This concept of happiness has attracted increasing interest among economists in recent years.

Throughout this paper, we follow the convention that the technical meaning of *"utility"* is determined by the tradition in Economics, while the technical meaning of *"happiness"* is determined by the tradition in Hedonic Psychology. Thus, *utility* is a reflection of people's choices; *happiness* is a reflection of people's feelings. Once one recognizes these two concepts as distinct, *discovering the nature of the empirical relationship between utility and happiness* stands out in sharp relief as one of the central questions at the frontier between Economics and Psychology.

In the existing literature attempting to link utility and happiness, the dominant explicit or implicit hypothesis is that current felt happiness is equal to flow utility.[3] We argue that the hypothesis that felt happiness equals flow utility is empirically untenable. Instead, to oversimplify our discussion below, we argue, in effect, that a large component of happiness is much more like the recent *change* or *innovation* in lifetime utility than it is like flow utility.

Of course, even unchanging, predictable circumstances can have an effect on happiness, so it is important to allow for another, longer-lasting component of happiness. We argue that this long-run component of happiness is not always aligned with utility, since people often knowingly and without regret make decisions that sacrifice a pleasant mental state day after day for the sake of some other goal.

Thus, in our view, happiness is the sum of a transitory response to good and bad news and a long-run response of mood to circumstances that is distinct from utility. To be specific, we

[2] For more of the history of these developments, see also George Stigler (1950).
[3] Kahneman (1999), Gruber and Mullainathan (2002), Frey and Stutzer (2004b), and Layard (2005) are some of the most explicit in equating happiness and flow utility.

propose that happiness is the sum of two components: (1) *elation*--or short-run happiness--which depends on recent news about lifetime utility and (2) *baseline mood*--or long-run happiness. Baseline mood is a subutility function—or output of a household production function—much like health, entertainment, or nutrition. In other words, long-run happiness is a "valuable commodity," that cannot be purchased directly, though inputs to it can be.

Such a theory of happiness not only makes sense of existing happiness data, but provides a road map for future research. According to this theory, data on felt happiness can make two contributions to Economics. First, short-run happiness in response to news can give important information about preferences. Second, long-run happiness is important for economic welfare in the same way as other higher-order goods such as health, entertainment, or nutrition. Policy issues surrounding long-run happiness arise because of the value of producing and disseminating knowledge about the household production function for happiness and from any externalities in the causes or effects of long-run happiness.

Desmond Morris, at the outset of his wonderful little book *The Nature of Happiness,* writes:

> "The true nature of happiness is frequently misunderstood. It is often confused with contentment, satisfaction or peace of mind. The best way to explain the difference is to describe contentment as the mood when life is good, while happiness is the sensation we experience when life suddenly gets better. At the very moment when something wonderful happens to us, there is a surge of emotion, a sensation of intense pleasure, an explosion of sheer delight—and this is the moment when we are truly happy. Sadly, it does not last very long. Intense happiness is a transient, fleeting sensation. We may continue to feel good for quite a while, but the joyful elation is quickly lost."

Morris's description of "happiness" emphasizes what we call *elation*—the word Morris also uses to describe this type of happiness. The "contentment" he refers to is close to our concept of *baseline mood*, which unlike Morris, we also consider a fully legitimate component of happiness, since both the contentment when life is good and the joy when life gets better are likely to affect measured subjective well-being.

A word is in order about the length of this paper. We have learned from experience in talking to colleagues and others that because of the widely varying preconceptions almost everyone has on the subject of happiness, the perspective we propose on happiness is easy to misunderstand. Therefore, we make an effort to lay out the issues very carefully. Moreover, as we discuss below, there is an existing consensus among most psychologists and economists who are involved in studying happiness with which we disagree. It is incumbent upon us to make clear exactly why we disagree with the existing consensus, which requires a reexamination of all of the key types of evidence that are used to back up that consensus.

The remainder of the paper can be divided into two halves. The first half, Sections 2-5, is conceptual. In it we make the case for utility and happiness as logically and empirically distinct concepts. The second half, Sections 6-10, is mathematical. In it we lay out a specific model of the relationship between utility and happiness, along with interpretations, extensions and applications.

2. Distinguishing Between Utility and Happiness

A. The Need to Establish Clear Terminology. One of the difficulties we face in explaining our viewpoint is that the tradition of equating "happiness" to flow utility runs deep in the history of economic thought. Indeed, Jeremy Bentham's (1781) first definition of 'utility' made the equation of utility and happiness explicit:

> "By the principle of utility is meant that principle which approves or disapproves of every action whatsoever according to the tendency it appears to have to augment or diminish the happiness of the party whose interest is in question …."

The "Revealed Preference" definition of utility—to which we resolutely adhere—is closer to Bentham's second, more inclusive, definition of utility, in the immediately following paragraph:

> "By utility is meant that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness, (all this in the present case comes to the same thing) or (what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered: if that party be the community in general, then the happiness of the community: if a particular individual, then the happiness of that individual."

Another difficulty we face in distinguishing utility and happiness is that, while "Revealed Preference" guides economic research, a more naïve Marginalism has remained very common in economic teaching. For example, "Principles of Economics" courses often teach about diminishing marginal utility by engaging students' intuitions about how happy they would feel in consuming different consumption bundles.

Let us state clearly that, throughout this paper, when we discuss utility, we do so from the perspective of Paretian Welfare Economics. Whether explicitly or implicitly, welfare questions motivate a large share of economic research; an orientation toward welfare questions is particularly important in informing our assessment of utility in cases where people are liable to mistakes. As for the focus on Pareto optimality, in our view, the use of happiness data is *not* a Philosopher's Stone that magically solves the difficulties in comparing utility interpersonally, but happiness data—used judiciously—can give useful information about individual preferences.[4]

Any adequate theory of utility and happiness must explain why the meanings of happiness and utility seem so similar. The right nuances for explaining the semantic relationship between "happiness" and "utility" can be found in the first two definitions for "happy" in the *American Heritage Dictionary* (1976, Houghton Mifflin):

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[4] One can then make the leap from individual preferences to statements about social welfare on more or less the same terms as one could in the absence of happiness data. To the extent that happiness data give the illusion of providing a cardinal utility function, it is an illusion similar to that provided by expected utility theory—where one may sometimes need to be reminded that a monotonic transformation $f(E(U))$ of the *overall* objective function $E(U)$ leaves preferences unaltered. Just as there is no *necessary* reason why the curvature of U in the expected utility representation $E(U)$ tells us how to aggregate preferences interpersonally, there is no *necessary* reason why whatever structure is revealed in preferences *as they relate to happiness data* tells how preferences must be aggregated. At a minimum, any debate about what happiness says about social welfare must take into account the existing literature on social welfare and social choice theory.

happy … 1. Characterized by luck or good fortune; prosperous. 2. Having or demonstrating pleasure or satisfaction; gratified.''

The second definition is the meaning of "happy" in Psychology. The first definition talks about prosperity, which seems closely linked to utility, but there is a hint of a stochastic element in the nature of happiness: "luck or good fortune." Our view of happiness emphasizes *recent* good luck by positing that an important component of happiness has to do with an individual's reaction to recent news about lifetime utility. Although the differences are important, news about lifetime utility and lifetime utility itself are linked tightly enough that it is not surprising to find a certain confusion between the two in the structure of the lay lexicon. In other words, if people feel happy whenever they receive good news about lifetime utility, it is not hard to see why they would sometimes use the word "happiness" to describe lifetime utility itself. Yet scientifically, we consider it crucial to have two distinct, clearly delineated concepts for revealed preference utility and happiness in the psychological sense of current feelings. Maintaining two distinct concepts—on an equal footing—in a situation where each has a certain tendency to subordinate or engulf the other, is one of the main contributions of this paper.

One way to think about the distinction between utility and happiness is that one's commitment to an Ordinalist, "revealed preference" definition of utility is confronted with an acid test when confronted with happiness data. There is a sense in which the most radical implications of the Ordinalist Revolution are apparent only in the light of data on experienced happiness.

Both felt happiness and choice-based utility are well-defined, observable concepts. Our aim is to determine the dynamic relationship between the standard psychological concept of current affect—felt happiness—and the standard economic concept of lifetime utility. Establishing *any systematic relationship* between happiness and utility would provide an important bridge between Psychology and Economics, allow psychological data and theory to be used in Economics in a way that is complementary to standard economic data and theory, and enable economists to bring to bear all the tools of economic theory toward understanding happiness.

B. Distinguishing Between Utility and Happiness as a Matter of Logic. In Psychology, the term "*subjective well-being*" refers to a multidimensional concept that includes evaluations of one's life-as-a-whole and of specific life-domains as well as the pleasantness of one's average experienced affect. Though the terminology has not been entirely standardized in the literature, *affect* is a useful term to refer to how happy a respondent currently feels, as opposed to judgments about his or her whole life. An attractive feature of affect measures is that the cognitive burden they place on respondents is modest in contrast to the extremely difficult cognitive task of forming a judgment about the quality of one's entire life. Throughout this paper, we use "current affect" and "happiness" interchangeably.

Economists have been slower than psychologists to focus on subjective well-being data. But a growing economic literature has made use of subjective well-being data. Richard Layard's (2005) book gives a good introduction to this literature and Bruno Frey and Alois Stutzer (2002)

give a partial survey.[5] This literature lays out many provocative findings, but with a few exceptions, the focus of this literature has been on the cross-sectional and trend properties of subjective well-being rather than on its detailed dynamic properties. Two key motivations for the use of subjective well-being data in Economics (shared in large measure by Hedonic Psychology itself) have been (i) the desire to study the welfare implications of non-traded goods[6] (something that is especially important for older people for whom market work is a less dominant part of their lives) and (ii) the desire to study welfare implications in contexts where preferences are potentially inconsistent and to diagnose optimization mistakes.[7]

Despite this growing literature, many economists are still very skeptical of the use of subjective well-being data,[8] in large part because the theoretical status of affect--"happiness"—within economic theory is unclear. A simple multiple-choice question illustrates this lack of clarity:

What is Happiness?

a. Flow utility?
b. The individual's overall objective function?
c. The part of the individual's objective function that abstracts from the desire to do one's duty?
d. The individual's objective function plus pleasure from memory?
e. None of the above?

To begin to answer this kind of question, it is important first to distinguish utility and happiness as a matter of logic. Then the relationship between utility and happiness will ultimately be an empirical matter. Using the shorthand "lifetime utility" to refer to an individual's overall objective function—*including things the individual cares about that occur after his or her death*—we can distinguish lifetime utility and current affect ("happiness") as follows:

- **Lifetime Utility** = The extent to which people get what they want, where what they want is indicated by their *choices*.
- **Current Affect** = How positive people's *feelings* are at a given time.

In thinking about lifetime utility, it is important to remember that people's choices clearly show that they value a wide range of goods that are not traded in markets or only partially traded in markets. Thus, the economic concept of lifetime utility is not limited to what are sometimes called "economic goods" but includes the value an individual places on *non-traded goods* such as respect, freedom, clean air, a vibrant community, being married to a particular person, and such *partially-traded goods* as time allocations--which are partially traded because people are paid for work time---and health and longevity--which are partially traded because people pay for health care.

C. Utility and Happiness as Empirically Distinct Candidates for a Welfare Measure. Lifetime utility is the standard welfare measure in economics at the individual level. It is often

[5] Some of the recent empirical papers in economics using happiness data are John Helliwell (2002), David Blanchflower and Andrew Oswald (2004), Clark (1999), Rafael Di Tella, Alberto Alesino and Robert MacCulloch (2004), Di Tella and MacCulloch (1999), Di Tella, MacCulloch and Oswald (2001, 2003), and Wolfers (2003).
[6] See for example Frey, Simon Luechinger and Stutzer (2004) and Frey and Stutzer (2000, 2004a).
[7] See for example, Jonathan Gruber and Sendhil Mullainathan (2002) and Frey and Stutzer (2004b).
[8] See, for example, Daniel Hamermesh (forthcoming).

thought of as a discounted sum over time of "flow utility." As a counterpoint to this, Kahneman (1999), in a chapter that has been influential among psychologists who study well-being, has urged a discounted sum over time of affect (momentary experienced happiness) as the appropriate measure of overall individual welfare.[9] A *prima facie* case can be made for each of these views. Both subjective well-being and utility are based on trusting an individual's own judgment, but different judgments are trusted in each case: as a welfare measure, lifetime utility puts trust in an individual's (conscious and subconscious) judgments as reflected in choices, while the discounted sum of affect puts trust in an individual's (largely subconscious) judgments as expressed in feelings.

It would be very convenient if flow utility and affect were essentially equivalent; in that case the standard economic measure of individual welfare would match Kahneman's (1999) proposed measure of individual welfare. Unfortunately, things are not so easy. In brief, as we discuss below, affect seems to behave very differently from at least our traditional notions of the behavior of flow utility:

- The Easterlin Paradox: Flow utility trends upward while affect has no strong trend.
- Hedonic Adaptation: Flow utility is usually thought to respond permanently to permanent shocks, while affect seems to be very strongly mean-reverting.

Clearly, one could attempt to modify either one's ideas about utility or the mode of measuring happiness to try to bring flow utility and affect closer together. We argue that it is better to accept *utility* as determined by standard, best-practice economic methods of measurement, and *affect* as determined by standard, best-practice psychological methods of measurement, then pose as an *open-ended question* the nature of the *relationship* between these two concepts. We make a specific proposal for what this relationship might be, but we consider the question—thus posed— more important than our attempt at an answer.

3. Measuring Happiness

The logical distinction between happiness and utility becomes clearer the more closely one pays attention to the way each concept is measured. In this section we argue that psychologists can reliably measure happiness, in the carefully defined sense of how people feel at a given time. Of course, that leaves the question of what happiness *is*.

To say the same thing in a different way, some economists think happiness can't be measured well. *This is just not true.* Happiness (current affect) is one of the easiest of all subjective concepts to measure. What *is* true (that these economists are intuiting) is that once happiness is measured, we don't know what it means in terms of economic theory.

Psychologists have taken measurement issues in assessing emotions in general, and happiness in particular, very seriously. Randy Larsen and Barbara Fredrickson (1999) give a survey of research touching on this issue. Self-report measures of happiness and sadness (the most common type of measure) have been related to impressionistic observer ratings of happiness,

[9] Kahneman calls momentary affect "instant utility," but here, to avoid confusion, it is best to reserve the term "utility" for the concept of overall individual welfare in Economics.

highly-structured coding of facial expressions by trained observers, assessment of voice tone, electromyographic measurement of face muscle activation, measurement of skin conductance, heart-rate, blood pressure and respiration, electro-enchephalograms, positron emission tomography and functional magnetic resonance imaging of brain activity (where "…approach related positive emotions are associated with left anterior activation whereas withdrawal related negative emotions are associated with right anterior activation" Larsen and Fredrickson (1999), p. 53.) Self-report measures of happiness and sadness have also been shown to predict many types of cognition and behavior in the laboratory, including writing speed and performance speed on other tasks, judgments of probabilities, the output of free word association and word completion under time pressure, speed of judging positive and negative words versus nonwords, and the speed of the startle reflex after a loud sound. All of these experiments add up to consistent evidence that happiness is a measurable psychological state.[10]

Among self-report measures of happiness, the gold standard is experience sampling, in which people are signaled at random intervals to report their current happiness. Kahneman, Alan Krueger, David Schkade, Schwarz, and Arthur Stone (2004) argue that the day reconstruction method is a close second. Measuring happiness as part of a large-scale survey presents an extra issue in that the survey itself may represent a significant slice of a day. To avoid too much emphasis on the feeling states engendered by the interview process itself one can ask about happiness over a longer, but still relatively short span of time.[11] The Health and Retirement Study measures affect by the following series of questions:

> *"Now think about the past week and the feelings you have experienced. Please tell me if each of the following was true for you much of the time this past week:* [12]
>
> *a. Much of the time during the past week, you felt you were happy. (Would you say yes or no?)*
> *b. (Much of the time during the past week,) you felt sad. (Would you say yes or no?)*
> *c. (Much of the time during the past week,) you enjoyed life. (Would you say yes or no?)*
> *d. (Much of the time during the past week,) you felt depressed. (Would you say yes or no?)"*

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[10] In general, self-report measures of emotions can be affected by social desirability and the semantic framing effects that arise cross-culturally, and lack of conscious awareness of emotions. For the most part, social desirability and semantic framing effects should be fairly constant over time within a given culture and can be dealt with empirically using fixed effects. The likelihood that people might lack conscious awareness of emotions is a subject of debate within Psychology. Some psychologists insist on conscious awareness as part of the definition of an emotion. (Larsen and Fredrickson, 1999 reports that "some would question whether an unperceived emotion is an emotion at all.") But even Tim Wilson (2002), in a book-length argument for the possibility of unconscious feelings, points out that "feelings differ from the rest of the adaptive unconscious in their potential to reach awareness" and allows that "It might even be the case that the default is for feelings to emerge into awareness, and that it takes special circumstances to prevent them from doing so." (See Wilson, 2002, p. 134.) It seems likely that the overall positive or negative aspect of feelings that we are focusing on under the label of "happiness" makes it into consciousness more reliably than the detailed reasons behind feelings or finer categorizations of emotions. Wilson (2002) goes on to discuss repression, inattention and "the obscuring of feelings by the smoke screen of people's conscious theories and confabulations." Repression and inattention seem unlikely to cause serious problems for the survey measurement of happiness. However, "the smoke screen of people's conscious theories" about happiness is a serious issue, which we address below.

[11] Michael Robinson and Gerald Clore (2002, p. 950) looked at evidence on happiness reports with different time frames. Their evidence led them to conclude that a few week's time is the longest interval for which one can get happiness reports that are not contaminated in an important way by people's theories of how they "should" feel.

[12] In the first wave respondents were instead asked "*Please tell me how often you have experienced the following feelings during the past week: all or almost all of the time, most of the time, some of the time or none or almost none of the time.*"

Operationally, one can treat happiness as the latent variable behind these four yes/no questions. This series of questions on the Health and Retirement Study is a subset of the Center for Epidemiologic Studies Depression (CES-D) measure of depressive symptoms.[13] These questions illustrate what we mean when we say that the concept of happiness we are referring to is about current feelings. These questions ask about easily accessible feelings and memories of feelings in the past week. One indication of how readily respondents answer these questions is that the average amount of survey time required for all four questions put together is less than 35 seconds.

It is important to contrast current affect measures like those on the HRS with life satisfaction measures, such as those on the German Socioeconomic Panel—*"On a scale from 1 to 10, how satisfied are you with your life?"*—and "global happiness" questions, such as those on the World Values Survey:

"Taking all things together, would you say you are
1. *Very happy*
2. *Quite happy*
3. *Not very happy*
4. *Not at all happy*
9. *Don't Know [DO NOT READ OUT]"*

An extensive body of psychological research explores the cognitive processes underlying global judgments of happiness and life-satisfaction (for a review and process model see Schwarz and Strack, 1999). It converges on the following conclusions[14]:

1. Reported life-satisfaction does not reflect stable inner states of respondents. Instead, these judgments are formed on the spot and depend on which aspects of life happen to come to mind at the time of judgment, which gives rise to pronounced context effects. For example, when students are asked to report their overall life-satisfaction and their dating frequency, both correlate r = .1 when the life-satisfaction question is answered first, but r = .7 when the dating frequency question precedes the life-satisfaction question, thus bringing the domain of dating to mind (Strack, Martin, and Schwarz, 1988).
2. The use of comparison standards is similarly context dependent. People can evaluate their current lives relative to their expectations, their past situation, the situation of others, and so on, resulting in profoundly different judgments. For example, the mere presence of a handicapped other in the room is sufficient to increase global life-satisfaction (Strack, Schwarz, Chassein, Kern, and Wagner, 1990) and one's current life looks good or bad depending on which aspect of one's past was brought to mind (Strack, Schwarz, and Gschneidinger, 1985).
3. People can simplify the complex task of evaluating their life-as-a-whole by drawing on their current feelings as an indicator of their overall well-being. For example, survey respondents report higher life-satisfaction when called on sunny rather than rainy days—unless a preceding question about the weather makes them aware that their current mood may not provide diagnostic information about the overall conditions of their lives (Schwarz and Clore, 1983).[15]

[13] See Steffick (2000) for a detailed description and assessment of the CES-D questions in the HRS. Besides omitting the other less relevant questions, we have reversed the order of the first two questions even after those omissions in order to give the version of the question that we would recommend for use on other surveys that do not have a more extensive CES-D battery of questions.

[14] We are particularly grateful to Norbert Schwarz for this summary of the psychological research on different subjective well-being measures.

[15] The relationship of such context-dependence to decision-making is an important research question. For example, Hirshleifer and Shumway (2003) indicates that sunny days have a detectable effect on stock-market trading.

This context-dependence of evaluative measures of well-being attenuates any meaningful relationship with objective circumstances of life and motivates approaches to the measurement of well-being based on people's momentary affective experience.

In comparison to global evaluations of one's life-as-a-whole, assessments of current affect pose more reasonable cognitive demands. As noted in point 3 above, experimental evidence suggests that survey responses to questions about overall life satisfaction or about global happiness with life rely heavily on the readily accessible internal information a respondent has about current affect (Schwarz and Clore, 1983).[16] Thus, how a respondent feels *right now* has a strong effect on answers to overall life-satisfaction and global happiness questions, whether we like it or not. We maintain that it is clearer to focus on current happiness directly, so that we know what we are getting, in a transparent way. Finally, to the extent that respondents are not using current affect as a shortcut to make an overall evaluation of life satisfaction or global happiness, there is a serious danger that they will report how happy or satisfied they think they *should* feel about their lives according to whatever folk theories they have about happiness and satisfaction.[17]

4. Measuring Utility

For economists, a discussion of measuring utility is only a reminder. Utility is defined by revealed preference—the information gleaned from the choices people make. Some of the accumulated wisdom from economic research is encoded in standard functional forms that are repeatedly applied and tested. The techniques of revealed preference can be applied to tradeoffs over seemingly incommensurable values, and apply even to situations involving choices over time.

For non-economists, one can say that the concept of utility relies on an individual's judgment of his or her priorities, as reflected especially in his or her actual choices when faced with a tradeoff, or, at a minimum, his or her choices in a hypothetical situation. Higher utility out of any two choices is defined by what the individual chooses (or would choose) when presented with those two choices. Thus, utility is a measure of the extent to which people get what they want, and differences in utility are predictors of behavior. This allows a deep connection between positive (descriptive) and normative (prescriptive) aspects of utility theory in Economics.

A. The Upward Trend in Utility. In view of the Easterlin (1974, 1995, 2003) Paradox of secularly nontrending happiness, an important application of the principle of revealed preference is to a hypothetical choice between the comprehensive consumption bundle (including all externalities, public goods and time use patterns) now and the comprehensive consumption bundle fifty years ago in the U.S. Real per capita income has grown dramatically over that

[16] See also Schwarz (1996, 1999) and Schwarz and Bohner (2001).

[17] For example, consider the fact reported by Lucas, Clark, Georgellis and Diener (2004), that life satisfaction is permanently dragged down by an episode of unemployment. Even if the affective sting of past unemployment has long since faded away, asking for an overall evaluation of life satisfaction invites the respondent to evaluate the past as well as the present. It is not surprising that a past episode of unemployment permanently affects one's assessment of one's autobiography.

period of time, which means that the total set of marketed consumption bundles that people can choose from has expanded. Higher real per capita income allows people more choices, out of which they typically elect to spend in ways they could not previously afford--rejecting the available option of continuing to spend in the same way they did at the lower income level. Average work hours have trended slightly downward. Moreover, as Easterbrook (2003) points out, a large set of goods not traded or only partially traded in the market have either stayed about the same or improved over the last fifty years. Among partially-traded goods, medical care and longevity have been improving dramatically, while household conveniences have reduced the time necessary for housework and increased the time available for genuine leisure even for many who do spend longer hours in market work. Equality between the sexes and races, while far from complete, is much better than two generations ago; the number of democratic nations is on the rise; and even the War on Terror, which at worst could involve the nuclear destruction of a large portion of Manhattan, is an improvement over the Cold War, which at worst could have destroyed human life from the face of the earth. Finally, many of the non-traded goods that worsened for a while after 1955, such as rates of crime, teenage pregnancy and drug abuse, have turned the corner and begun trending in a favorable direction for the last two decades. In short, although many problems remain, and are the focus of nightly news reports, we argue that it would be a bad deal to trade the problems we face today for the problems of yesteryear, implying that utility is higher than fifty years ago.

Of course there are those who look back at the past with nostalgia. In part, the increasing individual freedom that comes with higher per capita income may have some undesirable side effects such as a diminished sense of community, of the sort Robert Putnam (2000) describes in his book *Bowling Alone: The Collapse and Revival of American Community*. (Trends in the divorce rate and other aspects of family structure can be seen as part of the same phenomenon.) Similarly, the rise in per capita income may have increased the availability of illegal drugs and access to a wide variety of delicious foods and drinks that create important intra-psychic conflicts. Still, how many would really want to go back to the way it used to be if they saw clearly the way it *really* used to be? It is easy to forget the legitimate and the irrational fears engendered by the Cold War, the toll of racial and other injustices on those mistreated, the enforced conformity that went along with the greater sense of community in the past, and how effective the long-available drug of alcohol is at messing up the lives of those who are prone to intra-psychic conflict. And it is easy to take for granted boons such as word processing, the ability to watch any of a huge range of movies at home, the existence of J. K. Rowling's *Harry Potter* series, and inexpensive access by means of free internet access at the public library to a huge range of fascinating scientific findings that were not known fifty years ago, let alone available at the click of a mouse.

Besides ordinary selective memory that often leads us to forget former difficulties once they have been surmounted, there is another kind of bias that helps to fuel such nostalgia: despite recent trends in historiography toward telling the stories of those at the bottom of the social ladder[18] as well as the stories of common men and women, our image of the past is still often dominated by the biographies of those near the top of the social ladder who were much better off

[18] Our choice of the "social ladder" metaphor is influenced by the form of a question on the HRS leave-behind survey asking people to mark their perceived social rank on a printed ladder, pioneered by Michael Marmot's Whitehall II studies of British civil servants. (See Marmot, 2004.)

than the average person in their time. Even when we assess the past by thinking of the experience of our own grandparents, they are far from a random sample of people in their time. The ancestors of a randomly chosen individual in the present are likely to be people who were more successful than average in number of descendants--and likely to be above average in the degree of success in their life experience more generally.[19] The experience of those who died young in the past or who never found mates is not remembered as well as the experience of those who did. The travails of those in the present who die young or who never find mates is more apparent.[20]

One reason it is important to hold imagined social rank constant when assessing the past versus the present is that most people care a lot about social rank.[21] From the standpoint of revealed preference, it is not difficult to observe people making choices that sacrifice other valuable things in order to attain higher social rank. As a consequence, it is not incredible that someone might choose to be a king or queen in a bygone era rather than a middle-class person today, even if the real value of the market consumption bundle of the middle-class person today is worth much more. Individuals' positional concerns are not irrational. In many domains of life, relative standing is more crucial to obtaining desired outcomes than absolute standing (for discussions see Frank, 1985, 1999; Hirsch, 1976; Sen, 1983). Social rank yields hard-to-measure but real benefits in terms of respect and favorable treatment by others. Because, in practice, social rank is so highly correlated with income, at least in the United States, secular comparisons are useful for distinguishing concern with income from concern with social rank.[22]

The point of this extended discussion is to argue that average lifetime utility for people of a given age is higher than it was fifty years ago, even after accounting for a wide range of tradeoffs going far beyond those that are in obvious monetary terms. Of course, the choice between the comprehensive consumption bundle of fifty years ago and the comprehensive consumption bundle now is a hypothetical choice. But every year millions of people make a choice that is similar in important respects by migrating from a poor home country to the U.S. and other rich countries. Many leave behind tight-knit communities in which they have high local social status for a foreign land where they will be at the bottom of the social status ladder and where they cannot even speak the language. Clearly, in making the enormous effort of migrating, with all the psychic costs of being uprooted from one's familiar cultural surroundings, they are choosing

[19] In the future, this bias could go the other way, since the ratio of family size for high-status parents to family size for low-status parents seems to be falling over time.

[20] Note that, in comparing the past to the present, it is important to abstract from people's preference for the familiar and status-quo bias more generally, which would have worked in favor of the actual experience in the past as much as in the present. A good way to abstract from the attraction of familiar idiosyncratic details of one's life is to imagine a choice between being (a) thrown into the life of a randomly chosen individual in the present and (b) being thrown into the life of a randomly chosen individual in the past. Unfortunately, there is no such helpful device to help in abstracting from the familiarity of one's entire era.

[21] For some direct evidence on the strength of preferences over social rank based on hypothetical choices, see Solnick and Hemenway (1998). For a discussion of social comparison by psychologists, see Sulls and Wills (1991).

[22] There are some instructive instances of social rank diverging from income rank even in the present-day U.S. Clergy and teachers (including professors) often have considerably higher social rank than their income rank. This relatively high social rank is important in making many people willing to sacrifice a significant amount of income to go into these fields.

something that they value highly—the modern consumption bundle in the U.S. and other rich countries.[23]

B. Mistaken Choices. The greatest difficulties in measuring utility arise when people make mistaken choices or have inconsistent preferences.

Garden-variety mistakes based on a lack of knowledge of objective facts are the easiest to deal with. Consider the case of someone who chooses a particular car, thinking that it will get good gas mileage, but then discovers that it gets bad gas mileage. Once she learns this, the purchaser regrets the earlier decision and wishes that she had chosen a different car. In this case, in judging utility one needs to either use the choice the purchaser *would have made* if fully informed, *or* the choice the purchaser did make between ideas of cars with assumed characteristics.

Sometimes a mistake arises not from lack of basic facts, but from a failure of computation. For example, one of the authors has only very recently begun to adjust his book-buying habits for the high shadow-cost of available book-reading time that is generated by the large number of books already in his personal library, by thinking "What are the chances that on any future date this book will win out over all of the competition?" This is the kind of reasoning that does affect one's choices when the calculation has finally been made. Taking Paretian Welfare Economics as our touchstone, we consider it relatively uncontroversial to suggest that utility (strictly speaking, preferences) be measured according to what people would choose when not only well-informed in terms of raw information, but also when they are aware of relevant calculations and lines of reasoning.[24]

A third type of mistake is making mistakes about what one's subjective experience will be after a given choice. There is nothing disruptive of standard economic theory about the existence of experience goods, such as a new flavor of ice cream, for which preferences are known only after trying some of the good. Marketing strategies by firms selling experience goods vary from actively providing a free taste to forcing people to buy a substantial package based on guesswork. When free samples are not provided, it is easy to make mistakes due to not fully knowing one's own tastes, even if the physical properties of the product itself are well-known.

For an expensive durable good, an optimal decision of whether to purchase the good should involve considering the time-path of one's subjective experiences with the good. It is not hard to imagine someone changing her mind about buying an expensive car upon being shown evidence that after a year people report roughly the same experience when driving an expensive car as when driving a much cheaper car—say because driving is one of those activities that becomes reasonably automatic and so fades into the background of awareness—pushed out by thoughts of where one is going to and where one has just been. Indeed, people might not even need formal

[23] Note that, at $9600, the per capita GDP of Mexico—an important source of migration to the U.S.—is not far below the U.S. real per capita GDP in 1955.

[24] There is a practical problem of distinguishing between the force of a calculation or line of reasoning itself and the desire to agree with the person urging that line of reasoning. In principle there are ways to deal with that problem. For example, in presenting a hypothetical choice, it is important to even-handedly present correct calculations and lines of reasoning that favor both the pro and con side of a decision. Also, to minimize social pressure, it may be possible to present calculations and lines of reasoning by a prepared text or an interactive computer setup. Making sure the agent is able to make the decision with as much anonymity as possible may also be helpful.

evidence for things like this; their own past experience of being less excited by a new good after the first few months could inform their later decisions. However, a considerable body of evidence reviewed in George Loewenstein and David Schkade (1999) indicates that people make serious mistakes in predicting future affect. Though it is larger in size and scope, one can view a mistake in predicting future affect as akin to a mistake in predicting whether one will like a particular type of ice cream. It is not clear whether people are making the right decisions or not until they are well-informed about the modification of the time-path of affect that will actually result from a purchase.

Some psychologists have gone further, to maintain that the fact that reported happiness with a new car is often high in the first few months after purchase and much lower thereafter—in a way that people are bad at predicting—*necessarily* means that someone has made a mistake in purchasing it. To our way of thinking, this is going too far. The key question is whether a correct knowledge of the modification of the time-path of affect that will actually be induced by a good would make a material difference to a decision. The issue becomes clearest if we consider the choice of a purchaser who is fully conversant with the Hedonic Psychology literature and carefully observant of the pattern of his or her own affective reactions. As long as the purchaser is aware of and thoughtfully considers the fact that happiness with a new durable is likely to fade after a time (and absent the kind of inconsistency discussed below), it seems appropriate to defer to that well-informed, thoughtful decision in judging utility, regardless of the time-path of subjective experience with the new car. Indeed, there is every reason to think that people care about many attributes of a car other than its price and the subjective experience they will have with it—such as its ability to get reliably to work and back. Even the set of all indirect effects of a purchase on affect (for example, including the reduced likelihood of sorrow from being scolded for getting to work late) should not necessarily be dominant in the decision of whether to make a purchase. The concept of utility (or equally in this context, preferences) involves deferring to each individual's own view of how much to factor in the modification of the time-path of affect that would result from a purchase when making the decision of whether to buy or not to buy. Since the consequences for affect are only one aspect of a good, it would not necessarily be irrational to give those consequences only a small weight even after understanding them fully.

A fourth type of mistake is described by Barry Schwartz (2004) in his well-publicized recent book *The Paradox of Choice.* He emphasizes the mistake of trying "too hard" to optimize. The "maximizers" he identifies by an abbreviated personality test seem to optimize without regard to the costs of the time and effort devoted to deliberation about a choice. Of course, this is not true optimization in a larger sense; a fully optimal choice must take into account deliberation costs. However, this raises an important issue for the measurement of utility. We argue that the utility function for everything other than deliberation costs should be measured by the choices that would be made by exactly such an agent who disregards deliberation costs.[25] Where people's preferences are similar to one another, this concept of utility approximates the utility that can be

[25] Calculation and deliberation costs should be recognized just as much as any other costs an agent faces. The difficulties in modeling "bounded rationality" problems due to the "infinite regress" problem discussed by John Conlisk (1996) among others should not blind us to the obvious fact of deliberation costs. Because we do not view the recognition of deliberation costs as a departure from "rationality" at all, we favor the more neutral term "bounded cognition" for what has traditionally been called "bounded rationality."

achieved when a small jury selected from a large group of people with similar preferences pays the deliberation costs for everyone in the whole group. For example, *Consumer Reports* is a practical effort to help people approximate this level of utility.

The general point that arises from thinking about mistakes is that, even when underlying preferences are fully consistent, choices arise from the interaction of preferences, ordinary constraints *and information structures.* The relevant information structures can include both external information constraints and internal cognitive constraints. In principle, internal cognitive constraints are no harder for economic theory to deal with than external informational constraints. For example, Woodford's (2002) model of monetary nonneutrality (based on the model of rational inattention in Christopher Sims, 2002) has been criticized for relying on extremely low bit transmissions rates. One way to defend Woodford's model is to locate the low bit transmission rates inside the small portion of the typical decision-maker's psyche devoted to thinking about macroeconomics.

Rayo and Becker (2005) provide an interesting example of explicitly modeling decision-making as the outcome of an underlying utility function ("evolutionary efficiency") filtered through internal informational constraints. Assuming a limit on the total number of gradations into which values of the underlying utility function can be distinguished, they show that an optimal deployment of that limited available total precision is to make fine distinctions in the neighborhood of values where an agent will actually be operating but only gross distinctions at outlying values.[26]

Could consideration of mistakes overturn the conclusion of subsection A that utility is rising? It is instructive to consider again the choice hundreds of thousands of people make every year to migrate from a poor home country to a foreign rich country. Certainly some regret their decision *ex post* and wish they had never migrated, and some even pay the fixed cost of returning to their home country to a situation no richer than before. But among those who are able in the end to bring their families as well, there is no evidence of widespread regret at migrating to a rich country. There is even less regret among the grandchildren of those who migrated, who escape most of the large fixed costs of migrating.

C. Inconsistent Preferences. Inconsistent preferences are more difficult to deal with than mistakes. Just as mistakes involving one's own preferences can be modeled as an underlying utility function together with internal information acquisition, transmission and processing constraints, inconsistent preferences are now routinely modeled as an intra-psychic game between multiple agents within the same person, each having a distinct set of preferences. However, if there is more than one set of preferences operating within a single individual, normative analysis faces a version of the Social Choice problem even for evaluating individual welfare. Unlike the standard Social Choice problem, there is no reason for a presumption of equal ethical value for all the different intra-psychic agents.

[26] In their paper, Rayo and Becker (2005) call the filtered version of underlying utility "happiness." However it is unclear in what way it would relate to happiness as we are using the term. In particular, like visual processing (which they use as an analogy), the filtered version of utility they discuss might operate at a very early unconscious or "automatic" stage in the sense of Colin Camerer, George Loewenstein and Drazen Prelec (2005) and so could be several cerebral processing steps prior to "happiness" in the experiential sense.

In order to do normative welfare analysis even at the individual level, one must take some stand on this intra-psychic social choice problem. Our proposal in this regard would be to rely, in all ordinary cases, on the psyche's own dispute resolution system. As Camerer, Loewenstein and Prelec (2005) discuss, the brain's controlled cognitive system is often brought into action to use deliberation to resolve disputes between other systems in the brain. Thus, we consider well-informed, thoughtful, revealed preference to be the best practical gold standard for an individual's preferences for the purposes of welfare analysis at the individual level.[27]

When multiple preferences coexist within the same individual, the whole-person utility function that is the solution to the intra-psychic social choice problem may not be the utility function that has the tightest relationship with happiness. Here, a key issue is which "selves" give affect reports to an interviewer. A relatively straightforward case is when the problem is short-sightedness in the sense of hyperbolic discounting of the sort described by David Laibson (1997), where there is one "self" in command at each point in time, in a known sequence. Other cases could be more complex. Although we consider it a high priority for the future, modeling the relationship between reported happiness and either whole-person utility or the set of utility functions within the psyche is beyond the scope of this paper. From here on, in discussing the relationship between happiness and utility, we will assume that the individual has only one set of preferences, which are internally consistent.

D. Is Happiness in the Utility Function? The principle of revealed preference indicates that happiness is in the utility function. Hundreds of thousands of people spend thousands of dollars each on therapy that is not reimbursed by insurance in hopes of becoming happier or at least less unhappy. Millions of people endure the significant negative side effects of chemical antidepressants in order to feel happier. Self-help books and magazines featuring cover articles on happiness sell briskly. Moreover, many products that may not actually make one's psychological state significantly more positive are advertised as if they will, as described in great detail by Melinda Davis (2002). Advertising aimed at suggesting that a product will improve one's brain state would not be so prevalent if a desire for positive affect were not an element of preferences. In sum, many people want to feel happier and are willing to sacrifice other things in order to attain that psychological state.

On the other hand, it seems clear that happiness is neither the only thing in the utility function nor a sufficient statistic for all of the goods that are in the utility function. To make this clear it is best to use the technical term "affect" for happiness as a reminder that we are talking about feelings. People care about things other than how they feel. Most obviously, they sometimes sacrifice current affect for a later benefit; for example (to take one of people's lowest affect activities according to Kahneman, Krueger, Schkade, Schwarz and Stone, 2004) it makes sense to spend time on household chores despite the low momentary affect associated with that activity because of the later benefits of having a clean house. There might be a later increase in affect as

[27] Insisting on transitivity is one aspect of "thoughtfulness" here.Thus, in principle, in assessing preferences, we would rely on an individual's deliberative choices for an entire menu of decisions at once, with an iterative process where the individual is forced to resolve non-transitivities.

a result, but it is not clear that the later benefits show up in affect and utility in the same way.[28] Second, people often sacrifice their own affect to benefit their children, as when one spends long hours at a grueling job to finance college educations for one's children. In standard economic models, the benefits to one's children show up in one's own utility function, but it is not clear that the benefits to others show up in one's own affect in the same proportion as in utility. Third, some people genuinely care about things that contribute to their lives but do not on average contribute to affect. For example, it would not necessarily be a bad decision to pursue excellence even if one knew that the effort would lower one's expected level of affect over a lifetime. Even striving for social rank—a dimension in which affect and utility track each other especially well—provides good examples of the divergence between affect and utility. Think of how many people have knowingly and deliberately sacrificed happiness (affect) for the sake of ambition. Some of these people would do it all over again if they had their lives to live over.

E. Persuasion about Preferences. Since most people do care about happiness at least somewhat to begin with, extolling the wonders of happiness and exhortations to value happiness more highly can often be effective tools for those who desire to persuade others to change their priorities—that is, to change their preferences and the utility function that would be needed to represent those preferences. To the extent that people *are* genuinely persuaded by such arguments, their utility function will shift to be somewhat more tightly related to happiness. The adverb "genuinely" in "genuinely persuaded" is needed to subtract out the effects of social pressure in which people are brought to outwardly assent to something they do not really agree with. From the standpoint of Pareto optimality, there is no reason to question the new, post-persuasion utility function if the persuasion is, indeed genuine. However, it seems only fair that people be made aware that it is not *illogical* to put a low valuation on happiness in one's preferences, if one so chooses in a top-down process of concretizing one's own preferences.[29]

5. Evidence that Happiness is Not the Same Thing as Flow Utility

Having laid out the definitions of felt happiness and choice-based utility both conceptually and operationally let us look more closely at their relationship. It would be convenient for many reasons if happiness in the sense of current affect were proportional to flow utility. Not only would this make a welfare measure based on a discounted sum of current affect equal to lifetime

[28] This is a very interesting empirical question. In testing whether intertemporal tradeoffs in utility match intertemporal tradeoffs in happiness alone, one must address the problem that people are not good at predicting their future happiness, as pointed out by Loewenstein and Schkade (1999). It may be possible to address this problem with some combination of educating people about the likely consequences of a decision for future feelings and eliciting what their expectations about future feelings are after that education to control for any remaining mispredictions of future feelings.

[29] Of course, in a large fraction of cases of attempted persuasion about preferences, the desired preferences for the other person will be given the rhetorical label "happiness," "true happiness," "genuine happiness," or "authentic happiness," regardless of how important happiness in the narrow sense of positive affect is in those preferences. For logical clarity (which can be at variance with persuasive power), the phrase "recommended preferences" can be substituted in place of "true happiness" or similar phrases. Aristotle's use of *eudaimonea* (the Greek word for happiness) in the *Nicomachean Ethics* (fourth century B.C.E.) can be seen as an example of using "happiness" as a label for such recommended preferences. Saying this in no way diminishes the cogency of Aristotle's recommendations.

utility, but such a simple measure of flow utility would make utility empirics more like production empirics, where one actually gets to see output directly. However, there are two reasons why it is very difficult to maintain that happiness and flow utility are even close to the same thing: the Easterlin Paradox and Hedonic Adaptation.

A. The Easterlin Paradox. As Easterlin (1974, 1995, 2003) observes, real per capita GDP and real consumption expenditure in the United States has risen dramatically in the last fifty years, but the percentage of people saying they are "very happy" has been falling slightly. The story is even more dramatic in Japan, where the percentage rise in per capita GDP is even more rapid, but the graph of subjective well-being is essentially flat. In other words, in developed societies, profound increases in average real income and in the objective standard of living over the last 50 years have not been associated with increases in the average happiness of their citizens. As argued above, it is not just a matter of money not buying happiness, since there are many other positive trends. In short, there is strong evidence that utility has gone up, but happiness has not.

B. Hedonic Adaptation. In addition to the difference in the trend behavior of utility and affect, the shorter-run dynamic behavior of affect is also quite different from the dynamic behavior of flow utility as normally modeled. As an empirical matter, affect in response to a number of important categories of changes in circumstances is subject to *hedonic adaptation*--regression of affect toward its previous level. Some of this evidence is surveyed in Frederick and Loewenstein (1999). In response to discrete negative events with lasting practical consequences, significant hedonic adaptation over time is observed for incarceration (Zamble and Proporino, 1990; Zamble, 1992), the loss of the use of limbs, (Wortman and Silver, 1987) and for serious burns (Patterson, et al., 1993). The death of a spouse seems to have a particularly long-lasting effect on affect. But Kaprio, Koskenvuo, and Rita's (1987) finding that suicide rates the week after a spouse's death are elevated almost tenfold for women and almost seventyfold for men suggests especially low affect immediately after the loss, which then moderates to some extent.

Some of the most striking data is that on lottery winners. Less than a year after winning the lottery, Brickman, Coates and Janoff-Bulman (1978) find that winners of large lotteries displayed only slightly higher life satisfaction. Frederick and Loewenstein (1999) interpret this as evidence suggestive of substantial hedonic adaptation since it is likely that many winners of large lotteries are ecstatic immediately after winning. More recently, Gardner and Oswald (2001) look at people receiving a windfall--primarily lottery winners--in the British Household Panel Survey. They find that winning £10,000 raises affect by *six times* as much in the first year as £10,000 per year in additional income. This comparison is suggestive of income having been subject to greater hedonic adaptation than the hedonic adaptation to the relatively recent windfall.

Brickman and Campbell (1971) refer to the implications of hedonic adaptation for the trend in affect the *hedonic treadmill*. Because of the close apparent connection between the Easterlin Paradox and the phenomenon of hedonic adaptation, it seems appropriate to search for a joint explanation.

C. The Implications of *Affect* Data for Hedonic Adaptation and the Easterlin Paradox. In unpublished work, Kahneman and Schwarz seem to have discovered another important fact

about hedonic adaptation: measures of current affect such as data from experience sampling show even stronger hedonic adaptation (mean reversion) than life-satisfaction or global happiness measures. (There is some discussion of this in Kahneman, Krueger, Schkade, Schwarz and Stone, 2004.) As discussed above in footnote 18, because life satisfaction and global happiness evaluations incorporate an element of autobiography *and* people's ideas about how they "should" feel, they will tend to show more permanent effects of events such as unemployment, as Lucas, Clark, Georgellis and Diener (2004) find.

What is even more serious, the likely influence of people's folk theories of how they "should" feel on life satisfaction and global happiness evaluations may account for some of the modest relationships with income that these measures show. Also, some of the variance in income comes from recent enough income innovations that the dependence of happiness on news we argue for below could account for some of the remainder of the correlation observed between income and life satisfaction. (Recall that life satisfaction and global happiness measures are significantly influenced by current affect.)

Given these hints, we predict that future research focusing on affect data as opposed to life satisfaction and global happiness evaluations will deepen the Easterlin Paradox and raise estimates of the extent of hedonic adaptation.

D. Hedonic Adaptation vs. Habit Formation. Note that hedonic adaptation is not the same thing as habit formation. Hedonic adaptation is a statement about happiness, as measured by psychologists. Habit formation is a statement about utility, as measured by revealed preference. For example, habit formation often refers to a tendency to do something more if you have done it in the past—an effect of past consumption on marginal utility. Of course, *if* happiness were proportional to flow utility *then* hedonic adaptation and habit formation would be tightly linked. This could be empirically problematic, because data on hedonic adaptation might then imply extremely strong habit formation. For example, suppose utility was of the form made popular by George Constantinides (1990), which can be represented as

$$v_t = E_t \sum_{j=0}^{\infty} \beta^j U(C_{t+j} - \theta H_{t+j}),$$

where v_t is lifetime utility, β is the discount factor for flow utility U, current consumption is denoted C, the "habit" H is a weighted average of past consumption levels, and θ is a parameter between zero and one. Given this form of the utility function, *if* happiness were proportional to flow utility, then evidence of complete hedonic adaptation would only be consistent with $\theta = 1$. For comparison, Joseph Lupton (2002) estimates $\theta \approx .75$ when estimating based on data for life-cycle portfolio choices and a value of θ close to zero when looking at consumption choices. The reason consumption data does not support a high value of θ is that, unless the lags in the habit H are quite long, a high value of θ implies there should be a strong autocorrelation for consumption growth rates that is absent in the data. If happiness were proportional to flow utility, matching the speed of hedonic adaptation would require a fast-moving habit, for which consumption data point to a value of θ near zero. Moreover, even the higher value of $\theta \approx .75$ would not match the observed extent of hedonic adaptation.

A more subtle discussion is required if—to match happiness data—someone suggests a type of habit formation that would not show up in empirical data *other* than happiness data. Suppose that everyone agreed, based on empirical results, that current affect A_t was given by $A_t = f(C_t) - f(C_{t-1})$. To make things even better, suppose that lifetime utility v_t could be represented as

$$v_t = E_t \sum_{j=0}^{\infty} \beta^j [f(C_{t+j}) - f(C_{t+j-1})].$$

One could then claim that affect was equal to flow utility, where flow utility was given by

$$U(C_t, C_{t-1}) = f(C_t) - f(C_{t-1}),$$

with lifetime utility v_t being given by

$$v_t = E_t \sum_{j=0}^{\infty} \beta^j U(C_{t+j}, C_{t+j-1}).$$

But a bit of algebra shows that

$$v_t = -f(C_{t-1}) + (1-\beta) E_t \sum_{j=0}^{\infty} \beta^j f(C_{t+j}).$$

Since C_{t-1} is already fixed at time *t*, and the multiplicative factor (1-β) does not affect preferences, this utility function represents the same preferences over choices from time *t* on as the lifetime utility function

$$v_t = E_t \sum_{j=0}^{\infty} \beta^j f(C_{t+j}).$$

There are enough degrees of freedom in this example to force flow utility to be equal to affect. We argue, however, that in this instructive case it is clearer and more evocative of the existing economic literature to represent the lifetime utility function in the equivalent, but simpler, more convenient, and more familiar, form $v_t = E_t \sum_{j=0}^{\infty} \beta^j f(C_{t+j})$, where $f(C_t)$ is thought of as the flow utility function $U(C_t)$. The complexity in affect can then be represented in the *relationship* between flow utility and affect. In particular, the stipulated equation $A_t = f(C_t) - f(C_{t-1})$ can then be described by saying that "affect is equal to the first difference of flow utility."[30]

[30] Note that with a finite horizon, the two formally similar versions of the utility function would no longer represent exactly the same preferences. The lifetime utility function $v_t = E_t \sum_{j=0}^{T-j} \beta^t [f(C_{t+j}) - f(C_{t+j-1})]$ would imply a

While the two flow utility functions $U_t=f(C_t)$ and $U_t=f(C_t)-f(C_{t-1})$ are equivalent in the preferences they represent over choices at time *t* and beyond, could the difference between them bear on the hypothetical choice between the consumption bundle now and the consumption bundle fifty years ago discussed in Section 4 A? One answer is to point out that the individual and social choices we really face are those of the next fifty years, not of the past fifty years. Looking toward the future, we have the habits that we have from the past, and must take those as given. From this point of view, the two utility functions are fully equivalent.

Another answer is to carefully pose the hypothetical choice between different comprehensive consumption bundles in a way that takes into account all relevant habit formation. For example, imagine that one were forced to put one's newborn child up for adoption in one of two worlds, where one world has the comprehensive consumption bundle of fifty years ago, while the other world has the comprehensive consumption bundle we have now. Alternatively, assuming that per capita GDP and other objective circumstances improve as much in the next fifty years as they have in the last fifty years, would you rather put your newborn child up for adoption in the world that has the comprehensive consumption bundle we have now or the world that has the comprehensive consumption bundle of fifty years from now? Because it is hard to imagine the future in detail (even after conditioning on the values of some key statistics, as here) this is a more difficult question, but an important one.[31]

The closely related choice of which society one would wish to be born into is a crucial tool in John Rawls's (1971) extremely influential book of political philosophy *A Theory of Justice* (anticipated by Rawls 1951, 1958). In the Economics literature, choices between societies are also a crucial tool in John Harsanyi's (1953, 1955) theory of social welfare (discussed ably by Pattanaik, 1968.) Of course, these are very difficult choices to make. Nevertheless, revealed preference gives some guidance here, while a simple model of 100% hedonic adaptation would guarantee that happiness data could give *no* guidance for such choices.

E. Local and Global Marginal Thinking vs. Focusing Illusion. Just as the distinction between utility and happiness breaks any tight link between hedonic adaptation and habit formation, the

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greater tendency to consume in the period immediately before death than $v_t = E_t \sum_{j=0}^{T-j} \beta^t f(C_{t+j})$. However, the lifetime utility function $v_t = E_t \sum_{j=0}^{T-j} \beta^t [f(C_{t+j}) - f(C_{t+j-1})]$ would still be equivalent to the lifetime utility function $v_t = E_t \left\{ \left[\sum_{j=0}^{T-j-1} \beta^t f(C_{t+j}) \right] + \frac{\beta^{T-t}}{1-\beta} f(C_T) \right\}$. This equivalent form with "flow utility" depending only on current consumption might easily be more convenient, despite the odd-looking coefficient on $f(C_T)$.

[31] Note that while there is good reason to hope that utility will be higher in the future, it is not clear that the Easterlin Paradox will continue into the future. It is possible that average long-run happiness will be significantly higher in the future.

distinction between utility and happiness should make one cautious in using happiness data to assert that people are making systematic optimization mistakes.[32]

David A. Schkade and Daniel Kahneman (1998) consider a thought experiment familiar to readers of David Lodge's (1978) comic novel, *Changing Places*, in which a professor from the gray English industrial city of Birmingham has the opportunity to spend a sabbatical year at Euphoric State on the shores of San Francisco Bay while a California professor takes his place as a visitor at Birmingham. Schkade and Kahneman (1998) study two groups of students, one residing in a gray Midwestern climate and the other in the brilliant sunshine of California. When surveyed, students in both locations have the same distribution of subjective well being. Both Midwestern and California students also predict that either they themselves or a student like them would be more satisfied with specific aspects of California including climate, outdoor activities, social life and cultural opportunities. Schkade and Kahneman explain their results in terms of a *focusing illusion*:

> When a judgment about an entire object or category is made with attention focused on a subset of that category, a focusing illusion is likely to occur, whereby the attended subset is overweighted relative to the unattended subset. In particular, when attention is drawn to the possibility of change in any significant aspect of life, the perceived effect of this change on well-being is likely to be exaggerated. (p. 340.)

While they do not conduct such an experiment, it appears that Schkade and Kahneman believe that a person who actually moved to California would not experience a permanent increase in measured happiness or satisfaction. This would seem logical in light of the equality of overall life satisfaction they observe among Midwestern and California students. Moreover, they cite other instances involving paraplegics, lottery winners and widowed spouses in which the positive or negative effect of these events on measured happiness is transient.

What do these results imply? Tacitly assuming that happiness can be set equal to flow utility, Schkade and Kahneman suggest that people mispredict utility for two reasons. First, because of the focusing illusion they overemphasize the importance of a particular aspect of life in California—say, climate—among the determinants of overall satisfaction. Second, and perhaps for the same reason, people fail to predict that their mood will adapt to local circumstances within a relatively short period of time. This appears to be consistent with Schkade and Kahneman's interpretation when they write, "At the individual level, the focusing illusion may lead to unnecessary initiatives. For example, it is not unlikely that some people might actually move to California in the mistaken belief that this will make them happier. (p. 345)

The theory we advance in this paper would predict the same pattern of survey results about happiness, both cross-sectionally and longitudinally, but the interpretation of the results would be different. When the prospect of relocating, say, from Ann Arbor to Berkeley arises, conventional economic theory suggests that an individual needs to consider global utility maximization by comparing the (ordinal) heights of two utility mountains, one corresponding to attainable levels

[32] In the absence of an adequate theory of the relationship between utility and happiness, it is best to be cautious about asserting that people are making systematic optimization mistakes even when it is clear that people *are* making mistakes in predicting the dynamics of happiness. We return to this issue after presenting our theory of the relationship.

of utility in Ann Arbor and the other to attainable levels of utility in Berkeley. The heights of these mountains depend on location-specific nontraded goods such as climate, topography and culture but also on variations in location-specific traded and partially traded goods that would be available to the person given wages, prices, employment opportunities, family and friends, leisure possibilities and so on. In conventional economic theory, an individual would make a migration decision by comparing the heights of the two utility mountains. Once in Berkeley, the utility mountain in Ann Arbor becomes irrelevant and an individual's decisions are concentrated on finding allocations of income and time to alternative bundles of traded, partially traded and non-traded goods that place her as close as possible to the summit of the local utility mountain.

We suggest that focusing is best understood not as an illusion, but rather as a mental act that plays a familiar role in economic theory. Conventional economic theory suggests that a consumer chooses an allocation that maximizes his utility subject to a budget constraint, a time constraint and other relevant constraints such as distance from family and friends. In finding this optimum, the consumer compares the marginal utility gained from a good with the utility value of its marginal cost in dollars, time, or social interaction. A mental calculation of marginal utility—a partial derivative—requires focusing because it asks how much utility would change holding everything else constant. The empirical evidence of focusing described by Schkade and Kahneman suggests that people are readily able to think about the positive or negative impact of a particular event or state, holding other aspects of life constant.

As is often noted both by economists and non-economists, the optimization task assumed to take place in standard economic theory is daunting in the complexity of its cognitive demands on both information and calculation. To find the local optimum associated with a given utility mountain corresponding to a given location and a given time, an individual may need to consider only variations in a small number of aspects of life because many others are already settled through past decisions, trials and errors. In most day-to-day decisions, focusing on the few dimensions at issue yields a large savings in deliberation costs. The person already has a job, a spouse and children, a home and, perhaps, the only significant decision at the moment is whether to go to a Chinese or Italian restaurant tonight. By contrast, a large decision involving changing a location, choosing a spouse or changing jobs will cause many aspects of life to change simultaneously. To find the optimum in such cases, the person needs some way to discover the highest utility mountain in a vast range of (high dimensional) mountains, each associated with a particular discrete choice. Just knowing that the next step has higher altitude is not enough.

Even in deciding about an actual move, a fully rational *homo economicus* might conduct a series of thought experiments, similar to those on Schkade and Kahneman's questionnaire concerning satisfaction with aspects of life in the Midwest or California, for each relevant aspect of life. If we assume that utility is additively separable in different aspects of the locations, then the total difference in utility from a move is

$$\Delta U = \Delta U_1 + ... + \Delta U_n .$$

Some of these aspects will be essentially the same in both locations, so the individual can focus on just those that are different, together with whatever combinations of aspects interact in a nonseparable way.

Daydreaming in a focused way may be a very helpful way of sorting through particular aspects of a location choice before getting on to the difficult task of making an actual location decision—which entails a summary valuation. After all, Hawaii, New Zealand or the South of France may have even better climates than California. But, among these, perhaps France and California are the best of these in culture and cuisine, on which a given person places a higher marginal utility value. But, after considering the value of these particular aspects of other mountains, it may be that the advantages of the current mountain dominate because it is close to family and friends, its properties are more certain and staying avoids the costs of moving. In long run equilibrium, migration takes place until the expected utility of individuals in the place they reside is at least as high as it is in other places. Moreover, in equilibrium, location-specific advantages such as climate will tend to generate offsetting compensating disadvantages such as high housing prices or low wages (Sherwin Rosen, 1986). It would not be surprising to find that utility is nearly equated in those locations that seem like relevant alternatives.

In this subsection, we have argued that our theory would yield the pattern of survey results reported by Schkade and Kahneman (1998), but that our interpretation of these results would be quite different from their theory of focusing illusion. This raises the question of whether there are any testable differences between the two theories. The most obvious concerns regret. If focusing creates an illusion that leads to the misprediction of utility, we would expect that, on average, people who actually moved to California would experience regret. In our theory, focusing is just an intermediate mental step in forming a summary judgment involving weighting a broad range of relevant issues and aspects of life. While the summary judgment might be erroneous from an ex post point of view, there is no reason to think that the errors are in one direction or the other—California might turn out to be even better than one imagined in a Midwestern college classroom. Similar testable differences between focusing illusion and our theory could be sought from data on regret from other sources such as new car purchases, dating behavior and many other areas of life.

F. Is Choosing Lower Long-Run Happiness Evidence of a Mistake or Evidence that Happiness and Utility are Not the Same Thing?

Equating happiness with utility is a key assumption in what has become an established theoretical consensus among happiness researchers in Economics as well as Psychology. This consensus challenges the validity of the foundations of conventional Welfare Economics which lie in revealed preference theory. In this section, we briefly describe the established consensus in the context of a specific empirical application by Frey and Stutzer (2004b) which examines the relationship between happiness and time spent commuting. Their assumption that happiness and utility are the same thing, in conjunction with the empirical relationship between happiness and commuting, leads them to conclude that individuals systematically mispredict utility. This conclusion, in turn, calls into question the key assumption of revealed preference theory: namely, that the chosen alternative yields higher utility to the consumer than those which are not chosen. Instead, in the spirit of "Subjective Well-Being is Desirable, But Not the Summum Bonum," (Diener and Scollon, 2003), we argue that Frey and Stutzer's (2004b) findings provide evidence that utility and happiness are empirically distinct, but do not bear on the validity of welfare theory based on revealed preference.

In the consensus theory, as summarized by Frey and Stutzer (2003, 2004b), reported subjective well-being is taken as a proxy measure for utility. Maintaining this very strong assumption opens up a wide range of empirical applications and allows for direct tests of conventional theory, as Frey and Stutzer (2004b) illustrate with their analysis of commuting time. Most people find commuting time unpleasant, but endure it as a necessary evil in order to work at a more interesting or better paying job while living in a nicer or cheaper location. In equilibrium, along the lines of Rosen (1986), they argue that individuals should sort themselves among locations such that the disutility of additional commuting is offset by compensating monetary or nonpecuniary benefits associated with a better job or residential location. In such an equilibrium, they argue, total utility should not be related to total commuting time.

Frey and Stutzer (2004b) test this hypothesis in a regression of happiness on commuting time using data from the German Socioeconomic Panel (GSOEP), holding a number of socioeconomic characteristics constant but leaving labor income free to vary. They find a significant negative coefficient for commuting time, contrary to the zero coefficient expected under a Rosen-esque theory. Of course, persons with higher (non-labor) wealth might have higher utility and choose both a better job or house and a shorter commute, thus creating a spurious negative correlation between happiness and commuting time. However, Frey and Stutzer find a significant (although somewhat smaller) coefficient on commuting time in an alternative specification in which permanent differences in wealth or other differences are controlled with the use of individual fixed effects. While their econometric model might be subject to other criticisms, for our purposes we provisionally accept their empirical finding of a negative relationship between happiness and commuting time. We also note that other investigators have suggested similar results for other kinds of decisions. For example, Gruber and Mullainathan (2002) find that cigarette tax increases raised the happiness of potential smokers; Schorr (1991) argues that people mismanage the balance between work and leisure, tending to overwork; and Loewenstein, Ted O'Donoghue and Matthew Rabin (2002) suggest that misguided purchases of consumer durables such as fancy cars occur because people overestimate the future satisfaction the purchase will bring.

The theoretical explanation advanced by Frey and Stutzer (2004b) and other happiness researchers for such findings is that people systematically mispredict the future utility or, equivalently in this view, the future happiness they will obtain by taking a given action. In particular, Frey and Stutzer (2004b) hypothesize that misprediction is most severe for goods or activities with extrinsic attributes that can be purchased in the market relative to those with intrinsic attributes involving nonmarket social interactions. Thus, while a commuter may choose his home and job with the expectation that the extra money he gets from lower rent or a higher wage will offset the utility loss resulting from spending less time with his family and friends, the negative relationship between happiness and commuting time is interpreted to imply that people systematically overestimate the future relative utility of the things they obtain with the extra income.

Standard economic theory can easily accommodate unsystematic mistakes by consumers, but has a much more difficult time making sense of systematic mistakes. If people get lower net utility from long commutes, why don't they learn this and change the location of their home or job

accordingly? Frey and Stutzer (2004b, p. 9) explicitly address this issue. They argue that the formation of expectations about future utility depends on reconstructions of feelings in the past. Failure to learn from mistakes results because "…remembered utility and predicted utility become similar and relatively independent of actually experienced utility." For example, they cite studies in which participants on vacation or holiday trips enjoyed the actual trip less than they had predicted, but report enjoyment levels similar to the ones predicted when they recall the experience afterward.

This is a remarkable argument. Revealed preference suggests that the people who took a vacation gained expected utility. Moreover, in recalling the trip they believe they actually received as much satisfaction as they had expected to get. Presumably, they felt no regret. Their decision appears to involve no mistake according to standard revealed preference arguments and certainly nothing in their recalled experience would cause them to be less likely to take a similar trip in the future. Despite all that, it is alleged that these people actually experienced less utility during the trip than they had expected to receive. This discrepancy is interpreted as a mistake and the failure to notice it after the fact is regarded as the reason that people do not learn from experience and correct their mistakes. Hence, misprediction of utility is common, causing people to make wrong decisions repeatedly which, against their own interest, result in lower levels of experienced utility than could be achieved by alternative decisions. The hypothesis that utility misprediction is relatively greater for actions with extrinsic aspects suggests that materialistic people will be most harmed by these mistakes.

In our view, to make a convincing argument that the individuals were making a mistake, one would need either to find evidence of regret or indications that being presented with the purported evidence of misprediction of utility caused people to want to change their decisions. In the case of commuting, we do not think people would be surprised to be told that commuting is quite unpleasant. Learning evidence that it is difficult to buy much happiness with money or that the effects of additional money on happiness are transient could have more impact on people's decisions. In the case of trips, forgetting some of the annoyances of travel may, in fact, distort people's decisions; being reminded of these annoyances might affect their decisions to some extent. However, some of the most important benefits of a trip are precisely the memories one brings back. To the extent those memories are positive, the traveler has achieved one of the main objectives of a trip—with the forgetting of annoyances serving as a helpful aspect of the household production function for vacation memories. The incidence of regret and second-thoughts after being presented with relevant data is ultimately an empirical matter for which the quantitative size of effects is just as important as the qualitative direction of effects.

In the absence of evidence of regret or second-thoughts upon being presented with relevant data, the other possibility (which we highlight) is that utility and happiness are not the same thing. Under this alternative, the interpretation of much of the evidence cited by happiness researchers about utility misprediction and systematic mistakes in decisionmaking is simply misleading. While we present our argument using a formal model in the second half of this paper, it is useful to provide some informal intuition now for our contention that evidence from the happiness literature is not inconsistent with a conventional economic model of rational (albeit not omniscient) utility maximizing consumers. It seems quite reasonable, as Diener and Scollon (2003) argue, to assume that maximizing subjective happiness is not the only goal of many

consumers because happiness competes with other values or objectives, some of which do not have positive effects on affect. Concretely, much like Becker (1965) or Lancaster (1966), we think of happiness as the outcome of one of a number of household production processes each of which combines inputs of goods, time, and social and physical environment to generate outputs of final commodities according to a household technology. For instance, in the commuting example of Frey and Stutzer (2004b), an individual may endure unpleasant commuting in part because it affords additional money or a more desirable residential location that enables him to buy nice things for his wife and children, to have his children attend a better school or to be able to contribute to a charity to relieve the suffering of others. An empirical question, mostly not addressed in the happiness literature, is whether each of these ways to use money has the same effect on subjective mood or happiness. It seems possible that they do not but, nonetheless, that the individual would be willing to sacrifice his own happiness to benefit others. If so, the negative correlation between commuting distance and happiness observed by Frey and Stutzer (2004b) is quite consistent rational with utility maximizing behavior by persons whose preferences include goals beyond narcissistic fixation on their own pleasure. *Though an altruistic motivation makes the example especially clear, the same logic applies if the objective the individual is pursuing in preference to happiness is a non-altruistic goal.*

G. Summary of the Argument that Utility and Happiness are Empirically Distinct. Here is the underlying structure of the argument that utility and happiness are empirically distinct. First, using standard utility representations, utility has a strong upward trend, while happiness has very little trend. Moreover, happiness is strongly mean-reverting even after permanent changes in circumstances, while utility is not. Second, if one is willing to use nonstandard utility representations (including the flexibility one has in choosing flow utility functions that add up to equivalent lifetime utility functions), one can say the following:

> (a) On one hand, if changes or innovations in lifetime utility were the *only* component of happiness, then maximizing happiness and maximizing lifetime utility would be essentially equivalent; indeed, happiness could even be viewed as an exotic way of representing lifetime utility *except* that since happiness is focused on changes, it still could not represent preferences over initial levels or initial paths. To put the issue dramatically, though happiness is quite tightly linked to utility in this case, because it is focused on changes, happiness provides no representation of people's views over which society it is best to be born into.
>
> (b) The frequent use of the concepts of utility and happiness to make social welfare statements makes it ill-advised to dismiss the representation of preferences over which society to be born into as unimportant or meaningless. Indeed, this kind of preference is closely related to important conceptions of social justice. These preferences over different comprehensive social situations do not necessarily line up with measured happiness.
>
> (c) Any evidence for persistent, predictable effects of choice variables on happiness imples that changes or innovations in lifetime utility are *not* the only component of happiness.

(d) The fact that at times people knowingly, thoughtfully and without regret make choices that predictably lower their mood, day after day, implies that utility and happiness are empirically distinct.

All of the statements (a—d) remain true regardless of what utility representation one uses for a given set of preferences. Further discussion of these arguments must wait until we have laid out our model.

6. An Integrated Theoretical Framework for Utility and Happiness

Given the empirical evidence that utility and happiness behave very differently, what is the relationship between happiness and utility? In this section we will explain the main elements of our answer in a model with more structure than is really needed. Within that structure we propose that

$$affect = baseline\ mood + elation,$$

where *elation* is short-run happiness—which depends on recent news about lifetime utility and *baseline mood* is long-run happiness—which is a subutility function much like health, entertainment, or nutrition. There is a two-way linkage between affect and utility in this theory. First, baseline mood is an argument of the flow utility function. Second, elation is a function of news about lifetime utility.

One weakness of the approach in this section—using relatively well-defined functional forms—is that, because of the illusion of cardinality for von Neumann-Morgenstern utility, it does not sufficiently emphasize the ordinal nature of utility. The Appendix takes a more general axiomatic approach, which allows us to more clearly demonstrate the consistency of our theory with Ordinalism.

A. News and Short-Run Happiness. To motivate the mathematical model below, let us begin with the observation that—although the relationship between circumstances and happiness is weak in the long run—all the evidence suggests that subjective well-being responds in an intuitive and important way to *news* about objective circumstances. For example, subjective well-being rises significantly after experimental subjects find a dime and falls significantly after experimental subjects are given negative test results (e.g., Schwarz, 1987). The theoretical outline we propose builds on these observations by positing that a major component of affect depends directly on *news* about objective life circumstances that has arrived over the last few months rather than on the *level* of circumstances. This assumption is consistent with the general observation that people evaluate changes rather than states, an assumption that is also central to Prospect Theory (Kahneman and Tversky, 1979).

We call the component of happiness due to recent news about lifetime utility *elation*. *Dismay* is the algebraic opposite of elation: *dismay = -elation*. If expectations are rational, standard results about rational expectations imply that *news*—dynamic revisions to rational expectations—will be zero-mean and unpredictable. As a result, *elation*—which is a function of recent news—will be strongly mean reverting. Intuitively, news doesn't stay news for very long. At the psychological level, the initial burst of elation dissipates once the full import of news is emotionally and cognitively processed.

B. Happiness in the Utility Function. Since Gary Becker's (1965) pioneering work, much of the activity of a household outside of paid work has been reconceived as household production of goods. Becker (1965) emphasized the concept of household production as a way to study the structure of the household's utility function. For example, a household may undertake many activities and purchases all focused on preserving health, such as buying and consuming

vitamins, exercising, and going to the doctor. It often aids intuition to think of the health subutility function as giving the output of a household production function for health. We think of the part of happiness *not* due to recent news about lifetime utility as this kind of subutility function—or equivalently as the output of a household production function.

We call the part of happiness *not* due to recent news about lifetime utility *baseline mood*. In particular,

> 1. Any predictable aspect of happiness is part of baseline mood. This includes any persistent aspect of happiness.
>
> 2. Any aspect of happiness that *would* be predictable if the relevant arguments of the subutility function were predictable is a part of baseline mood. The pleasantness of one's current activity falls into this category. [33]

Physical health provides a good analogy for baseline mood. Like health, baseline mood

- can be measured independently of its arguments (inputs);
- is only one argument of the flow utility function;
- depends on different things than flow utility does—or on the same things with different; weights
- has a complex household production function or subutility function.

Ultimately, it is an empirical matter what baseline mood depends on, but provisionally, we view baseline mood as depending on factors such as:

a. genes[34]
b. psychologically active drugs, such as Prozac
c. sleep
d. exercise[35]
e. eating habits
f. time spent with friends[36]
g. social rank[37]
h. the pleasantness of one's current activity.[38]

Viewing baseline mood as one of the arguments of flow utility allows the powerful language of price theory to be applied to baseline mood, just as to health. For example, Hall and Jones (2004) argue that health is a luxury good in the sense that continuing increases in per capita income will increase the budget share devoted to health-related expenditures. Similarly, one

[33] See Kahneman, Krueger, Schkade, Schwarz and Stone (2004) on the average level of affect experienced during different activities. As one unsurprising example, people experience higher affect while eating than the affect they experience while doing housework.
[34] See Diener and Lucas (1999).
[35] See Thayer (1989), Biddle and Murtrie (1991), Steptoe, Kimbell and Basford (1996) and Argyle (1999).
[36] See Lewinsohn, Sullivan and Grosscup (1982), Reich and Zautra (1981) and Argyle (1999).
[37] See Luttmer (2004).
[38] See Kahneman, Krueger, Schkade, Schwarz and Stone (2004).

might argue that continuing increases in per capita income are likely to increase the budget share devoted to baseline-mood-related expenditures.[39]

A key limitation on our ability to apply price theory to baseline mood is the possibility that people may not have accurate knowledge of the production function for baseline mood. People's expenditures of time and money will depend on their beliefs about the production function for baseline mood rather than the true function. Pursuing the analogy to health again, it seems reasonable that, just as people don't know the true production function for health, they may not know the true production function for baseline mood. In principle, the discovery and dissemination of facts about the determinants of baseline mood could have large positive welfare effects.[40]

One factor that could make it especially difficult for people to figure out the determinants of baseline mood is the salience of the component of happiness due to elation. Although the elation mechanism has its own functions, from the standpoint of figuring out the determinants of baseline mood, elation acts as noise.

To the extent that people do understand the determinants of baseline mood, price theory can contribute in important ways to an understanding of long-run happiness. Consider, for example, the negative correlation that has sometimes been found between "materialism" and happiness. Robert Lane (2000) gives a discussion of the mixed empirical evidence for such a negative correlation. In assessing the evidence, it is also important to be aware of the partial tautology in relating measures of unhappiness to materialism indices that contain many survey items measuring dissatisfaction and griping. Nevertheless, in order to make the logical point as clearly as possible, suppose it could be documented conclusively that materialism, in the narrow sense of valuing material goods highly, lowers happiness. Price theory suggests that as long as there is any tradeoff between happiness and material goods, those who value material goods more compared to happiness will choose a bundle with more material goods (as often found for those who are more materialistic) and less happiness. The mechanics of the tradeoff could, for example, be due to decisions such as the decision of whether to commute further to a higher paying job discussed in Section 5F. Materialism lowering happiness would be similar to the effect preferences have on any choice between two distinct goods—such as when those who place an extremely high value on career success have worse physical health because they do not make time to exercise or see the doctor.

Another important application of price theory is to the Easterlin Paradox itself. Even after accounting for the elation mechanism, since baseline mood is likely to be a normal good, there is still a version of the Easterlin Paradox that we must confront. With people much richer now,

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[39] The hypothesis that in the future of rich countries baseline mood will be a luxury good is inspired by Maslow (1943), who argues that once basic needs (such as physiological and safety needs) are satisfied, higher needs (such as needs for love, belonging, esteem and actualization) come to the fore. Both long-run happiness at home and long-run happiness at work might exhibit strong income effects. However, one bit of evidence running contrary to this idea that baseline mood is a luxury good is that in the Hindhu and Buddhist traditions a great deal of time and effort were often devoted to baseline-mood-raising meditation even thousands of years ago at much lower levels of per capita income than today.

[40] This view of the value of pinning down the determinants of baseline mood is consistent with the program of Positive Psychology, as described by Seligman (2002).

why don't they purchase more baseline mood? Trends in the externalities related to community and social rivalry[41] and any exacerbations of internal conflicts can certainly contribute toward an explanation, since most of these externalities and internal conflicts are likely to figure into happiness at least as strongly as they figure into utility. Lack of knowledge of the true production function for baseline mood could also contribute in an important way toward explaining this version of the Easterlin Paradox. But there may also be a price-theoretic element to the explanation. *Although income has gone up, the price of baseline mood may have risen.* The most likely reason for this is if many of the inputs into baseline mood are time-intensive, such as exercise or time spent with friends. With the price of baseline mood higher, people may choose to expand their consumption of other goods rather than baseline mood. The greater people's willingness to substitute between baseline mood and other goods, the smaller the price rise necessary to explain the Easterlin Paradox.

C. A Formal Model of Utility and Affect. The formal model in this subsection assumes a fully rational optimizing agent, with an internally consistent utility function, who is well informed about the nature of his or her own preferences. Indeed, we posit a lifetime utility function that is totally standard in how it is built up from flow utility U. The one difference from the standard case is that the flow utility function U is a comprehensive function that includes baseline mood M as an argument:

$$v_t = E_t \sum_{j=0}^{T-t} \beta^j U(K_{t+j}, X_{t+j}, M(K_{t+j}, X_{t+j})).$$

K_t is a potentially large vector of state variables encoding every aspect of the past that carries over to affect the present in a way that matters for utility, such as wealth, weight, level of fatigue, one's spouse being alive, oneself being alive, genes, etc., concatenated with a vector of exogenous variables (variables over which the individual has no control) such as the weather, the state of the entire economy and the level of consumption of the average person in society (to allow for direct social rivalry in consumption) and other external determinants of social rank. X_t can be a large vector of control variables representing aspects of the current actions that can be chosen, such as time allocations (including exercise, time with friends, and sleep), consumption (including psychologically active drugs and the services of psychotherapists), and portfolio choices. Baseline mood $M(K_t, X_t)$ is written as a general function of K_t and X_t—which also appear as direct arguments in the flow utility function. Thus, in one sense, the flow utility function is no different from a function of the vectors K_t and X_t, directly:

$$U(K_t, X_t, M(K_t, X_t)) = \mathcal{U}(K_t, X_t).$$

However, in applications, the dependence on the baseline mood subutility function M can provide additional structure to the flow utility function. Moreover, the specification of M makes predictions about what will be observed in affect data.

The lifetime utility function can also be written recursively as

[41] Television may have enhanced the negative effect of social rivalry on happiness by leading people to believe the distribution of income and other advantages in society is higher than it actually is, leading people to underestimate their true social rank. See O'Guinn and Shrum (1997).

$$v_t = U(K_t, X_t, M(K_t, X_t)) + \beta E_t v_{t+1},$$

pinned down also by the terminal condition that lifetime utility is uniformly zero after the end of all things the agent cares about: $v_{T+1} \equiv 0$. (This recursive form takes a step toward the Bellman equation without yet assuming optimization.)

We define the lifetime utility innovation ι_t ("iota") as

$$\iota_t = v_t - E_{t-1} v_t.$$

The lifetime utility innovation ι_t is a precise way of formalizing the concept of "news about lifetime utility." Since the lifetime utility innovation is the surprise in lifetime utility at time *t*, rational expectations implies that the lifetime utility innovation ι_t is mean-zero and unpredictable by all information available at time *t-1* or earlier.

The recursive expression for lifetime utility can be lagged and rearranged to yield this equation for the lifetime utility innovation:

$$\iota_t = v_t - \beta^{-1}[v_{t-1} - U(K_{t-1}, X_{t-1}, M(K_{t-1}, X_{t-1}))].$$

Thus, the lifetime utility innovation is almost, but not quite, equal to a simple change in lifetime utility. It differs by removing the predictable part of the movement in lifetime utility due to the passage of time, whether from discounting or from flow utility becoming "water under the bridge."

Elation, in turn, is an increasing function of current and past lifetime utility innovations:

$$e_t = e(\iota_t, \iota_{t-1}, \iota_{t-2}, ...).$$

Finally, affect A_t itself ("happiness") is the sum of baseline mood and elation:

$$A_t = M(K_t, X_t) + e(\iota_t, \iota_{t-1}, \iota_{t-2}, ...).$$

Notice that in this framework, the utility function is defined first, in a way that is a straightforward extension of a standard form. Then elation (the news component of happiness) is modeled as dependent on lifetime utility innovations. Baseline mood (the non-news component of happiness) is modeled in a fairly agnostic way as a function of current variables and implicitly of lagged variables through the state vector K_t. To match empirical evidence about baseline mood, it is important to include non-marketed goods such as social rank in the arguments of baseline mood.

D. Evidence that Expectations Matter for Affect. One of the central predictions of this model is that expectations will matter for affect, since the lifetime utility innovations are given by $\iota_t = v_t - E_{t-1} v_t$, and elation is a function of current and past lifetime utility innovations. The

importance of expectations for affect is indicated by the evidence surveyed in Frederick and Loewenstein (1999) that advance notice of the death of a spouse reduces the size and duration of the drop in affect after the actual death of the spouse. The following passage from Frederick and Loewenstein (1999, p. 315) is especially close to the spirit of the model here: "Even if advance notice does improve post-outcome well-being, its *overall* effect on well-being is ambiguous, since receipt of the bad news may diminish the well-being of the person between the time the notice is received and the time the event actually occurs." In the model here, it is the processing of bad news that generates a period of lower affect, whether the primary bad news occurs before the actual death of the spouse or only at the time of the actual death.

Camerer, Loewenstein and Prelec (2005, p. 28) give a good summary of some remarkable neurobiological research relevant to the role of expectations in determining affect:

> An important feature of many homeostatic systems is that they are highly attuned to changes in stimuli rather than their *levels*. A dramatic demonstration of such sensitivity to change came from single-neuron studies of monkey responding to juice rewards (see Wolfram Schultz and Anthony Dickinson 2000). These studies measured the firing of dopamine neurons in the animal's ventral striatum, which is known to play a powerful role in motivation and action. In their paradigm, a tone was sounded, and two seconds later a juice reward was squirted into the monkey's mouth. Initially, the neurons did not fire until the juice was delivered. Once the animal learned that the tone forecasted the arrival of juice two seconds later, however, the same neurons fired at the sound of the tone, but *did not* fire when the juice reward arrived. These neurons were not responding to reward, or its absence … [ellipses and all italics in original] they were responding to deviations from expectations. (They are sometimes called "prediction neurons.") When the juice was expected from the tone, but was not delivered, the neurons fired at a very low rate, as if expressing disappointment.

These results are just the tip of the iceberg in the neurobiology literature. A great deal of evidence points to machinery in the human brain that generates sophisticated short-run expectations—expectations that people are not always consciously aware of. See for example John O'Doherty et al. (2003), Jay Gottfried, O'Doherty and Raymond Dolan (2003), Ben Seymour et al. (2004), Seymour et al. (forthcoming) and O'Doherty (2005).

E. The Evolutionary Significance of Elation. Though any such claim is highly speculative at this point, we are inclined toward Randolph Nesse's (2000, 2001, 2004, forthcoming) functional interpretation of affect as part of the motivational system for processing utility-relevant information. If something good happens, elation motivates the individual to think about what went right (in case there is a way to make it happen again) and how to take advantage of any new opportunities that may have arisen. If something bad happens, dismay (negative elation) motivates the individual to think about what went wrong (in case there is a way to avoid it in the future), and how to mitigate the harm of the new situation. On this view, elation and dismay are in the same genus as *curiosity*, which is part of the motivational system for processing information that is neither obviously good nor bad, but for which there may be value to finding out more. Indeed, experimental inductions of elated and depressed moods have been found to change individuals' strategy of information processing across a variety of tasks (for reviews see Schwarz, 1990, 2002 and William Morris, 1999). Elated people are especially good at seeing opportunities, while dismayed people are especially good at seeing dangers.

F. The Evolutionary Significance of Hedonic Adaptation. Thinking of a temporary jump in affect occurring after utility-relevant news as functionally related to information-processing makes the functional significance of hedonic adaptation similar to the functional significance of adaptation in other aspects of perception. Frederick and Loewenstein (1999, p. 303) make this comparison explicit:

> "Adaptive processes serve two important functions. First, they *protect* organisms by reducing the internal impact of external stimuli…. Second, they *enhance perception* by heightening the signal value of changes from the baseline level…."
>
> "Hedonic adaptation may serve similar protective and perception-enhancing functions…. persistent strong hedonic states (for example, fear or stress) can have destructive physiological concomitants … Thus, hedonic adaptation may help to protect us from these effects."
>
> "Hedonic adaptation may also increase our sensitivity to, and motivation to make, local changes in our objective circumstances…."

Rayo and Becker (2005) construct a formal model that spells out the logic of Frederick and Loewenstein's (1999) claim.

G. Speculations on the Evolutionary Significance of Baseline Mood. Certain kinds of persistent situations could call for heightened sensitivity toward opportunities or toward dangers. For example, moderately high social rank or good physical health may make it safe to look more for opportunities than for dangers. Thus, it could make sense for these situations to stimulate the same machinery that is turned on by the receipt of good news. The high variance of persistent individual differences in baseline mood suggests a frequency dependence in which there is an advantage to being a pessimist looking for dangers when most of the surrounding people are optimists who might miss dangers, while there is an advantage to being an optimist who sees opportunities if there are plenty of pessimists around to alert one to possible dangers, and few other optimists around to boldy seize opportunities.

One of the most interesting possibilities is that important aspects of the determination of baseline mood are just quirks in the affective system that have no functional significance. The mixed-strategy evolutionary equilibrium in which the fitness of moderately happy and moderately unhappy people is equal would reduce the strength of any evolutionary pressure against such quirks.

Regardless of how the "production function" for baseline mood arose, now that it is present, it makes sense to exploit it, just as Stephen Pinker (1997) argues that we exploit our sense of taste (designed, say, to motivate the search for nuts and ripe fruits) with cheesecake and our musical sense (designed, say, to help us distinguish the sounds of different kinds of objects) with symphonies and Rock and Roll.

H. Implications of the Integrated Framework for Utility and Happiness. There are three key implications of this benchmark model for the relationship between affect and utility. First, there is a clear distinction between the psychological concept of affect and the economic concept of flow utility. Affect is *not* equal to either flow utility or to the overall objective function.

Second, the elation component of affect depends primarily on unexpected *changes* in lifetime utility. For applications, the most important point about elation is that the theory here contradicts the notion that a temporary movement in affect is unimportant because of its short duration. To the contrary, *a temporary movement in affect may be extremely important as a signal of important utility-relevant news related to the long-term welfare of the individual.*

Third, baseline mood, while not a summary measure of flow utility, is something that people care about. As with health, the relative concern with raising baseline mood compared to raising consumption of other goods may increase along with per capita income, implying that the average share of effort and expenditures devoted to raising baseline mood may increase in the future.

Since elation depends on (mean-zero) *news* about lifetime utility, rather than on the *level* of lifetime utility, elation has no trend. Thus, utility can rise with per capita income while happiness has only the trend imparted by the growth rate of baseline mood. This guarantees that the economic concept of lifetime utility and the psychological concept of the temporal sum of affect over time put forward by Kahneman (1999) will be numerically distinct approaches to assessing overall welfare. Distinguishing clearly between utility and happiness allows scientific questions about utility and happiness to proceed in a way that respects the insights of both Psychology and Economics without prejudging the ethical question of the proper contribution of each concept to the assessment of overall welfare–an ethical question that revolves fundamentally around the extent to which one should trust people's immediate feelings and the extent to which one should trust people's choices as indications of what most enhances their welfare. In this ethical debate, traditional Welfare Economics has implicitly staked out a position in favor of utility as the better measure of overall welfare, but the case for Kahneman's (1999) proposal deserves to be thoughtfully considered as well.[42]

Maintaining a clear distinction between affect and flow utility also makes it possible to see where the psychological approach toward welfare assessment and the economic approach toward welfare assessment are pulling in the same direction. For example, social rank—whether appearing as an effect of other people's consumption or time use on baseline mood or on flow utility directly—will matter for both the psychological and economic measures of overall welfare. As another example, as long as baseline mood is an argument of the flow utility function, any advance in scientific understanding of determinants of baseline mood, and the dissemination of scientific knowledge about baseline mood to individuals in society will be important for both measures of overall welfare.

7. Elation Theory and the Confusion Between Utility and Happiness

Any adequate account of the relationship between utility and happiness must explain why these two concepts are often confused. Why is it that they often seem to mean the same thing? To answer this question, it is useful to compare maximizing lifetime utility with Kahneman's (1999)

[42] The strength of Kahneman's case depends in important measure on whether, as he argues, there is no way to construct a consistent underlying set of preferences from the contradictory decisions people make, even after following the approaches discussed above in Section IV, "Measuring utility."

proposal of maximizing the true mathematical expectation of the present discounted value of happiness[43] in the context of the theory presented above.

A. Maximizing the Present Discounted Value of Happiness versus Maximizing Lifetime Utility. To the extent that baseline mood is different from flow utility and to some extent controllable, maximizing the expected present discounted value of happiness as Kahneman (1999) recommends will be different on that account from maximizing lifetime utility. But what about maximizing the expected present discounted value of happiness when baseline mood is beyond the individual's control? In that case only elation will matter in maximizing the presented discounted value of happiness. Proposition 1 addresses this case:

Proposition 1: Given (i) rational expectations, (ii) perfect memory, (iii) happiness that is the sum of baseline mood and elation, (iv) baseline mood that is exogenous to the individual, and (v) elation that is a positive linear combination of lifetime utility innovations, as of time *t*, maximizing the expected present discounted value of affect is equivalent to maximizing lifetime utility.

Proof: Let elation e_t be given by

$$e_t = \sum_{\ell=0}^{n} a_\ell \iota_{t-\ell}.$$

Then the expected present discounted value of happiness is

$$E_t\left\{\sum_{j=0}^{T-t}\beta^j A_{t+j}\right\} = E_t\left\{\sum_{j=0}^{T-t}\beta^j M_{t+j} + \sum_{j=0}^{T-t}\beta^j e_{t+j}\right\} = E_t\left\{\sum_{j=0}^{T-t}\beta^j M_{t+j} + \sum_{j=-n}^{T-t} b_{j,t}\iota_{t+j}\right\},$$

where

$$b_{j,t} = \sum_{\ell=-j}^{n}\beta^{j+\ell}a_\ell$$

as long as time *t* is at least *n* periods away from death, and somewhat less if *t* is less than *n* periods from death. Using the definition of lifetime utility innovations, perfect memory and the fact that the expectation of lifetime utility innovations conditional on previous information is zero, one can simplify the expected present discounted value of happiness further, to

$$E_t\left\{\sum_{j=0}^{T-t}\beta^j A_{t+j}\right\} = \sum_{j=0}^{T-t}\beta^j E_t M_{t+j} + b_{0,t}(v_t - E_{t-1}v_t) + \sum_{j=-n}^{-1} b_{j,t}\iota_{t+j}.$$

[43] The extension of Kahneman's proposal to the true mathematical expectation in uncertain situations is not explicit in Kahneman (1999), but it seems a reasonable interpretation.

Given the exogeneity of baseline mood M and the perspective of time t, everything in this expression is fixed except for $b_{0,t}\, v_t$. Thus, maximizing the expected present discounted value of happiness is equivalent to maximizing $b_{0,t}\, v_t$, which in turn is equivalent to maximizing v_t.[44]

B. Maximizing Current Happiness. Note that under the assumptions of Proposition 1, maximizing *current* happiness alone is also equivalent to maximizing lifetime utility, since

$$A_t = M_t + e_t = M_t + \sum_{\ell=0}^{n} a_\ell \iota_{t-\ell} = M_t + a_0 v_t - a_0 E_{t-1} v_t + \sum_{\ell=1}^{n} a_\ell \iota_{t-\ell}.$$

Given the assumed exogeneity of baseline mood M_t, the only thing that is not fixed in this expression as of time t is the term $a_0 v_t$, so one does the same thing to maximize current happiness as to maximize lifetime utility. The reason a present discounted value of happiness is not required is that elation is already forward-looking.[45]

C. Why Utility and Happiness are Often Confused. Psychological evidence is accumulating that baseline mood can in fact, be modified deliberately—and in ways that go beyond the zero-sum game of acquiring social rank. But a lack of understanding of the determinants of baseline mood can make baseline mood seem exogenous. As noted above, one reason for this lack of understanding may be that a large fraction of the time-series variance of happiness may be accounted for by elation and dismay. To the extent that elation and dismay dominate people's perception of happiness, Proposition 1 indicates why people might think that utility and happiness are essentially the same thing.

It is when people do begin to recognize that baseline mood might be controllable that the distinction between utility and happiness becomes crucial. Understanding the ways in which baseline mood is controllable clearly matters for optimization. Understanding the distinction between utility and happiness is becoming important precisely because we are beginning to see a wider variety of ways to raise *utility* by raising *happiness* rather than being limited to raising *happiness* (temporarily) by raising *utility*.

8. Utility of Elation.

To the extent that people value transient happiness as well as lasting happiness, elation may enter the utility function. Because elation depends in turn on news about lifetime utility, putting elation in the utility function requires one to solve simultaneously for elation and lifetime utility. For that reason, we have delayed the discussion of elation in the utility function until this point.

A. Adding Elation when Elation is a Linear Function of Lifetime Utility Innovations. One key result, showing the robustness of the model of Section 6 to the addition of elation, is the following:

[44] Note that only exogeneity of the conditional *mean* of baseline mood is needed for this result. An ability to control the variance of baseline mood, with no effect on the mean, would still leave elation totally dominant in the expected present discounted value of happiness.

[45] In an analogy to exotic financial securities due to George Akerlof when he first heard about elation, elation provides a kind of *tranche* of current and future effects on flow utility.

Proposition 2: Given rational expectations, adding to the flow utility function a linear function of lifetime utility innovations (with positive coefficients summing to less than one) has no effect on the preferences represented by the utility function.

Proof: Using an asterisk to represent the modified flow utility and lifetime utility functions, let

$$U^*(t) = U(t) + \theta e_t = U(t) + \theta \sum_{\ell=0}^{n} a_\ell \iota^*_{t-\ell}.$$

where $\theta \sum_{\ell=0}^{n} a_\ell < 1$. Note that the relevant lifetime utility innovations will be those for the modified lifetime utility function. Modified lifetime utility is then

$$v^*_t = v_t + \theta E_t \sum_{j=-n}^{T-t} b_{j,t} \iota^*_{t+j},$$

where, as above, $b_{j,t} = \sum_{\ell=-j}^{n} \beta^{j+\ell} a_\ell$ as long as time t is at least n periods away from death, and somewhat less if t is less than n periods from death. The essential structure here is that modified lifetime utility v^*_t is equal to the original lifetime utility v_t plus the expected value of a linear combination of the modified lifetime utility innovations with positive coefficients running from n periods back, up to the lifetime utility innovation in the agent's last period. Because lifetime utility innovations have mean zero conditional on previous information, one can simplify this further to

$$v^*_t = v_t + \theta b_{0,t} \iota^*_t + \theta \sum_{j=-n}^{-1} b_{j,t} \iota^*_{t+j} = v_t + \theta b_{0,t} (v^*_t - E_{t-1} v^*_t) + \theta \sum_{j=-n}^{-1} b_{j,t} \iota^*_{t+j}.$$

The condition that $\theta \sum_{\ell=0}^{n} a_\ell < 1$ guarantees that $\theta b_{0,t} < 1$. Therefore, one can solve for v^*_t:

$$v^*_t = \frac{v_t - \theta b_{0,t} E_{t-1} v^*_t + \theta \sum_{j=-n}^{-1} b_{j,t} \iota^*_{t+j}}{1 - \theta b_{0,t}}.$$

Because $-\theta b_{0,t} E_{t-1} v_t + \theta \sum_{j=-n}^{-1} b_{j,t} \iota^*_{t+j}$ is fixed as of time *t*, as a representation of preferences over choices at time *t*, v^*_t is equivalent to $v_t/(1-\theta b_{0,t})$, which in turn is equivalent to v_t itself.

To recap the proof, when a linear combination of lifetime utility innovations is added to the lifetime utility function, (1) the future lifetime utility innovations do not affect decisions because their expectation is zero, (2) the past lifetime utility innovations do not affect decisions because they are predetermined and (3) the current lifetime utility innovation does not affect decisions because, to the extent it is not predetermined, it is perfectly correlated with the original lifetime utility function.

B. Manipulating the Timing of News and Manipulating Expectations. In the proof of Proposition 2, have we tacitly assumed a fixed information structure? Does adding elation that is a positive linear combination of lifetime utility innovations to the utility function affect preferences over information structures, even when both information structures would lead to the same decisions over other variables? For example, could it make people want to delay when they hear news in order to manipulate their own feelings? The answer is no. Because rational expectations take into account the information structure, there is no way to game the system with any rule set up in advance. Suppose for example, that you told your friend to tell you good news right away, but to withhold bad news. The Bayesian inference in rational expectations would cancel out any effect on the expected lifetime utility innovation, though it would certainly affect the *ex post* distribution of lifetime utility innovations. Formally, v^*_t can be expressed as a linear function of v_t and *past* expectations about lifetime utility. Choosing a different information structure *now* can only affect current and future expectations about lifetime utility. That includes choosing an information structure when your friend says "I know what happened, do you want me to tell you or not?" since any revelation is still in the future, if in the near future.

Of course, even a mean-zero effect on the distribution of lifetime utility innovations will affect lifetime utility when added elation is a nonlinear function of lifetime utility innovations or elation enters the utility function nonlinearly, as we discuss below. Also, imperfect memory of past expectations may provide an opening for gaming the system by trying to reduce one's remembered past expectations. This may be particularly relevant for the memories of past expectations parents transmit to a child about the child's prospects: the gap between parent and child can be one source of imperfect memory in a dynasty. More generally, an attitude of gratitude (whose value is not diminished by the triteness of the phrase) can serve the same purpose as manipulable memory. It often involves substituting comparisons with others in a worse situation for comparisons with one's own remembered past expectations or one's own deductions of what one ought to have expected in the past.

Given perfect memory, but irrational expectations, it may be harder to beneficially manipulate expectations than one might at first think, since then lowering one's expectations adds to flow utility in the future, but subtracts from flow utility now.[46] (As long as one is more than n periods away from death, this will have no effect on lifetime utility. Closer to death, pushing one's expectations down is harmful and pushing one's expectations up is beneficial.) It is when one can manage high expectations now, but remember them in the future as if they were low expectations that there is a real opening for beneficial manipulation of beliefs.

C. Do Mistakes about the Rate of Hedonic Adaptation Matter? We argued above that because utility and happiness are distinct, the psychological phenomenon of hedonic adaptation does not have any necessary implications for the shape of the utility function. In particular, if

[46] Nevertheless, there is evidence people do some of this kind of manipulation of expectations. Nisan (1972) finds that study participants taking an immediate test were less confident than those taking a test in 4 weeks. Similarly, Shepperd, Ouellette, & Fernandez (1996) find that college seniors were more muted in estimated first-job salaries than sophomores and juniors. (See also Shepperd, Findley-Klein, Kwavnick, Walker and Perez (2000).) In each case, confidence was reduced when proximity to performance outcomes was more immediate. We are grateful to Norbert Schwarz for cluing us in to this evidence.

flow utility depends only on baseline mood and not on elation, as in the model above, the determination of elation, including the rate of hedonic adaptation, has no effect on the lifetime utility function. Thus, when elation is not an argument of the utility function, misprediction of hedonic adaptation causes no material harm to utility maximization, contrary to the claims of Schkade and Kahneman (1998).

To pursue the question further, consider how much harm there is to mistakes about the rate of hedonic adaptation in the context of the model of subsection A, with a positive linear combination of lifetime utility innovations added to the flow utility function. Mistakes about the rate of hedonic adaptation are mistakes about the true values of the coefficients a_ℓ. Since the modified lifetime utility function is equivalent to the original utility function regardless of the values of the coefficients a_ℓ (as long as they are positive and add to less than one), mistakes about the rate of hedonic adaptation will not distort decisions at all and so will be costless!

In the light of the lack of harm to optimization from misperception of the rate of hedonic adaptation in this benchmark case, any serious claim of quantitatively significant harm to optimization from misperception of the rate of hedonic adaptation would require careful modeling. For example, when elation is a nonlinear function of lifetime utility innovations, or flow utility is a nonlinear function of elation, there is likely to be at least some harm from misperception of the rate of hedonic adaptation, but it is not clear how large this harm would be. In the case of imperfect memory, misperception of the rate of hedonic adaptation might cause one to exert too much or too little effort toward manipulating one's memories, but whether this results in a serious reduction in lifetime utility depends on how great the scope is for manipulation of memory.

One of the most important effects of underestimating the rate of hedonic adaptation is that it will cause an overestimation of the unconditional variance of elation, since the effects of unforeseen increases or decreases in lifetime utility seem like they will be long-lasting. An overestimation of the unconditional variance of elation should, in turn, cause an individual to overestimate the fraction of the variance of happiness due to elation and underestimate the fraction of the variance of happiness due to baseline mood. As shown above, this overestimation of the persistence of elation does not necessarily interfere with maximizing lifetime utility, but it *would* tend to push Kahneman's suggested alternative of maximizing the expected present discounted value of happiness in the direction of maximizing lifetime utility. Since elation embodies movements in lifetime utility, anything that exaggerates the importance of elation in happiness is likely to make maximizing happiness more like maximizing utility, as indicated by the extreme case of Section 7, where elation is the only controllable component of happiness.

D. Elation Nonseparable in the Utility Function. Given Proposition 2, the key issues arising from elation in the utility function are (1) imperfect memory and departures from rational expectations, discussed briefly above, (2) nonseparability of elation in the utility function, and (3) nonlinearity of the utility function in lifetime utility innovations once elation is substituted out.[47] Here we will barely mention the possible consequences of nonseparability.

[47] There are some other possible extensions of the model that we cannot give a serious discussion to here. One of the more interesting is the possibility that elation responds more to news about whether one's choices worked out

Nonseparability of lifetime utility innovations could make manipulating the timing of news optimal. For example, an altruistic person might want to throw a surprise party to take advantage of a complementarity in the recipient's utility function between elation and the presence of friends. Nonseparability of elation in the utility function can also generate wealth effects that modify the size of the effects of imperfect memory, nonrational expectations and nonlinearity.

E. Elation Nonlinear in Lifetime Utility Innovations as a Foundation for Prospect Theory. It is worth discussing in some depth the effects of nonlinearity of the flow utility function in lifetime utility innovations, because this can lead very naturally to a version of Prospect Theory. Rather than discuss the effects of nonlinearity in general, we focus on a particular type of nonlinearity, motivated by the evolutionary interpretation of elation in Section 6E. Consider the following set of features one might wish a model to exhibit:

a. Elation is proportional to the rate of cognitive processing of news.
b. Within bad or good news, the total amount of processing needed is proportional to the magnitude of the news.
c. Bad news requires more processing per unit of lifetime utility innovation than good news. (This implies a partial separation of the cerebral system for working through good news from the cerebral system for working through bad news.)
d. It takes longer to process a big chunk of news than a small chunk of news.

Let us present a toy model that illustrates how these features could arise. It is in continuous time to provide detail of how news is being processed and for convenience. News arrives once, at time 0. G is a positive state variable representing the cumulative amount of unprocessed good news. B is a negative state variable for the cumulative amount of unprocessed bad news magnified by the parameter $\psi>1$ to represent the additional difficulty of processing bad news.[48] Formally, at the instant of news, either G or B jumps according to

$$\Delta G = \max(\iota, 0)$$
$$\Delta B = \psi \min(\iota, 0).$$

The capacity for cognitive processing is γ, so that in the absence of additional news, and as long as $G>0$,

$$dG / dt = -\gamma .$$

Similarly, in the absence of additional news, and as long as $B<0$,

$$dB / dt = \gamma.$$

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than to news about things beyond one's control. That would make it possible to manipulate elation by labeling good events as due to one's efforts, while labeling bad events as beyond one's control.

[48] We choose ψ –Greek psi in the shape of a pitchfork—to symbolize the hellishness of working through bad news.

Elation is γ for some time after good news, while elation is $-\gamma$ for some time after bad news.[49] The time it takes to get over a chunk of news is proportional to the size of the news. It takes ψ times as long to get over bad news.

The von Neumann-Morgenstern lifetime utility function at the moment the news is received at time zero is given by

$$\int_0^\infty \exp(-\rho t)[\, f(C_t) + \theta e_t \,],$$

with $\theta<\psi^{-1}$. If the lifetime utility innovation ι_0 is greater than zero, the present discounted value of elation $g(\iota_0)$ is given by

$$g(\iota_0) = \int_0^\infty \exp(-\rho t) e_t \, dt = \int_0^{\iota_0/\gamma} \exp(-\rho t)\gamma \, dt = \frac{\gamma}{\rho}\left[1 - \exp\left(-\rho \iota_0 / \gamma\right)\right].$$

If $\iota_0<0$,

$$g(\iota_0) = \int_0^\infty \exp(-\rho t) e_t \, dt = \int_0^{-\psi\iota_0/\gamma} \exp(-\rho t)[-\delta] dt = -\frac{\gamma}{\rho}\left[1 - \exp\left(\psi\rho \iota_0 / \gamma\right)\right].$$

Graphically, $g(\iota_0)$ is concave for positive lifetime utility innovations and convex for negative lifetime utility innovations, with a kink at zero. (The slope is 1 for small positive values, but $\psi>1$ for small negative values.) $g(\iota_0)$ has an asymptote at γ/ρ at $+\infty$ and an asymptote at $-\gamma/\rho$ at $-\infty$. This is a shape familiar from Prospect Theory (Kahneman and Tversky, 1979).[50]

Let v_- be the level of lifetime utility immediately before the news at time zero, while v_+ is the lifetime utility immediately after the news. The news tells the constant level of consumption C that will prevail from time zero on. Therefore,

$$v_+ = \frac{f(C)}{\rho} + \theta g(v_+ - v_-),$$

which can be solved uniquely for v_+, since the maximum slope of θg is $\theta\psi<1$:

[49] A more realistic model might make the flow of elation and dismay increasing in the magnitude of the news, and greater in absolute magnitude for bad news than good news, but this assumption will do for our example.

[50] One facet of this model worth pointing out is that, other than the kink at zero, the curvature of $g(\iota_0)$ depends on the discount rate ρ. It may be that this will not provide sufficient curvature to match the observations that motivate Prospect Theory. But in a more complex model, hyperbolic discounting could come to the rescue by providing a high discount rate in the first little while. In any case, it is easy to add mechanisms that generate more curvature. Most obviously, one can posit that the amount of cognitive processing required goes up less than proportionately with the magnitude of news, so that $\Delta G = \varphi(\iota)$ and $\Delta B = -\psi\varphi(-\iota)$, where the function $\varphi(\cdot)$ is increasing and concave for positive values and uniformly zero for negative values.

$$v_+ = h\left(\frac{f(C)}{\rho}, v_-\right).$$

Also,

$$v_- = E_- h\left(\frac{f(C)}{\rho}, v_-\right),$$

which has a unique solution for v_- since h is decreasing in v_-. To get a little more intuition, think of what happens for small θ. If θ is small, then

$$v_+ = \frac{f(C)}{\rho} + \theta g\left(\frac{f(C)}{\rho} - v_-\right) + O(\theta^2).$$

Thus, the lifetime utility function takes some of its curvature from $f(C)$ and some of its curvature from g. If $f(C)$ has the functional form of decreasing absolute risk aversion, then as the agent becomes richer, more and more of the curvature of the lifetime utility function will come from g. Also, since g is kinked at zero, the function g—which comes from the agent's awareness of the affective consequences of good and bad news—will dominate the agent's choices between small risks. For choices among large enough risks, the fact that g has a limited range, bounded between two asymptotes, could make the curvature of f the dominant factor.

One aspect of these equations that may seem esoteric is the self-referential aspect of lifetime utility depending on its own innovation. In order to see more clearly how that self-dependence is resolved, it is helpful to look at a different approximation: the approximation for small lifetime utility innovations. For small positive lifetime utility innovations,

$$v_+ \approx \frac{f(C)}{\rho} + \theta(v_+ - v_-),$$

so that

$$v_+ \approx (1-\theta)^{-1}\left[\frac{f(C)}{\rho} - \theta v_-\right]$$

and

$$\iota_0 \approx (1-\theta)^{-1}\left[\frac{f(C)}{\rho} - v_-\right].$$

For small negative lifetime utility innovations,

$$v_+ \approx \frac{f(C)}{\rho} + \psi\theta(v_+ - v_-),$$

so that

$$\nu_+ \approx (1-\psi\theta)^{-1}\left[\frac{f(C)}{\rho} - \psi\theta\nu_-\right]$$

and

$$\iota_0 \approx (1-\psi\theta)^{-1}\left[\frac{f(C)}{\rho} - \nu_-\right].$$

There are two interesting results apparent from this approximation. First, the realization of consumption at which there is no surprise is where $\frac{f(C)}{\rho} = \nu_-$, just as it would be if elation were not in the utility function. Second, the kink at this level is made sharper by the way ψ appears in the factor $(1-\psi\theta)^{-1}$. This factor looks formally like a Keynesian multiplier—reflecting the self-referential aspect of lifetime utility depending on its own innovation.

The model above is only a toy model, but we think it accurately indicates the likely flavor of a more general treatment of nonlinear von Neumann-Morgenstern preferences over elation: given the structure of elation, Prospect Theory can easily arise from rational preferences over one's own emotions.[51] Such an affective foundation for Prospect Theory puts Prospect Theory in context. For example, this kind of model predicts that Prospect-Theory-like behavior will arise where the affective consequences of a choice are much larger than the non-affective consequences of a choice. Also, to the extent that Prospect Theory arises from the affective consequences of choices, affect data will be helpful in understanding people's choices, even though it will not be the whole story.

9. Implications of the Theory for Happiness Empirics

Even without the extensions discussed in Section 8, the integrated framework for utility and happiness laid out in Section 6 has many important implications for empirical work using happiness data. One of the most basic tests of the value of our framework is whether pursuing these implications for empirical work turns out to be fruitful.

A. The Time-Series Properties of Happiness Matter. The most obvious implication of our framework is the need for more research on the time-series properties of happiness. For example,

- How fast and how extensive is hedonic adaptation for affect, as compared to the (so far) better-studied hedonic adaptation for life satisfaction and global happiness measures?
- Do the time series properties of happiness have any implications for econometric practice in research to identify the determinants of happiness?

We have work in progress along both of these lines, but the details must to left to other papers.

[51] These are psychological preferences in the same sense as those appearing in the "psychological games" studied by Geneakoplos, Pearce and Stacchetti (1989).

B. Price Theory Can be Used to Study Baseline Mood. Second, the theory of baseline mood implies that standard price theoretic tools can be applied to the low-frequency movements of happiness. For example, the dollar value people place on feeling permanently happier can be gauged by how much they are willing to pay for psychotherapy in time and money (beyond what insurance pays for), divided by the effect of the psychotherapy on happiness. The less effective psychotherapy is at actually raising happiness, the higher the implied valuation on happiness. In the case of antidepressants, in addition to the monetary and time cost, one would have to determine how much people would be willing to pay to have an antidepressant free of side effects and add that value before dividing by the effect on happiness. Such ratios can begin to identify the marginal value of happiness.

Several other price-theoretic issues have been discussed above. Even in the context of our framework, normality of baseline mood still leads to a version of the Easterlin Paradox. It is important to construct measures of the price of happiness over time to see if an upward trend in that price can explain why people are not choosing higher baseline mood in their ever-expanding consumption bundle.

As mentioned above, one limitation in the use of these price theoretic tools is that they depend on knowing people's beliefs about the household production function for baseline mood. Would people do more things that add to happiness if they knew what they were? For example, there are some hints that, in addition to its other benefits, getting more sleep might add significantly to happiness.[52] If this is true, and people knew it, this could place a strong upper bound on the value people place on happiness (the hourly wage divided by the effect of an extra hour's sleep on happiness), but such a conclusion would only be warranted if people really knew exactly how much benefit an extra hour's sleep would have for happiness. On might obtain a more reasonable estimate of the value of happiness by conditioning on people's reports of how much they *believe* an extra hour of sleep each night would add to happiness.

Given measures of the marginal value of happiness, any evidence about the determinants of happiness should be included in cost-benefit analyses. If the marginal dollar value of happiness is high, it could motivate ever more careful empirical work to measure the strength of the effects of variables on long-run happiness. In particular, it could motivate many clever minds to look for good instruments for the possible determinants of long-run happiness.[53]

In principle, the application of price-theoretic tools to baseline mood should yield tests of the theory as well as applications. This kind of test of the theory is likely to emerge over time as the measures of the relevant concepts are refined.

C. The Elation Theory is Readily Testable. Because the theory of elation is the most highly structured aspect of our theory, it is also the most readily testable. In particular, we hope to test whether or not people's hypothetical choices between alternatives A and B always match their

[52] Norbert Schwarz, personal communication, and Kahneman, Krueger, Schkade, Schwarz and Stone (2004). The results are not definitive because of the lack of a good econometric instrument for hours of sleep that is known *a priori* not to affect happiness directly.

[53] Kerwin Charles (2002) is a good example of the kind of attention to exogeneity in happiness research that we mean.

predictions of how happy they would be immediately after receiving the news that A had happened or that B had happened with no action on their part. Our theory predicts that people will choose the alternative that would seem like the best news to them (as indicated by their happiness immediately after hearing). To the extent that this does not seem like a very daring prediction, it indicates that the reader has a prior belief in favor of one of the key linchpins of our theory. Nevertheless, it *is* a testable prediction. It is *not* true by definition.

D. Elation Provides Information about Preferences and Expectations. The theory of elation implies that, if it is possible to control for variation in baseline mood, the response of happiness to news will give direct information about preferences. Indeed, the elation component of happiness is essentially an "excess returns" measure for lifetime utility. Therefore, in principle, happiness data can serve as the basis for exactly the same kinds of "event studies" as those carried out using data on excess financial returns.

To implement this insight about the use of happiness data for "event studies," it would be very helpful to have a regular monthly, or even daily, time series on average aggregate affect. This would allow a test of average preferences over aggregate events. In particular, after accounting for the lagged effects of the previous months' news, the theory of elation implies that whether affect goes above baseline or below baseline indicates whether the month's news has been on average good news overall or bad news overall. Since many things happen in a month, each month's data would give information about whether a different innovation vector for the expected consumption bundle represented an increase or a decrease in lifetime utility. Over time, this would tell a great deal about average preferences for aggregate events. Information about preferences for aggregate events is particularly valuable because many of these things do not have regular markets. For example, one might want to know about the relative importance people put on geopolitics compared to economics. Any month in which there is good economic news but bad geopolitical news, or the reverse, would provide relevant information. Election returns are often read as giving this kind of information, but affect data immediately on the heels of news may give more detail. At a minimum, high-frequency happiness data serves as a kind of general-purpose poll question that can give useful insight into how people feel about any big event that comes along.

Kimball, Helen Levy, Fumio Ohtake and Yoshiro Tsutsui (2006) report a pilot study using a few months' worth of happiness data on the University of Michigan Surveys of Consumers. They find a significant dip in measured happiness both in the first week of September 2005, right after Hurricane Katrina, and in the week after the earthquake in Pakistan that occurred in October 2005. Adaptation to the hedonic effects of these national and international news events was close to complete after two weeks. The dip in happiness after Hurricane Katrina was significantly greater in the South Central region of the United States, closest to the hurricane's landfall. The size of the average U.S. reaction to the earthquake in Pakistan is almost as great as the size of the average U.S. reaction to Katrina. Although the human toll from the earthquake in Pakistan was much greater than from Katrina, this still indicates a surprisingly high degree of concern for people on the other side of the world if we are correct in our hypothesis that the size of short-run spikes in happiness indicates the magnitude of the implications of news for lifetime utility. Tsutsui, Kimball and Ohtake (2005) apply a similar event-study methodology to the

hedonic reactions in a Japanese sample to the overwhelming electoral victory of Japanese Prime Minister Koizumi in October 2005.

In situations where preferences are clear, the theory of elation draws a strong link between happiness and expectations. This provides another avenue for testing the theory. Section 6D discusses some of the supporting evidence that has already been established on this score. More can be done in this area. One of the most interesting tests would be in areas where people are known to violate rational expectations or where the memory of past expectations is likely to fade. Here the test would be to see if the pattern of people's reported happiness matched the quirks in their expectation formation and memory.

Assuming that the elation theory is valid, it may have relevance for the survey measurement of preferences and expectations quite broadly. On the preference side, since the elation mechanism seems to be fairly automatic as a psychological process, it may be that it is easier and more reliable for respondents to predict their happiness after option A and after option B than it is for them to make a direct choice. On the expectations side, given the unfamiliarity of precise probabilities compared to the familiarity of happiness, it may be easier and more reliable for respondents to report happiness than for them to directly report probabilities. For example, after setting the stage by asking how happy a sample of people on one side of the political divide would feel (A) if their preferred presidential candidate won or (B) if their less preferred presidential candidate won, their average happiness in the days before the election might be an efficient way to assess their subjective probabilities of victory for their preferred candidate.

We have an example from personal experience of using elation to gather information about the strength of preferences. One of us was present when a daughter opened letters from the admissions departments of the colleges she had applied to. The evident strength of the daughter's positive affective reaction was persuasive in establishing the extra value she placed on going to her much more expensive first-choice college, as opposed to her much less expensive second-choice college. Of course, this did not indicate what the ultimate wisdom of each choice would be, but it did indicate her preferences given her beliefs about what it would be like to go to each college.

E. Sufficient Statistics. As we have argued at length, elation and dismay measure the effect of news on expected lifetime utility. Somewhat more formally, elation provides a sufficient statistic that captures the effect on the (expected) lifetime utility of current or future events that had not previously been anticipated. This interpretation of elation is similar to the more familiar idea that in analyzing lifecycle maximization problems the marginal utility of income, a scalar quantity denoted by λ_t, "serves as the sufficient statistic which captures all information from other periods that is necessary to solve the current-period maximization problem." (Blundell and MaCurdy, 1999, p.1594). In particular, λ_t measures the utility value of a dollar saved for expenditure in the future relative to a dollar spent on consumption today and also the marginal utility value of additional time spent on leisure or household production per unit of foregone earnings. Unanticipated changes in the marginal utility of income provide a signal about changes in the optimal allocation of consumption and leisure over the lifecycle.

It is interesting to consider the roles of these two quantities for consumer behavior. The role of the marginal utility of income is well known. Any news about changes in expected future income or price which causes the marginal utility of income to fall serve as a signal to a utility-maximizing consumer to increase current consumption and leisure by reducing saving; news that leads to an increase in the marginal utility of income is a signal to reduce consumption and leisure and increase saving. Both elation and λ_t are derived from the (expected) lifetime utility function. It follows that news that affects probability beliefs about future incomes, prices, health or any other variables that affect preferences or constraints that causes changes in λ_t will also tend to cause elation or dismay.

Mathematically, there are two differences between elation in our theory and λ_t as sufficient statistics. First, elation is about the *total* lifetime utility, while λ_t is about the *derivative* of lifetime utility with respect to wealth. Second, it is *temporary spikes* in the level of elation that indicate a change lifetime utility, while it is *permanent changes* in the level of λ_t that indicate a change in the first derivative of lifetime utility.[54]

In principle, economists could gain insight into the effects of news by studying the dynamics of consumption and labor supply jointly with longitudinal data on subjective well-being. Observed changes in savings, consumption or labor supply respond to news that influences the marginal value of a dollar while spikes in subjective well-being reflect changes in total lifetime utility. It is easy to show that elation and changes in the marginal utility of income are not necessarily correlated in a simple way. For example, a person who receives news that he has been promoted and will be receiving a higher salary next year will feel elation—a signal that his lifetime utility has gone up—and his marginal utility of income will fall—a signal that he should allocate more of his wealth to current consumption. Today, he might choose to celebrate his promotion with dinner at a fancy restaurant. Consider a less fortunate person who has just heard a jury convict him of a long prison sentence. Obviously, this person suffers dismay. However, given the difference in the availability of fine food in prison and in town, his marginal utility of income also falls and he may also choose a fancy restaurant meal today, assuming that his appeal allows him to stay out of prison for a while. As another example, a person (with full medical insurance) who has had a successful operation on a malignant tumor will experience elation and an increase in his marginal utility of income, signaling that he should increase his saving to accommodate his longer life expectancy.

Although elation and changes in the marginal utility of income could be correlated in either direction, it is likely that most news in the economic domain reflects good or bad news about future income and wealth. That is, macroeconomic news about expansions or recessions or microeconomic news about one's own promotion or layoff tend to produce both unexpected gains or losses in lifetime utility and signals to increase or decrease current consumption. This

[54] A similarity between elation and λ_t is that econometric identification of both spikes in elation and changes in λ_t requires subtracting out an individual fixed effect. It may also be necessary to control for a few other factors that have predictable effects on changes in subjective well-being or behavior. For example, the real interest rate can have predictable effects on the evolution of consumption and labor supply, even in the absence of news, while time-varying determinants of baseline mood can have predictable effects on overall subjective well-being.

might be consistent with psychological evidence that has been interpreted as suggesting that an up mood is a signal to move forward with bold plans, putting aside worries, while a down mood is a signal to focus on things that might go wrong and to proceed with caution. It would be interesting to examine whether the correlation between mood and consumption is usually positive and also to test whether this correlation is reversed in the less usual situations such as those described above when mood and the marginal utility of income move together rather than in opposite directions.

10. Implications of the Theory for Policy

A good way to discuss the policy implications of our framework is to contrast the views that we believe follow from our framework with those of Layard (2005). Layard (2005) is very bold in making policy recommendations based on happiness theory and empirics. Although he is especially bold, we consider the general tenor of his recommendations to be reasonably representative of views expressed in much of the existing happiness literature.

Layard explicitly accepts Kahneman's (1999) proposal to use the expected present discounted value of measured happiness averaged across people as the social welfare function. Besides the issues we discuss in this paper, Layard is assuming a solution to interpersonal comparability issues that we think have not been solved, but let us leave that aside, since all of our social welfare measures share that difficulty in all but the easiest applications.[55]

Many of Layard's recommendations depend only on happiness being more valuable than current public policy recognizes. The general discounting of intangibles in policy discussions makes this likely. Generating and popularizing happiness accounts in parallel to GDP accounts is a reasonable step to rectify insufficient attention to these intangibles. Taking happiness more seriously also suggests many other concrete steps, such as fighting the stigma to antidepressants and psychological treatment, and devoting more resources to mental health care, mental health research, happiness research, and public education about the determinants of long-run happiness.

Other recommendations depend on the externalities inherent in people caring about social rank. Since both revealed preference and happiness data indicate that social rank is important, these recommendations remain on the mark. Quantitatively, a revealed preference measure of the importance of social rank may be different from an affective measure, but qualitatively, the implications of social rank mattering are the same either way.

[55] The Ordinalist Revolution made it clear that the key philosophical issues in judging social welfare for purposes of public policy could not be avoided even if a perfect direct measure of individual welfare existed. Most notably, there is no easy escape from the difficulties surrounding interpersonal comparison. For example, should those with more refined tastes who can distinguish more minute differences in quality therefore be accorded greater weight in social choice? See Stigler (1950).

Affective data also provide a good reminder of the importance of many other externalities and public goods—an importance that can be verified by revealed preference. The sense of community matters, the strength and quality of marriages and families matter: and the responsiveness of government matters. Again, a revealed preference measure may differ quantitatively in the importance it suggests for these externalities, but it is likely to agree qualitatively.

There are two areas where we differ with Layard. First, Layard makes many recommendations based on Kahneman's (1999) social welfare measure, where we would turn to utility based on revealed preference as the appropriate welfare measure. This leads to stark differences in recommendations about tradeoffs between economic growth and other values. For example, Layard argues that since economic growth does very little to raise happiness, while being forced to move from one city to another lowers happiness significantly, it is worth sacrificing a great deal of economic growth in order to slightly reduce the need for mobility. To us, this either tacitly assumes that feeling happy is the only thing people care about (which we dispute), or it requires forcing upon them the objective of maximizing happiness when, given the choice, they reject this objective for themselves. There are many indications that economic growth is, in fact, important to people, even if it does not raise happiness. In principle, the dollar value of happiness could be high enough to make such a sacrifice worthwhile even if happiness is not the only thing in the utility function, but it would require an extremely high value. Even given existing lay knowledge about the determinants of baseline mood, if the value people place on happiness were high enough to make this kind of sacrifice worthwhile, we should see many more people seeking psychological treatment, sleeping more, exercising more, eating better, pursuing meditative practices, and so on, than we observe. Of course, if stability of residence enters the utility function beyond its effect on happiness, its valuation could be higher, but this is not Layard's argument.[56]

It is worth being very explicit about why Kahneman's (1999) social welfare measure differs so much in its implications from standard social welfare measures in Economics. Our theory implies that the present discounted value of affect Kahneman points to is the sum of two very different components: the present discounted value of baseline mood and the present discounted value of elation. Conceptually, we view the present discounted value of baseline mood as something like the present discounted value of any other sub-utility function, such as the present discounted value of a health measure. While likely to be correlated with lifetime utility, this present discounted value of baseline mood represents only one of the things people care about. (Less importantly, this present discounted value also has in it no representation of any decreasing returns to baseline mood in the utility function.) By contrast, the present discounted value of elation is a very interesting quantity that (at least approximately) represents the cumulative

[56] Note that for the set of things that only enter utility through happiness, valuing them at their effect on happiness times the revealed preference dollar value of happiness is a very different procedure from the common valuation procedure of dividing the effect of a variable on happiness by the effect of *income* on happiness. This procedure is wrong because it assumes that income only affects utility by affecting happiness—something we know to be false for income to the extent that people thoughtfully sacrifice happiness for higher income. In order to use income as a *numeraire*, all the benefits of income on utility need to be accounted for, not just the (possibly small) fraction of the benefits of income that show up in a higher level of happiness.

innovation in lifetime utility over the interval of time covered in the discounted sum. In other words, the present discounted value of elation answers the question of how well one's life has turned out compared to what one expected at an earlier time, perhaps long ago, when the discounted sum began. If for example, one could separate out elation from baseline mood in measured affect and constructed present discounted sums of elation from a long panel of the adult population over 18, the average discounted sum of elation would represent how much better or worse people's lives turned out than they expected at age 18. As a social welfare measure, this intriguing quantity has one serious problem: it does not credit as social improvement any improvement in how people's lives in a society look as of age 18. Even if the panel were extended back to five-year olds, the present discounted sum of elation from that age on would not give due weight to improvement in life prospects as life prospects appear as of age 5. In our view, many of the most valuable aspects of progress over the past few centuries, or even the past few decades, are ones that would be highly valued by five-year olds, not just in the moment, but as they think about what their lives will be like when they grow up.

Second, we consider Layard too quick to believe that people are making systematic mistakes in optimization.[57] People no doubt do make mistakes, but because happiness is not the only thing people care about, happiness data alone is seldom enough to identify optimization mistakes. The key types of evidence we would point to for identifying mistakes are regret and people changing their minds on a decision after thinking more carefully or getting better information. Also, not all factual mistakes lead to optimization mistakes. In Section 8 C, we argue at length that mistakes in predicting the dynamics of affect do not necessarily lead to optimization mistakes.

11. Conclusion

Happiness research matters because—even if economic progress continues unabated over the next 50 years in the U.S. and other advanced countries—whether the citizens of these countries end up rich and happy or rich and unhappy depends on whether money *can* buy happiness *and* on whether the additional economic resources will, in fact, be used to obtain additional happiness. To the extent there is a tradeoff between happiness and other values, the increases in income and wealth that accompany economic progress are likely to make improvements in subjective well-being increasingly important for welfare compared to further improvements in other areas.[58]

In order for happiness research to fully tap into the vast accumulated human capital of the Economics profession, we consider it important to develop a theory that respects the canons of Economics as well as the findings of Psychology. One of the most important canons of Economics is Ordinalism, or the principle of Revealed Preference.

[57] In this, Layard follows Gruber and Mullainathan (2002) and Frey and Stutzer (2004b).

[58] One area where trends in happiness could have important macroeconomic effects is in the area of happiness on the job. For example, it is possible that, in the coming decades, advances in subjective well-being at work could alter people's relationship to work in a way that significantly raises the average retirement age. Happiness on the job is likely to be an increasingly important element of competitive advantage—particularly for firms that need to attract skilled workers who may place a higher dollar value on happiness.

Revealed Preference, applied to the Easterlin Paradox of nontrending happiness in the face of dramatic improvements in per capita income and many other areas of life, clearly distinguishes utility from happiness. Utility is the extent to which people achieve what they care about, as indicated by their choices; happiness is how they feel. This distinction is important. In particular, the distinction between utility and happiness leads to many insights and productive questions that would be difficult to see as long as utility and happiness are confused with one another.

Appendix: Axiomatics

This paper is not the place to deal thoroughly with axiomatic issues about the link between happiness and utility, but it is useful to briefly address some issues about the preference for baseline mood and the link between innovations in lifetime utility and elation.

Preference for Baseline Mood: One element of our discussion above is the postulate that people value long-term happiness positively. This postulate cannot be made meaningful without auxiliary hypotheses distinguishing things that matter for utility only through their effect on happiness—which is a statement outside of strict revealed-preference analysis over the goods in the utility function more elementary than happiness. To illustrate this logical issue, suppose the flow utility function can be described by the function $U(K_t, X_t, M_t)$, where baseline mood M_t is given by the function $M_t = \Phi(K_t, X_t)$ and the partial derivative $U_M > 0$. This flow utility function is obviously equivalent to the alternative flow utility function Ω defined by $\Omega(K_t, X_t, M_t) \equiv U(K_t, X_t, 2\Phi(K_t, X_t)-M_t)$, but the partial derivative $\Omega_M < 0$.

This is not a new issue. It arises for any Becker-esque treatment of goods produced by a household production function. For example, it would not be unreasonable to say a priori (at least as an approximation) that, on the benefit side, a washing machine is only valued for its laundering services, which in turn are only valued for their contribution to clothing services. This stipulation would then be important to an analysis of the demand for washing machines.

In an applied context, we think auxiliary hypotheses of the type needed to study the place of baseline mood in the utility function can, in fact, be reasonable. For example, it might be reasonable to assume that other than its time and money costs, talk therapy enters the utility function only through its effect on baseline mood. This auxiliary assumption, together with evidence on the size and duration of the effect of talk therapy on baseline mood would allow what is otherwise a revealed preference evaluation to be placed on happiness. To take a more complex example, one might assume that besides its time and money cost, an antidepressant medication enters the utility function only through baseline mood and its medical side-effects. Preferences over another medication that generates similar side effects but has few benefits for the individual might make it possible to evaluate the cost of the side effects. Then, other than time and money costs, the vector good of switching from the other ineffective medication to the effective antidepressant would enter the utility function only through its effect on baseline mood.

Happiness and News about Lifetime Utility. In connection with elation, the key axiomatic issue is whether it is possible to express our main claims about happiness and news in a way that is independent of any particular representation of the lifetime utility function. Let the stochastic process of the control variable vector X and the state variable vector k be the fundamentals that lifetime utility depends on. Define K as a vector giving the history of k through time t and the history of X through time $t-1$. That is,

$$K_t = (k_t, k_{t-1}, ...k_0; X_{t-1}, X_{t-2}, ...X_0).$$

Call lifetime utility v_t, as before. Note that v_t depends on the information at time t about the future, so news is reflected in changes in v. We propose the following three axioms relevant to happiness and news:

1. *Happiness A at time t is a function of the realized history of X, k and v up through time t. That is,* $A_t = h_t(K_t, X_t, v_t, v_{t-1}, ..., v_0)$.

2. *Holding fixed the history of realized X and k through time t, and holding fixed the past history of realized v through time t-1, happiness at time t is increasing in current lifetime utility* v_t. *That is, if* $v_t' > v_t$ *, then* $h_t(K_t, X_t, v_t', v_{t-1}, ..., v_0) > h_t(K_t, X_t, v_t, v_{t-1}, ..., v_0)$.
3. *Holding fixed current lifetime utility* v_t *and the realized history of X and k through time t, happiness at time t is decreasing in previous realized values of lifetime utility. That is, for any integer j>0, if* $v_{t-j}' > v_{t-j}$ *, then*
$$h_t(K_t, X_t, v_t, v_{t-1}, ..., v_{t-j}', ..., v_0) > h_t(K_t, X_t, v_t, v_{t-1}, ..., v_{t-j}, ..., v_0).$$

Remarks: These axioms are all ordinal. The would not be changed in meaning by monotonically increasing transformations of *v* and *h*.

These axioms can be applied readily to any lifetime utility function that can be expressed by the terminal condition $v_{T+1} \equiv 0$ (perhaps with $T \to \infty$ in the end) and the recursive relationship $v_t = \Psi(k_t, X_t, F_{v_{t+1}})$, where $F_{v_{t+1}}$ is the probability distribution function for v_{t+1}. (Although there would be excess baggage in using the expanded state vector K_t, this recursive equation can also be written $v_t = \Psi(K_t, X_t, F_{v_{t+1}})$.) Note that expected utility maximization is not required for the axioms to be meaningful.

Assuming the simultaneous equations ultimately yield a well-defined and well-behaved lifetime utility function, these axioms can also be applied to lifetime utility functions like those in section 8 for which, in light of the expression for happiness given by News and Happiness Axiom 1, one can represent the inclusion of overall happiness in the utility function by an intertemporal equation of the form
$$v_t = \Psi(K_t, X_t, F_{v_{t+1}}, v_{t-1}, v_{t-2}, ..., v_0),$$
together with the terminal condition $v_{T+1} \equiv 0$.

In conjunction with the additively time-separable intertemporal expected utility function of Section 6, for which using the reduced form flow utility function $\mathcal{U}$, and *k* for the state variable vector that directly matters for flow utility, the equation $\iota_t = v_t - \beta^{-1} v_{t-1} + \beta^{-1} \mathcal{U}(k_{t-1}, X_{t-1})$ means that we can define a function H_t so that
$$\begin{aligned} &h_t(K_t, X_t, v_t, v_{t-1}, ..., v_{t-j}, ..., v_0) \\ &= H_t(K_t, X_t, v_t - \beta^{-1} v_{t-1} + \beta^{-1} \mathcal{U}(k_{t-1}, X_{t-1}), ..., v_1 - \beta^{-1} v_0 + \beta^{-1} \mathcal{U}(k_0, X_0), v_0) \\ &= H_t(K_t, X_t, \iota_t, \iota_{t-1}, ..., \iota_1, v_0). \end{aligned}$$
In words, the entire history of *k* and *X* included in *K* allows one to calculate the history of flow utility, which allows one to back out the history of lifetime utility from the history of lifetime utility innovations and v_0. This equation makes it easy to apply Happiness and News Axioms 2 and 3. Axiom 2 implies that $\frac{\partial H_t}{\partial \iota_t} > 0$. In addition to $\frac{\partial H_t}{\partial v_0} < 0$, Axiom 3 implies that $\beta^{-1} \frac{\partial H_t}{\partial \iota_{t-j}} > \frac{\partial H_t}{\partial \iota_{t-j-1}}$ for any integer j from 0 to *t-1*. This says that recent news about future events will have a bigger effect on happiness than older news about future events. (The factor β^{-1}

merely puts the comparison between the effects of lifetime utility innovations at different lags on a present-value rather than a current-value basis.) This inequality allows the possibility that distant enough lags of lifetime utility innovations could have a negative effect on happiness. Though we do not think this possibility is empirically relevant, we also do not think it should be ruled out *a priori*.

Finally, we argue that, other than for the application of Happiness and News Axiom 3, it is reasonable to include the initial value of lifetime utility in the comprehensive history state variable vector *K*. We interpret v_0 as the view of lifetime utility in the instant before birth begins, when the individual has no information about her or his life prospects other than the information that is embodied in genes and body structure at that point. Because the individual's information set is biologically limited up until birth, it is appropriate to view v_0 as an element of the state variable vector that is not subject to subtle expectational effects. After this inclusion, we can write happiness as

$$A_t = H_t(K_t, X_t, \iota_t, \iota_{t-1}, ..., \iota_1).$$

Happiness A_t depends on the current (expanded) state variable vector K_t, the current control variable vector X_t, and the history of lifetime utility innovations. This is our essential claim about the nature of happiness given an additively time-separable intertemporal expected utility function. The additivity in the main text equation $A_t = M(K_t, X_t) + e(\iota_t, \iota_{t-1}, \iota_{t-2}, ...)$ between the function $M(K_t, X_t)$ of *K* and *X* and the function $e(\iota_t, \iota_{t-1}, \iota_{t-2}, ...)$ of lifetime utility innovations is only a mathematical and expositional convenience.

References

Argyle, Michael, 1999. "Causes and Correlates of Happiness," chapter 18 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Aristotle, fourth century B.C.E. *Nicomachean Ethics*, available in many modern editions.

Becker, Gary, 1965. "A Theory of the Allocation of Time," *Economic Journal* 75, pp. 492-517.

J. Bentham (1789) Introduction to the Principles of Morals and Legislation. 1948 edition, New York: Hafner.

Biddle, S., and N. Murtrie, 1991. *Psychology of Physical Activity and Exercise,* London: Springer/Tavistock/Routledge.

Blanchflower, David G., and Andrew Oswald, 2004. "Well-Being Over Time in Britain and the USA," *Journal of Public Economics*, *88*, 1359-1386.

Brickman, P., and D. Campbell, 1971. "Hedonic Relativism and Planning the Good Society," in M. H. Appley ed., *Adaptation Level Theory: A Symposium*, New York, Academic Press, pp. 287-302.

Brickman, P., D. Coates and R. Janoff-Bulman, 1978. "Lottery Winners and Accident Victims: Is Happiness Relative?" *Journal of Personality and Social Psychology*, 36 (8), pp. 917-927.

Camerer, Colin, George Loewenstein and Drazen Prelec, "Neuroeconomics: How Neuroscience Can Inform Economics," *Journal of Economic Literature* 43 (March 2005), pp. 9—64.

Charles, Kerwin K., 2002. "Is Retirement Depressing?: Labor Force Inactivity and Psychological Well-Being in Later Life" NBER working paper #9033.

Clark, A., 1999. "Are wages habit-forming? Evidence from micro data," *Journal of Economic Behaviour and Organisation, 39*, 179-200.

Conlisk, John, 1996. "Why Bounded Rationality," *Journal of Economic Literature* XXIV:2 (June), 669-700.

Constantinides, George, 1990. "Habit Formation: A Resolution of the Equity Premium Puzzle," *Journal of Political Economy* 98 (June), 519-43.

Davis, Melinda, 2002. *The New Culture of Desire: The Pleasure Imperative Transforming Your Business and Your Life***,** Free Press.

Di Tella, Rafael, Alberto Alesina, and Robert MacCulloch. "Happiness and Inequality: Are Europeans and Americans Different?" *Journal of Public Economics* 88, nos. 9-10 (August 2004): 2009-42.

Di Tella, Rafael, and Robert MacCulloch, 1999. "Partisan Social Happiness," *Review of Economic Studies* (forthcoming).

Di Tella, Rafael, Robert MacCulloch, and Andrew J. Oswald, 2003. "The Macroeconomics of Happiness." *Review of Economics and Statistics* 85 (4), 793-809.

Di Tella, Rafael, Robert MacCulloch, and Andrew Oswald, 2001. "Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness," *American Economic Review* 91 (March).

Diener, E., and Lucas, R. E., 1999. Personality and subjective well-being. In D. Kahneman, E. Diener and N. Schwarz (Eds.), *Well-Being: The Foundations of Hedonic Psychology* (pp. 213-229). New York: Russell Sage Foundation.

Diener, Ed, and Christie Scollon, 2003. "Subjective Well-Being is Desirable But Not the Summum Bonum," mimeo, University of Illinois at Urbana-Champaign.

Easterbrook, Gregg, 2003. *The Progress Paradox: How Life Gets Better While People Feel Worse,* Random House, New York.

Easterlin, Richard A., 1974 . "Does Economic Growth Improve the Human Lot?: Some Empirical Evidence," in P. A. David and W. R. Levin eds., *Nations and Household in Economic Growth*, Stanford University Press, pp. 98-125.

Easterlin, Richard A., 1995. "Will Raising the Incomes of All Increase the Happiness of All?" *Journal of Economic Behavior and Organization* 27, pp. 35-47.

Easterlin, Richard A., 2003. "Explaining Happiness," *Proceedings of the National Academy of Science*, 100 (19), pp. 11176-11183.

Frank, R. H., 1985. *Choosing the right pond*. New York: Oxford University Press

Frank, R., 1999. *Luxury Fever: Why Money Fails to Satisfy in an Era of Excess*, New York: N.Y. Free Press.

Frederick, Shane, and George Loewenstein, 1999. "Hedonic Adaptation," chapter 16 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Frey, Bruno S., Simon Luechinger and Alois Stutzer, 2004. "Valuing Public Goods: The Life Satisfaction Approach," Center for Economic Studies and Ifo Institute for Economic Research Working Paper #1158, University of Zurich.

Frey, Bruno S. and Stutzer, Alois, 2003, "Testing Theories of Happiness" In *Paradoxes of Happiness in Economics*, Conference held at the University of Milano-Bicocca, March 21-23, 2003.

Frey, Bruno S., and Alois Stutzer, 2000. "Happiness, Economy and Institutions," *The Economic Journal*, 110 (October), 918-938.

Frey, Bruno S., and Alois Stutzer, 2002. "What Can Economists Learn from Happiness Research?" *Journal of Economic Literature*, 40 (June), pp. 402-435.

Frey, Bruno S., and Alois Stutzer, 2004a. "Happiness Research: State and Prospects," Institute for Empirical Research in Economics Working Paper #190, University of Zurich.

Frey, Bruno S., and Alois Stutzer, 2004b. "Economic Consequences of Mispredicting Utility," Institute for Empirical Research in Economics Working Paper #218, University of Zurich.

Gardner, Jonathan, and Andrew Oswald, 2001. "Does Money Buy Happiness? A Longitudinal Study Using Data on Windfalls," mimeo, available at http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/oswald/

Geneakoplos, John, David Pearce and Ennio Stacchetti, 1989. "Psychological Games and Sequential Rationality," G*ames and Economic Behavior* 1, 60-79.

Gottfried, Jay A., John O'Doherty and Raymond J. Dolan, 2003. "Encoding Predictive Reward Value in Human Amygdala and Orbitofrontal Cortex," *Science* 301 (22 August), 1104-1107.

Gruber, Jonathan, and Sendhil Mullainathan, 2002. "Do Cigarette Taxes Make Smokers Happier?" NBER Working Paper #8872.

Hamermesh, Daniel S., forthcoming. "Subjective Outcomes in Economics," *Southern Economic Journal*.

Hall, Robert E., and Charles I. Jones, 2004. "The Value of Life and the Rise in Health Spending," National Bureau of Economic Research Working Paper #10737.

Harsanyi, John C., 1953. "Cardinal Utility in Welfare Economics and in the Theory of Risk-Taking," *Journal of Political Economy*, 61 (October), pp. 434-435.

Harsanyi, John C., 1955. "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility," *Journal of Political Economy*, 63, pp. 309-321.

Heckman, James J. and MaCurdy, Thomas E. (1980) "A Life Cycle Model of Female Labor Supply." *Review of Economic Studies* 47: 47-74.

Helliwell, John F., 2002. "How's Life? Combining Individual and National Variables to Explain Subjective Well-Being," NBER Working Paper #9065.

Hicks, J. R. and Allen, R. G. D., "A Reconsideration of the Theory of Value", Economica, February/May, 1934, pp.52-60 and 196-219.

Hirsch, F. (1976). *Social limits to growth*. Cambridge, MA: Harvard University Press.

Hirshleifer, David, and Tyler Shumway, 2003. "Good Day Sunshine: Stock Returns and the Weather," *Journal of Finance*, 1009-1032.

Kahneman, Daniel, Ed Diener and Norbert Schwarz, 1999. *Well-Being: The Foundations of Hedonic Psychology*, edited volume, Russell Sage Foundation, New York.

Kahneman, Daniel, 1999. "Objective Happiness," chapter 1 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Kahneman, Daniel, Alan B. Krueger, David Schkade, Norbert Schwarz, and Arthur A. Stone, 2004. "Toward National Well-Being Accounts," *American Economic Review*, 94, pp. 429-434.

Kahneman, Daniel, Alan B. Krueger, David A. Schkade, Norbert Schwarz and Arthur A. Stone, 2004. "A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method (DRM)," *Science* (December), 1776-1780.

Kahneman, Daniel, and Amos Tversky, 1979. "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica,* 47 (2), 263-291.

Kaprio, J., M. Koskenvuo, and H. Rita, 1987. "Mortality after Bereavement: A Prospective Study of 95,647 Widowed Persons," *American Journal of Public Health* 77, pp. 283--287.

Kapteyn, A., and Wansbeek, T., 1985. "The individual welfare function: A review," *Journal of Economic Psychology, 6,* 333-363.

Kezdi, Gabor, and Robert J. Willis, 2003. "Who Becomes a Stockholder? Expectations, Subjective Uncertainty, and Asset Allocation," mimeo, University of Michigan.

Kimball, Miles, Helen Levy, Fumio Ohtake and Yoshiro Tsutsui, 2006. "Unhappiness after Hurricane Katrina," NBER Working Paper #12062 (March).

Kreps, David, and Evan Porteus, 1978. "Temporal Resolution of Uncertainty and Dynamic Choice Theory," *Econometrica,* 46, 185-200.

Laibson, David, 1997. "Golden Eggs and Hyperbolic Discounting," *Quarterly Journal of Economics*, 62 (2), pp. 443-478.

Lane, Robert E., 2000. *The Loss of Happiness in Market Democracies*, Yale University Press, New Haven, pp. 141-158.

Larsen, Randy J., and Barbara L. Fredrickson, 1999. "Measurement Issutes in Emotion Research," chapter 3 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Layard, Richard, 2005. *Happiness*. London, UK: Penguin Press. This book is based to a large extent on Layard's 2003 Lionell Robbins Memorial Lectures, London School of Economics.

Lewinsohn, P. M., J. M. Sullivan and S. J. Grosscup (1982). "Behavioral Therapy: Clinical Applications," in A. J. Rush (ed.), *Short-Term Therapies for Depression* (pp. 50-87), New York: Guilford.

Lodge, David. (1978) *Changing Places*. Penguin Books.

Loewenstein, George, Ted O'Donoghue and Matthew Rabin (2002), "Projection Bias in Predicting Future Utility," mimeo. Carnegie-Mellon University.

Loewenstein, George, and David Schkade, 1999. "Wouldn't It Be Nice? Predicting Future Feelings," chapter 5 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Lucas, Richard E., Andrew Clark, Yannis Georgellis, and Ed Diener, 2004. "Unemployment Alters the Set Point for Life Satisfaction," *Psychological Science* 15 (1), pp. 8--13.

Lupton, Joseph, 2002. "The Habit Liability in Life-Cycle Consumption and Portfolio Choice," mimeo, Federal Reserve Board.

Luttmer, E.F.P., 2004. "Neighbors as negatives: Relative earnings and well-being," NBER Working Paper, No. w10667.

Lykken, D., and Tellegen, A., 1996. Happiness is a stochastic phenomenon. *Psychological Science, 7*, 186-189.

Marmot, Michael, 2004. *How Our Position on the Social Gradient Affects Longevity and Health*, London: Bloomsbury.

MaCurdy, Thomas E. (1980) "An Empirical Model of Labor Supply in a Life-Cycle Setting." *Journal of Political Economy* 89: 1059-1085.

MaCurdy, Thomas (1985) "Interpreting Empirical Models of Labor Supply in An Intertemporal Framework with Uncertainty." In J.J. Heckman and B. Singer, eds. Longitudinal Analysis of Labor Market Data (Cambridge University Press, Cambridge UK).

MaCurdy, Thomas E. and Blundell, Richard (1999) "Labor Supply: A Review of Alternative Approaches." In O. Ashenfelter and D. Card., eds. Handbook of Labor Economics, Vol. 3A. Elsevier: 1559-1695.

Maslow, Abraham, 1943. "A Theory of Human Motivation" *Psychological Review*, 50, pp. 370-396.

Morris, Desmond, 2004. *The Nature of Happiness*, Little Books Ltd., London.

Morris, W. N., 1999. The mood system. In D. Kahneman, E. Diener and N. Schwarz (Eds.), *Well-Being* (pp. 169-189). New York: Russell Sage Foundation.

Nesse, Randolph M., 2000. Is depression an adaptation? *Archives of General Psychiatry, 57*, 14-20.

Nesse, Randolph M., 2001. Motivation and melancholy: a darwinian perspective. *Nebr Symp Motiv, 47*, 179-203.

Nesse, Randolph M., 2004. Natural selection and the elusiveness of happiness. *Philos Trans R Soc Lond B Biol Sci, 359*, 1333-1347.

Nesse, Randolph M., forthcoming. "Natural Selection and the Regulation of Defenses," *Evolution and Human Behavior.*

Nickerson, Carol, Norbert Schwarz, Ed Diener, and Daniel Kahneman, 2003. "Zeroing in on the Dark Side of the American Dream: A Closer Look at the Negative Consequences of the Goal for Financial Success," *Psychological Science*, 14 (November), 531-536.

Nisan, M., 1972. "Dimension of time in relation to choice behavior and achievement orientation," *Journal of Personality and Social Psychology*, 21, 175-182.

O'Doherty, John P., 2005. "Reward Representations and Reward-Related Learning in the Human Brain: Insights from Neuroimaging," Wellcome Department of Imaging Neuroscience.

O'Doherty, John P., Peter Dayan, Karl Friston, Hugo Critchley and Raymond Dolan, 2003. "Temporal Difference Models and Reward-Related Learning in the Human Brain," *Neuron* 28 (April 23), 329-337.

O'Guinn, T.C. and Shrum, L. J., 1997. "The role of television in the construction of consumer reality". *Journal of Consumer Research,* 23, 278-294

Pareto, Vilfredo, 1906. Manuel of Political Economy trans. by Ann S Schwier, edited by Ann S. Schwier and Alfred N. Page (New York: Augustus M. Kelley, 1971).

Pattanaik, P. K., 1968. "Risk, Impersonality and the Social Welfare Function," *Journal of Political Economy*, 76 (December), 1152-1169.

Patterson, D. R., J. J. Everett, C. H. Bombardier, K. A. Questad, V. K. Lee, and J. A. Marvin, 1993. "Psychological Effects of Severe Burn Injuries," *Psychological Bulletin* 113, pp. 362--378.

Pinker, Stephen, 1997. *How the Mind Works*, Norton.

Putnam, Robert D., 2000. *The Collapse and Revival of American Community*, Simon & Schuster.

Rawls, John, 1951. "Outline of a Decision Procedure for Ethics," *Philisophical Review*, 60, pp. 177-197.

Rawls, John, 1958. "Justice as Fairness," *Philosophical Review*, 67, pp. 164-194.

Rawls, John, 1971. *A Theory of Justice*, revised edition 1999, Belknap Press of Harvard University Press, Cambridge, MA.

Rayo, Luis and Gary S. Becker, 2005. "Evolutionary Efficiency and Happiness," mimeo, University of Chicago.

Reich, J. W. and J. Zautra, 1981. "Life Events and Personal Causation: Some Relationships with Satisfaction and Distress," *Journal of Personality and Social Psychology*, 41, 1002-1012.

Robbins, Lionel C., 1932. *An Essay on the Nature and Significance of Economic Science*. 1984 edition, New York: New York University Press.

Robinson, Michael D. and Gerald L. Clorem 2002. "Belief and Feeling: Evidence for an Accessibility Model of Emotional Self Report," *Psychological Bulletin*, 128, 934-960.

Rosen, Sherwin (1986) "The Theory of Equalizing Differences," in O. Ashenfelter and R. Layard (eds.), *Handbook of Labor Economics*

Samuelson, Paul A., 1938. "A Note on the Pure Theory of Consumer's Behaviour," *Economica* February), 61—71.

Samuelson, Paul A., 1947. *Foundations of Economic Analysis.* Cambridge: Harvard University Press, (enlarged edition, 1983), esp. chapters V, VII, and VIII.

Schkade, D. A. and Kahneman, D. (1998). Does living in California make people happy? A focusing illusion in judgments of life satisfaction. *Psychological Science*, 9 (5), 340-529.

Schor, Juliet B. (1991) *The Overworked American: The Unexpected Decline of Leisure*. New York. Basic Books.

Schultz, Wolfram, and Anthony Dickinson, 2000. "Neuronal Coding of Prediction Errors," *Annual Review of Neuroscience*, 23: 473—500.

Schwartz, Barry, 2004. *The Paradox of Choice: Why More is Less*, New York: HarperCollins.

Schwarz, N. (1987). *Stimmung als Information: Untersuchungen zum Einfluß von Stimmungen auf die Bewertung des eigenen Lebens*. [Mood as information.] Heidelberg, Germany: Springer Verlag.

Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins and R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2; pp. 527-561). New York, NY: Guilford Press.

Schwarz, N., 1996. *Cognition and communication: Judgmental biases, research methods and the logic of conversation.* Hillsdale, NJ: Erlbaum.

Schwarz, N., 1999. "Self-reports: How the questions shape the answers," *American Psychologist, 54*, 93-105.

Schwarz, N. (2002). Situated cognition and the wisdom of feelings: Cognitive tuning. In L. Feldman Barrett and P. Salovey (Eds.), *The wisdom in feelings* (pp.144-166). New York: Guilford.

Schwarz, N., and Bohner, G., 2001. "The construction of attitudes," In A. Tesser and N. Schwarz (Eds.), *Blackwell handbook of social psychology: Intraindividual processes* (Vol.1, pp. 436-457). Oxford, UK: Blackwell.

Schwarz, N., and Clore, G.L., 1983. Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*, 513 - 523.

Schwarz, Norbert and Fritz Strack, 1999. "Reports of Subjective Well-Being: Judgmental Processes and Their Methodological Implications," chapter 4 in Daniel Kahneman, Ed Diener and Norbert Schwarz eds., *Well-Being: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York.

Seligman, Martin E. P., 2002. *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment*, Free Press, New York.

Sen, Amartya, 1983. "Poor, relatively speaking," *Oxford Economic Papers, 35*, 153-169.

Seymour, Ben, John P. O'Doherty, Martin Koltzenburg, Katja Wiech, Richard Rackowiak, Karl Friston and Raymond Dolan, forthcoming. "Opponent appetitive-aversive neural processes underlie predictive learning about pain relief," *Nature Neuroscience*.

Seymour, Ben, John P. O'Doherty, Peter Dayan, Martin Koltzenburg, Anthony K. Jones, Raymond J. Dolan, Karl J. Friston, 2004. "Temporal Difference Models Describe Higher-Order Learning in Humans," *Letters to Nature* 429 (June), 664-667.

Shepperd, J. A., Findley-Klein, C., Kwavnick, K. D., Walker, D., and Perez, S., 2000. "Bracing for loss," *Journal of Personality and Social Psychology*, 78, 620-634.

Shepperd, J. A., Ouellette, J. A., and Fernandez, J. K., 1996. "Abandoning unrealistic optimism: Performance estimates and the temporal proximity of self-relevant feedback," *Journal of Personality and Social Psychology*, 70, 844-855.

Sims, Christopher, 2002. "Implications of Rational Inattention," unpublished paper, Princeton University.

Solnick, Sara J., and David Hemenway, 1998. "Is More Always Better?: A Survey of Positional Concerns," *Journal of Economic Behavior and Organization*, 37, 373--383.

Steffick, Diane E., 2000. "Documentation of Affective Functioning Measures in the Health and Retirement Study," HRS Documentation Report DR-005, available online at http://hrsonline.isr.umich.edu/docs/userg/dr-005.pdf

Steptoe, A., J. Kimball and P. Basford, 1996. "Exercise and the Experience and Appraisal of Daily Stressors: A Naturalistic Study," *Journal of Behavioral Medicine*, 21, 363—374.

Stigler, George, 1950. "Development of Utility Theory," Journal of Political Economy 58, pts 1-2 (August-October), pp. 307-327, 373-396.

Strack, F., Martin, L.L., and Schwarz, N. (1988). Priming and communication: The social determinants of information use in judgments of life-satisfaction. *European Journal of Social Psychology, 18*, 429 - 442.

Strack, F., Schwarz, N., Chassein, B., Kern, D., and Wagner, D. (1990). The salience of comparison standards and the activation of social norms: Consequences for judgments of happiness and their communication. *British Journal of Social Psychology, 29*, 303-314.

Strack, F., Schwarz, N., and Gschneidinger, E. (1985). Happiness and reminiscing: The role of time perspective, mood, and mode of thinking. *Journal of Personality and Social Psychology, 49*, 1460 -1469.

Sulls, J., and Wills, T.A. (Eds) (1991). *Social comparison: Contemporary theory and research*. Hillsdale, NJ: Erlbaum.

Thayer, R. E., 1989. *The Biopsychology of Mood and Emotion*, New York: Oxford University Press.

Tsutsui, Yoshiro, Miles Kimball and Fumio Ohtake, 2005. "Koizumi Carries the Day: Happiness and Unhappiness after the Japanese Election," Osaka University and University of Michigan.

Wilson, Timothy D., 2002. *Strangers to Ourselves: Discovering the Adaptive Unconscious*, Harvard University Press, Cambridge, MA and London, England, especially chapter 6, pp. 137-159.

Wolfers, Justin, 2003. "Is Business Cycle Volatility Costly? Evidence from Surveys of Subjective Well-Being," NBER Working Paper #9619.

Woodford, Michael, 2002. "Imperfect Common Knowledge and the Effects of Monetary Policy," in P. Aghion, R. Frydman, J. Stiglitz, and M. Woodford, eds., *Knowledge, Information, and Expectations in Modern Macroeconomics: In Honor of Edmund S. Phelps*, Princeton Univ. Press.

Wortman, C. and R. Silver, 1987. "Coping with Irrevocable Loss," in *Cataclysms, Crises and Catastrophes: Psychology in Action*, Master Lecture Series, v. 6, Washington, D. C., American Psychological Association, pp. 189-235.

Zamble, E., 1992. "Behavior and Adaptation in Long-Term Prison Inmates: Descriptive Longitudinal Results," *Criminal Justice and Behavior* 19, pp. 409--425.

Zamble, E., and F. Proporino, 1990. "Coping, Imprisonment, and Rehabilitation: Some Data and Their Implications," *Criminal Justice and Behavior* 17, pp. 53-70.