Do people adapt to changes in income and other circumstances? The discussion is not finished yet.

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May, 2008

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Abstract

This paper deals with the question whether or not individuals adapt their satisfaction norms to income changes. We distinguish between an initial primary effect and a lagged secondary effect. If there is a negative rebound effect, satisfaction norms adapt. Individual satisfaction is proxied by two subjective measures, one capturing individual self-reported satisfaction with life and the other with income. The empirical analysis makes use of a panel micro -data set of annual observations, which allows following the same individual across time. In addition, the paper tests for different utility specifications. The main conclusions of this paper are that: the individual's adaptation of life satisfaction norms over time to income changes is only partial, depending strongly on the specification of the utility model. For financial satisfaction we do not find significant rebound effects. This may imply that the 'hedonic treadmill' does not work or that financial satisfaction norms adapt within one year to the new situation. In addition we find that the effect of income changes on happiness depends on whether individuals´ income increases or decreases (asymmetry). We also look at adaptation to other life events, such as changes in marital status and in employment status. The main conclusion is that adaptation patterns differ for the various life events and for different domains.

Keywords: Adaptation; financial satisfaction; income changes; life satisfaction; subjective well-being.

JEL-codes: D1, D6, I31.

Acknowledgments: We are grateful to Andrew Clark, Daniel Kahneman, and Andrew Oswald for helpful remarks. The responsibility for this paper lies with the authors.

1. Introduction

During the last decade the analysis of satisfactions with life as a whole or with some aspects of it, such as income, health, or one's job, has become a legitimate activity for economists and psychologists. Without suggesting a complete list, we refer to Clark et al. (2008), Clark and Oswald (1996), Di Tella and MacCulloch (2006), Diener et al. (2006), Easterlin (2001), Frey and Stutzer (2002), Frijters et al. (2005), Kahneman et al. (2006), Kahneman and Krueger (2006), Van Praag (1971) and Van Praag and Ferrer-i-Carbonell (2004, 2008). The empirical data for this field of research are derived from satisfaction questions in surveys, where respondents are asked to evaluate their satisfaction with their own situation.

In this paper we are interested in the question how *changes* in income and in other individual circumstances affect individual satisfactions *over time*. There are two particular types of satisfaction that are the most relevant candidates for our investigation. The first candidate for investigation is satisfaction with ´life as a whole´, often called Happiness. The other one is ´financial satisfaction´, which is measured by asking respondents how they evaluate the financial situation of their household. We will study both types of satisfactions side by side.

The large number of studies on the relationship between individual subjective self-reported life satisfaction and household or personal income give evidence that own income does not have a substantial effect on well-being. In addition to this, the relationship between average happiness in a country and its GDP per capita tends to flatten out after a threshold level, a phenomenon now known as the Easterlin paradox (Easterlin, 1974). These findings can be interpreted as that income would not be an important determinant of happiness. However, this is rather puzzling, as it contradicts most observed behavior, the existing theoretical literature, and our common sense. There is a growing body of literature that searches for explanations (see for example Clark et al., 2008).

The two main explanations for these observations that have been offered thus far are the income reference group effect and the adaptation phenomenon. The literature on the reference income effect shows that the increase of the reference income has an

important negative effect on an individual's satisfaction. Therefore, individuals may aim at having a higher income just to keep up with their neighbors. The empirical evidence has been accumulating across the years and the results seem to be strong and consistent (e.g., Clark and Oswald, 1996; Ferrer-i-Carbonell, 2005; Kapteyn at al., 1978; Luttmer, 2005; McBride, 2001; Stutzer, 2005; Van de Stadt et al., 1985; Van Praag, 1978; and Vendrik and Woltjer, 2007; see Senik, 2004, for deviating results). In Ferrer-i-Carbonell (2005) it was shown in addition that individuals with an income below the average in their reference group are negatively affected by the reference income, but that individuals with an income above the average in their reference group are not positively affected by their reference group's average income. In other words, the effect of the reference income on an individual's happiness would be asymmetric.

The second explanation given to reconcile the observed weak relationship between income and happiness is based on the adaptation phenomenon. The argument is that a higher income, once achieved, will not bring much additional happiness because individuals adapt their norms on what is 'satisfactory' to the changing circumstances. More precisely, individuals adapt their norms in reaction to the income change. The result is that income increases would only yield temporary increases in happiness. The earliest papers in this vein seem to be Brickman, P., & Campbell, D. T. (1971), who stamped the phenomenon the hedonic treadmill, and Van Praag (1971) who called it preference drift.

The empirical analysis looking at the adaptation phenomenon is, in our opinion, still somewhat limited and further evidence is needed in order to settle the debate. This paper aims at extending the evidence by adding some new features to the empirical analysis. First, and only with the exception of DiTella et al. (2007), Burchardt (2005) for financial satisfaction, and Van Praag and Ferrer-i-Carbonell (2004, 2008), the previous studies on the effect of income adaptation did not use a longitudinal panel data set from a general sample of the population (see also Clark, 1999 on the effect of wage changes on job satisfaction). This means that rather than looking at the effect of an income change over time on an individual's reported satisfaction, individual satisfactions have been compared either by using macro- data (Easterlin, 1974) or by using cross-section micro - data (Van Praag and Van Weeren, 1988, Van Praag, 1971, and Van Praag and Kapteyn, 1973). While Easterlin found (almost) complete

adaptation, the studies on cross section micro –data found only partial adaptation, a phenomenon that Van Praag (1971) called *preference drift*. The studies using macro data have unequivocally concluded that while income has constantly increased in most countries, reported happiness levels have failed to keep the same tempo (e.g., Easterlin, 1974, 1995, and 2008). In a widely cited study, Brickman et al. (1978) looked at the impact of income changes by using a very specific sample of lottery winners and comparing them with a control group. Although this is a very interesting study showing adaptation to income, it is not clear whether or not the results found for big lottery winners (probably individuals who very often play lottery) can be generalized. This line of research coined the adaptation phenomenon the *hedonic treadmill*.

This study presents new evidence, because we use individual panel data and therefore we can follow the same individual across time so as to examine the impact that income changes in the current and recent past have on one's reported happiness. In addition, there are few other studies looking at adaptation to other life events with individual panel data, e.g. Clark et al. (2007), Lucas (2007), and Oswald and Powdthavee (2007).

In this paper, we reconsider the problem using a first- difference specification, where we do not consider the model $U_t=U(x_t, x_{t-1},\ldots)$,but the model $U_t-U_{t-1}=f(x_t, x_{t-1},\ldots)$. Obviously, this may give some discussion when we assume that the satisfaction index has no cardinal significance. However, in present literature there are many examples where satisfaction *U* is treated as a cardinal variable, e.g., for instance, in regressions on *U*. It has been also shown in Ferrer -i-Carbonell and Frijters (2004) that results are pretty stable under different specifications. In this paper we apply two rather different cardinalizations on U in order to test the stability of our results.

We estimate the adaptation phenomenon with respect to life satisfaction and financial satisfaction using various plausible specifications and two alternative estimation methods. It will be seen that the results on adaptation to income crucially depend on the model specification used. Therefore, we conclude that the debate on whether and how individuals adapt to income is far from settled. In addition, we will examine the impact that changes in individual circumstances other than income (notably

employment and marital status) have on self- reported life satisfaction. Another relatively new feature of the present paper is that we will examine possible asymmetries by allowing the effect of changes on satisfaction to depend on the direction of the change (e.g. income increases vs. income decreases).

2. The empirical approach

2.1 The model

Most studies in the subjective satisfaction literature start with the following model:

$$LS_{nt} = \alpha + \beta Y_{nt} + \delta X_{nt} + \eta_n + \varepsilon_{nt} \qquad (1)$$

It says that for an individual (n) life satisfaction (also called happiness) LS_n at time t depends on the current level of income Y_{nt}, other individual characteristics X, and an individual fixed effect η_n, standing for unobservable persistent traits (such as optimism and intelligence). For estimation purposes the usual error term ε is added. For financial satisfaction a similar model is postulated where life satisfaction LS_{nt} is replaced by financial satisfaction FS_{nt}. If past income is incorporated in the panel data analysis, which has been done by DiTella et al. (2007) and Van Praag and Ferrer-i-Carbonell (2004, 2008, chapter 7), the regression looks like:

$$LS_{nt} = \alpha + \beta_1 Y_{nt} + \beta_2 Y_{nt-1} + \gamma X_{nt} + \eta_n + \varepsilon_{nt} \qquad (2)$$

It is obvious that this equation can be extended to cover more than one time lag. When we focus on the impact of changes, it makes sense to look at first –order-differences derived from equation (2) in order to estimate the equation:

$$LS_{nt} - LS_{n,t-1} = \beta_1 (Y_{nt} - Y_{n,t-1}) + \beta_2 (Y_{nt-1} - Y_{n,t-2}) + \gamma (X_{nt} - X_{nt-1}) + (\varepsilon_{nt} - \varepsilon_{nt-1}) \qquad (3)$$

In equation (3) the time-invariant terms such as gender and the individual fixed effects (η_n) are eliminated. This reduction makes it easier to identify the effects of the remaining variables.

In this specification, β_1 is the first year effect. If we assume that norms change gradually over time after the income shock, we assume that the initial effect β_1 reflects the original norm, that is the norm on satisfaction *before* the income change. If β_1 is zero, an income change has no first- period effect on happiness. If $\beta_1>0$ and $\beta_2=0$, an income change does have an effect on happiness but there is no adaptation of the norm as a reaction to the income change later on. That is, after one period, the happiness level does not fall back towards its initial level. If $\beta_1>0$ and $\beta_2>0$, the effect of an income change on happiness is split over two periods and the total effect is $(\beta_1+\beta_2)$. Finally, we may have a configuration $\beta_1>0$ and $\beta_2<0$. Then we see that after a first impact of changes in income on happiness, the individual's norm adapts to the change and the happiness level rebounds into the direction of its original level (often called *set point level*, Headey and Wearing, 1989). We call this second effect (β_2) a *rebound* effect and it is an indication of the individuals' adaptation behavior, i.e. how his norm changes as a reaction on the change in circumstances, in this case income. If $(\beta_1+\beta_2)=0$ it implies that there is a complete adaptation to income changes.

DiTella et al. (2007) estimate equation (2) where they add an individual non-random fixed effect. This is tantamount to an explanation by yearly deviations from the individual mean over time. This is conceptually and technically different from the regression proposed in this paper. In their analysis, DiTella et al. (2007) find that the sum of all the four lagged income effects included in their regression is statistically significant negative, although somewhat smaller than the first year coefficient (β_1 in our notation). This means that there would be a substantial adaptation to income. However, most of the separate effects they found are, unfortunately, statistically non- significant.

We consider four possible specifications. The first one does not include any control variable X so that the income effect on happiness captures all other possibly correlated effects, such as having a job or being healthy. We use this specification as a benchmark. The second specification introduces some realism to the first one by allowing the impact of income changes to depend on the individual's current objective situation X_{nt}. For example, the impact of an income change on happiness may depend on whether there is a partner that gives support, the position of the respondent in the life cycle, or the employment situation. Our third specification is

represented by equation(3). A last specification allows for as many time lags in the control variables *X* as for income. In general, we estimate

$$LS_{nt} - LS_{n,t-1} = \sum_{i=0}^{I} \beta_i (Y_{n,t-i} - Y_{n,t-i-1}) + \delta X_{n,t} + \sum_{j=0}^{j=J} \gamma_j (X_{n,t-j} - X_{n,t-j-1}) + \varepsilon_n \qquad (4)$$

In the first specification, we impose δ=γ=0 and in the second one γ=0. In the third specification δ=0 and J=1 and in the last one δ=0 and J=I. To simplify econometrics we restrict ourselves to analyzing the satisfaction changes from 2003 to 2004, where we take four lags into consideration.

As discussed earlier, the empirical analysis will also examine whether the effect of income changes on adaptation is asymmetric, i.e., whether the effect of income decreases differs from that of income increases. In the empirical analysis, we operationalize this asymmetry by the following equation:

$$LS_{nt} - LS_{nt-1} = \alpha + \beta_1 \Delta Y_{nt} + \beta_2 \nabla Y_{nt} + \gamma (X_{nt} - X_{nt-1}) + \varepsilon_{nt}$$

$$\Delta Y_t = |Y_t - Y_{t-1}| \;\; if \; (Y_t - Y_{t-1}) > 0 \;\; and \;\; 0 \;\; otherwise \qquad (5)$$

$$\nabla Y_t = |Y_t - Y_{t-1}| \;\; if \; (Y_t - Y_{t-1}) < 0 \;\; and \;\; 0 \;\; otherwise$$

where one can introduce more than one time lag. In a similar fashion, we will look at the asymmetry issue for changes in the variables *X*. Our results on changes in *X* will be compared with recent results on adaptation to health changes (Oswald and Powdthavee, 2007) and to changes on other life events, notably partnership and employment (Clark et al., 2007).

2.2 The econometric approach

For the empirical analysis, we make use of the German SOEP-data set, where respondents are answering on the following question modules:

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´, 10 ´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

Figure 1: Life Satisfaction Question

How satisfied are you today with the following areas of your life?

Please, answer by using the following scale: 0 means ´totally unhappy´, 10 means ´totally happy´.

How satisfied are you with your household income?

0____1____2____3____4____5____6____7____8____9____10
totally unhappy — totally happy

Figure 2: Financial Satisfaction Question

Since life and financial satisfaction responses are categorized in terms of a [0, 10]-scale, the *changes* in these variables can range over 21 values from -10 to +10. Considering differences of satisfactions obviously poses a problem. The first possibility is to generalize the Ordered Probit model. If satisfaction LS or *FS* is described by a latent variable model $LS_{nt} = \alpha + \beta Y_{nt} + \delta X_{nt} + \varepsilon_{nt}$, the differences ($LS_{nt}$ - LS_{nt-1}) may be described by an OP- model with twenty-one ordered categories.

A second option, which is winning popularity among happiness economists, is to assume that we observe a cardinal satisfaction index. This implies that we explain the observed values 0, 1,…, 10 by an OLS – model (see e.g. Oswald and Powdthavee, 2007) or that we consider a transformation of this index. For satisfaction levels this is accepted as a reasonable approach that does not lead to significant differences with OP models in terms of trade-offs between coefficients (Ferrer-i-Carbonell and Frijters, 2004). For other examples see the aforementioned work by Oswald and Powdthavee (2007) and DiTella et al. (2007)

In our context the easiest way is then to apply OLS on the observed differenced satisfaction responses, that is, the values –10, …,0,….,+10. The problem with this approach is that while the right hand side of an equation like (1) or (3) can assume any value on the $(-\infty,\infty)$ interval, the left-hand side is logically restricted to the interval [0,10] or, in the present case [-10, 10]. In order to repair this problem, we apply a method called Conditional Median (CM) that was first introduced in Van Praag and Ferrer-i-Carbonell (2008). This method is another variant of methods proposed and applied in Van Praag et al (2003) and Van Praag and Ferrer-i-Carbonell (2004, 2008). All these methods yield remarkably similar results, that is to say, apart from a scaling factor they give approximately the same estimates, which implies that the corresponding trade-off ratios between variables hardly differ.

The main assumption of the CM method is that life satisfaction can be described by a distribution function F(.) such that $1/10(LS) = F(\beta' x)$. We assume here that the discrete answer, say 7, stands for all values in the interval (6.5, 7.5]. For if the respondent would have liked to convey to us that her evaluation were a 7.8, she would have given an 8 as an answer. Therefore we argue that taking the median of the interval is the best approximation to the discrete recording of the satisfaction data. In practice this implies regressing the values $F^{-1}(1/10*LS)$ on the explanatory variables x. For the extreme values 0 and 10 we assume that they stand for values in the intervals [0, 0.5] and [9.5,10], respectively. Accordingly we assign to those extreme response categories the values $F^{-1}(1/10*0.25)$ and $F^{-1}(1/10*9.75)$, respectively. These values are the conditional median (CM) values, corresponding to the brackets of the total evaluation scale. It is obviously a matter of choice which distribution function specification we choose. However, as $\beta' x$ may assume any value on the real axis, it is logically consistent to choose a distribution function that has the real axis for its domain. Then the normal or the logistic distribution function lay at hand. We choose for the standard normal.

In this paper we will present the results of the two methods (Ordered Probit and CM) side by side. The set of variables included in X are age, gender, the number of individuals in the household, the years of education, and whether the individual has a partner, is of German origin, is employed, is officially disabled, and lives in East Germany. The specifications in which the control variables are taken in changes do not

include the time invariant variables. In line with the literature, the variable income change is defined as $\ln(Y_t) - \ln(Y_{t-1})$.

3. The data

The empirical analysis is based on the SOEP data set, a representative German household panel data that started in 1984 in West Germany and that since 1990 includes households from East Germany as well. The data set includes not only information on individual self-reported satisfaction but also on a range of personal and household characteristics. This has made the SOEP data very popular among happiness economists.[1] In this paper we use the satisfaction changes from 2003 to 2004 and the changes in other variables as far back as 2000 to 2001.

The main descriptive statistics of the sample are presented in Table 1. In the table, income is shown in euros per month and not in logarithms.

Table 1: Descriptive Statistics, German SOEP

	N	***Mean***	***Std. Dev***
Average Life Satisfaction in 2004, 0 to 10	21964	6.801	1.825
Average change in Life Satisfaction, 2004-2003	20810	-0.198	1.611
Average Financial Satisfaction in 2004, 0 to 10	21522	6.220	2.305
Average change in Financial Satisfaction, 2004-2003	20253	-0.137	1.881
Household income, month euros, 2004	20867	2808	2232
Household income, month euros, 2003	19777	2787	2009
Household income, month euros, 2002	18958	2809	2179
Household income, month euros, 2001	16499	2349	1250
Household income, month euros, 2000	15687	2292	1211
$\text{Ln}(Y_{2004})$-$\text{Ln}(Y_{2003}) > 0$	9228	0.197	0.264
$\text{Ln}(Y_{2004})$-$\text{Ln}(Y_{2003}) < 0$	7713	0.232	0.317
$\text{Ln}(Y_{2004})$-$\text{Ln}(Y_{2003}) = 0$	2356	0	0

In the sample, the *changes* in life and financial satisfaction vary from -10 to 10. Although on average individuals see their income increase every year, there are many observations for which income decreases. For example, there are 19297 individuals for whom we have information on their household income in 2003 as well as in 2004. Of all these individuals (last three rows of Table 1), 9228 (48%) see their income

[1] We are grateful to Gert Wagner and the DIW team for making the data set available to us.

increase while 7713 (40%) suffer an income decrease. In total, there are 2356 individuals for whom household income does not change.

4. Income adaptation: empirical results

4.1 Adaptation to income changes

Life satisfaction

The empirical estimates of equation(4) for life satisfaction with Ordered Probit and CM are presented in Table 2, where the different columns show the four specifications defined by the way in which the control variables (X) are included. The results will indicate whether income changes in 2004 affect life satisfaction changes in this same year and how this effect compares with the impact of past income changes on current life satisfaction changes. In other words, the first income change effect shows whether or not changes in income have an impact on reported life satisfaction. The second effect illustrates the adaptation behavior of individuals. In the tables we include income changes up to t-4 (from 2000 to 2001), as by then the income changes coefficients are not statistically significant anymore.

Table 2 shows that an income change has a statistically significant coefficient on current life satisfaction changes. Although there are differences, this coefficient is fairly similar in all the four specifications presented in the table. This means that an income increase (decrease) has a positive (negative) effect on the life satisfaction changes of an individual. It is interesting to notice the stability of this effect and its immunity for the control variables. The estimation results with OP and CM lead to similar results, except for a scaling factor.

The adaptation phenomenon however is less clearly defined, as it appears to depend on the specification used. Except in the last specification, there is a negative effect of the lagged income differences, which implies that there is a rebound effect. In other words, the initial effect of an income change on life satisfaction is reduced in the years after, moving the individuals back into the direction of the original level of life satisfaction. The magnitudes of the negative coefficients of the second and third year lagged income effect depend on the specification and econometric method used. While in some cases the adaptation or rebound is incomplete and a net effect of an

income change remains over the years, the opposite is true for other cases. In any case, the eventual adaptation phenomenon seems to occur rather fast and in all the specifications the coefficient for Ln(Y_{t-3})-Ln(Y_{t-4}) (if not earlier) is statistically non-significant.

Table 2: Life satisfaction changes (2003 to 2004) & income adaptation, SOEP

	No controls included		**Controls = X_{2004}**		**Controls = X_{2004}-X_{2003}**		**Controls = $X_t - X_{t-i}$**	
	Est.	***t-value***	***Est.***	***t-value***	***Est.***	***t-value***	***Est.***	***t-value***
Ordered Probit								
Ln(Y_{2004})-Ln(Y_{2003})	0.195	6.69	0.169	4.87	0.140	4.31	0.159	4.71
Ln(Y_{2003})-Ln(Y_{2002})	-0.062	-1.91	-0.088	-2.43	-0.067	-2.00	-0.031	-0.79
Ln(Y_{2002})-Ln(Y_{2001})	-0.054	-1.61	-0.084	-2.31	-0.054	-1.58	-0.017	-0.41
Ln(Y_{2000})-Ln(Y_{2001})	-0.026	-0.80	-0.048	-1.44	-0.028	-0.85	-0.017	-0.46
Number of obser.	14418		14176		14108		13839	
Pseudo R2	0.0013		0.0023		0.0035		0.0045	
Log-likelihood	-26140		-25649		-25477		-24969	
CM								
Ln(Y_{2004})-Ln(Y_{2003})	0.097	6.66	0.078	4.50	0.070	4.36	0.081	4.84
Ln(Y_{2003})-Ln(Y_{2002})	-0.028	-1.69	-0.043	-2.38	-0.029	-1.77	-0.007	-0.35
Ln(Y_{2002})-Ln(Y_{2001})	-0.023	-1.40	-0.040	-2.22	-0.022	-1.30	0.000	0.02
Ln(Y_{2000})-Ln(Y_{2001})	-0.023	-1.43	-0.034	-2.09	-0.023	-1.42	-0.017	-0.90
Constant	-0.055	-12.63	0.439	0.79	-0.053	-12.04	-0.055	-11.58
Number of obser.	14418		14176		14108		13839	
R2	0.0045		0.008		0.011		0.014	

Note: The estimated intercept terms and the control variables are not shown in the table.

The adaptation phenomenon in the first specification (without controlling for other variables) is in the order of about 60% for both CM and OP. In the second specification (the control variables are introduced at its current values), the adaptation is nearly 100% in all cases. Finally, in the third specification, which is more similar to the existing literature (DiTella et al., 2007), adaptation hovers between 40 and 86%, depending on the level of significance chosen and the econometric technique. This result is in line with DiTella et al. (2007), the only study we can compare to. In the last specification, in which the control variables are included in several time lags, all the income lag changes are not statistically

significant. This might be interpreted as that the initial positive impact of an income change has an ever lasting effect on life satisfaction.

Financial satisfaction

The estimation exercise as presented above is reproduced in Table 3 with respect to the narrower concept of financial satisfaction.

Table 3: Financial satisf. changes (2003 to 2004) & income adaptation, SOEP

	No controls included		**Controls = X_{2004}**		**Controls = X_{2004}-X_{2003}**		**Controls = $X_t - X_{t-i}$**	
	Est.	***t-value***	***Est.***	***t-value***	***Est.***	***t-value***	***Est.***	***t-value***
Ordered Probit								
Ln(Y_{2004})-Ln(Y_{2003})	0.549	18.62	0.549	15.70	0.542	16.61	0.540	15.92
Ln(Y_{2003})-Ln(Y_{2002})	0.022	0.68	0.007	0.21	0.031	0.92	0.033	0.85
Ln(Y_{2002})-Ln(Y_{2001})	0.000	-0.01	-0.019	-0.54	0.004	0.10	0.014	0.34
Ln(Y_{2000})-Ln(Y_{2001})	-0.035	-1.08	-0.049	-1.46	-0.029	-0.90	-0.053	-1.43
Number of obser.	14228		14001		13937		13693	
Pseudo R2	0.007		0.008		0.011		0.012	
Log-likelihood	-2774		-27218		-26996		-26485	
CM								
Ln(Y_{2004})-Ln(Y_{2003})	0.319	18.80	0.322	16.09	0.313	16.87	0.310	16.11
Ln(Y_{2003})-Ln(Y_{2002})	0.002	0.13	-0.002	-0.10	0.008	0.42	0.011	0.50
Ln(Y_{2002})-Ln(Y_{2001})	-0.004	-0.20	-0.012	-0.57	-0.002	-0.10	0.003	0.11
Ln(Y_{2000})-Ln(Y_{2001})	-0.029	-1.55	-0.034	-1.81	-0.025	-1.33	-0.042	-1.98
Constant	-0.046	-9.19	0.658	1.01	-0.046	-9.06	-0.045	-8.32
Number of obser.	14228		14001		13937		13693	
R2	0.0277		0.033		0.045		0.046	

Note: The estimated intercept terms and the control variables are not shown in the table.

The results show that for all specifications and econometric methods, we do not find rebound effects. This is puzzling. It might be interpreted in two ways. The first way interpretation would be that there is no leakage effect after the first year. In other words, there would be no adaptation to income changes in terms of financial satisfaction. Or in other words, there would be no phenomenon of a hedonic treadmill or preference drift for financial satisfaction. The second interpretation is that all adaptation of financial satisfaction norms takes place *within* one observation period, that is, *one* year. Then we have to interpret the effect 0.54 (or 0.31 in the CM-version) as the *net effect* after adaptation has taken place. In this case the adaptation

is only partial as the effects are greater than zero. As we find the first interpretation of no adaptation rather counter- intuitive, we will stick to the second interpretation of fast adaptation of the financial satisfaction norm *within one year*. This latter interpretation fits also with the old findings in Van Praag (1971) and Van Praag and Kapteyn (1973), which were derived from a cross-section data set. We illustrate these two interpretations in Figure 3 with graphs of two adaptation patterns. In the left part adaptation is completed within one year, leaving us only with the observation of a *final* net effect. In the right part we see an adaptation pattern that stretches over more than one year.

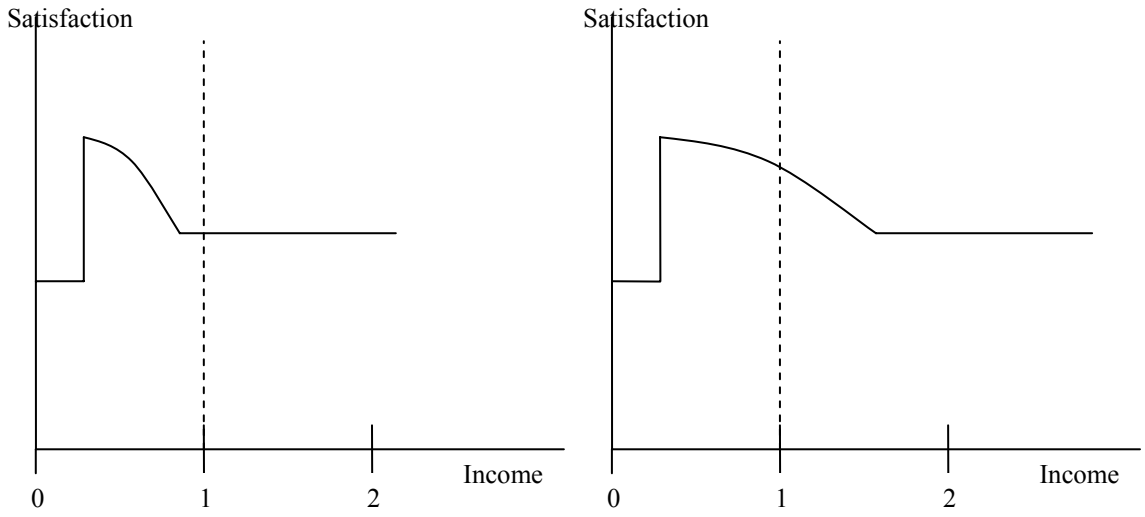

Figure 3: A fast and not so fast adaptation pattern.

The effect of the first year income change is more pronounced than when we use the aggregate concept of life satisfaction. This reflects the fact that income is only one of many determinants of the comprehensive happiness concept and not the most important one, while it is the most important determinant of the narrower concept of financial satisfaction (see Van Praag and Ferrer-i-Carbonell, 2004, 2008). The difference between the effects on financial satisfaction and life satisfaction is rather striking.

4.2 Asymmetric effects of income changes

As said before, the asymmetry of the impact that income changes have on satisfaction is a less frequently studied phenomenon. Following the idea of falling marginal utility one may expect that decreases in income may have a larger impact on life satisfaction than increases in income. In this section we empirically examine whether individuals, as some argue, adapt to income increases but not to income decreases.

In Table 4 we present the results of the estimation of equation (5) for life and for financial satisfaction using both the OP and CM methods. Table 4 uses the specification in which the control variables are introduced as changes from 2003 to 2004 (third specification of tables 2 and 3) and Table 5 shows the results in which the control variables are included in several time lags (fourth specification of Tables 2 and 3). The income changes are introduced in the regression in absolute (non negative) values and therefore one expects a positive sign in the first year for income increases and a negative one for income decreases. For subsequent years, the sign is expected to be the opposite.

Table 4: Asymmetry of income adaptation, SOEP, Controls =X_{2004}-X_{2003}

	Life Satisfaction				***Financial Satisfaction***			
	OP		**CM**		**OP**		**CM**	
	Est.	**t-value**	**Est.**	**t-value**	**Est.**	**t-value**	**Est.**	**t-value**
Constant			-0.063	-9.28			-0.058	-7.38
Ln(Y_{2004})-Ln(Y_{2003}) >0	0.224	4.00	0.093	3.33	0.717	12.73	0.417	13.05
Ln(Y_{2003})-Ln(Y_{2002}) >0	0.019	0.34	0.018	0.67	0.094	1.70	0.038	1.21
Ln(Y_{2002})-Ln(Y_{2001}) >0	-0.018	-0.34	0.003	0.10	-0.017	-0.32	-0.013	-0.43
Ln(Y_{2000})-Ln(Y_{2001}) >0	-0.063	-1.24	-0.038	-1.49	-0.052	-1.03	-0.031	-1.07
Ln(Y_{2004})-Ln(Y_{2003}) <0	-0.091	-2.10	-0.058	-2.72	-0.435	-9.98	-0.248	-9.98
Ln(Y_{2003})-Ln(Y_{2002}) <0	0.109	2.18	0.059	2.38	-0.024	-0.47	-0.009	-0.33
Ln(Y_{2002})-Ln(Y_{2001}) <0	0.060	1.12	0.033	1.26	-0.056	-1.05	-0.027	-0.88
Ln(Y_{2000})-Ln(Y_{2001}) <0	-0.024	-0.45	0.001	0.03	-0.008	-0.15	0.010	0.34
Number of obser.	14108		14108		13937		13937	
(Pseudo) R2	0.004		0.011		0.012		0.046	
Log-likelihood	-25472				-26987			

Note: The estimated intercept terms and the control variables are not shown.

For life satisfaction, Table 4 details the results found in the third column of Table 2 by showing that there is an important asymmetry on the adaptation to income changes.

While individuals do not seem to adapt their life satisfaction to income increases, they do completely adapt to income decreases. Thus, the results found in Table 2 (which were consistent with DiTella et al., 2007) are likely to be completely driven by the individuals experiencing an income decrease. In Table 5, however, and consistently with the fourth specification of Table 2, we do not find significant rebound effects neither to income increases nor decreases. In short, if there is some adaptation, this is to income decreases, while income increases have an ever lasting positive effect on life satisfaction. As in Table 3, financial satisfaction does not rebound after an initial income shock, regardless of whether this is an increase or a decrease in income.

Table 5: Asymmetry of income adaptation, SOEP, Controls = (X_{t-i}- X_{t-i-1})

	Life Satisfaction				***Financial Satisfaction***			
	OP		**CM**		**OP**		**CM**	
	Est.	**t-value**	**Est.**	**t-value**	**Est.**	**t-value**	**Est.**	**t-value**
Constant			-0.066	-9.45			-0.056	-7.02
$Ln(Y_{2004})$-$Ln(Y_{2003})$ >0	0.242	4.19	0.102	3.56	0.721	12.47	0.416	12.74
$Ln(Y_{2003})$-$Ln(Y_{2002})$ >0	0.052	0.88	0.040	1.38	0.095	1.61	0.036	1.09
$Ln(Y_{2002})$-$Ln(Y_{2001})$ >0	0.024	0.41	0.025	0.87	-0.008	-0.14	-0.010	-0.31
$Ln(Y_{2000})$-$Ln(Y_{2001})$ >0	-0.038	-0.71	-0.024	-0.93	-0.072	-1.36	-0.044	-1.48
$Ln(Y_{2004})$-$Ln(Y_{2003})$ <0	-0.110	-2.45	-0.070	-3.13	-0.428	-9.50	-0.242	-9.47
$Ln(Y_{2003})$-$Ln(Y_{2002})$ <0	0.075	1.36	0.040	1.46	-0.031	-0.56	-0.019	-0.60
$Ln(Y_{2002})$-$Ln(Y_{2001})$ <0	0.030	0.48	0.014	0.44	-0.078	-1.27	-0.037	-1.07
$Ln(Y_{2000})$-$Ln(Y_{2001})$ <0	-0.025	-0.43	0.000	-0.02	0.012	0.20	0.028	0.83
Number of obser.	13839		13839		13693		13693	
(Pseudo) R2	0.0046		0.015		0.012		0.047	
Log-likelihood	-24965				-26476			

Note: The estimated intercept terms and the control variables are not shown.

An interesting finding that is consistent across specifications (Table 4 and 5), econometric techniques, and for both kinds of satisfactions is that the first year impact of an income increase is larger than the impact of an income decrease. This result is rather surprising in that it contrasts with our intuition of falling marginal utility. Finally, and consistent with the results presented in section 4.1, Table 4 and 5 show that the first year impact of income change is larger for financial than for life satisfaction.

The main conclusions from this section are: income increases seem to have a larger impact on life and financial satisfaction than income decreases; for financial satisfaction we find no rebound effect at all; for life satisfaction we see that

adaptation to income changes depends on the specification used and, if it occurs at all, it is only for income decreases.

4.3 Adaptation to other variables: A brief account for life satisfaction

Although the main objective of this paper is to look at the adaptation to income changes, we will here briefly present the results for other life events. The specification used is very similar to the one in Table 5 although here we introduce the asymmetry not only for income but also for the changes in X. As for income one may expect that the effect that changes in some of these variables may have on life satisfaction will differ depending on the direction. For example, the impact on life satisfaction of moving from non-employment to employment may differ from the one experienced when moving from employment to non-employment. The results presented can be compared with the work by Clark et al. (2007) and Oswald and Powdthavee (2007) (see also Powdthavee, 2008 and Lucas, 2007). In this section we only look at *life* satisfaction, since this is the broader concept for which variables such as having a partner and disability are most relevant. Moreover, this makes our results more comparable to the abovementioned literature where the focus is on the life satisfaction question.

Table 6 shows the results in which we introduce this asymmetry for the variables 'having a partner', 'being disabled', employment, and household size. In addition we include asymmetric income changes and changes in years of education and living in East Germany. The empirical analysis is done again both by Ordered Probit and by CM. The results for the income variables are consistent with the ones presented in Table 5, although they are slightly different because in this specification we only include a three - time – lags structure.

Table 6: Satisfaction & asymmetry of adaptation, SOEP

	LS, OP		LS, CM	
	Est.	**t-value**	**Est.**	**t-value**
Constant			-0.069	-10.39
$Ln(Y_{2004})$-$Ln(Y_{2003})$ >0	0.247	4.45	0.104	3.77
$Ln(Y_{2003})$-$Ln(Y_{2002})$ >0	0.000	0.00	0.014	0.52
$Ln(Y_{2002})$-$Ln(Y_{2001})$ >0	0.028	0.53	0.027	1.06
$Ln(Y_{2004})$-$Ln(Y_{2003})$ <0	-0.114	-2.58	-0.070	-3.17
$Ln(Y_{2003})$-$Ln(Y_{2002})$ <0	0.040	0.76	0.021	0.79
$Ln(Y_{2002})$-$Ln(Y_{2001})$ <0	0.047	0.83	0.026	0.93
Partner in t-1 no partner in t	-0.223	-2.34	-0.103	-2.16
Partner in t-2 no partner in t-1	0.293	3.17	0.123	2.68
Partner in t-3 no partner in t-2	0.164	1.75	0.064	1.37
No partner in t-1 partner in t	0.109	1.24	0.056	1.28
No partner in t-2 partner in t-1	0.020	0.25	0.019	0.49
No partner in t-3 partner in t-2	-0.026	-0.33	-0.006	-0.14
Not employed in t-1 employed in t	0.344	7.34	0.145	6.22
Not employed in t-2 employed in t-1	0.134	2.87	0.069	2.96
Not employed in t-3 employed in t-2	-0.004	-0.08	0.001	0.03
Employed in t not-employed in t-1	-0.320	-7.80	-0.154	-7.54
Employed in t-1 not-employed in t-2	-0.043	-1.00	-0.016	-0.77
Employed in t-2 not-employed in t-3	-0.033	-0.81	-0.022	-1.09
Not able in t-1 able in t	-0.035	-0.42	0.007	0.17
Not able in t-2 able in t-1	-0.072	-0.90	-0.030	-0.74
Not able in t-3 able in t-2	-0.040	-0.49	-0.020	-0.50
Able in t-1 to not able in t	-0.067	-1.05	-0.039	-1.24
Able in t-2 to not able in t-1	0.058	0.83	0.020	0.58
Able in t-3 to not able in t-2	0.101	1.63	0.050	1.63
Increase in Ln(house.size)1	0.073	1.50	0.045	1.84
Increase in Ln(house.size)2	-0.123	-2.71	-0.062	-2.77
Increase in Ln(house.size)3	-0.041	-0.85	-0.029	-1.21
Decrease in Ln(house.size)1	-0.020	-0.46	-0.002	-0.11
Decrease in Ln(house.size)2	0.041	0.96	0.031	1.48
Decrease in Ln(house.size)3	-0.002	-0.04	0.004	0.17
Changes in LN(years edu)1	-0.292	-0.71	-0.074	-0.36
Changes in LN(years edu)2	-0.206	-0.42	-0.128	-0.52
Changes in LN(years edu)3	-0.481	-1.30	-0.223	-1.21
Changes in east1	-0.226	-1.35	-0.062	-0.74
Changes in east2	0.206	1.25	0.132	1.61
Changes in east3	-0.175	-1.36	-0.066	-1.03
Number of observations	14584		14584	
(Pseudo) R2	0.005		0.015	
Log-likelihood	-26369			

In Table 6 we see that losing a partner has a negative coefficient while the positive effect of acquiring a partner is not statistically significant. In other words, we find an important asymmetry with respect to the first year effect of changes in partnership. Despite the initial negative effect, individuals seem easily to adapt to loosing a

partner in the second year. Moving from employment to non-employment or vice versa has a fairly symmetric effect in the first year. The positive effect of becoming employed extends to the second period, while this is not true for the opposite case. Individuals do not seem to adapt at all to changes in employment status, irrespective of whether the change is positive or negative. The effect of the change in employment status seems to last permanently. These results on partnership and employment are in the same line of those found by Clark et al. (2007), i.e., individuals adapt to changes in partnership but not to unemployment. These authors, however, did not look at the asymmetric character of these effects.

Surprisingly, changes in disability status are not statistically significant. Oswald and Powdthavee (2007) found a statistically significant first year effect for disability and a later adaptation of between 30 to 50% depending on the degree of severity of the impairment. In our sample, we define individuals as disabled if they report 'yes' to the following question: "Are you legally classified as handicapped or capable of gainful employment only to a reduced extent due to medical reasons?" In another study, Lucas (2007) finds a modest to large effect of disability on changes in happiness with little adaptation over time. Increases in household size have a negative impact on life satisfaction, although the effect only occurs after the second year. It seems that a process contrary to adaptation is occurring here. The subjective cost of getting a child seems initially to be grossly underestimated. This result would be in line with Clark et al. (2007) who find a somewhat negative effect of first child on happiness between year one and two years old. In contrast, we do not find any statistically significant effect of decreases in household size. Finally, we do not find statistically significant effects for changes in education or on living in East Germany.

5. Conclusion

This paper contributes to the debate on the question if individuals adapt their norms on satisfaction to changing circumstances. By means of analyzing subjective satisfaction questions, we contribute to this debate by presenting an empirical analysis in which the effect of changing circumstances on the individual's well-being is examined by using panel data. Notably, we allow for different specifications of the

satisfaction function and for asymmetries on the direction of the changes (e.g. income increases vs. income decreases).

The main conclusions of this paper can be summarized as follows. The immediate effect of an income change on satisfaction is (i) statistically significant, (ii) considerably larger for financial than for life satisfaction, and (iii) asymmetric, i.e. the positive effect of an income increase is, contrary to intuition, larger than the negative effect of an income decrease. The effect of income changes in previous years on present feelings of satisfaction indicates whether or not there is a rebound effect. If there is a rebound effect it implies that individuals adapt their norms in reaction to income changes. The results presented in the paper show that (iv) the rebound effect of income changes on financial satisfaction is zero, most probably implying that financial satisfaction norms adapt *within one year* or much less probably that individual norms according to these findings would not adapt to changes to income at all. (v) For life satisfaction the adaptation phenomenon (rebound effect) depends on the specification used. In general, we can conclude that for one specification individuals show no adaptation to income increases and complete adaptation to income decreases, for the other one we find no adaptation at all. Thus, if there is some adaptation to income changes on life satisfaction, this is in response to income decreases. These results imply that the adaptation to income phenomenon is more intricate that we have traditionally thought (see also Diener et al., 2006). Our results neither confirm adaptation (e.g. Easterlin, 1974) nor do they refute (Stevenson and Wolfers, 2008). Our main conclusion is that money does seem to buy increased financial satisfaction in the long run and it may do the same for life satisfaction. This result is in line with the recent evidence suggesting a casual positive relationship between winning the lottery and mental well-being (Gardner and Oswald, 2007).

As for the other variables, the paper finds some asymmetry to changes in partnership although adaptation to the loss of a partner is rather fast; employment status has a symmetric permanent effect on life satisfaction; and (contrary to past work) changes in labor ability status do not seem to be statistically significant.

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