Does Happiness Adapt? A Longitudinal Study of Disability with Implications for Economists and Judges

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Abstract. Economists ignore the concept of hedonic adaptation (the possibility that people automatically bounce back from utility shocks). So also do judges. We show in longitudinal data that people who become disabled go on to exhibit marked recovery in mental wellbeing. Nevertheless, adaptation to severe disability is partial not complete. Using happiness equations, the paper develops a method to try to measure the exact strength of this recovery in wellbeing. Finally, in considering how judges might use such equations to calculate legal damages, the paper calculates the implied required path of monetary compensation. Its key feature is that compensation payments should be set to decline through the years.

Keywords: Disability; Adaptation; Happiness; Life-satisfaction; Longitudinal

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1. Introduction

Many articles in psychology journals argue that happiness bounces back after a bad life shock. Yet almost the entire literature of economics ignores this possibility and assumes, either explicitly or implicitly, that there is a simple and stable utility function u(x). When deciding on damages, the courts typically do as well.

Although it is not clear why there is such a divide between economists and psychologists, there are two probable reasons. First, the quality of the evidence is viewed by economists as poor. One of the most famous papers, for instance, is Brickman et al (1978). This paper is highly cited but not always quoted accurately. It is sometimes claimed in the literature that the authors demonstrate that lottery winners are no happier than non-winners and paraplegics are as happy as able-bodied individuals. In fact, the paper, which uses tiny cross-sections, does not say either of these things. Brickman et al (1978) report data in which disabled people do have lower life-satisfaction scores than the able-bodied, and this difference, when compared to a control group, is statistically significant at conventional levels. Moreover, lottery winners do have higher life-satisfaction scores than the controls, although the null hypothesis of no difference cannot be rejected at the 5% level. Second, one part of the psychology literature proposes the so-called 'set point hypothesis', which is the idea that people adapt completely to life shocks. Rightly or wrongly, economists view this position -- that utility effectively cannot be altered by outside events -- as so implausible that it is not worth considering. These attitudes have kept economists and psychologists apart.

In this paper we study how happiness levels adapt (sometimes described as 'habituation'). Frederick and Loewenstein (1999) call this hedonic adaptation. Another term is affective adaptation, which is the process, to quote Gilbert and Wilson's (2005) definition, whereby affective responses weaken after one

or more exposures to a stimulus. A valuable discussion, with examples, is given in Clark et al (2003). Earlier evidence is discussed in Argyle (1989) and Diener et al (1999). Easterlin (2003, 2005) argues that adaptation is generally incomplete, namely, that people do not merely automatically bounce back to a baseline level of happiness. Clark and Oswald (1994) discuss partial adaptation by the long-term unemployed. Becker and Rayo (2004) and Wilson and Gilbert (2005) are conceptual papers. The first, by two economists, likens hedonic adaptation to the ability of the human eye to adjust quickly, and for sound reasons of self-preservation, to changes in the amount of light. Becker and Rayo set out a mathematical model of how Nature might optimally have designed human beings' emotional responses to behave in a similar way. The second paper, by two psychologists, is different. It views humans as learning to change what they attend to and how they react. Wilson and Gilbert suggest that hedonic adaptation is not reducible to the type of adaptation found in the sensory or motor systems. The authors argue that adaptation stems instead from the internal human need, and ability, to explain and make sense of stimuli. They advocate what they describe as an AREA model: attend; react; explain; adapt. In a more purely empirical spirit, interesting new work by Riis et al (2005) also examines adaptation. Using an ecological momentary assessment measure of mood, the authors find little evidence that hemodialysis patients are less happy than healthy people. The authors suggest that patients in the sample have largely adapted to their condition; they show also that, in a forecasting task, healthy people fail to anticipate this adaptation. Affective forecasting is indeed known to be imperfect (Gilbert et al 1998, 2002; Ubel et al 2005).

Other investigators, such as Clark (1999), Clark et al (2004), Stutzer (2004) Layard (2005) and Di Tella, Haisken and MacCulloch (2005), have begun to consider the economic implications of how people adapt. Kahneman and Sugden (2005) discuss the policy implications of allowing for adaptation in experienced utility. Di Tella, MacCulloch and Oswald (2001, 2003) study adaptation of national happiness to movements in real income. By estimating dynamic equations, they find evidence that the wellbeing consequences of shocks to gross domestic product eventually wear off. Their 2003 paper

seems to be one of the first in the wellbeing research literature to suggest a practical way to use difference equations to solve out for a steady-state level of habituation. In principle, the adaptation literature is also related to work on habit formation, such as Carroll et al (2000) and Carroll and Weil (1994), and potentially to work on broader conceptions of preferences such as Frey and Meier (2004); but these links have not, to our knowledge, been explored. Currently, the economics literature on adaptation is small, and the extent of any hedonic adaptation in the world is not completely understood.

As well as being of theoretical interest, adaptation has practical implications. Consider a judge who, in a world where people adapt, is trying to decide on the necessary level of compensation to award someone who has negligently suffered a bad life event, L. Initially, the judge must estimate the immediate drop in happiness caused by L upon the person's life. Next, the judge must make an adjustment for the way the person's utility may automatically rebound. To our knowledge, legal scholars have written little on this issue, and judges apparently use mechanical rules of thumb with conceptual foundations that are, at best, ad hoc (see pp 345-347 of Elliott and Quinn, 2005). However, in a somewhat related spirit to our work, Posner (2000) argues persuasively for a better understanding of the emotions. Posner and Sunstein (2005) touch on similar issues.

2. Conceptual Issues

For clarity of exposition, let an individual's utility or happiness be given by a simple separable function

$$V = v(y) + h \qquad (1)$$

where v(.) is increasing and concave in the person's income, y, and h is some measure of overall health. After a disabling shock at time T, which makes work impossible, wellbeing drops to

$$V = v(z) + h - D \qquad (2)$$

where D is to be thought of as being in disutility units and z is some external (possibly government benefit) financial support. Assume y strictly greater

than z. Because of the assumption of adaptation, define a habituation function D = D(t – T), where t is the current time period, T was the original date of disability, and the first derivative of the function D(.) is negative.

Consider the simplest approach. If a judge's aim is, ex post, to redress the individual's fortunes and restore their original utility level, the optimal compensation is a monetary payment c* that provides equality of utility levels in the two states.

At the general level, there therefore exists an implicit function tying together income, compensation, external support, time, and time of the disability shock:

$$J(y,c,z,t,T) = 0. \qquad (3)$$

Solving J = 0 more explicitly under the simple assumptions given above, movements in c* are governed locally by the equation

$$0 = v'(y)dy - v'(c^* + z)dc^* - v'(c^* + z)dz + D'(t - T)dt \qquad (4)$$

and the key signs of the partial derivatives of the optimal payment function with respect to time since disability, income, and outside support, are then respectively

$$\partial c^* / \partial t \prec 0$$

$$\partial c^* / \partial y \succ 0$$

$$\partial c^* / \partial z = -1.$$

The intuition behind these three is straightforward. As time t lengthens since the onset of disability, the compensation level c* falls. This is because psychological adaptation gradually reduces the unhappiness caused by the disability. The higher the person's pre-disability income, the greater is c*. This says simply that high-wage workers should be compensated more generously for disability. A larger amount of external support z leads to a reduction in c* by an exactly offsetting amount. This is because court settlements can be less generous where other funds become open to disabled individuals. A reasonable question to ask is why insurance is not included in the analytical framework. We deliberately leave this to one side.

Except in a world with full insurance markets, it does not alter the underlying principle that judges will need to prescribe time-varying compensation schedules.

Although the functional forms chosen here are deliberately elementary, the broad principles go through with non-separable wellbeing equations, and with more complex forms of income pre- and post-disability. Time-varying payments will be the typical, not special, outcome in a world with hedonic adaptation.

3. Implementing an Empirical Test

However, do people really bounce back from a bad life event? Ideally, a longitudinal test is required. To be really persuasive, it needs to have a number of features:

(i) the individuals in the sample must be followed over a reasonably long period, so that information on them is available before a bad life event and afterwards;

(ii) the bad life event must be exogenous;

(iii) there needs to be a comparison group of individuals who do not suffer the event;

(iv) the sample should be at least moderately representative of the adult population;

(v) a set of controls, particularly income, has to be available in the data set, so that confounding influences can be differenced out.

To our knowledge, no study of this type has been published. Our paper is an attempt to come as close as possible to this design.

An interesting example of a bad life event is that of disability. Although tragic for the individual, for scientific investigators this phenomenon has attractive features. First, it can be viewed -- like the heart conditions studied by Wu (2001) -- as an approximately exogenous event. Hence it contrasts with the (important) phenomena of income changes and divorce, which have been studied longitudinally. Second, going back at least to Brickman et al (1978),

there has been a somewhat inconclusive psychological literature on the issue of whether people's wellbeing recovers fully from disability. In a large cross-section, Ville and Lavaud (2001) show that more severely impaired people have lower wellbeing, although age and time-since-the-disability are not statistically significant predictors. In a small cross-section, Chase, Cornille and English (2000) also find that the extent of disability is negatively correlated with life satisfaction. Yet, as explained earlier, Riis et al (2005) do conclude in favor of extreme adaptation to hemodialysis. Third, the courts routinely consider damage-claims for disability, but currently have no rigorous way to assess mental damages, so the issue is of practical importance.

We propose a test. The source used in the paper is the British Household Panel Survey (BHPS). This is a nationally representative sample of British households, containing over 10,000 adult individuals, conducted between September and Christmas of each year from 1991 (see Taylor et al, 2002). Respondents are interviewed in successive waves; households who move to a new residence are interviewed at their new location; if an individual splits off from the original household, all adult members of their new household are also interviewed. Children are interviewed once aged 16. The sample has remained broadly representative of the British population throughout the 1990s-2000s.

For 1996 to 2002, psychological wellbeing scores on each person are available. Respondents also provide information on physical disability. To try to obtain clear results, we focus on quite serious levels of impairment, and therefore look only at people who say that they are so disabled they are unable to work. In the entire data set of seven years, there are approximately 60,000 person-year observations. Within this, there are approximately 2500 person-year observations of disability.

We define two categories. One is 'disabled but able to do day-to-day activities including housework, climbing stairs, dressing oneself, and walking for at least 10 minutes'. We sometimes denote this Disabled, with an uppercase letter. The other, even more fundamentally impaired, category is

'disabled and unable to do at least one of the above day-to-day activities.' We term this group the Seriously Disabled. There are 315 observations (ie. person-years) in the first category. There are 2204 observations on the second category. It might seem surprising that the Seriously Disabled outnumber the less severely disabled, but that is because all these individuals are sufficiently incapacitated that they cannot work, and this is more commonly accompanied by some severe physical handicap.

3. Simple Longitudinal Plots

When trying to understand the consequences of an event like disability, it is necessary to go beyond the merely pecuniary. Mental distress itself must somehow be empirically captured. Our analysis therefore uses reported life-satisfaction scores as psychological wellbeing, or proxy-utility, measures. These life satisfaction levels run from 1 to 7. A natural way to think about people's answers is as being true 'utility levels' measured with some reporting error. Watson and Clark (1991) discuss and defend the use of such data. Oswald (1997) and Frey and Stutzer (2002a, b) summarize the ways in which reported wellbeing numbers' validity has been checked. Blanchflower and Oswald (2004) show that, where data on both are available, happiness equations and life-satisfaction equations have almost identical structures.

In these data, disabled people are less happy than the able-bodied. On a 1 to 7 scale, the mean life-satisfaction score of Not Disabled individuals in our data set is 5.28. It has a standard deviation of 1.27. The 315 people who are disabled but able to do day-to-day activities are less happy than average. Their mean life-satisfaction score is 4.69, with a standard deviation of 1.67. The 2204 severely disabled individuals, who cannot do those activities, are worse off still. Their mean wellbeing score is 4.05, with a standard deviation of 1.78. The Appendix gives more details on the data.

As would be expected, there are some people (129 to be exact) who report disability in every year of the panel. These observations are not the most helpful scientifically, because they provide no information about transitions

into disability. Nevertheless, they contribute a cross-sectional dimension to the measurement of happiness and disability. The gap in reported life satisfaction scores between these 'always disabled' individuals and the 'always able-bodied' can be calculated. It is depicted -- in a raw sense without control variables -- in Figure 1. The 13,776 people who never report disability have a mean wellbeing score of approximately 5.3 on a 1 to 7 scale. Those who are constantly disabled, marked in the Figure by the lighter line below the heavy line, have a mean score of approximately 4.3. Hence the raw difference caused by disability is approximately 1 life-satisfaction point. This can be thought of as fairly large, because it is a little less than one standard deviation of mean wellbeing. Although Figure 1 should not be thought of as an accurate estimate -- it does not factor out other differences in people's lives -- this is a first attempt at a quantitative illustration of the happiness cost of disability.

In this data set, it is possible to follow people longitudinally in the years before and after they become disabled. There are some hundreds of observations on entry into disability. In principle, information on these 'switchers' is particularly valuable.

Figure 2 is a longitudinal plot of mental wellbeing for those who go on to be disabled. Here the disability category includes both kinds in the data set ('able' and 'unable' to do day-to-day things). Time T is the year of entry into disability. In effect, this plot averages across those who are newly disabled in each of the different calendar years within the data set. There are 200 such people on whom there are at least three consecutive years of wellbeing data. Figure 2 reveals that life-satisfaction slightly exceeds 4.2 in year T-1. It falls abruptly, to approximately 3.9, in the actual year that the person reports being disabled. But then life-satisfaction in Table 2 rises back somewhat, to nearly 4.1 in T+1. In Figure 3, there is evidence consistent with an even more dramatic bounce-back in mental wellbeing. Nevertheless, a word of caution is necessary. There is much inherent variation in wellbeing scores. As explained below them, the points in the Figures have large standard errors attached.

Figure 4 plots the mean life-satisfaction scores, again annually, of those in the sample who became severely disabled at time T. The graph also records the mean level in the year prior to disability and the mean level in the year after disability. Here the usable sample is 165 people. Before disability strikes, the individuals have an average wellbeing level of 4.2. Once they become disabled, life satisfaction falls to a little below 3.9. One year later, wellbeing has recovered fractionally, to almost 4.0.

The recovery in reported life satisfaction is starker in Figure 5. Here the sample is small, at only 52 people. Nevertheless, Figure 2's general idea remains visible (though in Figure 3, the first year, to T+1, sees no recovery, which is perhaps because the individuals here are even more seriously impaired that those in Figure 4). By T+2, nevertheless, life satisfaction of the Seriously Disabled group is half-way back to the level at which it began.

One notable fact about the Figures is that the pre-disability levels of life satisfaction in Figures 2-5 are low. The T-1 values, which are officially when the people were still able-bodied, are similar to those in the lower line in Figure 1, which plots the values of life satisfaction of those continuously disabled throughout the sample period. If disability struck randomly, and in a way that is independent of other personal characteristics, then what might be expected is that the gap between the two lines in Figure 1 (of about one wellbeing point) would be similar to the gap between the high and low points in a graph like Figure 2 (of only about one third of a wellbeing point). This is not a fatal difficulty for the study, and is probably inescapable in real-world data sets, but it is a reminder that disability is sometimes preceded by a slow worsening of health or functioning.

4. Controlling for Other Influences

Although intriguing and stark, the patterns in Figures 2 to 5 do not control for other factors and, as explained below the graphs, often have quite large standard errors attached to them. Table 1 therefore moves to more formal

econometric evidence. It presents simple ordinary least squares estimates. The dependent variable is life satisfaction measured cardinally (again, on the 1 to 7 scale). All the paper's results can be replicated with ordered estimators, but, as in Luttmer (2005), for clarity of exposition we stick to elementary methods. Disability -- measured in two ways -- is the key independent variable. In columns 1 and 3, only exogenous regressors are included. These are gender and age. For the sake of generality, age is entered as a third-order polynomial; it has close to the literature's U-shape, minimising in the early 40s, although then runs fairly flat into later old age.

The coefficient on the milder of the two disability variables, in column I, is -0.527. Its standard error is 0.111, so the null of zero is rejected at all usual confidence levels. Being Disabled here (where the person is able to do day-to-day activities) is thus associated with a mental wellbeing penalty of approximately 0.5 life satisfaction points. An equivalent calculation is given in column III. In this case, in line with what intuition would expect, the Seriously Disabled (where the person is unable to do day-to-day activities) are much worse off and report 1.247 fewer life-satisfaction points.

In columns II and IV of Table 1, dummy variables are included for people's qualifications. Educational level in many circumstances will be an approximately predetermined variable (though this will not be true of those who were disabled in childhood). Perhaps surprisingly, the coefficients on disability in Table 1's life satisfaction equations are left effectively unchanged by the educational controls. This fact suggests that the unpleasantness of being disabled is independent of the level of education of the individual. Although an exact comparison is not possible, an interesting result of Smith et al (2005), on a sample of adults approaching retirement age, runs somewhat counter to this. The authors argue that assets -- on which our sample does not have good data -- can psychologically cushion people who encounter a period of disability. Assets and educational level are likely to be strongly positively correlated. Smith et al (2005) also provide evidence that disability lowers psychological wellbeing, although an exact comparison with our results

is not possible because the authors do not distinguish between one period of disability and continuing disability.

A longer set of controls is introduced in the life satisfaction equations of Table 2. In column I, it can be seen that, when compared to the numbers in Table 1, the estimates of disability's effect upon wellbeing are reduced only very fractionally by the allowance for extra regressors. The coefficients on the two kinds of disability are now, respectively, -0.464 and -1.144.

5. Monetary Compensation and Disability: The Need for a Time Path

In Table 2, and in almost all remaining tables, a variable is included for real income. As can be seen, it enters positively; richer people report higher levels of life satisfaction. The income coefficient is approximately 0.008, with a standard error of 0.001. This suggests a simple calculation. Like Clark and Oswald (2002), Van Praag and Ferrer-I-Carbonell (2004) and Powdthavee (2005), we can ask the conceptual question: how much extra real income would be required to exactly compensate someone for a change in another of the influences upon wellbeing (in this particular case, for disability)? With a coefficient of 0.008, and bearing in mind that the units of income are in thousands of pounds sterling, it follows that approximately £125,000 pounds (which is approximately $220,000 US dollars) extra per annum would buy one extra point of life satisfaction. Hence to compensate for being Disabled would here require an extra £58,000 per year. To compensate people in the Seriously Disabled category would require £143,000 per year. Interestingly, these sums are many multiples of the judicial rule-of-thumb amounts in, for instance, Elliott and Quinn, 2005, p.345.

These figures, however, make no allowance for emotional habituation or, put more simply, the idea that the intensity of feelings may wear off. How can such adaptation be studied in a regression framework? The paper does this in the following way. It defines in Table 2 a variable for the amount of time people have previously spent disabled. That fraction of time is then included

in wellbeing equations to see if, in the current period, ceteris paribus, past experience softens the psychological blow of current disability.

The paper creates a variable "Past disability from t-3 to t-1" and an equivalent one "Past disability from t-6 to t-1". Each is constructed to take values between zero and unity. A person who has been disabled for one previous year in the last three years, for example, will have the value 1/3 for his or her past disability from t-3 to t-1. More fully:
"Past disability from t-3 to t-1"
= 0 if no previous years of disability
= 1/3 if one previous year of disability
= 2/3 if two previous years of disability
= 1 if all three previous years were of disability.

Equivalently,
"Past disability from t-6 to t-1"
= 0 if no previous years of disability
= 1/6 if one previous year of disability
= 2/6 if two previous years of disability
…
= 1 if all six previous years were of disability

As part of the empirical strategy, these variables are entered separately and interacted with measures of current disability.

Table 2 explores what happens when the history-of-disability variables are incorporated into wellbeing equations. In column II, having past disability as a variable makes only a small difference. The long-run effects of each of the two forms of disability are now respectively (-0.281 + -0.369) and (-0.902 + -0.369), so they imply respective life-satisfaction penalties of approximately 0.6 points for Disabled and 1.3 points for Seriously Disabled.

In columns III and IV of Table 2, interaction terms are now included in the equations. These are statistically well-determined. They allow crude

measures of adaptation rates to be inferred from the regression equations. For example, consider column III of Table 2. A Disabled person who had been disabled for zero previous years would have a life satisfaction penalty = -0.598. A person who been Disabled for one previous year out of the last three would have a combined life satisfaction penalty of (-0.598) plus (1/3)(-0.827) plus 1/3(1.106) = -0.505. Someone who had been Disabled for two previous years out of the last three would have a combined life satisfaction penalty of (-0.598) plus (2/3)(-0.827) plus (2/3)(1.106) = -0.412. A person who had been Disabled for all three previous years out of the last three would have a combined life satisfaction penalty of (-0.598) plus (-0.827) plus (1.106) = -0.319. In short, the longer the experience of disability, the less emotionally painful current disability appears to be. Loosely, the life satisfaction points lost are 0.6 in the first year of this form of disability, 0.5 in the second, 0.4 in the third, and 0.3 in the fourth. This is a particularly simple attempt to estimate dynamics from Table 2, of course, and a later part of the paper examines an alternative using fixed-effect estimates.

When the most severe kind of disability is examined (that is, Seriously Disabled, which is the 'unable to do day-to-day activities' category of disability), the effects on wellbeing persist more strongly. The unhappiness from such disability does not wear off quickly. Using the earlier methodology, it can be checked from column III of Table 2 that zero past Serious Disability corresponds to a psychological effect of -1.228. One year of past severe disability makes little difference to this; the current unhappiness effect drops to -1.184. Two years leads to -1.140. Even three full years of this type of disability produces only mild attenuation. The effect upon wellbeing declines marginally to -1.095. Table 2 also includes, for completeness, some estimates with a six-year measure of past disability. A bottom-line number can be calculated. To compensate someone in the short run for being seriously disabled, then, would require a large enough flow of income to overcome a life-satisfaction penalty of more than 1.2 points. In terms of monetary payment, this equates to approximately £150,000 pounds a year.

These broad patterns are robust across sub-samples. Table 3 shows that the same equation structure holds, with well-defined coefficients, for men and women, the young and the old, and graduates and non-graduates.

To this point in the estimation, income has been assumed to enter linearly in the equations. Table 4 demonstrates that concave effects can be found – in quadratic form and in logarithmic form. These imply, because the marginal utility of income is then declining, that much larger monetary amounts would be required to compensate for disability. Depending on specification, disability compensation might here have to approach enormous annual sums -- up to ten times as high as the earlier figures based on linear specifications. Oswald (2005) points out that, when it moves from the study of first derivatives to the study of second derivatives, happiness research has to make much more stringent assumptions about human beings' implicit reporting-function from actual to reported happiness. Future analytical work will have to return to this issue. It is not impossible, at some point in the future, that large amounts of money will turn on expert witnesses' ability to convince judges of the need for a non-linear income term in a subjective wellbeing regression equation.

These regressions are cross-sectional. To go further and difference out people's unobservable dispositions, a fixed effects estimator is required. Tables 5 and 6 do this. They present within-groups equations. Table 5 has no controls and can be thought of as measuring the reduced-form consequences of 'switching' into disability. Interestingly, the life satisfaction penalty associated with the milder form of disability is now statistically insignificantly different from zero. It has a coefficient of -0.024 with a standard error of 0.075. Severe disability, by contrast, continues to have a well-determined negative effect upon people's lives, though it is smaller than in previous tables. The coefficient is -0.449 with a standard error of 0.041. Again, it would be straightforward to work out the income-equivalent value of the wellbeing fall.

Table 6 examines the time path of attenuation in the unhappiness from disability. For those in the milder category, who are Disabled (able), zero past disability is associated with -0.408 points of life satisfaction. Working through the numbers in column III of Table 6, one past year of disability corresponds to a net wellbeing effect from disability of -0.292. Two years translates to -0.0177. Three past years produces -0.062 points. In conclusion, there is essentially no long run effect upon wellbeing from disability of this type. Adaptation is estimated to be approximately complete.

Nevertheless, for Seriously Disabled individuals, Table 6's fixed-effects estimates demonstrate that there is less than 100% adaptation. Zero past disability is associated with -0.596 fewer life satisfaction points. One year of past disability leads to the number -0.521; two years implies -0.447; three years implies -0.372.

Interestingly, the compensation numbers implied by fixed-effects estimation are considerably larger than earlier in the paper. Figures 6 and 7 illustrate the difference illustrative cases.

It is possible to object to the use of life-satisfaction scores. As a variant, the Appendix shows that the paper's general point can be made in an equation where the dependent variable is the number of times people say they are happy. This dependent variable, although interesting, is available only for a single year in the British Household Panel, so cannot be analyzed longitudinally.

6. Objections and Counter Objections

A number of objections suggest themselves.

One is that the idea of using wellbeing data might be unworkable in the courts because judges, lawyers and juries could not be expected to understand the technical details of happiness regression equations. This sounds a reasonable criticism. Yet a similar argument could have been made, and

possibly was, back in the 1950s and 60s, against those economists who suggested that econometric methods might usefully be employed by judges in legal cases. Today, that is common in, for example, pay and sex discrimination trials.

Another, and a more technical, retort to the paper's ideas is that selection bias might be leading here to the mere appearance of adaptation. In our cross-section equations, for example, it could be argued that the most severely disabled will go on disproportionately to die or to go into hospital, and that this will produce, by a sheer composition effect, a rising mean level of wellbeing among those who remain in the sample. This criticism is potentially important. Nevertheless, such an argument cannot easily explain either the recovery pattern in Figures 2 to 5, where it is literally the same individuals who are followed each year, or the results in the paper's fixed-effects equations.

A further objection is that wellbeing data might be thought to be philosophically an inappropriate basis for compensation calculations. Physical incapacity and an inability to make an income, might go this traditional argument, should be the only issue for the courts; pecuniary disadvantage alone ought to be counterbalanced by legal compensation. That view, however, does not seem persuasive. Judges already have somehow to put a figure on the costs of pain and suffering. Emotional damage may be as important to human beings as physical damage or loss of earnings. In that case, happiness equations, where reported wellbeing is treated as proxy wellbeing with an error term, potentially offer an analytical tool for the courts.

Another potential objection is that income is not truly exogenous and that the wellbeing gain from money may itself wear off. Short of having randomly assigned income, as in lottery windfalls, there is probably little that can be definitively done about the endogeneity of incomes in standard data sets. However, if instruments could be found, it might be possible to adjust the estimated income parameters in a conventional way. If there is habituation-to-income, as DiTella, Haisken and MacCulloch (2005) argue, then that can

be incorporated both into the general method set out here and into actual financial compensation settlements. This point may be an important one and our hunch is that it will stimulate future work in the area. Nevertheless, when the life satisfaction equations in tables like Table 2 are re-estimated with lagged levels of income as extra regressors, which we have done as a check on the calculations, a positive steady-state effect of income (of approximately the same size as in Table 2) is found. Moreover, when Table 6 is re-estimated with a set of lagged income levels, only the current level of income enters with a statistically significant coefficient. In this data set, in other words, we do not seem to find strong evidence of habituation to income.

Another criticism is that the calculations set out earlier are too approximate to be applicable in actual court cases. That objection is a fair one, but it misses the point of the paper. Our purpose here is not to write a handbook for attornies to carry in their back-pockets. It is to describe a way of thinking about adaptation and a broad method for calculating the time path of payments that would be required to compensate individuals for bad life-events. Details -- and there will be many, including the issue of how to adjust for life events like divorce that have an endogenous component -- must be left for the future.

It should perhaps also be noted out that the courts could -- even in the futuristic world set out here -- continue to award lump-sums for emotional damage. They would not have in a literal sense to award people a time path of payments. The underlying principles of the paper still go through and would instead be used to assess the appropriate discounted value of a single cash payment to a disabled person.

Finally, the results in this paper point to a middle ground between the traditional economist's model of zero adaptation and the extreme set-point model advocated by some authors in the psychology literature. In this sense, it is compatible with emerging papers such as Lucas (2004) and Fujita and Diener (2005). Our instinct is that the two social-science disciplines will slowly converge in their thinking on these issues.

7. Conclusions

This paper is a study of the economics of partial hedonic adaptation. It blends new evidence with the simple theoretical idea that, in world where individuals adapt, legal compensation schedules should decline through time.

First, the paper tests for the existence of adaptation in happiness. Using longitudinal data, the paper tracks individuals' levels of reported life-satisfaction in the years leading up to, and after, disability. We find a striking degree of recovery in human wellbeing. The data do not, however, support the idea that there is a complete return to the old happiness level. Second, the paper proposes analytical methods for dealing with this type of phenomenon. It uses happiness regression equations. Third, because of adaptation, a person's emotional damage from disability reduces through the years, and this fact affects how economists and the legal profession should think about financial compensation. The idea of a time path of compensation becomes central. To redress the psychological costs caused by serious disability would on our simplest estimates, we calculate, require long-run payments of approximately £60,000 pounds a year (more than $100,000 dollars a year). In the early years, the payments would have to be 2 to 3 times this amount. Such estimates are magnified in fixed-effect specifications and in equation specifications with concavity of income.

Standard economics ignores hedonic adaptation. In the way the courts deal with damages, so too does the law. The bottom line of this paper is that economists' and lawyers' positions should be re-thought.

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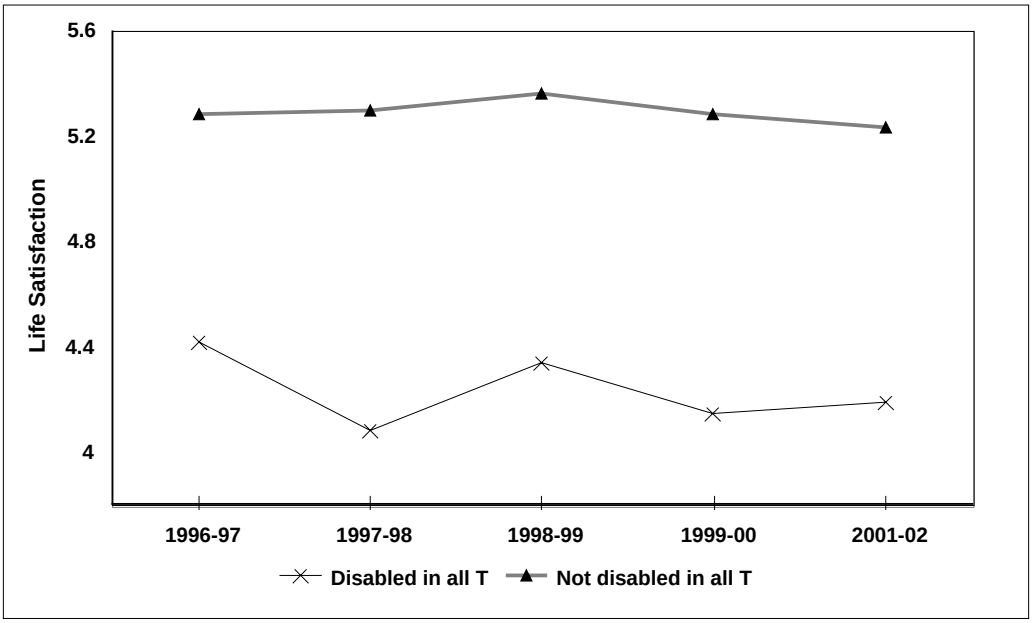
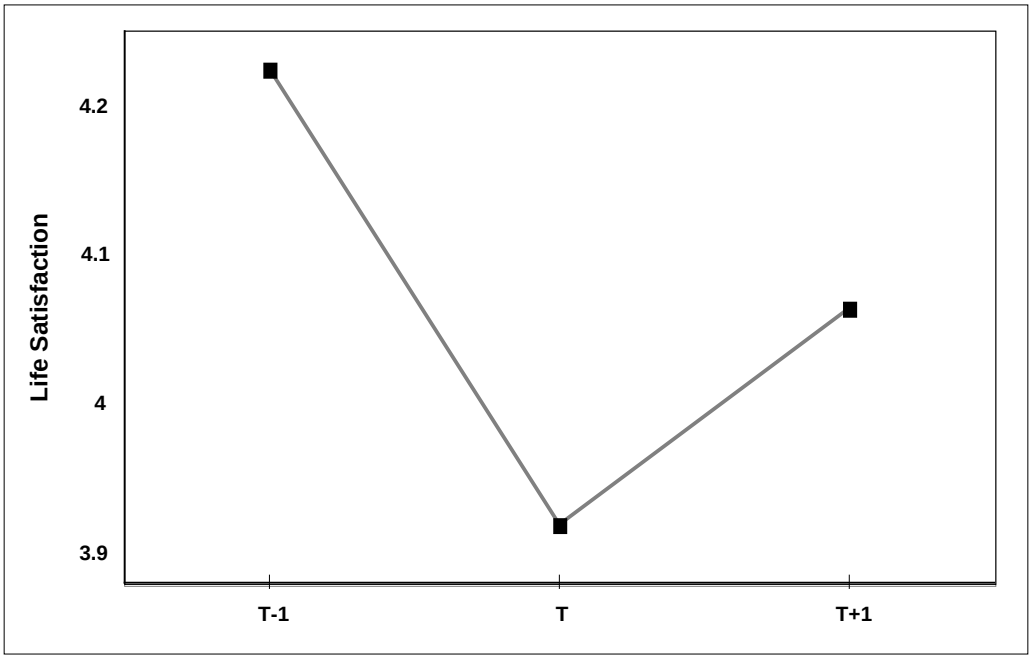
Figure 1: Life Satisfaction of the Never Disabled and the Always Disabled, BHPS 1996-2002



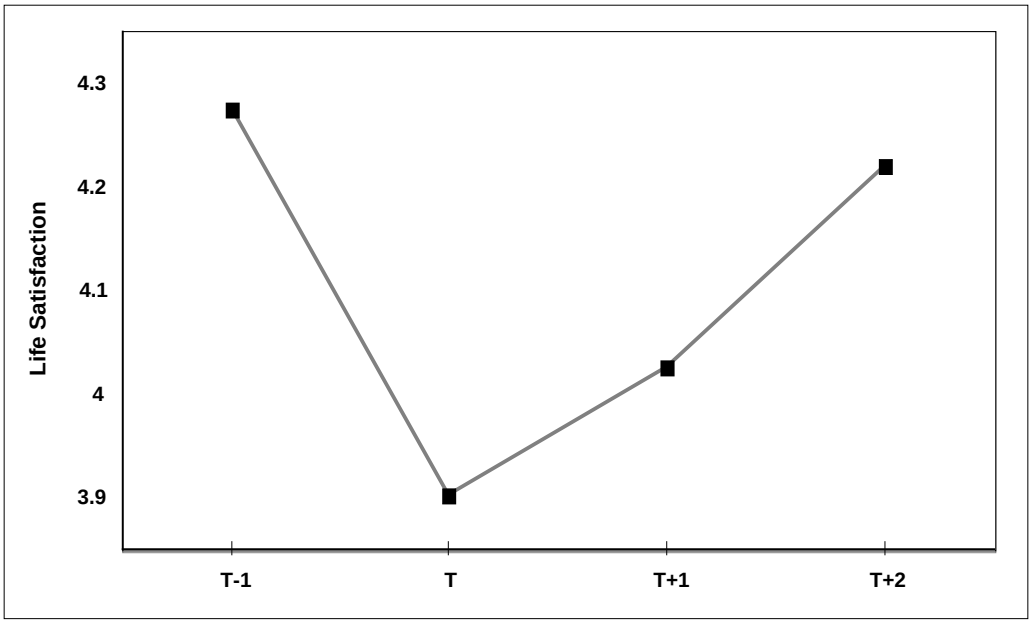
Note: There were 129 (13,776) individuals who were always disabled (never disabled).

Figure 2: Life Satisfaction of Those Who Entered Disability at Time *T* and Remained Disabled at *T+1*, BHPS 1996-2002



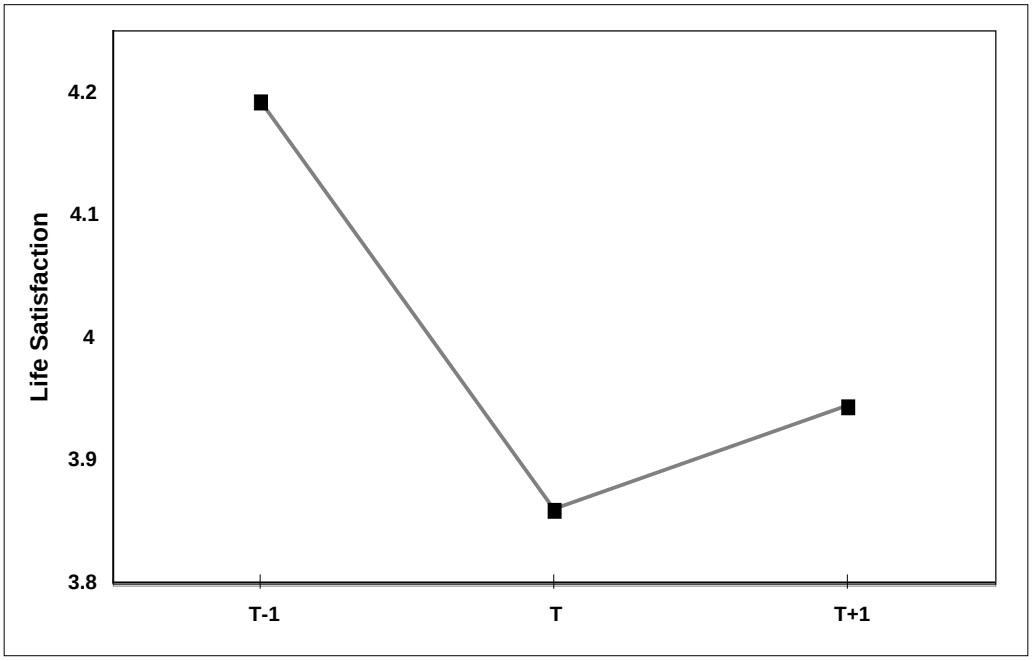
Note: There were 200 individuals who became disabled at time *T* and remained disabled in *T+1*. The mean life satisfaction of these individuals at *T-2* is 4.57. The *t*-test statistics [p-value] of whether the mean life satisfaction of the individual is equal are 1.761 [0.079] (between *T-1* and *T*) and -0.855 [0.393] (between *T* and *T+1*).

Figure 3: Life Satisfaction of Those Who Entered Disability at Time *T* and Remained Disabled in *T+1* and *T+2*, BHPS 1996-2002



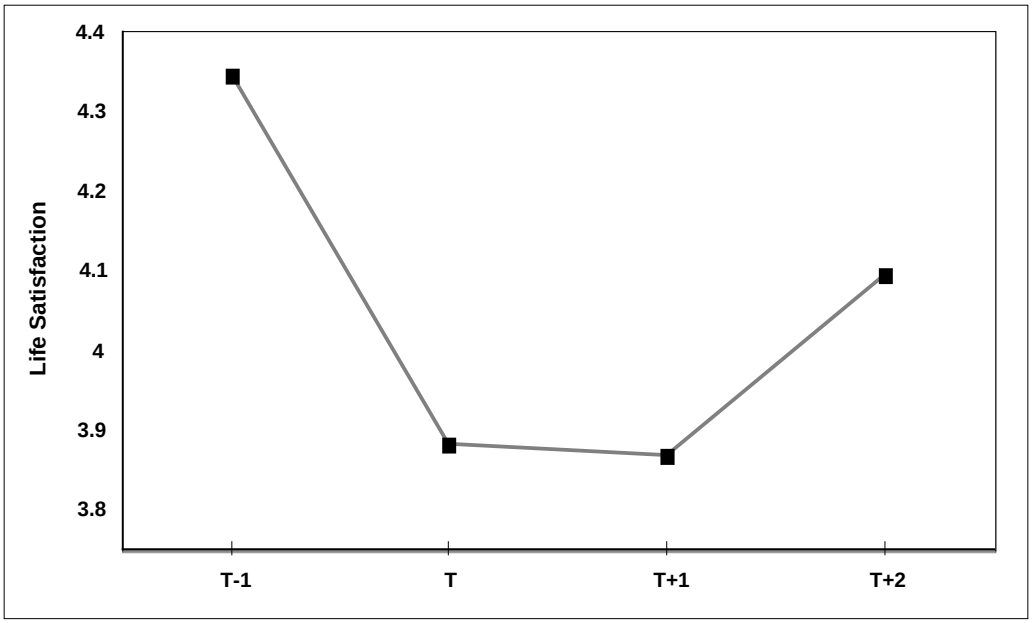
Note: There were 72 individuals who became disabled at time *T* and remained disabled in *T+1* and *T+2*. The mean life satisfaction of these individuals at *T-2* is 4.53. The *t*-test statistics [p-value] of whether the mean life satisfaction of the individual is equal are 1.374 [0.172] (between *T-1* and *T*), -0.466 [0.642] (between *T* and *T+1*) and -0.738 [0.461] (between *T+1* and *T+2*).

Figure 4: Life Satisfaction of Those Who Entered Serious Disability at Time *T* and Remained Seriously Disabled at *T+1*, BHPS 1996-2002



Note: There were 165 individuals who became seriously disabled at time *T* and remained seriously disabled in *T+1*. Serious disability includes those people who are not able to do at least one of the listed day-to-day activities. These include doing the housework, climbing the stairs, getting dressed, and walking for more than 10 minutes. The mean life satisfaction of these individuals at *T-2* is 4.52. The *t*-test statistics [p-value] of whether the mean life satisfaction of the individual is equal are 1.776 [0.076] (between *T-1* and *T*) and -0.459 [0.646] (between *T* and *T+1*).

Figure 5: Life Satisfaction of Those Who Entered Serious Disability at Time *T* and Remained Seriously Disabled in *T+1* and *T+2*, BHPS 1996-2002



Note: there were 52 individuals who became seriously disabled at time *T* and remained seriously disabled in *T+1* and *T+2*. The mean life satisfaction of these individuals at *T-2* is 4.63. The *t*-test statistics [p-value] of whether the mean life satisfaction of the individual is equal are 1.598 [0.113] (between *T-1* and *T*), 0.065 [0.949] (between *T* and *T+1*) and -0.748 [0.456] (between *T+1* and *T+2*).

Table 1: OLS Life Satisfaction Equations with Exogenous Variables, BHPS 1996-2002

	I		II		III		IV	
Disabled; able to do day-to-day activities	-0.527	(0.111)	-0.515	(0.111)	-	-	-	-
Disabled; unable to do day-to-day activities	-	-	-	-	-1.247	(0.051)	-1.243	(0.051)
Male	0.007	(0.016)	0.003	(0.016)	0.016	(0.016)	0.015	(0.016)
Age	-0.112	(0.007)	-0.116	(0.007)	-0.110	(0.007)	-0.110	(0.007)
Age^2/100	0.228	(0.016)	0.237	(0.016)	0.234	(0.016)	0.235	(0.016)
Age^3/100	-0.001	(0.000)	-0.001	(0.000)	-0.001	(0.000)	-0.001	(0.000)
Education: O-Level, A-Level	-	-	0.047	(0.022)	-	-	0.009	(0.022)
Education: Higher	-	-	0.083	(0.023)	-	-	0.015	(0.022)
Constant	6.801	(0.125)	6.801	(0.127)	6.753	(0.122)	6.754	(0.124)
Round dummies	Yes		Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes		Yes	
N	59,709		59,709		59,709		59,709	
R-squared	0.0265		0.0270		0.0575		0.0575	

Note: Life satisfaction is recorded on a 7-point scale, ranging from 1 "very dissatisfied" to 7 "very satisfied". Disabled, but able to do day-to-day activities, include those who are disabled but are able to do all of the following: i) housework, ii) climb stairs, iii) dress oneself, and iv) walk for at least 10 minutes. There are 315 observations of people who are disabled but able to do day-to-day activies as opposed to 2,204 observations of seriously disabled individuals who are not able to do at least one of the listed day-to-day activities. Reference variables are: non-disable, female, and no formal education. Round dummies are for the years interviewed in the panel. Standard errors are in parentheses.

Table 2: OLS Life Satisfaction Equations with Past Disability Variables

	I		II		III		IV	
Disabled; able to do day-to-day activities	-0.464	(0.112)	-0.281	(0.125)	-0.598	(0.169)	-0.473	(0.157)
Disabled; unable to do day-to-day activities	-1.144	(0.052)	-0.902	(0.062)	-1.228	(0.081)	-1.265	(0.084)
Past disability from t-3 to t-1 (3 yrs)	-	-	-0.369	(0.073)	-0.827	(0.095)	-	-
Disabled; able*past disability (3 yrs)	-	-	-	-	1.106	(0.277)	-	-
Disabled; unable*past disability (3 yrs)	-	-	-	-	0.960	(0.149)	-	-
Past disability from t-6 to t-1 (6 yrs)	-	-	-	-	-	-	-0.824	(0.103)
Disabled; able*past disability (6 yrs)	-	-	-	-	-	-	0.876	(0.295)
Disabled; able*past disability (6 yrs)	-	-	-	-	-	-	0.957	(0.159)
Unemployed	-0.544	(0.039)	-0.541	(0.043)	-0.524	(0.043)	-0.528	(0.046)
Self-employed	0.017	(0.028)	0.019	(0.029)	0.021	(0.029)	0.025	(0.030)
Look after home	-0.153	(0.031)	-0.141	(0.034)	-0.132	(0.034)	-0.128	(0.034)
Retired	0.011	(0.032)	0.047	(0.034)	0.071	(0.034)	0.070	(0.035)
Student	0.011	(0.030)	-0.004	(0.033)	-0.001	(0.033)	-0.017	(0.035)
Real household income per capita (*1,000)	0.008	(0.001)	0.008	(0.001)	0.008	(0.001)	0.007	(0.001)
Male	-0.026	(0.016)	-0.012	(0.017)	-0.012	(0.017)	-0.016	(0.017)
Age	-0.123	(0.010)	-0.125	(0.011)	-0.124	(0.011)	-0.126	(0.011)
Age^2/100	0.234	(0.021)	0.237	(0.022)	0.235	(0.022)	0.241	(0.023)
Age^3/100	-0.001	(0.000)	-0.001	(0.000)	-0.001	(0.000)	-0.001	(0.000)
Married	0.382	(0.027)	0.384	(0.030)	0.384	(0.030)	0.399	(0.030)
Living as a couple	0.302	(0.027)	0.283	(0.030)	0.286	(0.030)	0.315	(0.031)
Separated	-0.419	(0.057)	-0.420	(0.064)	-0.419	(0.063)	-0.386	(0.066)
Divorced	-0.144	(0.045)	-0.119	(0.048)	-0.116	(0.048)	-0.111	(0.049)
Widowed	0.061	(0.046)	0.082	(0.049)	0.082	(0.049)	0.106	(0.050)
Education: O-Level, A-Level	-0.048	(0.021)	-0.049	(0.023)	-0.049	(0.023)	-0.047	(0.023)
Education: Higher	-0.081	(0.022)	-0.076	(0.024)	-0.077	(0.024)	-0.072	(0.024)
Household size	0.006	(0.008)	0.009	(0.008)	0.009	(0.008)	0.005	(0.009)
Own home outright?	0.135	(0.020)	0.128	(0.021)	0.127	(0.021)	0.120	(0.022)
Days spent in hospital last year	-0.012	(0.001)	-0.012	(0.001)	-0.012	(0.001)	-0.013	(0.001)
Number of children	-0.030	(0.012)	-0.035	(0.013)	-0.037	(0.013)	-0.037	(0.013)
Constant	6.934	(0.156)	6.946	(0.168)	6.927	(0.168)	6.990	(0.171)
Round dummies	Yes		Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes		Yes	
N	52,973		52,973		52,973		44,405	
R-squared	0.0952		0.0947		0.0967		0.1002	

Note: Past disability measures the proportion of time the respondent spent being disabled prior to the inview date. Hence, past disability (3 years) takes the values of 0, 0.33, 0.66, and 1, whilst past disability (6 years) takes the values of 0, 0.17, 0.33, 0.5, 0.66, 0.83, and 1. Reference variables are: employed, female, never married, no formal education, and do not own home outright. Real household income per capita is income per annum, deflated by CPI. Standard errors are in parentheses.

Table 3: OLS Life Satisfaction Equations with Disability as Independent Variable for Sub-Samples

	Male		Female		Age<40		Age>=40		Non-graduates		Graduates	
Disabled; able to do day-to-day activities	-0.415	(0.247)	-0.814	(0.222)	-0.411	(0.283)	-0.686	(0.207)	-0.562	(0.202)	-0.747	(0.291)
Disabled; unable to do day-to-day activities	-1.365	(0.125)	-1.125	(0.106)	-1.615	(0.144)	-1.095	(0.096)	-1.197	(0.092)	-1.394	(0.169)
Past disability from t-3 to t-1 (3 yrs)	-0.813	(0.134)	-0.811	(0.134)	-0.701	(0.188)	-0.864	(0.108)	-0.868	(0.103)	-0.662	(0.251)
Disabled; able*past disability (3 yrs)	0.894	(0.379)	1.287	(0.403)	0.989	(0.525)	1.185	(0.323)	1.014	(0.316)	1.415	(0.573)
Disabled; unable*past disability (3 yrs)	1.007	(0.211)	0.908	(0.212)	1.181	(0.286)	0.849	(0.171)	0.957	(0.161)	0.871	(0.405)
Unemployed	-0.531	(0.056)	-0.545	(0.065)	-0.494	(0.051)	-0.521	(0.075)	-0.496	(0.050)	-0.612	(0.080)
Self-employed	0.046	(0.034)	-0.040	(0.056)	0.113	(0.041)	-0.027	(0.039)	0.023	(0.038)	0.017	(0.044)
Look after home	-0.396	(0.164)	-0.115	(0.036)	-0.170	(0.044)	-0.098	(0.049)	-0.162	(0.038)	0.008	(0.067)
Retired	-0.005	(0.052)	0.129	(0.046)	-1.033	(0.366)	0.029	(0.038)	0.024	(0.041)	0.182	(0.061)
Student	-0.017	(0.050)	0.018	(0.045)	0.042	(0.036)	-0.036	(0.212)	0.027	(0.039)	-0.026	(0.067)
Real household income per capita (*1,000)	0.008	(0.002)	0.007	(0.002)	0.012	(0.002)	0.006	(0.001)	0.008	(0.001)	0.007	(0.002)
Male	-	-	-	-	-0.021	(0.022)	-0.001	(0.024)	0.007	(0.021)	-0.046	(0.027)
Age	-0.144	(0.015)	-0.106	(0.015)	-0.232	(0.079)	-0.135	(0.055)	-0.113	(0.012)	-0.158	(0.021)
Age^2/100	0.277	(0.032)	0.200	(0.031)	0.742	(0.291)	0.273	(0.089)	0.223	(0.026)	0.287	(0.045)
Age^3/100	-0.002	(0.000)	-0.001	(0.000)	-0.008	(0.003)	-0.002	(0.000)	-0.001	(0.000)	-0.002	(0.000)

Table 3 (*continued*).

	Male		Female		Age<40		Age>=40		Non-graduates		Graduates	
Married	0.338	(0.044)	0.422	(0.041)	0.385	(0.035)	0.355	(0.056)	0.317	(0.039)	0.490	(0.044)
Living as a couple	0.288	(0.044)	0.286	(0.042)	0.257	(0.033)	0.304	(0.070)	0.234	(0.040)	0.360	(0.045)
Separated	-0.405	(0.095)	-0.424	(0.084)	-0.390	(0.080)	-0.449	(0.099)	-0.551	(0.079)	-0.164	(0.102)
Divorced	-0.002	(0.078)	-0.169	(0.061)	-0.178	(0.071)	-0.104	(0.069)	-0.187	(0.061)	0.009	(0.073)
Widowed	0.170	(0.089)	0.064	(0.060)	-0.250	(0.228)	0.063	(0.063)	0.068	(0.057)	-0.057	(0.110)
Education: O-Level, A-Level	-0.055	(0.033)	-0.045	(0.032)	0.073	(0.037)	-0.087	(0.029)	-0.037	(0.024)	-	-
Education: Higher	-0.108	(0.033)	-0.039	(0.034)	0.058	(0.038)	-0.138	(0.030)	-	-	-	-
Household size	0.011	(0.011)	0.007	(0.012)	0.039	(0.011)	0.008	(0.014)	0.016	(0.010)	-0.006	(0.015)
Own home outright?	0.094	(0.031)	0.151	(0.030)	0.063	(0.037)	0.146	(0.026)	0.138	(0.026)	0.097	(0.037)
Days spent in hospital last year	-0.011	(0.002)	-0.012	(0.002)	-0.010	(0.002)	-0.012	(0.002)	-0.013	(0.002)	-0.009	(0.002)
Number of children	-0.024	(0.018)	-0.042	(0.019)	-0.055	(0.018)	-0.026	(0.021)	-0.040	(0.016)	-0.016	(0.022)
Constant	7.221	(0.239)	6.684	(0.234)	7.382	(0.695)	6.834	(1.092)	6.641	(0.202)	7.526	(0.323)
Round dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes		Yes		Yes		Yes	
N	24,254		28,719		23,067		29,906		36,486		16,487	
R-squared	0.1072		0.0933		0.0802		0.1092		0.1010		0.0958	

Note: See Table 2. Graduates are those who have completed a university degree.

Table 4: OLS Life Satisfaction Equations Allowing for Non-Linearity in Income

	I		II	
Disabled; able to do day-to-day activities	-0.585	(0.169)	-0.576	(0.170)
Disabled; unable to do day-to-day activities	-1.215	(0.081)	-1.204	(0.081)
Past disability from t-3 to t-1 (3 yrs)	-0.820	(0.096)	-0.823	(0.096)
Disabled; able*past disability (3 yrs)	1.110	(0.276)	1.118	(0.279)
Disabled; unable*past disability (3 yrs)	0.952	(0.149)	0.949	(0.150)
Unemployed	-0.512	(0.043)	-0.496	(0.043)
Self-employed	0.025	(0.029)	0.035	(0.029)
Look after home	-0.124	(0.034)	-0.107	(0.034)
Retired	0.081	(0.034)	0.085	(0.034)
Student	0.004	(0.033)	0.019	(0.034)
Real household income per capita (*1,000)	0.012	(0.002)	-	-
Real household income^2/100	-0.005	(0.002)	-	-
Log of real household income per capita	-	-	0.109	(0.012)
Male	-0.014	(0.017)	-0.013	(0.017)
Age	-0.126	(0.011)	-0.126	(0.011)
Age^2/100	0.239	(0.022)	0.239	(0.022)
Age^3/100	-0.001	(0.000)	-0.001	(0.000)
Married	0.380	(0.030)	0.377	(0.030)
Living as a couple	0.282	(0.030)	0.282	(0.030)
Separated	-0.417	(0.064)	-0.403	(0.064)
Divorced	-0.114	(0.048)	-0.109	(0.048)
Widowed	0.078	(0.049)	0.073	(0.049)
Education: O-Level, A-Level	-0.052	(0.023)	-0.055	(0.023)
Education: Higher	-0.086	(0.024)	-0.088	(0.024)
Household size	0.011	(0.008)	0.009	(0.008)
Own home outright?	0.127	(0.021)	0.127	(0.021)
Days spent in hospital last year	-0.012	(0.001)	-0.012	(0.001)
Number of children	-0.030	(0.013)	-0.023	(0.013)
Constant	6.918	(0.168)	6.077	(0.193)
Round dummies	Yes		Yes	
Region dummies	Yes		Yes	
N	52,973		52,864	
R-squared	0.0973		0.0975	

Note: See Table 2. Standard errors are in parentheses.

Table 5: Fixed-Effect Life Satisfaction Equations with only Disability Variable, Round and Regional Dummies, BHPS 1996-2002

	I		II	
Disabled; able to do day-to-day activities	-0.024	(0.075)	-	-
Disabled; unable to do day-to-day activities	-	-	-0.449	(0.041)
Constant	5.279	(0.066)	5.300	(0.066)
Round dummies	Yes		Yes	
Region dummies	Yes		Yes	
N	59,709		59,709	
Group	21,517		21,517	
R-squared	0.0063		0.0093	

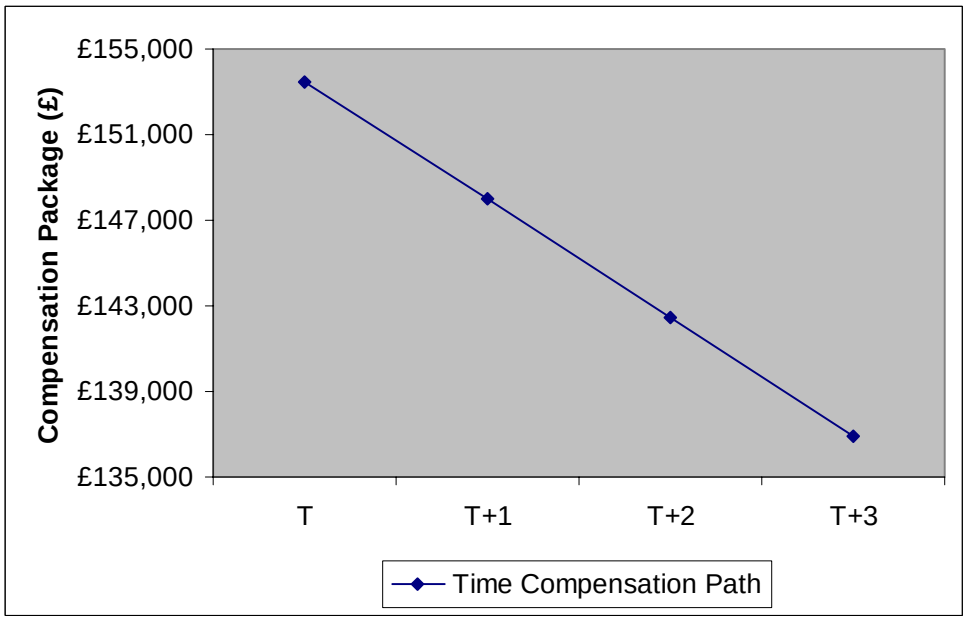
Note: Standard errors are in parentheses.

Table 6: Fixed-Effect Life Satisfaction Equations with Past Disability Variable

	I		II		III	
Disabled; able to do day-to-day activities	-0.278	(0.077)	-0.268	(0.080)	-0.408	(0.111)
Disabled; unable to do day-to-day activities	-0.536	(0.044)	-0.503	(0.046)	-0.596	(0.060)
Past disability from t-3 to t-1 (3 yrs)	-	-	0.068	(0.072)	-0.076	(0.086)
Disabled; able*past disability (3 yrs)	-	-	-	-	0.422	(0.188)
Disabled; unable*past disability (3 yrs)	-	-	-	-	0.300	(0.108)
Unemployed	-0.345	(0.031)	-0.336	(0.032)	-0.334	(0.032)
Self-employed	0.004	(0.032)	0.005	(0.033)	0.006	(0.033)
Look after home	-0.127	(0.028)	-0.111	(0.029)	-0.108	(0.029)
Retired	-0.046	(0.031)	-0.037	(0.032)	-0.025	(0.032)
Student	0.068	(0.036)	0.064	(0.036)	0.064	(0.036)
Real household income per capita (*1,000)	0.002	(0.001)	0.002	(0.001)	0.002	(0.001)
Age	-0.117	(0.025)	-0.121	(0.026)	-0.120	(0.026)
Age^2/100	0.253	(0.035)	0.269	(0.036)	0.268	(0.036)
Age^3/100	-0.002	(0.000)	-0.002	(0.000)	-0.002	(0.000)
Married	0.050	(0.042)	0.033	(0.043)	0.032	(0.043)
Living as a couple	0.163	(0.034)	0.157	(0.035)	0.156	(0.035)
Separated	-0.345	(0.061)	-0.348	(0.062)	-0.348	(0.062)
Divorced	-0.103	(0.056)	-0.116	(0.057)	-0.116	(0.057)
Widowed	-0.172	(0.066)	-0.178	(0.067)	-0.180	(0.067)
Education: O-Level, A-Level	-0.004	(0.049)	-0.010	(0.050)	-0.010	(0.050)
Education: Higher	0.045	(0.049)	0.053	(0.050)	0.053	(0.050)
Household size	-0.019	(0.009)	-0.017	(0.009)	-0.017	(0.009)
Own home outright?	0.043	(0.025)	0.035	(0.025)	0.034	(0.025)
Days spent in hospital last year	-0.006	(0.001)	-0.006	(0.001)	-0.006	(0.001)
Number of children	0.015	(0.015)	0.023	(0.015)	0.023	(0.015)
Constant	7.046	(0.927)	6.972	(0.989)	6.968	(0.989)
Round dummies	Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes	
N	59,709		52,973		52,973	
Group	21,517		17,311		17,311	
R-squared (within)	0.0199		0.0196		0.0198	

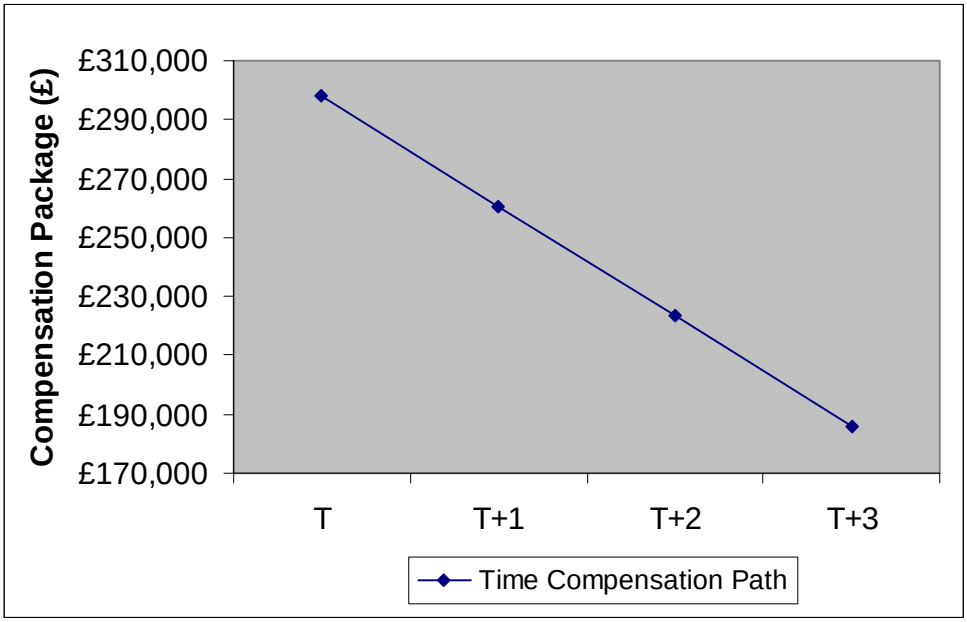
Note: Standard errors are in parentheses.

Figure 6: Time Compensation Path (Cross-section)



Note: The estimated time compensation packages are based on pooled OLS regression taken from Column III of Table 2.

Figure 7: Time Compensation Path (Fixed-Effects)



Note: The estimated time compensation packages are based on fixed-effects regression taken from Column III of Table 6

Table A1: Data Description and Summary Statistics

Varibles	Descriptions	Not Disabled		Disabled Able		Disabled Unable	
		Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Life satisfaction	satisfaction with life score, coded so that 1 = very dissatisfied, 7 = very satisfied	5.28	(1.27)	4.69	(1.67)	4.05	(1.78)
Past disability (3 years)	the proportion of time spent being disabled from t-3 to t-1	0.01	(0.09)	0.48	(0.43)	0.64	(0.41)
Number of time being happy in a day	number of time being happy in a day score, coded so that 1 = none, 6 = all the time	4.60	(1.07)	-	-	-	-
Unemployed	employment status, unemployed = 1	0.04	(0.19)	-	-	-	-
Self-employed	employment status, self-employed = 1	0.07	(0.25)	-	-	-	-
Family-cared	employment status, family-cared = 1	0.08	(0.27)	-	-	-	-
Student	employment status, student = 1	0.21	(0.41)	-	-	-	-
Retired	employment status, retired = 1	0.06	(0.24)	-	-	-	-
Real household income per capita (*1000)	annual household income per capita, adjusted to CPI index	9.52	(7.93)	6.82	(10.91)	6.55	(4.06)
Male	gender (male = 1)	0.45	(0.50)	0.56	(0.50)	0.51	(0.50)
Age	age	44.60	(18.68)	48.34	(12.85)	49.85	(11.58)
Age^2/100	age-sqauared/100	23.38	(18.42)	25.02	(11.67)	26.19	(11.63)
Age^3/100	age-cubed/100	1380.26	(1542.34)	1356.49	(872.23)	1437.66	(959.44)
Married	marital status, married = 1	0.54	(0.50)	0.41	(0.49)	0.57	(0.50)
Living as a couple	marital status, living with a partner = 1	0.11	(0.31)	0.11	(0.32)	0.07	(0.25)
Separated	marital status, separated = 1	0.02	(0.13)	0.02	(0.13)	0.03	(0.16)
Divorced	marital status, divorced = 1	0.05	(0.22)	0.19	(0.39)	0.14	(0.35)
Widowed	marital status, widowed = 1	0.08	(0.27)	0.04	(0.19)	0.05	(0.21)
Education: A-levels, O-levels	tertiary education, i.e. A-levels, O-levels	0.42	(0.49)	0.36	(0.48)	0.36	(0.48)
Education: High	higher education, i.e. university level	0.31	(0.46)	0.19	(0.39)	0.13	(0.33)
Household size	number of people living in the household	2.86	(1.37)	2.26	(1.15)	2.62	(1.45)
Own home outright	whether the respondent owns home outright (yes = 1)	0.24	(0.43)	0.16	(0.36)	0.19	(0.39)
Number of days in hospital last year	the number of days spent in hospital last year for the respondent	0.82	(5.61)	3.42	(18.46)	4.20	(15.57)
Number of children	number of children who are under 16 in the household	0.53	(0.95)	0.30	(0.67)	0.42	(0.91)
Total number of observations		71,032		315		2,204	

Note: Standard deviations are in parentheses. Disabled type Able: disabled, but able to do day-to-day activities include those who are disabled but are able to do all of the followings: i) housework, ii) climb stairs, iii) dress oneself, and iv) walk for at least 10 minutes. Disabled type Unable: disabled, and unable to do day-to-day activities.

Table A2: OLS Number of Times Being Happy in a Day Equations, BHPS 1999

	I		II		III	
Disabled	-0.926	(0.058)	-0.813	(0.105)	-1.046	(0.133)
Past disability from t-3 to t-1 (3 yrs)	-	-	-0.144	(0.120)	-0.446	(0.161)
Disabled*past disability (3 yrs)	-	-	-	-	0.656	(0.238)
Unemployed	-0.402	(0.056)	-0.321	(0.073)	-0.310	(0.072)
Self-employed	0.051	(0.034)	0.046	(0.040)	0.048	(0.040)
Look after home	-0.131	(0.040)	-0.100	(0.046)	-0.095	(0.047)
Retired	-0.074	(0.041)	-0.092	(0.050)	-0.075	(0.050)
Student	0.017	(0.040)	0.013	(0.050)	0.013	(0.050)
Real household income per capita (*1,000)	0.004	(0.001)	0.003	(0.001)	0.003	(0.001)
Male	0.109	(0.018)	0.121	(0.022)	0.120	(0.022)
Age	-0.078	(0.012)	-0.087	(0.014)	-0.087	(0.014)
Age^2/100	0.148	(0.025)	0.165	(0.030)	0.165	(0.030)
Age^3/100	-0.001	(0.000)	-0.001	(0.000)	-0.001	(0.000)
Married	0.188	(0.033)	0.180	(0.039)	0.179	(0.039)
Living as a couple	0.138	(0.036)	0.110	(0.043)	0.113	(0.043)
Separated	-0.271	(0.079)	-0.386	(0.104)	-0.386	(0.105)
Divorced	-0.037	(0.053)	-0.052	(0.065)	-0.052	(0.065)
Widowed	-0.073	(0.055)	-0.083	(0.065)	-0.085	(0.065)
Education: O-Level, A-Level	0.077	(0.024)	0.036	(0.029)	0.035	(0.029)
Education: Higher	0.085	(0.025)	0.052	(0.031)	0.050	(0.031)
Household size	0.001	(0.009)	-0.010	(0.012)	-0.010	(0.012)
Own home outright?	0.075	(0.024)	0.060	(0.029)	0.059	(0.029)
Days spent in hospital last year	-0.006	(0.002)	-0.007	(0.002)	-0.007	(0.002)
Number of children	-0.022	(0.014)	-0.013	(0.018)	-0.015	(0.018)
Constant	5.407	(0.433)	5.857	(0.435)	5.852	(0.435)
Round dummies	Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes	
N	15,168		10,046		10,046	
R-squared (within)	0.0664		0.0641		0.0653	

Note: Standard errors are in parentheses. The happiness question is "How much time during the past month... Have you been a happy person? 1. None of the time, 2. A little of the time, 3. Some of the time, 4. A good bit of the time, 5. Most of the time, 6. All the time." Disability variable is pooled from serious disability and those who are disabled but still able to do day-to-day activities.