NBER WORKING PAPER SERIES

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Rafael Di Tella
John Haisken-De New
Robert MacCulloch

Working Paper 13159
http://www.nber.org/papers/w13159

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2007

For generous comments and ideas, we thank Andrew Oswald, as well as Daniel Kahneman (who suggested the loss aversion tests), Bo Honore, Bill Simpson, Sebastian Galiani, Angus Deaton, Julio Rotemberg, Matthew Weinzierl and seminar participants at Harvard Business School, the Brookings/Warwick Conference on Happiness in June 5-6 2003 and that on Behavioral Economics organized by Federal Reserve Bank of Boston also in June 2003. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 13159
June 2007
JEL No. D0,I31

ABSTRACT

We study "habituation" to income and to status using individual panel data on the happiness of 7,812 people living in Germany from 1984 to 2000. Specifically, we estimate a "happiness equation" defined over several lags of income and status and compare the long run effects. We can (cannot) reject the hypothesis of no adaptation to income (status) during the four years following an income (status) change. In the short-run (current year) a one standard deviation increase in status and 52% of one standard deviation in income are associated with similar increases in happiness. In the long-run (five year average) a one standard deviation increase in status has a similar effect to an increase of 285% of a standard deviation in income. We also present different estimates of habituation across sub-groups. For example, we find that those on the right (left) of the political spectrum adapt to status (income) but not to income (status).

Rafael Di Tella
Harvard Business School
Soldiers Field Rd
Boston, MA 02163
and NBER
rditella@hbs.edu

Robert MacCulloch
The Business School
Imperial College London
South Kensington Campus
London SW7 2AZ
United Kingdom
r.macculloch@imperial.ac.uk

John Haisken-De New
Rheinisch-Westf?lisches Institut
f?r Wirtschaftsforschung
Hohenzollernstra?e 1-3
45128 Essen
GERMANY
jhaiskendenew@rwi-essen.de

I. Introduction

In a seminal paper, Easterlin (1974) showed that an indicator of well-being for the post-war period in the US remained flat in spite of the considerable rise in income.[1] In the cross-section for any particular year, however, income and happiness exhibit the expected positive association. One explanation that has been proposed for this "paradox" is the hypothesis that people only care about their relative position or "status". A second explanation is that people adapt to their income over time. In this case the cross-sectional evidence can be explained by relative position effects to which individuals do not adapt. In this spirit, Easterlin (2003) has argued that a better theory of well-being involves adaptation to income but not to events in the non-pecuniary domain.

The narrow purpose of the present paper is to test adaptation to status relative to income. As explained above, these theories are both part of an explanation to the Easterlin paradox (if there is adaptation to income but not to status). Our paper employs the approach developed in the small happiness literature that has emerged in economics following Easterlin's paper.[2] Using individual-level panel data on happiness from households living in Germany between 1984 and 2000, we provide evidence on three behavioral hypotheses, namely adaptation, status effects and loss aversion. In particular, we compare the extent of adaptation to income with the extent of adaptation to status. Our main objective is to provide evidence on the relative sizes of the (short and long-run) effects of being on higher income compared to enjoying higher status. We also compare the effects across sub-samples of people with different ideological inclination, of different gender and with different employment status. Finally, we compare how losses versus gains affect happiness and provide one way to quantify them (in terms of current income).

Our main finding is that there is significant adaptation to income. We can reject the hypothesis that people do not adapt to income in the four years following an income shock. The size of

[1] This growth-without-happiness paradox has been replicated in other countries and other periods by economists (e.g., Blanchflower and Oswald, 2004), psychologists (e.g., Diener and Oishi, 2000), political scientists (e.g., Inglehart and Klingemann, 2000) and sociologists (e.g., Veenhoven, 1993).

[2] See Frey and Stutzer (2002) and Senik (2005) for reviews and Hamermesh (2001) for an example of a related approach focused on job satisfaction. An important precursor of the happiness literature is work on the individual welfare function of income (see, for example, van Praag and Kapteyn, 1973).

adaptation is sufficiently large that no significant income effects on happiness remain after the fourth year. The adaptation effects we investigate are consistent with the model of Pollak (1970), Wathieu (2004), Rayo and Becker (2003), *inter alia*. A classic paper in psychology, Brickman, Coates and Janoff-Bullman (1978), showed that individuals who had won between $50,000 and $1,000,000 at the lottery the previous year reported comparable life satisfaction levels as those that didn't.[3] Frederick and Loewenstein (1999) and Diener and Diener (2002) present reviews of the evidence available, gathered largely by psychologists. Recent studies of habituation using happiness data include Di Tella *et al* (2003), who estimate the effect of income lags in a panel of 12 OECD countries, and Gardner and Oswald (2001) who use data on a panel of individuals who receive windfalls (by winning a lottery or receiving an inheritance). Our explanation is related to the work of van Praag and Kapteyn (1973) showing that income aspirations rise in proportion to income (sometimes called "preference drift"). Indeed, van de Stadt, Kapteyn and van de Geer (1985) find that the hypothesis of one-for-one changes in income aspirations and income cannot be rejected (see also van Praag and Ferrer-i-Carbonell, 2004 and Stutzer, 2003). More recently, Easterlin (2003) argues that family aspirations do not change as marital status and family size change but that material aspirations increase commensurately with household wealth.

Our paper also identifies significant status effects. We focus on the Treiman Standard International Occupation Prestige Score, a measure of the status attached to each job depending on the skills it requires, which has the advantage of having been designed by researchers in another context (see, for example, the description in Hoffmann, 1999). Controlling for changes in income, individuals declare themselves to be happier when they obtain a job that is deemed more prestigious. A one standard deviation increase in status is associated with a similar rise in happiness as an increase of 52% of one standard deviation in income during the first year. The evidence cannot reject the hypothesis that there is no adaptation to changes in status in the four years following a status shock. Using long-run (five year) averages, a one standard deviation increase in status is associated with a similar rise in happiness as an increase of 285% of a standard deviation in income.

[3] This is also sometimes called the "hedonic treadmill" hypothesis or the "setpoint" model (see Costa *et al*, 1987). Easterlin (2003) stresses that the evidence, which is based on small samples, is consistent only with incomplete adaptation. Using the German Panel, Clark *et al* (2003a, b) study adaptation to labor and life events (unemployment, layoffs, marriage and divorce).

Our estimates of status effects complement the findings in the growing literature testing if people care about their income relative to that of others, as in the models of interdependent preferences (where utility varies inversely with the average income of others) by Duesenberry (1949), Parducci (1968), Hamermesh (1975), Pollak (1976), Frank (1985) and Cole *et al* (1992), *inter alia*. Empirical evidence on the effect of relative position using well-being data is presented in Clark and Oswald (1996), Blanchflower and Oswald (2004) and Brown *et al* (2004).[4] An interesting recent study by Luttmer (2004) involves a panel of almost 9,000 individuals in the United States. He matches individual data on happiness and income with a measure of neighbor's income, given by the average earning in the locality in which individuals live (which contain 150,000 inhabitants, on average). He then observes that approximately similar decreases in individual happiness are produced when individual income falls as when the neighbor's income increases and concludes that there are sizeable relative income effects. Suggestive supporting evidence is provided in the form of larger estimated effects amongst individuals who socialize more in the neighborhood. In a similar spirit, Ferrer-i-Carbonell (2005) finds strong comparison income effects (particularly upwards; see also Weinzierl, 2005). A related paper by Clark (2003) provides evidence showing that the happiness drop associated with falling unemployed is smaller the higher is the unemployment rate in this person's reference group.

We also present different patterns of habituation across sub-groups. In particular, we estimate the degrees of adaptation to income and to status for those individuals who declare themselves to be on the left of the political spectrum and compare them to those estimated for individuals on the right-end of the spectrum. This is interesting for two reasons. First, left and right-wing voters are important in determining economic policies. Second, it is hard to argue that the differential habituation patterns are due to left and right-wing individuals being affected by different stochastic processes for income and status. Indeed, under the assumption that income and status behave similarly for left and right-wingers, the differences in the estimates we present must be picking up true differences in preferences across these two sub-groups. Similarly, we present different estimates for other sub-groups (e.g., men compared to women) though the assumption of similar stochastic processes for income and status across them may be less compelling. As another strategy to deal with this potential concern, we show in Monte-Carlo simulations how it

[4] There is a large literature on the link between social hierarchy and primate health, reviewed in Sapolsky (2005).

is statistically unlikely to obtain our pattern of differential happiness adaptation across income and status due solely to their differential stochastic processes when the happiness data come from a model where there is equal adaptation.

Finally, our paper considers briefly loss aversion. Given that a standard utility function is concave in income, such tests are considerably harder than testing for adaptation and status, so our results remain exploratory.[5] To identify a pure behavioral effect such as loss aversion, the challenge is to focus on sufficiently small changes to distinguish the asymmetric effect on happiness occurring solely from positive and negative short-run changes in income from the (non-behavioral) asymmetries that occur due to the utility function being concave in income. Still, we obtain some intriguing results. Our estimates indicate that a person on mean income of 60,971 DM (in 1995 values) reports similar happiness to someone on 63,195 DM, but who happens to be there as a result of a drop in their income of 2,721 DM (the average drop in our sample). One way to gauge the size of the effect is to note that one standard deviation in income losses is only 21% of a standard deviation in income levels, and both give rise to similar changes in happiness.

More broadly, the questions discussed in this paper are particular examples of a problem that is common in economics and psychology, namely how to compare behavioral effects. 'Economic psychology' has made considerable progress without a unifying model or approach. Instead, progress has been made by individual researchers proposing alternative hypotheses that often imply considerable deviations from classical assumptions. A number of tests have then been performed establishing the statistical significance of these behavioral traits. But one shortcoming of this approach is that it is hard to get a sense of the relative importance of the effects. For example, although it is intuitively appealing that there are asymmetries implying some degree of loss aversion (see Kahneman and Tversky, 1979) previous research does not seem to have a convincing answer concerning their relative economic importance. More precisely, we don't know how to value a study that ignores the possibility of loss aversion. If such effects are statistically significant but small in size, attention to loss aversion may be an unnecessary distraction.

[5] Most work on the area studies betting markets. For an interesting recent paper that studies loss aversion using data on horse races (without data on the individual bettors), see Jullien and Salanié (2000).

The rest of the paper is organized as follows. Section II discusses the empirical strategy used to quantify behavioral effects. Section III presents the data while section IV presents the results. Section V discusses some evidence on loss aversion. The final section concludes.

II. Empirical Strategy

Our purpose is to identify whether income and status have long lasting (historical) impacts on happiness or whether these dissipate over time. To do so, we run a series of regression specifications that are based on the following general form:

$$\begin{aligned} Happiness_{it} = &(\alpha_1 \log y_{it+1} + \alpha_0 \log y_{it} + \alpha_{-1} \log y_{it-1} + \alpha_{-2} \log y_{it-2} + \alpha_{-3} \log y_{it-3} + .. \alpha_{-T} \log y_{it-T}) \; + \\ &(\beta_1 \log S_{it+1} + \beta_0 \log S_{it} + \beta_{-1} \log S_{it-1} + \beta_{-2} \log S_{it-2} + \beta_{-3} \log S_{it-3} + .. \beta_{-T} \log S_{it-T}) \; + \\ &\delta \underline{X}_{it} + f_i + \eta_t + e_{it} \qquad (1) \end{aligned}$$

where lags and leads on both income, y_{it}, and status, S_{it}, are used to explain (current) life satisfaction levels, $Happiness_{it}$, of individual, i, at time, t. The level of income is measured by the logarithm of real (net) household income from all sources during the current year. The proxy, S_{it}, measures the status (i.e., relative standing) of one's job. Consequently equation (1) measures the degree to which people's happiness adapts to income and compares it with degree to which there is adaptation to a status good. The maximum number of lags used initially is arbitrary (T=four) but further tests are provided in the discussion of the results.

The vector, $\underline{X}_{it}$, consists of individual characteristics: *Marital state* (a set of dummies depending on whether the respondent is married, divorced, separated or widowed), *Employment state* (a set of dummies depending on whether the respondent is unemployed, retired, at school, at home, in the military, self-employed or a public servant) and *Education* (a set of dummies measuring the respondent's level of high school achievement, vocational training or college degree). We also control for whether the respondent has recently been in hospital (to proxy for physical health), number of children and whether there has been a child birth in the household the past year.

Of the remaining variables, f_i is an unobserved fixed-individual trait, η_t is a year fixed effect and e_{it} is random noise. Data on all the above variables exists for a sample of 7,812 West Germans

between 1985 and 2000. Happiness is measured on a 0-10 point scale. Estimation is done using an Ordinary Least Squares fixed-effects model although similar conclusions emerge when a more flexible cardinalization is used (see Ferrer-i-Carbonell and Frijters, 2004 for a discussion as well as the results reported in Kohler, Behrman and Skytte, 2005 and Frijters, Shields and Haisken-DeNew, 2004; see also the approach in Di Tella and MacCulloch, 2005).

We begin by testing for whether there is adaptation to income by running regression (1) with the restrictions, $\alpha_1=\beta_1=\beta_0=\beta_{-1}=\ldots=\beta_{-T}=0$. In the other words, we estimate:

$$Happiness_{it} = (\alpha_0 \log y_{it} + \alpha_{-1} \log y_{it-1} + \alpha_{-2} \log y_{it-2} + \alpha_{-3} \log y_{it-3} + .. \alpha_{-T} \log y_{it-T}) + \delta \underline{X}_{it} + f_i + \eta_t + e_{it} \qquad (2)$$

To test for whether there is adaptation to status the following restrictions are imposed: $\beta_1=\alpha_1=\alpha_{-1}=...=\alpha_{-T}=0$. We also estimate a specification with an unrestricted lag structure on both status and income jointly (i.e., assuming only that $\alpha_1=\beta_1=0$) and test for the importance of their average levels, which imposes the additional restrictions: $\beta_0=\beta_{-1}=...=\beta_{-T}$ and $\alpha_0=\alpha_{-1}=...=\alpha_{-T}$.

These tests are relevant to reconciling the strong positive effects of income position on happiness in a cross-section of people within a nation, with the lack of any noticeable effects of increasing average incomes on happiness over long periods of time. Two basic hypothesis have been suggested, adaptation and relative position effects. As explained above, the latter requires that there is no adaptation. Although some work has explored the significance of these effects, the comparative size and importance of these different explanations has not been directly tested. The formal hypotheses that we use to test for adaptation effects are:

$$H_o: \sum_{i=1}^{T} \alpha_{-i} = 0 \quad \text{versus} \quad H_1: \sum_{i=1}^{T} \alpha_{-i} \neq 0 \qquad (3)$$

$$H_o: \sum_{i=1}^{T} \beta_{-i} = 0 \quad \text{versus} \quad H_1: \sum_{i=1}^{T} \beta_{-i} \neq 0 \qquad (4)$$

and for long-run effects are:

$$H_o: \sum_{i=0}^{T} \alpha_{-i} = 0 \quad \text{versus} \quad H_1: \sum_{i=0}^{T} \alpha_{-i} \neq 0 \tag{5}$$

$$H_o: \sum_{i=0}^{T} \beta_{-i} = 0 \quad \text{versus} \quad H_1: \sum_{i=0}^{T} \beta_{-i} \neq 0 \tag{6}$$

We also check to see whether there are significant differences between the degree of adaptation to income and relative position that occurs after the initial period:

$$H_o: \sum_{i=1}^{T} \alpha_{-i} - \sum_{i=1}^{T} \beta_{-i} = 0 \quad \text{versus } H_1: \sum_{i=1}^{T} \alpha_{-i} - \sum_{i=1}^{T} \beta_{-i} \neq 0 \tag{7}$$

If people adapt to income but not to status then we may be able to explain how there can exist a positive relationship between happiness and income rank within a nation (if the rank is correlated with status) and also a flat long-run happiness time-series (in spite of rising average incomes).[6]

III. Data

We collect data from the German Socio-economic panel (GSOEP), a longitudinal data set begun in 1984 that randomly samples households living in the western states of the Federal Republic of Germany. In 1990 the eastern states were added to provide a representative sample of the (reunited) Germany, although in this paper we concentrate only in the West German sample. Given the role of lags in our empirical strategy we consider only individuals for which we have at least 5 years of data. The GSOEP survey contains the following 'happiness' question: *"In conclusion, we would like to ask you about your satisfaction with your life in general, please answer according to the following scale: 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?*". The possible answers appear on a scale showing the numbers 0, 1, 2, .. 9, 10, with the words *"Completely dissatisfied"* below 0 and *"Completely satisfied"* below 10.

[6] Since equation (1) takes log transformations of income and status, we are testing whether it is possible to reject the hypothesis that the (absolute) changes in happiness that occur following a 1% rise in income and a 1% rise in status are equal. A related test is whether the (proportionate) changes in happiness that occur (as a ratio of initial effects) following a 1% rise in income and a 1% rise in status are equal:

$H_o: \frac{1}{\alpha 0}\sum_{i=1}^{T} \alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T} \beta_{-i} = 0$ versus $H_1: \frac{1}{\alpha 0}\sum_{i=1}^{T} \alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T} \beta_{-i} \neq 0$.

III.a. Measurement of Income

The second key variable used in the present study is a measure of each individual's income. There are several different income-related questions in the survey that are relevant to this measurement. We use 'Real Household Post-Government Income' from the Cross-National Equivalent File (1984-2000). This variable represents combined household income after taxes and government transfers (of the head, partner and other family members). It equals the sum of pre-government income, social security and annual public transfer income, minus net household annual taxes. Household pre-government income consists of annual gross labour income, asset income, private transfer income and private retirement income. Since the income variables in GSOEP are reported as average monthly amounts received, they first had to be annualized by calculating the number of months in each year various types of income are received and multiplying this number by the reported average monthly amount. Next an estimated tax burden for households or individuals was computed using a tax-estimation routine. This tax package produces estimated annual tax burdens for all households in the GSOEP.

III.b. Measurement of Status

Status (i.e., an individual's relative standing to others) is measured using the Standard International Occupational Prestige Scale (SIOPS) which is an independent score (ranging from 1 to 90) that is given to each person's job (see the discussions in Treiman, 1977, Ganzeboom and Treiman, 1996, Hoffmann, 1999, *inter alia*). Each individual's status is calculated in two steps: first, the occupation is determined using the International Standard Classification of Occupations, 1988 (ISCO88) of the International Labor Office, and then in the second step the occupation is assigned a prestige score.

The first step using the ISCO88 system classifies occupations into a hierarchy that attempts to capture two dimensions: skill level and specialization. The former refers to the nature of skills required for the job (but not necessarily the way the skills were acquired). Skill specialization refers to the areas (such as subject matter, products and services produced or types of equipment used).[7] The second step uses the SIOPS scale that was originally constructed in 1977 by Donald

[7] A job is defined as a set of tasks or duties designed to be executed by one person. Jobs are grouped into occupations according to the degree of similarity in their constituent tasks and duties. As an example, the following

Treiman who examined the results of surveys on prestige evaluations of occupations carried out in approximately sixty countries. Occupational prestige is a measure that captures either a relationship of deference or derogation between role incumbents, or the general desirability or goodness of an occupation (see Siegel, 1971). Prestige is based on the rankings of occupations by survey respondents on the basis of goodness, worth, status, and power and is a robust measure, showing little variation regardless of how people are asked to rate occupations (see Kraus, Schild and Hodge, 1978), whether occupations are rated by men or women (see, Bose and Rossi, 1983), the race of raters (see Siegel, 1970), the date on which raters ranked occupations (see Nakao and Treas, 1994) or raters own social class standing (see Treiman, 1977 and Haller and Bills, 1979).[8]

It is important to note how the status data are so detailed that they give variation in what appear to be narrow categories. One example is the self-employed for whom those in business services earn a score of 78, those in the construction industry earn a score of 69 whereas those operating food stores earn a score of just 44. Table A provides the summary statistics (total, between and within) of all the variables used and the Appendix provides a full description of the data sets and variable definitions.

III.c. Comparison of the Time Series Properties of Income and Status

Our income and status series have different properties. One of the primary differences between status and income is the frequency of changes in the two series. Although in every year-to-year observation in our sample (real) income changed by some discrete amount, in 81% of observations there was no observed change in status. This is partly due to income being measured on a continuous scale (including income from all sources) and status being measured on a discrete 1-90 scale, though also reflects how status is inherently slower to change since it depends, at least in part, on the set of skills that a person possesses. Put differently, status is a more 'permanent' process than income which has a sizeable 'transient' component. The cost of adjusting one's status is large, leading to less frequent though, on average, larger changes than for

jobs are grouped together in ISCO88 to form the occupation unit group "3472 Radio, Television and Other Announcers": news announcer; radio announcer; television announcer; disc jockey; media interviewer; newscaster. Although each job may be distinct in terms of the output required from the person who executes the tasks, the jobs are sufficiently similar in terms of the abilities required as inputs into these tasks for them to be regarded as a single occupational unit for our purposes.

[8] See the 2003 summary prepared by Sarah Burgard and Judith Stewart for the MacArthur Research Network on Socioeconomic Status and Health (http://www.macses.ucsf.edu) on which this description draws.

income.[9] For example, the average (absolute) size of changes in (log) status is 26.6% (standard error=21.2%, n=2,601) whereas the average (absolute) size of changes in (log) income is 14.1% (standard error=20.8%, n=7,812). The first quantile of the status changes is 8.4% and the second quantile is 16.5% (i.e., one-fifth of all status changes are less than 8.4% in magnitude and two-fifths are less than 16.5%). By comparison, the first quantile of the income changes is 2.5% and the second quantile is 5.8% (i.e., one-fifth of all income changes are less than 2.5% in magnitude and two-fifths are less than 5.8%).

The above pattern of larger, though less frequent, changes in status compared to income is reflected in the auto-regressive properties of these two series. For example, the coefficient on the (first) lag of income in the regression: $\log y_{it}=\phi\log y_{it-1}+f_i+\eta_t+e_{it}$ (n=7,812, $\bar{t}$=6.8) is equal to 0.63 (standard error=0.003) and on status in the regression: $\log S_{it}=\varphi\log S_{it-1}+f_i+\eta_t+e_{it}$ (n=5,581, $\bar{t}$=6.4) is equal to 0.44 (standard error=0.005). That is, the coefficient of lagged status is significantly lower than the coefficient on lagged income due to the larger magnitude of changes that status is subject to. The other primary difference in the time series properties between income and status is the presence of a small upward trend in the former though not in the latter. At the start of the sample period in 1985, average status in our panel was equal to 41.8 (on the 1-90 scale) and by the end of the period in 2000 it equalled 43.6 (i.e., an increase of 4%). By comparison, average (real) income was equal to 56,688 DM in 1985 and 62,428 DM in 2000 (i.e., an increase of 10%).

IV. Main Results: Adaptation to Income and Status

IV.a. Basic Results

Table 1 tests for the presence of adaptation to income compared to status. We start in column (1) by presenting a benchmark estimate with just log of current income, individual and year fixed effects, as well as a set of personal characteristics (that include employment status, marital status, education, health and number of children). It reports a positive and significant effect of current income on happiness. In terms of size, note that the summary statistics reported in Table A show that happiness has a total standard deviation equal to 1.74 (the between- equals 1.36 and the within- equals 1.20). Thus, a one standard deviation increase in log income accounts for 6.3% of

[9] This is also a standard theoretical prediction of adjustment cost models (e.g., Caplin and Leahy, 1991).

a standard deviation increase in happiness (0.20*0.55/1.74).

In column (2) an arbitrary number of lags of each individual's income are included. To keep it general we include four (but see the discussion on columns (5-6) below).[10] The coefficient on current income is still positive and significant. One measure of the amount of adaptation in the sample is captured by the sum of the lags. They are negative and significant, at the 2 per cent level, which allows us to reject the hypothesis of no adaptation to income in the sample (see equation (3) with T=4). The sum of the coefficients on the lags is equal to -0.15 (i.e., -0.04-0.07-0.06+0.02). Consequently of the initial impact of income, 65.2% is lost over the ensuing four years (i.e., 0.15/0.23) leaving a long run effect of 0.08. Put another way, although the current effect of income from this specification suggests that a rise in average real income of 12% (from 56,429 DM in 1986 to 63,042 DM in 2000) adds 0.03 units onto happiness scores (i.e., 0.23*ln(1.12)) after four years have passed, adaptation effects reduce the size of the effect to only 0.01 units (i.e., 0.08*ln(1.12)). An F-test of whether the sum of all five coefficients on income (i.e., current and four lags) is equal to zero (see equation (5) with T=4) cannot be rejected (i.e., F(1,18765)=2.2; Prob.>F= 0.14). Figure 1 graphically depicts an example. It shows the happiness time series when a one-off permanent rise in income of 50% occurs at time 0.

Columns (3-4) test for status effects. In column (3) status has a positive and significant effect on happiness.[11] In the short-run (i.e., first year) a one standard deviation increase in status is associated with a similar rise in happiness as an increase of 52% of a standard deviation in income. The effect is significant at the 1 per cent level. A one standard deviation change in status explains 3.1% of the standard deviation in happiness. Column (4) estimates the comparable specification but instead using four lags of status (and the current level of income). Again, observing the lags to gauge the amount of adaptation, we cannot reject the hypothesis that there are no long-run changes to the coefficient on the current level of status (see equation (4) with T=4). If anything, the adjustment appears to be positive. The sum of the coefficients on the

[10] The number of observations drops quite dramatically in this column since introducing the long lag structure requires a continuous time series that is only available for a subset of individuals (on average, we have 8.2 years of observations for each person, with a range from 1 to 15).

[11] As explained in the introduction, status effects could explain the observed positive cross-sectional correlation between income and happiness. An alternative is that, at any point in time, the rich tend to receive bigger positive shocks (to which they will later adapt) than the poor. In our sample, the average change in income for the richest half of the sample is larger than that for the poorest half.

status lags is equal to 0.06 (i.e., 0.09+0.05-0.09+0.02). Consequently the initial impact of getting more status appears to *grow* over the ensuing years by 38% (i.e., 0.06/0.16) leaving a long run effect of 0.22. This lies in contrast to the above (opposite) result for income whereby the initial impact wore off over time. An F-test of whether the sum of all five coefficients on status (i.e., current and four lags) is equal to zero (see equation (6) with T=4) can be rejected at the 5 per cent level of significance (i.e., F(1,18764)=3.7; Prob.>F=0.05). Figure 2 depicts graphically an example of the happiness time series when a one-off permanent rise in an individual's status of 50% occurs.

Column (5) estimates a symmetric lag structure for both income and status. The coefficients on the lags of income sum to -0.15 and are significant at the 2 per cent level, rejecting the hypothesis that there is no adaptation to income. In terms of size they indicate that after four years the impact of income falls from 0.23 (i.e., the first year coefficient) to 0.08. For status, the coefficients on the lags sum to 0.08, suggesting that after four years the effect rises from 0.16 (i.e., the first year coefficient) to 0.24. The hypothesis that the size of the adaptation effect for income and status is equal can be rejected at the 7 per cent level (see equation (7) with T=4). An F-test of the null hypothesis that the sum of all five income coefficients (i.e., current plus four lags) equals zero cannot be rejected (i.e., F(1,18760)=2.2; Prob.>F=0.14) whereas we can reject that the sum of the status coefficients is equal to zero at the 5 per cent level (i.e., F(1,18760)=3.8; Prob.>F=0.05). Column (6) summarizes our discussion by regressing happiness on long-run averages, $(x(t)+x(t\text{-}1)+x(t\text{-}2)+ x(t\text{-}3)+x(t\text{-}4))/5$, where x is either income or status. Taken over this period no significant effects of income remain. However for status the effect is significant at the 10 percent level and, if anything, appears to be larger in size than the current effect. Using the coefficients on the average levels of these two variables, a one standard deviation increase in status is associated with a similar rise in happiness as an increase of 285% of a standard deviation in income (i.e., 0.30*0.19/0.02).

We also experimented with different specifications by repeating the regressions in columns (5-6) but instead using three lags (i.e., letting T=3 for n=27,395). The results are broadly very similar. The coefficients (standard errors) on the current level and past lags of income are α_0=0.25 (0.04); α_{-1}=0.01 (0.05); α_{-2}=-0.11 (0.05) and α_{-3}=-0.01 (0.04). The sum of the coefficients on the three

lags equals -0.11 so what remains after the short-run effect of 0.25 is a long-run effect of 0.14. For status, the corresponding coefficients (standard errors) are β_0=0.11 (0.06); β_1 =0.08 (0.06); β_2=0.01 (0.06) and β_3=-0.10 (0.06). The sum of the coefficients on the lags equals -0.01 so in this case what remains after the short-run effect of 0.11 is a (long-run) effect of 0.10. Comparison with the results using four lags reveals a similar pattern of significant adaptation to income over the three years following an income shock whereas we again cannot reject the hypothesis that no adaptation to status occurs over this period.[12] We also repeated the column (6) specification but instead calculated averages between t and t-3 (i.e., $(x(t)+x(t-1)+x(t-2)+x(t-3))/4$). The coefficients (standard errors) on average income and average status are 0.09 (0.05) and 0.11 (0.09), respectively, where the former is significant at the 6 percent level.[13]

IV.b. Adaptation Effects across the Left and the Right and other sub-groups

Our approach allows us to provide estimates across different sub-groups.[14] Indeed, we can estimate and compare adaptation to income and to status across gender, the two main political groups (left and right) and the employed and self-employed. The first and most important reason that these results are important is the economic significance of these sub-groups (for example, the influence of left and right-wing groups on policy).

A second reason for presenting them in detail is that comparing estimates across sub-groups is useful in dealing with a statistical problem that we now describe. One interpretation of the results in Table 1 is that they reflect a true difference in human adaptation to pecuniary shocks (i.e., higher income) versus non-pecuniary shocks (e.g., obtaining a job with higher status). However, a natural alternative explanation is that the result could be a statistical artifact caused by the different time series properties of our income and status variables. For example, income changes

[12] However the hypothesis that the sum of all the coefficients on income (i.e., current and three lags) equals zero when T=3 can now be rejected at the 1 per cent level

[13] These results on the importance of adaptation effects raise the question of why individuals spend so much effort in trying to improve their economic condition. Some have argued that humans do not predict utility very well. For example, Ubel, Jepson and Loewenstein (2001) study happiness predictions amongst people waiting for a kidney transplant. They find that those who receive one tend to report lower levels than they had predicted, whereas those who do not receive transplants report a higher quality of life that they had predicted. See also Gilbert *et al* (1998) for evidence concerning predictions amongst academics concerning being denied tenure, Loewenstein and Schkade (1999) for a review of the evidence and Loewenstein, O'Donoghue and Rabin (2003) and Frey and Stutzer (2003) for detailed discussions.

[14] For example, Diener, Lucas and Scollon (2005) argue that people adapt to different baselines, depending on their emotional dispositions.

almost continuously though often by small amounts whereas status changes less regularly though by relatively larger amounts when it does (see section III). A simple way to address this potential problem is to test for differences across sub-groups (like males versus females). If the two sub-groups have different long- versus short-run responses to income and status, as measured by the regression coefficients, then the reason is more likely to be differential adaptation to pecuniary versus non-pecuniary shocks (to the extent that the time series properties of income and status are similar across the sub-groups). Consequently we estimate equation (1) separately for each sub-group and, as an alternative approach, estimate for the full sample the following regression:

$$\begin{aligned} Happiness_{it} = {} & (\alpha_0^h + r_{it}(\alpha_0^g - \alpha_0^h)) \log y_{it} + (\alpha_{-1}^h + r_{it}(\alpha_{-1}^g - \alpha_{-1}^h)) \log y_{it-1} + \ \ldots \ (\alpha_{-T}^h + r_{it}(\alpha_{-T}^g - \alpha_{-T}^h)) \log y_{it-T} \\ & + (\beta_0^h + r_{it}(\beta_0^g - \beta_0^h)) \log S_{it} + \ (\beta_{-1}^h + r_{it}(\beta_{-1}^g - \beta_{-1}^h)) \log S_{it-1} + \ldots (\beta_{-T}^h + r_{it}(\beta_{-T}^g - \beta_{-T}^h)) \log S_{it-T} \\ & + \delta \underline{X}_{it} + f_i + \eta_t + e_{it} \quad (8) \end{aligned}$$

where the dummy variable, r_{it}, is equal to one when the individual is a member of sub-group, g, and zero when she is a member of sub-group, h. Our hypothesis test of differential adaptation to income and status across the two sub-groups is:[15]

$$H_o: \left(\sum_{i=1}^{T}\alpha_{-i} - \sum_{i=1}^{T}\beta_{-i}\right)^g = \left(\sum_{i=1}^{T}\alpha_{-i} - \sum_{i=1}^{T}\beta_{-i}\right)^h \quad \text{versus} \quad H_1: \left(\sum_{i=1}^{T}\alpha_{-i} - \sum_{i=1}^{T}\beta_{-i}\right)^g \neq \left(\sum_{i=1}^{T}\alpha_{-i} - \sum_{i=1}^{T}\beta_{-i}\right)^h \quad (9)$$

A different approach is to use Monte Carlo simulations to test whether it is statistically possible to obtain differential lag structures on income and status in happiness regressions even when there is no difference in the true model (i.e., whether the different time series properties of income and status can lead to biased regression coefficients).

Table 2 compares adaptation to income and status across several different sub-groups: males versus females, right versus left-wingers and employees versus the self-employed. Columns (1-2)

[15] Alternatively the hypothesis test may use proportionate changes in happiness (as a ratio of the initial effects):
$H_o: \left(\frac{1}{\alpha 0}\sum_{i=1}^{T}\alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T}\beta_{-i}\right)^g = \left(\frac{1}{\alpha 0}\sum_{i=1}^{T}\alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T}\beta_{-i}\right)^h$ versus $H_1: \left(\frac{1}{\alpha 0}\sum_{i=1}^{T}\alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T}\beta_{-i}\right)^g \neq \left(\frac{1}{\alpha 0}\sum_{i=1}^{T}\alpha_{-i} - \frac{1}{\beta 0}\sum_{i=1}^{T}\beta_{-i}\right)^h$.
The results are similar whichever metric is chosen.

are for males and females.[16] We reject the hypothesis of no adaptation to income for females. The sum of the income lags is negative and significant. The size is sufficiently large so that the hypothesis of no long-run effect of income on happiness cannot be rejected for females, as the sum of all coefficients (both current and lagged) is not significantly different from zero. In contrast, adaptation to income amongst males is small and not precisely estimated, resulting in positive long-run income effects. The coefficients on status present a different pattern, with the evidence suggesting that there is a significant positive long-run effect for females while not for males. The hypothesis test of whether the degree of adaptation to income relative to status is the same across these two sub-groups (see equation (9) in Section IVb where g=male and h=female) shows a rejection of the null at the 12 percent level.

We next divide people along party political lines. Columns (3-4) in Table 2 show that left-wingers (i.e., supporters of either the Social Democratic Party or Greens) adapt to income changes but not to status changes. We can reject the hypothesis of no adaptation to income for left-wingers at the 9% level. The size of the effect is large (leading to no long-run effect of income). By comparison right-wingers (i.e., supporters of either the Christian Democrats or Christian Social Union) exhibit no adaptation to income (leading to significant long-run happiness effects from money at the 4 percent level). The coefficients on status present a different pattern: though there do not appear to be significant lagged effects across either sub-group, there is evidence of a positive long-run effect for left-wingers and not for right-wingers.[17] The hypothesis test of whether the degree of adaptation to income relative to status is the same across these two sub-groups (see equation (9) in Section IVb where g=left- and h=right-winger) shows a rejection of the null at the 5 percent level.

The last two columns in Table 2 show the results for the employed and self-employed sub-groups. They suggest that employees adapt to income (at the 4 per cent level) leading to no significant long-run effect, whereas for status the sum of the current and lagged coefficients is significant at the 6 per cent level. By comparison the self-employed (who may be expected to be

[16] Information on the job status of women is less frequent so the samples are not of equal size.

[17] Given that the individuals who declare a political inclination is a smaller sample (and that we are studying a partition of this sub-sample) we consider individuals that have been in our sample for a shorter period of time (average T years in columns (3-4) in Table 2 drops relative to Table 1).

in business to make money instead of seeking higher status) obtain long-run happiness gains from more income (at the 1 per cent level) but not from more status. The hypothesis test of whether the degree of adaptation to income relative to status is the same across these sub-groups (see equation (9) in Section IVb where g=employed and h=self-employed) cannot be rejected.

Another way to approach the problem of whether the differential lag structures between income and status is a statistical artifact caused by the different time series properties of these two series is by way of Monte Carlo simulations. We again assume a null hypothesis that there is an equal degree of adaptation to income relative to status and estimate a happiness regression equation with this restriction imposed (setting T=4). This equation is then used to generate happiness data using our actual income and status series, the other covariates and random noise. These data are subsequently used to run an unrestricted happiness regression. One thousand repetitions of the above steps are done to generate confidence intervals.[18] We are now unable to reject the null hypothesis of equal adaptation (of income relative to status) suggesting that the differential lag structures between income and status identified in Table 1 derive from genuine differences in preferences and not from different properties of the income and status time series biasing our regression results.[19]

IV.c. How much of the Easterlin Paradox Can Adaptation Explain?

The above results are relevant to the Easterlin paradox. The regressions in Tables 1 and 2 suggest that status is a significant positive determinant of well-being and its effects do not wear off over time, whereas the effects of income last approximately four years. Consequently the strong correlation observed in cross-section regressions between income and happiness within a nation may be predominantly due to the influence of status (since it is correlated with income position and has a permanent effect).[20] The pure income effects that are present appear to derive solely

[18] The 95% interval for the sum of the lagged income coefficients is (-0.20, -0.03) and for the lagged status coefficients is (-0.25, 0.11).

[19] We also obtain similar results in simulations where happiness data are generated from regressions with the restriction that only current income and status matter. In this case, when we run our unrestricted regression and generate confidence intervals (using 1000 repetitions) no differences are found in the degree of adaptation to income and status (i.e., the lags of both income and status are insignificant).

[20] The correlation coefficient between income and status is 0.24. However in a fixed effects regression of income on status, the overall-R^2 is 0.06, between-R^2=0.06 and within-R^2=1e-4, indicating that most of the changes in income experienced by an individual are not related to changes in their status. This helps account for why the coefficient on income is unchanged once we control for status in Table 1.

from the short-run whereby individuals who are doing well tick up their happiness scores. This explanation may put too much weight on statistical significance of the estimated effects. Given that the estimated long-run effect is positive (and insignificant), an alternative is to focus exclusively on the size of the estimated effects and ask if they are enough to explain the observed gap between happiness and income levels. In other words, can we account for the observed flat happiness levels over long-run periods of time by people adapting to income with the estimated coefficients?

First, we observe that the original 'Easterlin Paradox' referred to the fact that "for the one time series studied, that for the United States since 1946 higher income was not systematically accompanied by greater happiness" (see pg 118 of Easterlin, 1974). A more recent calculation has been done by Blanchflower and Oswald (2004) using the US General Social Surveys between 1972 and 1998. They note that there is a reasonable amount of stability in the proportion of people giving different well-being scores over this period. Oswald (1997) notes these papers are based on surveys that use repeated (representative) cross-sections of different people and so run the risk of sampling from a population that is changing its composition. In Figure 3 we deal with this problem by plotting life satisfaction from 1985 to 2000 using individual panel data so that the group of individuals sampled in 1985 are the same ones sampled in 2000. The time series of happiness again remains roughly flat (although this exercise has the advantage of controlling for sample composition, it has the obvious disadvantage of introducing the possibility that the flat time series reflects life-time consumption smoothing for the same individuals as they grow older).

In terms of the results in Table 1, since US real GDP per capita increased by 2.83 times between 1946 and 1998, the impact would have been to raise happiness by 0.21 units on the 0-10 scale had no adaptation occurred (i.e., 0.20*ln(2.83) using the short-run coefficient in column (1)). The standard error of this estimate is 0.02. However we would expect the increase to have been just 0.08 (s.e.=0.05) after taking account of adaptation (i.e., 0.08*ln(2.83) using the long-run effect calculated from column (5)). Easterlin (1995) points to the special case of Japan after recovery from World War II where "between 1958 and 1987 real per capita income multiplied by a staggering five-fold" from a base income level "lower than or equal to those prevailing in a considerable number of today's developing countries". However over this time period "there was

no improvement in mean subjective well-being" (see pp. 38-39). In terms of our results, the impact of the rise in Japanese real per capita income would have been to raise happiness by 0.32 units had no adaptation occurred (i.e., 0.20*ln(5) using the short-run coefficient in column (1)). The size of the happiness effect reduces to 0.03 (s.e.=0.09) after taking account of adaptation (i.e., 0.02*ln(5) using the long-run effect calculated from column (5)). These "back of the envelope" calculations suggest that our estimates of adaptation are sufficiently large so as to be able to explain why no long-run trend in happiness is observable over several decades, even taking some of the more extreme cases actually observed (such as Japan).

IV.d. Causality

There is, of course, the possibility that personality traits maybe driving the connection between happiness and income. Our approach to deal with this problem is to employ a panel of individuals. Thus, the inclusion of individual fixed effects can deal with the special case of fixed traits, such as ability, preferences, personality or family background.[21] However there is still the possibility of time-varying shocks to happiness that later change an individual's income.[22] Such shocks are closer to measures of positive affect than to those of overall life satisfaction that we employ in this paper. Work by Lucas *et al* (1996) suggests that our measure of overall life satisfaction is not influenced by the affective state of the person at the time of the interview. Using self-reports measured across 4 weeks and 2 years apart, life satisfaction measures never failed to meet Campbell and Fiske's (1959) criteria for discriminant validity from the affective components of subjective well-being. Using third-party reports on individual well-being (in which convergent validity coefficients could be expected to be lower) life satisfaction failed to meet the criterion only 4 times out of 32 comparisons with positive affect.

We can also estimate whether endogeneity due to time-varying shocks to happiness is of sufficient economic magnitude to bias our results. For example, a person may get depressed and start working less, causing them to lose their job and income. To better understand the empirical

[21] See, for example, Winkelmann and Winkelmann (1998) for an early study of unemployment with this strategy. An interesting variation on the fixed individual effects strategy has recently been explored in Kohler *et al* (2005) in their study of fertility and partnership decisions. Using happiness data on identical (monozygotic) twins, the authors are able to control for unobserved endowments (ranging from preferences and abilities arising in genetic dispositions to family history) that affect both happiness and fertility/marriage decisions.

[22] Gardner and Oswald (2001) have argued that we can use windfalls (winning the lottery and receiving an inheritance) as exogenous events. See also Oreopoulos (2003) for a related strategy using school dropout laws.

importance of these effects, we compare the happiness response to an exogenous economic loss caused by one's plant closing down with a potentially endogenous one arising from being fired. The 2.7% of our sample whose plant was closed experienced a decline in happiness from 7.0 to 6.5 (i.e., 0.5 on average) and the 5.7% who got fired experienced a drop from 7.2 to 6.6 (i.e., 0.6 on average). The difference is insignificant suggesting that endogeneity due to time-varying shocks is not materially biasing our coefficients.[23]

V. Further Results: (Asymmetric) Change Effects

Another way to illustrate the presence of adaptation is to estimate regressions where changes in income are included. This also helps us to approach loss aversion as an extension of the adaptation tests that are at the core of our study. People may care about current changes in income for purely classical reasons as they may be better predictors of future income than current income levels. A more psychological version of the hypothesis that changes matter is focused on an asymmetry: some changes matter more than others. Kahneman and Tversky (1979) posit the idea of loss aversion as *"an alternative theory of choice … in which value is assigned to gains and losses rather than to final assets and in which probabilities are replaced by decision weights. The value function is normally concave for gains, commonly convex for losses, and is generally steeper for losses than for gains"*. In other words, the loss aversion hypothesis states that losses (negative changes) matter more than gains (positive changes).

V.a. Empirical Strategy to Study the Effect of Changes (and Loss Aversion)

We first estimate regression (1) with the restrictions: $\alpha_1=-\alpha_{-1}$ and $\alpha_{-2}=\alpha_{-3}=\alpha_{-4}=\beta_1=\beta_0=\beta_{-1}=...=\beta_{-4}=0$ to capture the rate at which (current) income is changing. This specification allows for happiness to be affected by anticipated (future) changes in income:

$$Happiness_{it} = (\alpha_0 \log y_{it} + \alpha_1 \Delta Y) + \delta \underline{X}_{it} + f_i + \eta_t + e_{it} \qquad (10)$$

[23] We also experimented with plant-closing as an instrument. As only 2.7% of the sample experienced a closing and most of these also experience unemployment spells, a full analysis of adaptation to the income part of such a shock runs into a weak instrument problem. For example, if the specification in column (2) in Table 1 is estimated through 2SLS using plant-closing as an instrument for income then the coefficient on income is 3.28 (s.e.=1.97). Note that we control for falling unemployed in the second stage, so it is reasonable to assume that all of the effect of our instrument on happiness operates through income.

where Δ^y=log y_{it+1}-log y_{it-1}. We allow for asymmetries between positive and negative changes in income by relaxing the restriction that their coefficients must be equal:

$$Happiness_{it} = (\alpha_0 \log y_{it} + \alpha_1^p \Delta^{pos\_y} + \alpha_1^n \Delta^{neg\_y}) + \delta \underline{X}_{it} + f_i + \eta_t + e_{it} \quad (11)$$

where $\Delta^{pos\_y}=\Delta^y$ and $\Delta^{neg\_y}=0$ for $\Delta^y>0$ (i.e., positive income changes) and $\Delta^{pos\_y}=0$ and $\Delta^{neg\_y}=\Delta^y$ for $\Delta^y<0$ (i.e., negative income changes). To focus solely on the effect of anticipated changes in income we use the restriction, $\alpha_{-1}=\alpha_{-2}=\alpha_{-3}=\alpha_{-4}=\beta_1=\beta_0=\beta_{-1}=...=\beta_{-4}=0$, which allows us to estimate similar specifications to equations (10) and (11) except that now Δ^y=log y_{it+1}-log y_{it}.

To investigate whether loss aversion is present we compare the sizes of the coefficients on Δ^{pos_y} and Δ^{neg_y} (by testing H_o: $\alpha_1^p=\alpha_1^n$ versus H_1: $\alpha_1^p\neq\alpha_1^n$). We would also like to know how important these effects are in terms of income levels. Maybe the role of loss aversion is small and it is reasonable to use a description of preferences that ignores it. We quantify relative importance by comparing the size of the happiness effect coming from the average negative change in income (i.e., using the coefficient, α_1^n) to the effect coming from the average level of income across our sample (i.e., using the coefficient, α_0). For completeness we also consider behavioral effects stemming from asymmetric weightings of gains versus losses of status by replicating the above empirical strategy substituting income for status.

V.b. Results

Table 3 presents our results. In column (1) happiness is regressed on the current income level and the change in income, Δ^y (measured as the average change in income between the previous and next year). Both the level and change enter positively and are estimated with considerable precision (at the 1% level of significance). Column (2) estimates separate coefficients for changes in income that are positive and changes that are negative. Controlling for the level of income, people declare themselves less happy when they are undergoing a decline in income (note that *Positive Changes*=Δ^y and *Negative Changes*=0 for $\Delta^y>0$ whereas *Positive Changes*=0 and *Negative Changes*=Δ^y for $\Delta^y<0$). In terms of relative size, a person who experiences a negative change (i.e., fall) in income of 10% happens to report a similar level of happiness to a person who has

experienced a positive change (i.e., rise) in income of 21% (=0.1*0.17/0.08) and whose levels of income are both the same. We can only, however, reject equality of the coefficients on positive and negative changes at the 26 percent level in column (2) (i.e., F(1,56452)=1.3) so the evidence in favor of an asymmetry is weak. In terms of the size of loss aversion, the coefficient on *Negative Changes* suggests that a person who is on a steady (mean) income of 60,971 DM is expected to report a similar happiness level as a person who is on 63,195 DM but as a consequence of a decline in their income of 2,721 DM (which is the average decline in our sample).[24] In percentages, although in the second scenario the individual's level of income is 3.6% higher than in the first, the experience of the loss of 4.3% of their income brings them back to the same happiness level (i.e., 0.036*0.2=0.043*0.17).

Columns (3-4) present an alternative definition of the change in income term and reach stronger conclusions. The change is now defined in terms of how much income changes between the current and next period (i.e., between year t and t+1). Column (3) again sets the test for quantifying loss aversion by regressing happiness on current income and its change. Both enter positively and significantly. Column (4) estimates separate coefficients for income changes that are positive and negative. Controlling for income levels, people again declare themselves less happy when they experience a decline in income (but not when the change is positive). We can now reject equality of the coefficients on the positive and negative changes at the 1 percent level (i.e., F(1,56452)=15.2). Consequently there is evidence in favor of a (significant) asymmetry when 'prospective' income changes are used. The size of the effect is similar to our previous estimate.[25]

Although these results suggest that there may be a role for changes (after controlling for levels) as a determinant of happiness levels, the effects appear to be economically small. To get another idea of the size, assume a discount rate of 6% (i.e., the same rate assumed by Wolfers (2003) to calculate the optimal disinflation path with happiness data). Then the experience of the above (transitory) loss of 2,721 DM can be compensated by the individual receiving an annuity of 136

[24] This number is the solution to the equation: 0.20*ln(60,971)=0.20*ln(x)-0.17*(ln(x+2,721)-ln(x)).

[25] Using the specification in column (4) to quantify these effects, a person who is on the average level of income (equal to 60,971 DM) is expected to report a similar level of happiness to being on 63,230 DM but as a consequence of a decline in their income of 2,721 DM (i.e., the average decline in our sample). This number is the solution to the equation: 0.22*ln(60,971)=0.20*ln(x)-0.19*(ln(x+2,721)-ln(x)).

DM. This calculation comes from equating the discounted value of the annuity (i.e., 136/0.06) to the necessary compensation in today's values of 2,259 DM (i.e., 63,230-60,971).

Table 3 also tests for loss aversion effects with respect to status. Column (5) tests for the importance of changes in status on happiness (defined in terms of the average change between *t*-1 and *t*+1). There are no significant effects once we control for the level of status and column (6) indicates no evidence in favor of an asymmetry existing between positive and negative changes. In the last two columns we define *Current changes of status* in terms of how much status changes between the current and next period (i.e., year *t* and year *t*+1) corresponding to the tests in columns (3) and (4). Again this is for the reason that 'prospective' changes in status may be the most relevant ones for happiness. There is some (albeit weak) evidence in favor of this view in the sense that the coefficient on positive changes is insignificant (p-value=0.93) whereas for negative changes it is significant at the 19 percent level.

Finally, in Table B in the appendix we present a more flexible approach. So far our results have imposed as an assumption that the relation between income and happiness scores has a logarithmic functional form. We now drop this assumption and allow for a more general (non-linear) structure using dummy variables corresponding to a series of income intervals: 0 to 20,000 DM (the base level category); 20-30,000 DM; 30-40,000 DM and finally up to 90-100,000 DM and >100,000 DM. We measure income changes with a dummy equal to 1 if the change is positive (and zero otherwise) and another dummy equal to 1 if the change is negative (and zero otherwise). Another advantage of using dummies defined over small increments to test for loss aversion is that this hypothesis refers to local effects.[26] Individual and year fixed effects as well as the standard set of personal controls are included (to keep the sample size as large as possible we do not include a status control). In column (1) the coefficients on the income level dummies increase until income reaches 70-80,000 DM, although the differences between adjacent categories are not statistically significant. The positive change dummy equals +0.02 (s.e.=0.01) and the negative change dummy equals -0.07 (s.e.=0.01). An F-test of their difference indicates that equality can be rejected at the 5 per cent level (i.e., F(1,56460)=4.3). Column (2) estimates a

[26] Testing for whether there is evidence in favor of any substantial concavity over relatively small bets has been a focus of the empirical loss-aversion literature (since we might expect individuals to be roughly risk-neutral over small changes).

less restrictive specification by dividing up the (positive and negative) changes into different size categories: 0 to 2,500 DM (the base change); 2,500-5,000 DM; 5,000-7,500 DM, 7,500-10,000 DM; 10,000-12,500 DM and >12,500 DM (similar categories are defined for losses). For positive changes the only significant category occurs for increases in income that lie between 7,500 and 10,000 DM. By comparison all the negative change categories are significant (relative to the base of -2,500 to 0 DM). The income level that divides the sample into two is approximately 55,000 DM. Inspection of the coefficients up to this level suggests that the effect of income on happiness is stronger (and monotonic) for the poor compared to the rich (the difference in the effect of going from 50-60,000 DM to >100,000 DM is less than half of the effect of going from the lowest to the 20-30,000 DM category). Splitting the sample confirms this and also suggests that the negative change effects are stronger for the poorer sub-sample.

VI. Conclusions

The Easterlin paradox refers to the finding that, over long periods of time, average happiness in a country tends to be flat in the presence of considerable increases in income. In the cross-section for any particular year, however, income and happiness tend to exhibit the expected positive association. Two theories that have been used to explain this are adaptation and relative position concerns, and some evidence on their importance is beginning to emerge. Interestingly, if they are to help with the Easterlin paradox (see Easterlin, 1974) then a particular pattern is needed: individuals are required to exhibit adaptation to income but not to status. In this paper, we provide such a test, estimating a happiness equation with a distributed lag structure for income and status on individual panel data on 7,812 people living in Germany between 1984 and 2000.

We find strong adaptation to changes in income but not to changes in status. The adaptation effects to income are large in size. Once the long-run effects are estimated (by summing up the current and lagged income coefficients) we cannot reject the null hypothesis that people adapt totally to income within four years. By comparison, significant effects of status are found to remain after this time. In the short-run (first year) a one standard deviation increase in status is associated with a similar rise in happiness as an increase of 52% of a standard deviation in income. Using long-run (five year) average values of these variables, a one standard deviation

increase in status is associated with a similar rise in happiness as an increase of 285% of a standard deviation in income. Consequently these estimates (suggesting adaptation to income but not to status) display precisely the pattern required to explain the Easterlin paradox.

Our strongest results, however, obtain when we estimate adaptation effects across different sub-groups (e.g., partitioning the sample following gender and ideological lines as well as employment status). We can (cannot) reject the hypothesis of no-adaptation to income for females (males), left-wingers (right-wingers) and employees (the self employed). Adaptation to status is insignificant and the lagged coefficients tend to be *positive* (implying that the effects may grow over time). We can reject the hypothesis of no long-run effects of status on happiness for females, left wingers and employees. We also compare relative adaptation (income relative to status) across sub-groups. For example, we find strong evidence that left-wingers adapt to income but not to status, while right-wingers adapt to status but not to income. The null hypothesis of equal relative adaptation (of income relative to status) across sub-groups of left and right-wing individuals can be rejected at the 1 percent level.

Finally we use the approach to estimate loss aversion effects. We find suggestive (but weaker) evidence for the hypothesis that there is an asymmetry between gains and losses in income (after controlling for levels) as a determinant of happiness levels but the size of these effects appear to be economically small.

Table A
Summary Statistics: 1985 to 2000.

Variable	Units	No. of Obs.	Mean	Std dev	Min.	Max.
Happiness	0-10 *scale*	Total=64,296	7.15	1.74	0	10
- between		n=7,812		1.36	0	10
- within		$\bar{t}$ =8.2		1.20	-1.30	13.41
Current level of real income	1995 *Deutschmarks*	Total=64,296	60,971	31,847	150	639,850
- between		n=7,812		30,912	192	520,055
- within		$\bar{t}$ =8.2		15,561	-141,325	392,524
Current level of real income (logs)	log*(Real Income)*	Total=64,296	10.89	0.55	5.01	13.37
- between		n=7,812		0.52	5.25	13.16
- within		$\bar{t}$ =8.2		0.28	5.61	13.98
Current level of status	1-90 *scale*	Total=39,365	42.59	12.15	13	78
- between		n=5,978		11.46	13	78
- within		$\bar{t}$ =6.6		5.13	-3.77	82.34
Current level of status (logs)	log*(Status)*	Total=39,365	3.71	0.30	2.56	4.36
- between		n=5,978		0.29	2.56	4.36
- within		$\bar{t}$ =6.6		0.13	2.59	4.60

Note: All variable definitions are contained in the appendix.

Table 1
Determinants of Happiness, Germany, 1985-2000: Adaptation to Income and Status

Dependent Variable: *Happiness*	(1)	(2)	(3)	(4)	(5)	(6)
Current level of real income						
Income in year *t*	0.20	0.23	0.19	0.19	0.23	
	(0.02)	(0.05)	(0.04)	(0.04)	(0.05)	
Past levels of real income						
Income (-1)		-0.04			-0.04	
		(0.06)			(0.06)	
Income (-2)		-0.07			-0.07	
		(0.06)			(0.06)	
Income (-3)		-0.06			-0.06	
		(0.06)			(0.06)	
Income (-4)		0.02			0.02	
		(0.05)			(0.05)	
Average income (*t* to *t*-4)						0.02
						(0.06)
Current level of status						
Status in year *t*			0.18	0.16	0.16	
			(0.06)	(0.07)	(0.07)	
Past levels of status						
Status (-1)				0.09	0.09	
				(0.07)	(0.07)	
Status (-2)				0.05	0.06	
				(0.07)	(0.07)	
Status (-3)				-0.09	-0.09	
				(0.07)	(0.07)	
Status (-4)				0.01	0.02	
				(0.07)	(0.07)	
Average status (*t* to *t*-4)						0.19
						(0.11)
Results of F tests						
Σ Income Lags		**-0.15**			**-0.15**	
Prob *(Σ Lags* > F*)*		0.02			0.02	
Σ Current & Lagged Income		0.08			0.08	
Prob *(Σ Current & Lagged Income*>F*)*		0.14			0.14	
Σ Status Lags				0.06	0.08	
Prob *(Σ Lags* > F*)*				0.52	0.50	
Σ Current & Lagged Status				**0.22**	**0.24**	
Prob *(Σ Current & Lagged Status*>F*)*				0.05	0.05	
R^2 **overall**	0.04	0.02	0.02	0.02	0.02	0.02

Note: [1] Total no. of observations equals 64,296, individuals 7,812 and mean years 8.2 for column (1); total no. of observations equals 22,609, individuals 3,818 and mean years 5.9 for columns (2-6). All OLS regressions include individual and year dummies, and personal controls (see appendix for full list of variables). Tests in bold face are significant at 10 percent level. [2] *Income*: Log of real household net income. *Status:* Log of the Treiman Standard International Occupation Prestige Score. [3] Dependent variable: Individual responses to the question: *"Please answer according to the following scale, 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?*

Table 2
Happiness, West Germany, 1985-2000: Adaptation to Income and Status by Groups

Dependent Variable: *Happiness*	*Sex*		*Politics*		*Employment Status*	
	Female	Male	Left	Right	Employee	Self
	(1)	(2)	(3)	(4)	(5)	(6)
Current level of real income						
Income in year *t*	0.17	0.28	0.28	0.21	0.20	0.52
	(0.08)	(0.06)	(0.10)	(0.10)	(0.06)	(0.13)
Past levels of real income						
Income (-1)	-0.03	-0.05	-0.09	-0.07	-0.04	-0.002
	(0.09)	(0.08)	(0.12)	(0.12)	(0.06)	(0.14)
Income (-2)	-0.11	-0.03	-0.05	0.25	-0.09	0.05
	(0.09)	(0.07)	(0.11)	(0.11)	(0.06)	(0.14)
Income (-3)	-0.10	-0.05	-0.04	-0.34	-0.04	-0.03
	(0.09)	(0.07)	(0.11)	(0.11)	(0.06)	(0.13)
Income (-4)	0.03	0.02	-0.02	0.19	0.03	-0.11
	(0.07)	(0.06)	(0.09)	(0.09)	(0.05)	(0.11)
Current level of job status						
Status in year *t*	0.12	0.17	0.24	0.03	0.18	0.04
	(0.11)	(0.08)	(0.12)	(0.14)	(0.07)	(0.23)
Past levels of job status						
Status (-1)	0.17	0.03	0.23	-0.06	0.07	0.17
	(0.12)	(0.08)	(0.12)	(0.15)	(0.07)	(0.22)
Status (-2)	0.03	0.06	-0.05	0.18	0.02	0.45
	(0.12)	(0.08)	(0.12)	(0.15)	(0.07)	(0.23)
Status (-3)	-0.11	-0.07	0.03	-0.28	-0.12	0.03
	(0.12)	(0.09)	(0.12)	(0.15)	(0.07)	(0.23)
Status (-4)	0.15	-0.06	0.03	0.13	0.07	-0.55
	(0.12)	(0.08)	(0.12)	(0.15)	(0.07)	(0.23)
Results of F tests						
Σ Income Lags	**-0.21**	-0.11	**-0.20**	0.03	**-0.14**	-0.09
Prob *(Σ Lags* > F*)*	0.04	0.16	0.09	0.90	0.04	0.55
Σ Current & Lagged Income	-0.04	**0.17**	0.08	**0.24**	0.06	**0.43**
Prob *(Σ Current & Lagged Income*>F*)*	0.70	0.02	0.53	0.04	0.35	0.01
Σ Status Lags	0.24	-0.04	0.24	-0.03	0.04	0.10
Prob *(Σ Lags* > F*)*	0.18	0.72	0.16	0.92	0.65	0.82
Σ Current & Lagged Status	**0.36**	0.13	**0.48**	0	**0.22**	0.14
Prob *(Σ Current & Lagged Status*>F*)*	0.08	0.36	0.02	0.96	0.06	0.80
R^2 **overall**	0.02	0.01	0.03	0.03	0.03	0.03

Note: [1] Total no. of observations equals 14,562, individuals equals 2,256 and mean years equals 6.5 for col. (1); 8,047 observations, 1,562 individuals and 5.2 years for col. (2); 7,090 observations, 1,622 individuals and 4.4 years for col. (3); 5,663 observations, 1,382 individuals and 4.1 years for col. (4); 20,281 observations, 3,531 individuals and 5.7 years for col. (5); 2,328 observations, 495 individuals and 4.7 years for col. (6). All OLS regressions include individual and year dummies, and personal controls (see appendix for full list of variables). Tests in bold face are significant at 10 percent level. [2] *Income* is the log of real household net income. *Status* is the log of the Treiman Standard International Occupation Prestige Score (on a 1-90 scale). [3] Dependent variable: The individual responses to the question: *"Please answer according to the following scale, 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?* [4] *Left Wing* is defined as supporting Social Democratic Part or the Greens. *Right Wing* defined as support for Christian Democrats or the Christian Social Union.

Table 3
The Determinants of Happiness in West Germany, 1985-2000: The role of Changes

Dependent Variable: *Happiness*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current level of real income								
Income in year *t*	0.20	0.20	0.24	0.22	0.19	0.19	0.19	0.19
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Current level of status								
Status in year *t*					0.17	0.17	0.17	0.19
					(0.05)	(0.05)	(0.05)	(0.06)
Current change of real income								
Δ Income at year *t*	0.14							
	(0.03)							
Positive change		0.08						
		(0.06)						
Negative change		0.17						
		(0.05)						
Δ Income between *t+1* and *t*			0.10					
			(0.02)					
Positive change				-0.06				
				(0.05)				
Negative change				0.19				
				(0.03)				
Current change of status								
Δ Status at year *t*					0.01			
					(0.04)			
Positive change						0.01		
						(0.06)		
Negative change						0.01		
						(0.06)		
Δ Status between *t+1* and *t*							0.05	
							(0.05)	
Positive change								-0.01
								(0.08)
Negative change								0.11
								(0.08)
Results of F-tests								
Positive changes-Negative changes		0.09		**0.25**		0		0.12
Prob *(Negative-Positive Change>F)*		0.26		0.0001		0.94		0.33
R^2 overall	0.04	0.04	0.04	0.04	0.02	0.02	0.02	0.02

Notes: [1] Total no. of observations equals 64,296, individuals 7,812 and mean years 8.2 for cols (1-4); 36,803 observations, 5,529 individuals and 6.7 years for cols (5-8). OLS regressions include individual dummies, year dummies and personal controls (employment status, marital status, education, health and children; see the appendix for full definitions). Tests in bold face are significant at 10 percent level. [2] *Income* is the log of real household net income. *Status* is the log of the Treiman Standard International Occupation Prestige Score (on a 1-90 scale). [3] For Δ Income=Δ^y >0, *Positive Changes*=Δ^y and *Negative Changes*=0 whereas for Δ^y <0 *Positive Changes*=0 and *Negative Changes*=Δ^y. [4] Dependent variable: The individual responses to the question: *"Please answer according to the following scale, 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?*

Appendix: Figures

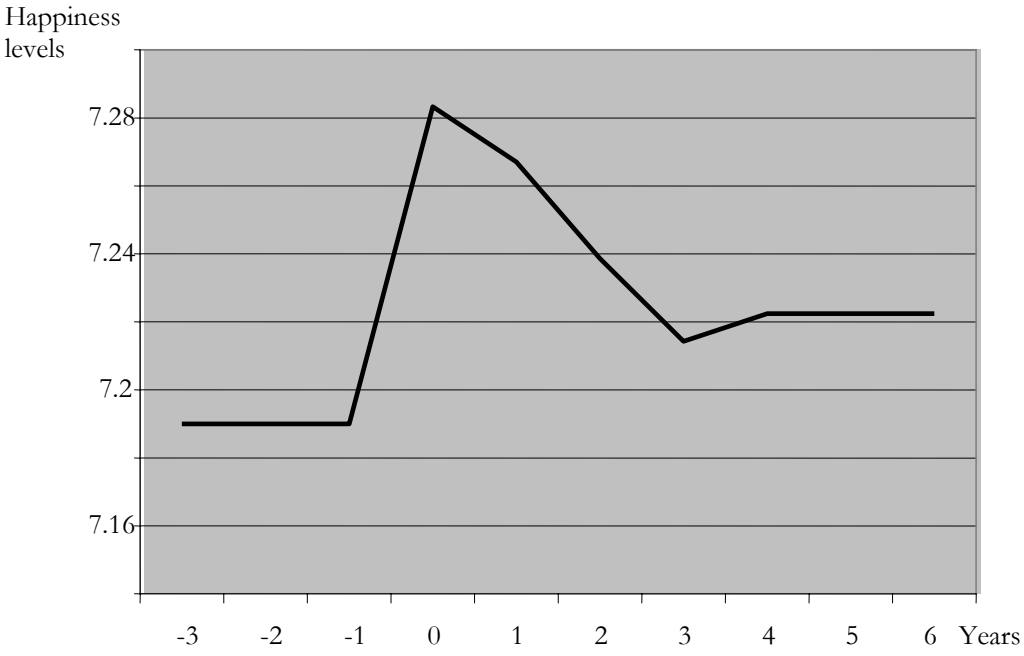

Figure 1: Happiness after a Shock at t=0 that causes income to rise by 50%

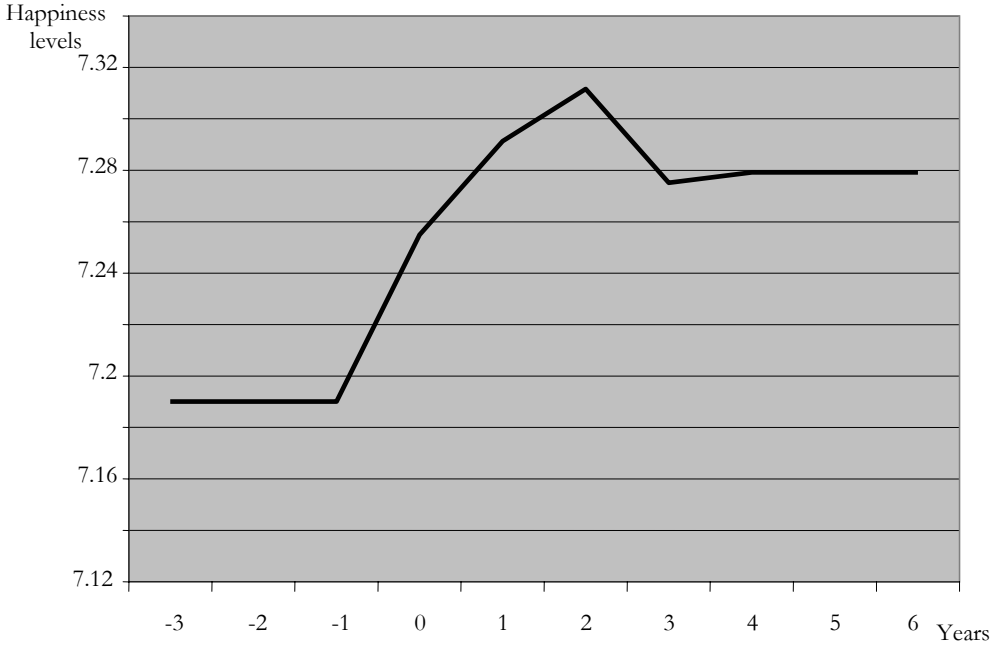

Figure 2: Happiness after a Shock at t=0 that causes status to rise by 50%

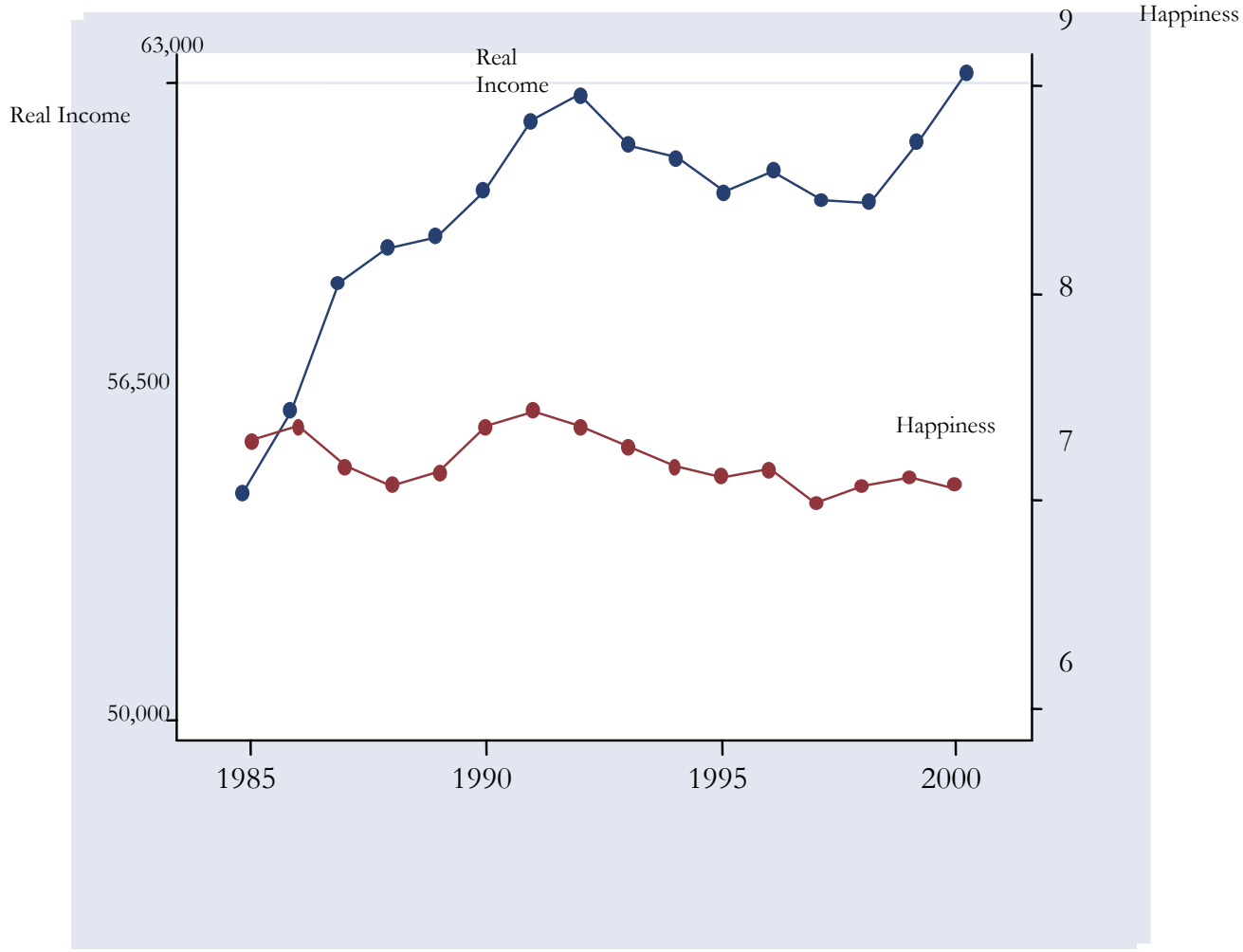

Figure 3
The graph plots Average Real Income and Happiness (on a 0 to 10 scale) for a group of 7,812 individuals who are followed from 1985 to 2000.

Appendix (continued): Definitions and Sources

Data Definitions

Happiness: The individual responses to the question: *"In conclusion, we would like to ask you about your satisfaction with your life in general, please answer according to the following scale, 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?*

0 1 2 3 4 5 6 7 8 9 10
completely dissatisfied completely satisfied"

Current level of real income: The logarithm of Real Household Post-Government Income from the *Cross-National Equivalent File 1980-2000*. This variable represents the combined income after taxes and government transfers of the head, partner, and other family members. Household post-government income equals the sum of household pre-government income, household social security income, household annual public transfer income minus net household annual taxes. Household pre-government income consists of household annual gross labour income, household annual asset income, household private transfer income, household private retirement income. See Bardasi et al (1999). Since all income variables in the GSOEP are reported as average monthly amounts received, they first had to be annualized by calculating the number of months in each year various types of income are received and multiplying this number by the reported average monthly amount. Next an estimated tax burden for households or individuals was computed by the DIW, using a tax estimation routine similar in method to the one developed by the PSID staff. This tax package produces estimated annual tax burdens for all households in the GSOEP. These annual tax values are combined with the annualized components of income to create the measure of household post-government income.

Status: The Treiman Standard International Occupation Prestige Score (on a 1-90 scale) measured in logarithms. Each individual's occupation is given an occupational prestige score. These prestige score is based on the rankings of occupations by survey respondents on the basis of goodness, worth, status, and power as summarized, for example, in Ganzeboom and Treiman (1996).

Employment state: A set of dummy variables taking the value 1 depending on the respondent's employment state: (1) unemployed (2) retired (3) at school (4) at home (5) in the military (6) self-employed (7) public servant. The base category is employed (in the private sector). These are derived from the answers to the following questions: (1) *"Are you officially registered as unemployed at the Employment Office ("Arbeitsamt")? Yes, No."* (2) *"We've drawn up a type of calendar below. Listed on the left are various employment characteristics that may have applied to you last year. Please go through the various months and check all the months in which you were: … in retirement or early retirement 'Vorrhestand'* (3) *… in school, at university or 'Fachschule'* (4) *... housewife/houseman"* (5) *"Which of the following applies best to your status: Full time employed, Part time employed, In occupational/professional education or retraining, marginally employed, Doing you compulsory military service/community service as a substitute; Not employed"* (6) *"What position do you have at the moment? If you have more than one job at the moment, please answer the following in reference to your main job: self-employed (including family members*). If so are

you a: *self-employed farmer, self-employed academic, other self-employed persons without or with up to nine employees, other self-employed persons with ten or more employees, family member helping out"* (7) *"What position do you have at the moment? If you have more than one job at the moment, please answer the following in reference to your main job: civil servant (including judges and professional soldiers).* If so are you: *lower level, middle level, upper level, executive level"*.

Marital state: A set of dummy variables taking the value 1 depending on the respondent got married, divorced, separated or widowed over the course of the past year. The base category is being single. They are determined by the response to the following question: *"Has you family situation changed since the beginning of [last] year. Please indicate if any of the following apply to you and if so, when this change occurred: I married; I moved in with my partner; I got divorced; I separated from my spouse/partner; My spouse/partner died; my son or daughter left the household; Had a child; Other'*.

Education: A generated variable determined from the following questions: *"Now to a completely different topic: education and training. First, what type of school leaving certificate do you possess? Have you (successfully) completed vocational training or studies (at an institution of higher education)? Yes/No. What type of vocational or higher education degree was that? Now to the topic of further education and training. Have you participated in further education in one of the following areas within the past year?"*

Hospital: A dummy measuring if you went to hospital last year. It is derived from the question: *"And what about stays in hospital in the last year? Were you taken into hospital once or more than once for at least one night last year? No, Yes"*.

Number of children: A generated variable that measures the number of children in the household.

Birth of child: A dummy variable measuring whether there was the birth of a child occurring over the past year. It is derived from the following question: *"Has your family situation changed since the beginning of [last] year. Please indicate if any of the following apply to you and if so, when this change occurred: I married; I moved in with my partner; I got divorced; I separated from my spouse/partner; My spouse/partner died; my son or daughter left the household; Had a child; Other'*.

Left-wing / Right-wing: A leftist is classified as a person whose political party identification is Social Democrat, The Social Democratic Party or The Greens. A rightist is classified a person who votes for either The Christian Democrats or The Christian Social Union.

Data Sources

The German Socioeconomic Panel

The GSOEP is the public use version of the Socio-Economic Panel (SOEP), a longitudinal data set begun in 1984. It was developed in a former Special Research Unit at the Universities of Frankfurt/Main and Mannheim in cooperation with the DIW, and initially financed by the German National Research Fund (DFG). In 1990, the DIW assumed control of the panel with funding from the Joint Federal-Land Commission for Promotion of Research Activities. The SOEP began with a sample of 6,000 households living in the western states of the Federal Republic of Germany, including a disproportionate number of non-German migrant workers. In November 1990, the eastern states of Germany were reunited with the western states of the Federal Republic of Germany. In June 1990, the DIW began a survey of families in the eastern states and merged these data with the existing SOEP population to provide a representative sample of reunited Germany.

The Trieman Standard International Occupation Prestige Scale

Ganzeboom and Treiman (1996) generate internationally comparable measures of occupational status using the International Standard Classification of Occupations, 1988 (ISCO88) of the International Labor Office, and prestige scores from the Standard International Occupational Prestige Scale (SIOPS).

The International Standard Classification of Occupations

ISCO88 is an internationally comparable classification that pools occupational titles into a hierarchical 4-digit system that can be aggregated to progressively broader groups, representing the different tasks and duties of jobs. It is organized according to two dimensions: skill level and skill specialization. The former refers to the nature of skills required for the job (but not necessarily the way the skills were acquired). Skill specialization is related more to areas such as subject matter, products and services produced or types of equipment used.

Deriving the SIOP Status Scales

Prestige measures are generated from the popular evaluation of occupational standing. They reflect the classical sociological hypothesis that occupational status constitutes the single most important dimension in social interaction. First, occupational titles from national and local prestige studies conducted in 60 countries are matched to ISCO groups. Second, the SIOPS scale is generated by averaging the national prestige scores, appropriately rescaled to a common metric. This scale has been used widely as a prestige scale in international research (Krymkowski, 1991) and has been applied at the national level as well.

Examples

The examples below report Standard International Occupational Prestige Scales (SIOPS) and International Standard Classification of Occupations (ISCO) scores for a selection of occupational titles:

SIOPS	*ISCO*
71	*1120 SENIOR [NATIONAL] GOVERNMENT OFFICIALS [incl. Minister, Ambassador]*
64	*1110 LEGISLATORS [incl. Member of Parliament, Member of Local Council]*
60	*1200 CORPORATE MANAGERS [LARGE ENTERPRISES]*
..	
23	*9200 AGRICULTURAL, FISHERY, ETC. LABORERS*
18	*9300 LABORERS in MINING, CONSTRUCTION, MANUFACT & TRANSPORT [incl. Unskilled]*
13	*9161 Garbage collectors [incl. Dustman]*

Appendix (continued)

Table B

Testing for Asymmetric Change Effects, using Dummies for Earnings Categories

Dependent Variable: *Happiness*	(1)	(2)
Real income dummies		
Income 20 - 30,000 DM	0.20	0.24
	(0.04)	(0.04)
Income 30 - 40,000	0.31	0.35
	(0.04)	(0.04)
Income 40 - 50,000	0.38	0.43
	(0.04)	(0.04)
Income 50 - 60,000	0.48	0.52
	(0.04)	(0.04)
Income 60 - 70,000	0.50	0.54
	(0.04)	(0.04)
Income 70 - 80,000	0.54	0.58
	(0.04)	(0.04)
Income 80 - 90,000	0.53	0.58
	(0.04)	(0.05)
Income 90 - 100,000	0.50	0.55
	(0.05)	(0.05)
Income > 100,000 DM	0.58	0.63
	(0.05)	(0.05)
Real income change dummies:		
Income Change Positive	0.02	
	(0.01)	
2,500 < Δ Income < 5,000 DM		0.03
		(0.02)
5,000 < Δ Income < 7,500		-0.02
		(0.02)
7,500 < Δ Income < 10,000		0.05
		(0.03)
10,000 < Δ Income < 12,500		0.05
		(0.04)
Δ Income > 12,500 DM		0.03
		(0.03)
Income Change Negative	-0.07	
	(0.01)	
-2,500 > Δ Income > -5,000 DM		-0.04
		(0.02)
-5,000 > Δ Income > -7,500		-0.07
		(0.03)
-7,500 > Δ Income > -10,000		-0.09
		(0.03)
-10,000 > Δ Income > -12,500		-0.14
		(0.04)
Δ Income < -12,500 DM		-0.09
		(0.03)
R^2 overall	0.02	0.02

Notes: [1] OLS regressions include individual dummies, year dummies and personal controls. [2] *Real income change dummies* defined as follows: *Income Change Positive*=1 if $\Delta^y>0$; *Income Change Negative*=1 if $\Delta^y<0$ (where $\Delta^y=\Delta$ Income). The size dummies equal 1 depending on magnitude of the positive changes (e.g., $2500<\Delta^y<5000$, $5000<\Delta^y<7500$) or negative changes (e.g., $-2500>\Delta^y>-5000$, $-5000>\Delta^y>-7500$). [3] Sample consists of 64,296 observations, 7,812 individuals and 8.2 mean years.

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