

# Predicting the Trend of Well-Being in Germany: How Much Do Comparisons, Adaptation and Sociability Matter?

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# Predicting the Trend of Well-Being in Germany: How Much Do Comparisons, Adaptation and Sociability Matter?

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## Abstract

Using longitudinal data on households living in Germany, we quantify what part of the change in subjective well-being observed over the last two decades is predicted by changes in variables which typically show strong cross-sectional correlation with subjective well-being. We especially focus on absolute income, income comparisons, income adaptation, and sociability, finding that all have some predictive power. The increase in sociability indicators predicts the largest positive change in subjective well-being. Absolute income, income comparisons and income adaptation also predict substantial changes in subjective well-being, if taken separately. However, if considered together their net prediction is quite small: the positive change predicted by income growth is compensated for about three fourths by the joint negative predictions due to income comparison and income adaptation. Finally, we find that aging of the population predicts the largest negative change in subjective well-being. This result appears to hinge on the large loss of satisfaction experienced by individuals in old age.

*Key words:* subjective well-being, life satisfaction, social capital, sociability, relational goods, relative income, social comparisons, income adaptation

JEL classification: I3, O1

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## 1. Introduction

In this paper we offer the first attempt to quantify the extent to which the main correlates of subjective well-being (SWB) predict its variation over time. Trends of SWB have attracted attention of researchers especially because of one stylized fact: the lack of substantial growth of SWB in some Western countries. More precisely, decades-long time series suggests that SWB has not increased significantly in US and in UK (see [Easterlin, 1974](#); [Blanchflower and Oswald, 2004b](#)). This is an astonishing fact when seen in the context of the dramatic economic growth which has characterized these countries after the Second World War. Indeed, a lively discussion has grown around such issues, mostly focusing on the opposition between short period and long period trends (see [Easterlin, 1995](#); [Stevenson and Wolfers, 2008](#); [Easterlin and Angelescu, 2009](#)).

However, very recently our understanding of the stylized facts about the trends of SWB across nations has changed substantially, suggesting that the picture is, by far, more rich and interesting than just a flat trend. Thanks to the growing availability of times series on SWB, it has become evident that reported measures of well-being do not revert to a fixed amount over the long term and that they do vary across countries to a large extent ([Stevenson and Wolfers, 2008](#); [Kahneman et al., 2009](#)). In particular, while SWB has increased in some countries, it has decreased in some others.

Research based on micro data has provided us with potential explanations of these facts. In particular, four forces have been identified that can potentially influence the trend of SWB. The first, and the most straightforward, is the growth of absolute income. On average, individuals with higher incomes are more satisfied than individuals with lower incomes, although this relationship tends to weaken as income grows (see e.g. [Frey and Stutzer, 2002](#)). Such a result is consistent with the basic predictions of economic theory, including that of decreasing marginal utility of income.

The second force is income comparisons. Social comparison theory holds that what matters for the average individual is his/her relative position with regards to a selected group of people he/she respects and to whom he/she wants to resemble ([Veblen, 1899](#); [Duesenberry, 1949](#)). These people, forming the so called reference group, determine the income to which the average individual compares his/her own. The growth of one's reference income typically has a negative effect on SWB (see [Clark et al., 2008](#), and references therein).

The third force is income adaptation. The theory of adaptation assumes that changes in the economic conditions of individuals tend to have a transitory effect on their well-being

(e.g. [Frederick and Loewenstein, 1999](#); [Clark et al., 2008](#)). As time goes by adaptation is supposed to erode the benefits of an increase in income.

The fourth force is the evolution of sociability, namely the relational part of social capital.<sup>1</sup> [Helliwell \(2006\)](#) has shown that several indicators of sociability are positively correlated to SWB. [Bruni and Stanca \(2008\)](#) and [Becchetti et al. \(2008\)](#) have documented that SWB is strongly correlated with relationships among individuals maintained for their own sake, also termed relational goods ([Uhlaner, 2009](#); [Gui and Sugden, 2005](#)). In a related paper, [Becchetti et al. \(2009\)](#) provide a causal analysis of the relationship between relational goods and SWB, showing that the latter have a strong and significant effect on SWB.

All these papers suggest that SWB is strongly correlated with sociability, but do not clarify whether sociability can help to predict the trend of SWB in one country or to explain cross-country differences in SWB trends. This kind of analysis has been carried out by [Bartolini et al. \(2009\)](#) who have brought forth world-wide evidence that long-term changes in sociability – measured as membership in groups or associations – largely predict long-term changes of SWB. Applying the methodology followed by [Easterlin and Angelescu \(2009\)](#) in studying the long-term relationship between SWB and income, [Bartolini et al. \(2009\)](#) documents that SWB is strongly related to sociability in both developed and developing countries. In a different but related paper, [Bartolini et al. \(2008\)](#) show the declining happiness trend of the US is better predicted when sociability indicators are included among predictors.

In this paper, we try to quantify the relative importance of these four forces for the case of Germany during the period 1994-2007. We use the German Socio-Economic Panel (GSOEP) for several reasons. First, it is one of the main sources of evidence on the relevance of adaptation and social comparisons (e.g. [Ferrer-i-Carbonell, 2005](#); [Vendrik and Woltjer, 2007](#); [Layard et al., 2009](#); [Clark et al., 2008](#), and references therein). Second, the GSOEP is rich in sociability indicators and indeed it has been used to show the importance of such variables for well-being ([Becchetti et al., 2008, 2009](#)). Third, the GSOEP is a longitudinal dataset which enables to overcome some of the limitations of cross-sectional data.

Our predictions turn out to work quite well in terms of precision, almost matching the observed trend. As shown by [Di Tella and MacCulloch \(2008a\)](#), this result is not at all warranted. Estimates indicate that all four forces contribute crucially to the good

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<sup>1</sup>The notion of social capital is a composite concept, comprising various kind of non-market relations among individuals but also beliefs and behaviors towards institutions

fit. However, three fourths of the benefits predicted by income growth (first force) are compensated by the negative predictions due to comparisons and adaptation (second and third forces). Sociability appears to be the largest positive predictor of SWB. Finally, we found a substantial role for demographic variables. In particular, we found that the aging of the population predict the largest negative change in SWB. This latter result appears to crucially hinge on the loss of satisfaction experienced in old age.

The paper is organized as follows. Section 2 describes data, concepts and our empirical strategy. Section 3 reports our main figures together with detailed comments on the numbers of interest. Section 4 provides a series of robustness checks that corroborate our basic findings. Section 5 summarizes our results and provides some final remarks.

## 2. Data and empirical strategy

In this study we employ the German Socio-Economic Panel dataset<sup>2</sup> managed with the panelwhiz tool<sup>3</sup>. In our baseline estimations, we consider the sub-sample of West and East Germans between 1994 and 2007. This restriction is imposed by data availability – more on this below. As anticipated in the introduction, we have chosen the GSOEP for various reasons. We emphasize here the two most important from an econometric standpoint. First, the longitudinal structure of the GSOEP allows us to control for fixed unobservable characteristics at the individual level. Second, the GSOEP contains a sufficient number of observations for social capital variables at the individual level, making it possible to explore the role of sociability.

Our measure of SWB is reported life satisfaction. Besides standard socio-economic correlates we consider four potential predictors of SWB. The first is absolute income. The second correlate is reference income which is intended to capture the effects of social comparisons. The third correlate is one’s own past income which is intended to capture the effects of income adaptation. The fourth correlate is a set of social capital indicators at the individual level which are intended to capture the contribution of sociability to the evolution of SWB. In the following we provide a detailed definition of all these constructs.

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<sup>2</sup>The data used in this publication were made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin.

<sup>3</sup>The data used in this paper were extracted using the add-on package PanelWhiz v2.0 (Nov 2007) for Stata. PanelWhiz was written by John P. Haisken-DeNew (john@panelwhiz.eu). The PanelWhiz generated .do files to retrieve the SOEP data used here (panelwhiz plugins are available upon request). Any data or computational errors in this paper are our own. [Haisken-DeNew and Hahn \(2006\)](#) describe PanelWhiz in detail.

In order to quantify how changes across time of our independent variables predict the change in time of SWB we adopt a two-steps empirical strategy which has been already applied in [Di Tella and MacCulloch \(2008a\)](#) and [Bartolini et al. \(2008\)](#). First, we estimate a baseline equation quantifying partial correlations between SWB and its correlates. Second, we calculate the product between the estimated coefficients that are statistically significant and their variation over the period 1996-2007. In this way we obtain the variation of SWB predicted by the variation over time of our significant regressors. We emphasize that is not a simple decomposition technique. First, we only use stistically significant coefficients to carry out our predictions. Second, second-step calculations are based on weighted averages which are representative of the whole German population, while first-step estimates are based on the unweighted samples of West and East Germany only. By doing this we avoid statistical biases due to the use of weighted regressions and, at the same time, we attain representativeness of the German population when we carry out predictions.

We stress that the crucial implicit assumption of our empirical strategy is that, apart from level effects, all people in Germany behave according to the same SWB equation at all points in time during the period considered. This is a standard assumption in the literature on SWB but should not be overlooked.

### *2.1. The data*

The GSOEP is a longitudinal survey of households and persons in the Federal Republic of Germany and it is run on a yearly basis by the DIW in Berlin<sup>4</sup>. The GSOEP focuses on micro-data about demographic, economic, social and political variables. The survey started in 1984 and initially was designed for West Germany only, including about 6000 households. However, since June 1990 the sampling was extended to include about 2000 East German households.

For our baseline regression, we focus on the sub-samples constituted by residents in West and East Germany for the period 1996-2007. We exclude sub-samples dedicated to foreigners, immigrants, high income households, as well as refreshments. In other words, we only consider the Germans participating to the initial East and West samples. The reason is that the sub-samples that we discarded are constructed with a large use of oversampling to allow the assessment of specific questions about sub-populations. The potential risk of using these sub-samples is that of biases due to sample selection. When we move to predicting the

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<sup>4</sup><http://www.diw.de>

trend of SWB we take care of a correct representation of the German population by using the whole sample to which we apply the appropriate weights provided in GSOEP.

Due to both sample constraints and data missing we end up using 59527 person-year observations out of 222404 available. The years for which we actually have observations for all variables of interest are 1994, 1996, 1997, 1999, 2001, 2005, and 2007. This substantial loss of information with respect to yearly records is mostly due to the fact that indicators of sociability are not recorded on a yearly basis.

As a robustness check, later on we will repeat the analysis considering only the subsample constituted of West Germans which allows to extend the period to 1988-2007.

## 2.2. Estimation of the SWB equation

We posit that an individual's SWB is determined by the following function:

$$SWB_{i,t} = v(X_{i,t}, y_{i,t}, \bar{y}_{i,t}, y_{i,t-k}, SC_{i,t}) \quad (1)$$

where the indices  $i$  and  $t$  denote, respectively, the individual and the year; moreover,  $y$  is a variable representing  $i$ 's income,  $\bar{y}$  is a variable representing the reference income  $i$  compares herself with,  $X$  collects a set of social and demographic characteristics, and  $SC$  stands for a set of social capital variables at the individual level. Note that  $i$ 's income appears twice:  $y_{i,t}$  is  $i$ 's income in year  $t$ ,  $y_{i,t-k}$  is  $i$ 's income  $k$  years before year  $t$ .

Of course, we do not observe  $SWB_{i,t}$  directly but only a proxy of it, namely reported SWB which we indicate with  $SWB_{i,t}^R$ . In particular, we rely on the following question provided in the GSOEP: "And finally, we would like to ask you about your satisfaction with your life in general. Please answer by using the following scale, in which 0 means totally unhappy, and 10 means totally happy. How happy are you at present with your life as a whole?". As the answer takes discrete values, from 0 to 10, we are in a typical case of latent dependent variable proxied by a multinomial ordered variable. Because of such a latency and the longitudinal characteristic of the dataset, best statistical practice would suggest the use of ordered probit augmented with individual random effects and Mundlak's corrections (see e.g. Ferrer-i-Carbonell, 2005) or, in alternative, ordered logit with individual fixed effects. However, it is now well documented that in similar cases the use of OLS with individual fixed effects is equivalent to the use of these alternative techniques (Ferrer-i-Carbonell and Frijters, 2004). In the light of this we resort to the use of OLS with individual fixed effects to estimate the following baseline equation:



$$SWB_{i,t}^R = \alpha + \beta_1 \cdot X_{i,t}^d + \gamma_1 \cdot \ln(y_{i,t}) + \gamma_2 \cdot \ln(\bar{y}_{i,t}) + \gamma_3 \cdot \ln(y_{i,t-k}) + \delta \cdot SC_{i,t} + e_{i,t} \quad (2)$$

In addition to the variables specified in equation (1) we add a set of dummies to control for the fixed effects of years, Lander, and former West Germany. This is reported in equation (2) by adding the superscript  $d$  to  $X$  which means that we augmented  $X$  with the described dummy variables. Other variables considered in  $X$  are: age, marital status, work status, household size, presence of children, and years of education. The descriptive statistics of these variables are reported in table 10 in the Appendix.

Absolute income  $y$  is operationalized as the GSOEP variable “adjusted monthly household net income”. “Adjusted” stands for the fact that income is real and converted in euros of 2000. We preferred the use of household income instead of personal income because we believe that household income better proxies the true access to economic resources that individuals have (see e.g. Ferrer-i-Carbonell, 2005; Vendrik and Woltjer, 2007).

One potential issue with regard to the interpretation of the income coefficient is the role of hours worked. However, as recently shown by Knabe and Rätzel (2009) with GSOEP data, leaving working hours out of the analysis does not lead to an underestimation of the income coefficient (see also Pouwels et al., 2008).

### 2.3. Reference income

We operationalize reference income of individual  $i$  in year  $t$  as the average income of  $i$ 's reference group in year  $t$ . The reference group of individual  $i$  in year  $t$  is constructed as the sub-sample of people living in  $i$ 's region (west or east) in year  $t$  that have about  $i$ 's education and age. More precisely, three categories of education are used according to years of education: less than 11, between 11 and 12, and 13 or more. Similarly, three age brackets are considered: younger than 30, between 31 and 60, and 61 or older.

The combination of these characteristics generates 378 different reference groups. The mean size of these groups is of 969 individuals, the median is 683 and the minimum size is 70. We opted for having only three age categories in order to be able to condition the reference group on the region and still have groups of non-negligible sizes. Indeed, we believe that living in the same region in the same year is more relevant to comparisons than being almost of the same age.

As convincingly argued by Falk and Knell (2004), reference groups are likely to be endogenous. However, one's reference group is likely to change rather slowly and in accordance

with the change in one's lifestyle. Thus, our definition of reference group should work sufficiently well for our purposes.

Another issue is what measure of income should be used to calculate reference income. We use household income as in Ferrer-i-Carbonell (2005), Vendrik and Woltjer (2007), and Layard et al. (2009). This amounts to assume that the likelihood of having characteristics similar to  $i$ 's ones is greater for people in  $i$ 's household than for the rest of the population.

Of course, other definitions of reference group are possible. For instance, one could further refine the reference group by also considering gender (Ferrer-i-Carbonell, 2005; Vendrik and Woltjer, 2007). Alternatively, one can focus especially on the community or region of residence (as in Diener et al., 1993; Stutzer, 2004; Luttmer, 2005), people's cohort (McBride, 2001), or people's state or country (Easterlin, 1995; Blanchflower and Oswald, 2004b). Finally, individuals might have more than one reference group (Kapteyn and Wansbeek, 1985; Vendrik and Hirata, 2007). Admittedly, there is no simple way to establish what is the reference group of an individual.

D'Ambrosio and Frick (2008) propose an original definition of reference group which allows to distinguish relativity effects based on social comparisons from those having an information basis. Overall, they find that the SWB of an individual is negatively affected by the comparison with permanently richer individuals, while the presence of newly richer individuals plays the informational role described in Hirschman's tunnel effect only for those individuals that experience an increasing income.<sup>5</sup>

Finally, Di Tella et al. (2007) propose, in alternative to usual measures of relative income, the use of the Occupational Prestige Score (OPS) as a measure of social standing. The OPS is a coded ranking, often applied by sociologists, which is based on an individual's type of job. This measure is certainly interesting and deserves attention but it reasonably captures many other aspects of the working and social life beyond relative income. Since one of our objectives is to single out the net effect of income on SWB, the OPS does not seem fully appropriate.

#### 2.4. Lagged income

We control for income adaptation by including one's own past household income in the SWB equation. Several specifications of this variable are possible and, in fact, we have tried

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<sup>5</sup>For more on the tunnel effect see Hirschman (1973) or, more recently, Senik (2004).

some. In line with what found by [Layard et al. \(2009\)](#), the specification of past household income that seems more relevant to  $SWB_{i,t}^R$  is  $y_{i,t-3}$ , that is, a three-years-in-the-past income.

Beyond [Layard et al. \(2009\)](#), other two papers attempt to measure the role of past income on current SWB using the GSOEP, namely [Di Tella et al. \(2007\)](#) and [Di Tella and MacCulloch \(2008b\)](#). [Di Tella et al. \(2007\)](#) apply all lags between 1 and 4 years in the past; [Di Tella and MacCulloch \(2008b\)](#) apply all lags between 1 and 7 years in the past. While the first paper offers, in addition, the analysis of adaptation to one's social status (as measured by the OPS), the second paper investigates the issue of income adaptation when basic needs are satisfied, exploring a broader sample of subjects than ours (including also the the World Gallup Poll and the Eurobarometer for 16 European countries). The fundamental conclusion of both papers is that after about 5 years adaptation is almost complete for certain social groups, while it is never complete for others. On balance, evidence suggests that adaptation exists and is relevant but is not complete, at least when the whole population is considered.

Our choice of using a three-years-in-the-past income to capture income adaptation is not an *ad hoc* choice. To show this in section 4.1 we report estimations of equation (2) where  $y_{i,t-k}$  is alternatively specified with  $k$  equal to 1, 2, 4, 5, 6, 7 and 8. Again, the choice of using household income instead of personal income follows the idea that people's access to resources is better proxied by the former.

### 2.5. Indicators of sociability

In this paper by sociability we mean non-instrumental non-market relationships among individuals. There is a certain terminological variability in the rapidly growing economic literature on sociability. The latter is indicated with the term social capital ([Helliwell, 2006](#); [Helliwell and Putnam, 2004](#); [Sabatini, 2006](#)), relational goods ([Uhlener, 2009](#); [Gui and Sugden, 2005](#); [Bruni and Stanca, 2008](#); [Becchetti et al., 2008](#)), social interactions ([Durlauf, 2001, 2002](#)). Although we recognize that these terms might be used to mean different constructs we stress that this is not the case in the present study.

We measure sociability with a number of indicators which are supposed to capture voluntary social interactions. More precisely, we focus on the frequency of social activities such as attending religious events, attending cultural events, attending cinema, pop concerts and similar, participating actively in sports, attending social gatherings, helping out friends, performing volunteer work, and participating in local politics. The GSOEP has a specific variable for each of these activities. In particular, respondents are asked to say which of the following frequencies best fits their lifestyle: every day (1); every week (2); every month

(3); less frequently (4); never (5). Their descriptive statistics are reported in table 10 in the Appendix.

For each of the eight indicators we construct a dummy variable which is set equal to 1 if the respondent perform the mentioned activity at least once a month, and 0 otherwise. We have chosen the reported frequency “at least once a month” as a threshold because it well captures the sample variation. This can be seen in table 1 which illustrates the frequencies of social activities for the whole population of Germany during the period considered. These figures are representative of the actual population as we used the appropriate weights to calculate them.

Becchetti et al. (2008) and Becchetti et al. (2009) investigate the relationship between sociability and SWB using the GSOEP. In both papers only five of the eight indicators mentioned above are employed to construct a Relational Time Index which is then applied in a bunch of causality tests. More precisely, the following indicators are excluded: (i) attending cinema, pop concerts, dance hall and related events, (ii) helping out friends or relatives, and (iii) participating in local political activities. It is true that these indicators do not capture only a relational dimension but also other aspects of life that are reasonably relevant to SWB. Listening to good music or tuning one’s body to music might increase SWB by itself. We do not deny this case, but presume that such activities have a relational part which qualifies them as beneficial to SWB. Put it differently, going to a pop concert or to a dancing hall without having good interactions with other individuals is not likely to provide a sensible increase in one’s SWB, although the benefit from going cannot be totally imputed to social relations. Paraphrasing Lim and Putnam (2008), dancing alone is not fun.

### 3. Results

In this section we illustrate the baseline estimation of equation (2) as well as the predictions of changes in SWB associated with changes in its correlates. Special attention will be given to income-related variables and sociability indicators. Therefore, the discussion will mostly be focused on figures related to them and, for the sake of comparison, other important correlates such as marital and work status. Indeed, the estimates associated with correlates other than these are in line with the SWB literature and do not deserve any special comment.<sup>6</sup> The only exception is age to which we will devote some space. All relevant

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<sup>6</sup>For a detailed discussion of standard demo-socio-economic controls see Clark and Oswald (1994); Blanchflower and Oswald (2004b); Frey and Stutzer (2002), and Van Praag et al. (2003).

<b>Go to church or religious institution</b>				<b>Cultural events (concerts, theater, lectures)</b>			
<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>	<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
[−1] No Answer	1,673.19	0.46	0.46	[−1] No Answer	1,974.03	0.54	0.54
[1] Every day	13,245.93	3.65	4.11	[1] Every day	10,178.24	2.8	3.35
[2] Every week	17,774.41	4.9	9	[2] Every week	26,486.73	7.3	10.64
[3] Every month	43,464.11	11.97	20.98	[3] Every month	85,108.55	23.44	34.08
[4] Less Frequently	84,280.77	23.21	44.19	[4] Less Frequently	87,583.15	24.12	58.21
[5] Never	30,049.32	8.28	52.47	[5] Never	27,421.27	7.55	65.76
not observed	172,585.28	47.53	100	not observed	124,321.03	34.24	100
Total	363,073	100		Total	363,073	100	
<b>Cinema, pop concerts, dance, sport events</b>				<b>Participate in sports</b>			
<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>	<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
[−1] No Answer	2,285.49	0.63	0.63	[−1] No Answer	3,226.42	0.89	0.89
[1] Every day	12,726.16	3.51	4.13	[1] Every day	53,677.99	14.78	15.67
[2] Every week	30,145.76	8.3	12.44	[2] Every week	27,850.02	7.67	23.34
[3] Every month	71,153.10	19.6	32.04	[3] Every month	34,421.52	9.48	32.82
[4] Less Frequently	83,926.06	23.12	55.15	[4] Less Frequently	94,412.28	26	58.83
[5] Never	26,472.51	7.29	62.44	[5] Never	25,163.74	6.93	65.76
not observed	136,363.93	37.56	100	not observed	124,321.03	34.24	100
Total	363,073	100		Total	363,073	100	
<b>Visit firends, relatives, or neighbors</b>				<b>Help out friends, relatives, or neighbors</b>			
<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>	<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
[−1] No Answer	1,249.44	0.34	0.34	[−1] No Answer	1,849.72	0.51	0.51
[1] Every day	70,305.45	19.36	19.71	[1] Every day	20,766.50	5.72	6.23
[2] Every week	63,095.45	17.38	37.09	[2] Every week	51,622.22	14.22	20.45
[3] Every month	37,463.24	10.32	47.4	[3] Every month	77,657.99	21.39	41.84
[4] Less Frequently	5,528.37	1.52	48.93	[4] Less Frequently	25,745.52	7.09	48.93
not observed	185,431.04	51.07	100	not observed	185,431.04	51.07	100
Total	363,073	100		Total	363,073	100	
<b>Volunteer work</b>				<b>In actions groups, political parties, local gov</b>			
<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>	<b>Answer</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
[−1] No Answer	3,068.02	0.85	0.85	[−1] No Answer	3,334.45	0.92	0.92
[1] Every day	22,899.73	6.31	7.15	[1] Every day	12,585.66	3.47	4.38
[2] Every week	16,821.25	4.63	11.79	[2] Every week	3,804.68	1.05	5.43
[3] Every month	24,909.77	6.86	18.65	[3] Every month	12,253.39	3.37	8.81
[4] Less Frequently	125,660.27	34.61	53.26	[4] Less Frequently	154,204.49	42.47	51.28
[5] Never	45,392.93	12.5	65.76	[5] Never	52,569.29	14.48	65.76
not observed	124,321.03	34.24	100	not observed	124,321.03	34.24	100
Total	363,073	100		Total	363,073	100	

Table 1: Distributions of answers to item measuring sociability indicators for the whole GSOEP.

figures are reported either in this section or in the Appendix.

### 3.1. *The SWB regression*

We estimate equation (2) using OLS with individual fixed effects under the baseline specification described in the previous section. Table 2 reports the estimates.

A first relevant finding is that greater income goes with greater SWB, although not dramatically greater. The coefficients of reference income and lagged income are both highly significant and consistent with the presence, respectively, of social comparisons and hedonic adaptation. However, while the coefficient of absolute income is about 0.42, the coefficients of reference income and lagged income sum up to about -0.35 (being about -0.27 and -0.08, respectively), which amounts to more than four fifths of the former. Nevertheless, according to these numbers rising income goes with higher life satisfaction. To understand the magnitude of this effect is sufficient to look at the net change implied by a 500 euros rise in income, starting from an income of 200 euros per month. Passing from 200 to 700 euros is associated with a gain in life satisfaction of 0.093; from 700 to 1200 the gain is 0.04; from 1200 to 1700 the gain is 0.026; from 1700 to 2200 the gain is 0.019; from 2200 to 2700 the gain is 0.015; from 2700 to 3200 the gain is 0.013; from 3200 to 3700 the gain is 0.011, and so forth. These are non-negligible numbers.

Put it differently, evidence is consistent with the idea that both social comparisons and adaptation are at work, with the former having the most important role. However, the joint work of social comparisons and adaptation does not seem strong enough to wipe out the whole positive effect of rising income. This is consistent with what found by a series of papers exploring the potential role of social comparisons such as [Luttmer \(2005\)](#) and [Bartolini et al. \(2008\)](#) for the US, [Blanchflower and Oswald \(2004b\)](#) for both US and UK, and [Ferrer-i-Carbonell \(2005\)](#) for Germany.

Our findings are tightly related to those obtained by [Layard et al. \(2009\)](#) who estimate a SWB equation similar to ours using the GSOEP, although for West Germans only and considering a longer period. Similarly to us, they find that both lagged and reference income are negatively correlated with SWB, with reference income playing the major role. One difference between the figures in [Layard et al. \(2009\)](#) and ours is that the former show that benefits of income growth are fully offset by past and reference income. We suspect that this different outcome is due to the fact that they use a rough measure of reference income, namely average national household income.

The papers by [Di Tella et al. \(2007\)](#) and [Di Tella and MacCulloch \(2008b\)](#) suggest that, at least for certain social groups, income adaptation is complete after about five years. This is partly in contrast with our findings and with those of [Layard et al. \(2009\)](#) as we both find only a secondary role for income adaptation. We suspect that the main drive of this difference is the absence of a reference income variable with the consequence that past income might be capturing part of the reference income effects, hence increasing its relevance to SWB. Indeed in the case of [Di Tella et al. \(2007\)](#) social standing is measured by means of the OPS index, while in [Di Tella and MacCulloch \(2008b\)](#) social standing is totally absent. Admittedly, beyond our suspects we have no real clue on the source of such a difference. In any case, since in both papers full adaptation occurs only for certain social groups – females, leftists and employees in [Di Tella et al. \(2007\)](#), home-owners in [Di Tella and MacCulloch \(2008b\)](#) – on average full adaptation fails to happen, which is consistent with our findings.

A second relevant finding is that sociability seems to matter a great deal. To be more precise, a certain kind of sociability: being involved in volunteering and local political activities does not seem to go with higher SWB. On the contrary, attending cultural or religious events, participating in social gatherings, playing sports and helping friends seem to have a sensible positive correlation with SWB. In particular, participation in social gatherings shows the highest correlation. In principle, one cannot exclude that the insignificance of some regressors is due to a substantial overlap of indicators. To test this we run a principal component analysis on our eight sociability indicators. Results goes in the direction of rejecting the idea of strong overlapping – detailed results are reported in the appendix. Indeed, seven components capture between .16 and .06 of total variation, while the first one captures about .29. To obtain at least .8 of total variation we need at least six components while to obtain .95 we need all eight components.

To have an idea of the potential impact of sociability on SWB we can do a few simple calculations and comparisons. Consider two hypothetical individuals with identical characteristics but for the fact that the first has all sociability indicators equal to zero while second participates to social gatherings, helps friends, attends to both religious and cultural events, and plays sports at least once a month – and so has all sociability indicators equal to one. The SWB of the second individuals is larger by a factor of .65, which is definitely a substantial amount. To see this consider an individual that earns 1200 euro per month and ask how much additional earnings are required for an increase in SWB of about .65. Simple

calculations show that the individual must earn an additional 1000 euro per month – almost doubling his/her earnings – and this without considering adaptation and comparisons.

These findings are substantially in line with what found by [Bruni and Stanca \(2008\)](#) using the World Value Survey, by [Bartolini et al. \(2008\)](#) using the U.S. General Social Survey, by [Powdthavee \(2008\)](#) using the British Household Panel Survey, and by [Becchetti et al. \(2008\)](#) and [Becchetti et al. \(2009\)](#) using the GSOEP. More precisely, all these papers find a positive and significant correlation between sociability and SWB. Of particular interest are the papers of [Becchetti et al. \(2008\)](#) and [Becchetti et al. \(2009\)](#) which investigates the issue of the causal relationships between sociability and SWB. Their findings suggests that sociability causes SWB, although the presence of a reverse causation cannot be excluded.

As anticipated at the beginning of this section, the estimates associated with the remaining regressors are in line with the SWB literature so that we do not provide comments on them. The only exception is age which seems to have a concave negative impact suggesting that old age is associated with particularly low life satisfaction for Germans. This is in contrast with the typical finding in the SWB literature which suggests that the relationship between age and SWB is U-shaped.<sup>7</sup> Given the large amount of evidence in favor of the U-shape hypothesis, our result is of some interest and certainly deserves attention. In particular, there are papers where a SWB equations is estimated using the GSOEP and where the U-shape is found. This is the case of both [Van Praag et al. \(2003\)](#) and [Ferrer-i-Carbonell \(2005\)](#). In these papers, however, the age variables are the logs of current age and current age squared so that comparisons are hard to make.

Another case is [Ferrer-i-Carbonell and Frijters \(2004\)](#) who find the U-shape in a variety of different models that use a specification of age variables similar to ours, suggesting that our finding of a negative and concave relationship between age and SWB rests on something peculiar to this study. A natural guess in this regard is that the introduction of sociability indicators distorts the U-shape relationship.<sup>8</sup> To test for this we run a new regression excluding sociability indicators. The negative concave relationship, however, turned out to be robust to such an exclusion.

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<sup>7</sup>See e.g. [Clark and Oswald \(2006\)](#), [Blanchflower and Oswald \(2004a\)](#) and references therein for a full list of contributions supporting the U-shape hypothesis in economics. See instead [Mroczek and Spiro \(2005\)](#) for a recent contribution in the psychological literature which also supports the U-shape hypothesis. Interestingly enough, [Mroczek and Spiro \(2005\)](#) find that the age of minimum SWB is greater than the one typically found by economists of about twenty years (in the 60s instead of the 40s).

<sup>8</sup>In this respect, [Becchetti et al. \(2008\)](#) do not provide any indication since they do not allow for a non-linear relationship between age and SWB.



A possible alternative explanation is that the U-shape relationship is not the whole story, at least for what concerns the GSOEP. This is indeed suggested by the analysis of [Becchetti et al. \(2009\)](#) who, using dummies for age categories, find that the relationship between age and SWB is U-shaped only up to mid 60s and after that becomes negative and concave.<sup>9</sup> To test if we were capturing the old age concavity we run an additional regression excluding people of age 65 or older. We found that the usual U-shape re-appears. This suggests that the negative and concave relationship estimated in the baseline regression is mainly due to a strongly negative and concave relationship in the very old age. We run further regressions with higher specification of age variables with an order higher than two which confirms our hypothesis.

### 3.2. Prediction of SWB

Before proceeding with our analysis, it is useful to have an idea of the evolution of SWB in the period considered. Figure 3.2 illustrates the path of SWB separately for East and West Germany as well as for them considered as a whole. As one can see SWB slightly declines, if anything, for everybody between 1996 and 2007.<sup>10</sup> Therefore, we can say that a prediction should give an almost flat trend in order to be acceptable.

Using the estimates of (2) we attempt to predict the average variation of SWB from 1996 to 2007 in the whole Germany. We do this by calculating the implied variation in SWB associated with each statistically significant regressor in equation 2, apart from Lander and years dummies. More precisely, the implied SWB variation is obtained as the sum over the products of the (statistically significant) estimated coefficients and the total variation of the regressors associated with such coefficients. Formally, we predict the SWB variation as follows:

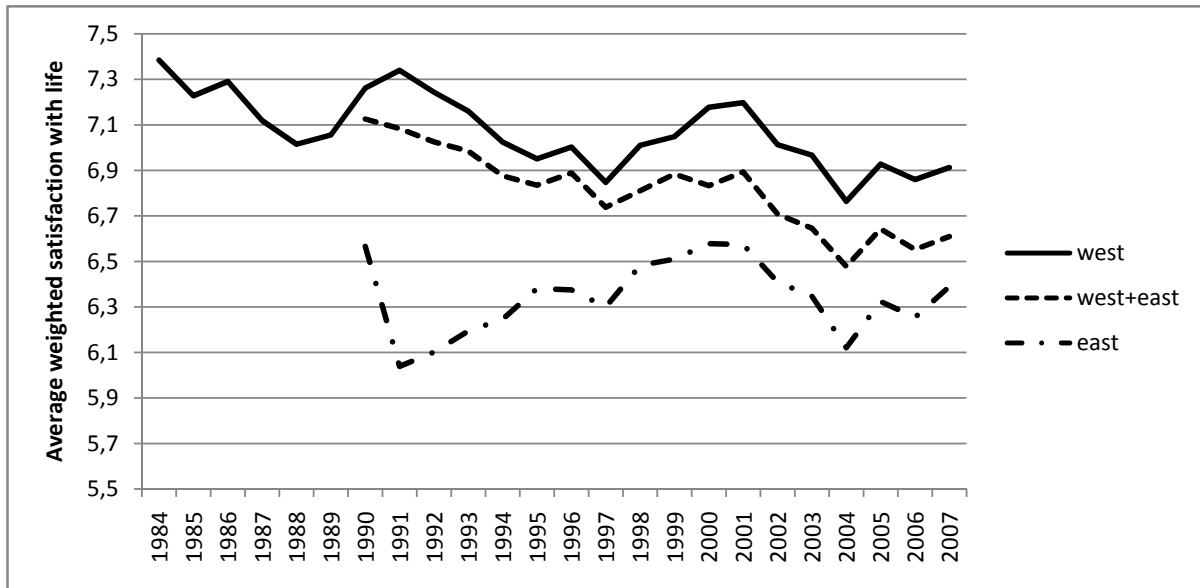
$$\Delta\hat{S}WB = \hat{b}\Delta\tilde{X} + \hat{c}_1\Delta\ln(y) + \hat{c}_2\Delta\ln(\bar{y}) + \hat{c}_3\Delta\ln(y_{-3}) + \hat{d}\Delta\tilde{S}C \quad (3)$$

where  $\hat{b}$ ,  $\hat{c}_1$ ,  $\hat{c}_2$ ,  $\hat{c}_3$  and  $\hat{d}$  are the estimated coefficients of (2) which resulted statistically significant at least at the 10% level, while  $\Delta\tilde{X}$ ,  $\Delta\ln(y)$ ,  $\Delta\ln(\bar{y})$ ,  $\Delta\ln(y_{-3})$ , and  $\Delta\tilde{S}C$  collect the variations of regressors associated with such coefficients.

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<sup>9</sup>See also [Van Landeghem \(2008\)](#) on this.

<sup>10</sup>This period is not long enough to tell us something certain about the Easterlin paradox ([Easterlin and Angelescu, 2009](#)) but, since Germany grew considerably between 1996 and 2007, it nevertheless suggests that the paradox may be there.



Trends of average weighted satisfaction with life for the three sub-samples: westerners (1984 – 2007); easterners (1990 – 2007) and the two sub-samples together (1990 – 2007). Averages have been computed using cross-sectional sampling weights (GSOEP source variable: w1110507).

Figure 1: Trends of average weighted satisfaction with life for the three sub-samples: westerners (1984 – 2007); easterners (1990 – 2007) and the two sub-samples together (1990 – 2007). Averages have been computed using cross-sectional sampling weights (GSOEP source variable: w1110507).

We emphasize that variations of regressors are calculated using the weights provided in the GSOEP which allows to correct for special purpose stratifications and over-samplings. This has two consequences. First, we can attempt to predict the variation of SWB for the whole population of Germany, and not only for the sample of individuals surveyed in the GSOEP. Second, our calculation is indeed a prediction and not just a decomposition technique. This latter point is reinforced by the fact that, while we estimated equation (2) for the period 1994-2007, we calculate equation (3) only for the period 1996-2007. We do this because before 1994 lagged income is not observed for the East Germany sample while in 1993 and 1995 sociability indicators are not observed at all.

Table 3 reports the predicted changes in SWB at the most disaggregated level. Before moving to more aggregated figures, a brief comment on the trends of significant regressors is worth doing. Married and widowed individuals seem to have decreased in number while separated ones have increased. This suggests that the number of singles has been systematically increasing during the period considered. Not surprisingly, average age increased of

about two years while the share of household having children decreased for all categories considered. Consistently with these trends, household size decreased as well. These numbers depict an important change in the average household in Germany: older, smaller, with less children, and more often constituted by a single person. As expected, income growth has induced an increase in all income variables, i.e. absolute income, reference income, and past income. Again unsurprisingly, both unemployment and military/civil service slightly decreased.

Turning to sociability indicators we see that most of them increased between 1996 and 2007. This is especially true for participating actively in sports and attending cultural events which increased, respectively, of 10% and 4%. Also the remaining indicators show an upward variation of about 1-2%. The only exception is participation to religious activities, with a 3% decrease.

Let us now turn to the most relevant set of figures. Table 4 illustrates the predicted changes in SWB when we aggregate the regressors in five categories: marital status, age, income, sociability, and work status. Basically, these categories represent important life domains which are supposed to sensibly affect life satisfaction.<sup>11</sup> Before commenting on each category separately, we find important to remind the reader that small changes in SWB are typically very relevant. Indeed, SWB is a measure with an extremely low variability: it shows a standard deviation of just 1.84 in a scale which length is 11 (from 0 to 10). Therefore, even a 0.1% change in SWB, which amounts to an absolute change of about 0.007, is worth serious attention.

First note that the total predicted variation is .06, which is very close to observed variation that is about .07. This is a remarkably good result, not at all warranted. Indeed, [Di Tella and MacCulloch \(2008a\)](#) show that applying a similar technique, one can get predictions far away from observed values. Moreover, they show that adding regressors with significant estimates can even worsen the prediction precision.

A second interesting thing to note is that substantial changes in marital status predict a rather small change in SWB. This is the result of two contrasting facts: less married people and more separate people against less widowed people. This is in sharp contrast with what found in [Bartolini et al. \(2008\)](#) where marital status was shown to predict a large decrease in the SWB of US citizens. One possible reason for this difference is the different period

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<sup>11</sup>Such an aggregation is provided in the attempt to give meaning to numbers, but we want to emphasize that it is by no means the only meaningful way to aggregate SWB variations.

considered – [Bartolini et al. \(2008\)](#) look at 1975-2004 – which may have seen a much stronger deterioration of traditional marriages and an upsurge of separations and divorces. Another potential explanation is that marital relationships were less hard to sustain in Germany than in the US. A further thing to note is that a mild change in work status predicts a small change in SWB. Here, however, there is no contrast: both less unemployment and less military/civil service predict a higher SWB.

Moreover, note that the increase in age predicts the largest negative change in SWB. Given the negative concave relationship between age and SWB that we found in the estimates of (2) this is not surprising. However, we admit that this result was unexpected, at least in terms of magnitude. Trying to make sense out of the numbers, we can imagine that the growth in the number of very old people may be a first responsible for the lack of growth in SWB in Germany. This claim, however, needs to be carefully scrutinized in further dedicated studies.

Turning our attention to income growth, we see that it predicts a small but not negligible increase in SWB. This is consistent with the findings of both [Bartolini et al. \(2008\)](#) for the US and [Di Tella and MacCulloch \(2008a\)](#) for the EU. In other words, it seems that more money goes with more SWB, although only moderately so. We stress that the evidence provided here is relative to the short/medium run.

A further positive change in SWB is predicted by the change in household characteristics. More precisely, the reduction in the number of children predicts a reduction in SWB which is more than offset by the positive change predicted by the shrinking in household size. This is consistent with what found in [Blanchflower and Oswald \(2004b\)](#) and [Bartolini et al. \(2008\)](#). Our interpretation is that the reduction in household size captures the fact that a given amount of household income commands more goods and services per household member, while having less children captures a poorer relational environment in the household.

Finally, sociability predicts an important increase in SWB. More precisely, it provides the largest predicted variation of SWB after that predicted by age, and the largest positive. This suggests an important role for sociability. Again, this is consistent with [Bartolini et al. \(2008\)](#) who finds that the US change in SWB between 1975 and 2004 is better predicted when we include, among other regressors, social capital indicators. Our findings reinforce that of [Bartolini et al. \(2008\)](#) since the former are obtained controlling for individual unobservable fixed effects and income adaptation.

Summing up, the slight decrease in SWB that has taken place in Germany between

1996 and 2007 is well predicted by the following contrasting trends: better sociability for a moderate increase in SWB, income growth for a slight increase in SWB, aging for a substantial decrease in SWB, an improvement of work status for a slight increase in SWB that just offset the slight decrease predicted by the worsening of marital status.

### *3.3. Prediction or Decomposition?*

Given the similarities between a simple decomposition of variation and our prediction exercise, one might wrongly think that our analysis is in fact just a decomposition. We stress that this is not the case. There are at least two important reasons for this.

In the first place, we do not use all estimated coefficients, but only those that turn out to be statistically significant at least at 10% level. Moreover, we also discard statistical significant coefficients of regional and year dummies. We do this because we want to test if we can predict the SWB trend only on the basis of the correlates we focus on.

In the second place, we estimate our baseline regression without weights while we carry out our predictions applying weights. This means that the variation used to estimate our baseline regression is not the same that we apply to make our predictions.

Finally, as convincingly shown by [Di Tella and MacCulloch \(2008a\)](#), following our approach one can get predictions far away from observed values. In particular, adding regressors with significant estimates will not necessarily ameliorate the precision of prediction, but can actually worsen it. This is a proof that we do predictions and not just decomposition.

**OLS with individual fixed effects, Germany in 1994-2007**

Dependent variable: Life satisfaction (1-10)	Coefficient	p-value
married	0.0968	[0.024]**
separated	-0.3320	[0.000]***
divorced	-0.0014	[0.983]
widowed	-0.2110	[0.009]***
age	-0.0211	[0.000]***
age squared	-0.0003	[0.000]***
household size	-0.1250	[0.000]***
1 child	0.1280	[0.002]***
2 children	0.1550	[0.004]***
3 or more children	0.3670	[0.000]***
years of education	0.0095	[0.233]
living with parents when 16	-0.0009	[0.983]
log of monthly household income	0.4210	[0.000]***
log of reference income	-0.2720	[0.001]***
log of monthly household income 3 years before	-0.0751	[0.000]***
at least monthly attending religious events	0.0766	[0.000]***
at least monthly attending cultural events	0.1280	[0.000]***
at least monthly attending cinema, pop concerts and similar	0.0276	[0.183]
at least monthly actively participating in sports	0.0671	[0.000]***
at least monthly volunteering	-0.0200	[0.290]
at least monthly participating in social gatherings	0.1900	[0.000]***
at least monthly helping out friends	0.0733	[0.000]***
at least monthly participating in local political activities	-0.0160	[0.533]
unemployed	-0.5540	[0.000]***
student	0.0214	[0.679]
not working for other reasons	-0.0446	[0.147]
retired	0.0495	[0.240]
doing military or civil service	-0.2430	[0.055]*
living in West Germany	-0.1590	[0.779]
Year dummies	yes	.
Lander dummies	yes	.
constant	8.144	[0.000]***
<hr/>		
Number of observations	59527	
Overall R-square	0.03	
F-stat	35.34	p < 0.000

Table 2: OLS regression with robust standard errors and individual fixed effects. The omitted categories are: employed, living in East Germany, without children, and single. Year and Lander dummies included. First column shows the coefficients from the regression (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%). The last column reports the p-value.

Predicting the evolution of life satisfaction in Germany, disaggregated

Estimates of baseline regression					Predicted			
Variables	Coeff	p-value	Mean	StDv	Mean	StDv	$\Delta 96-07$	$\Delta SWB$
SWB (observed)			6.885	1.842	6.816	1.855	<b>-0.069</b>	
married	0.097	[0.024]**	0.560	0.496	0.521	0.500	-0.039	-0.0038
separated	-0.332	[0.000]***	0.018	0.132	0.021	0.143	0.003	-0.0010
divorced	-0.001	[0.983]	0.071	0.258	0.094	0.292	0.023	
widowed	-0.211	[0.009]***	0.105	0.306	0.087	0.282	-0.018	0.0037
age	-0.021	[0.000]***	47.183	18.035	49.025	18.034	1.842	-0.0389
age squared	-0.0003	[0.000]***	2551.5	1824.7	2728.7	1868.9	177.211	-0.0503
household size	-0.125	[0.000]***	2.590	1.285	2.439	1.236	-0.151	0.0189
1 child	0.128	[0.002]***	0.169	0.375	0.150	0.357	-0.019	-0.0024
2 children	0.155	[0.004]***	0.108	0.311	0.088	0.283	-0.020	-0.0031
3 or more children	0.367	[0.000]***	0.035	0.185	0.025	0.156	-0.011	-0.0039
years of education	0.010	[0.233]	11.464	2.515	12.044	2.639	0.580	
with parents at 16	-0.001	[0.983]	1.708	0.455	1.757	0.429	0.049	
log monthly income	0.421	[0.000]***	7.699	0.487	7.750	0.583	0.050	0.0212
log reference income	-0.272	[0.001]***	7.815	0.158	7.867	0.230	0.053	-0.0143
log income 3 years before	-0.075	[0.000]***	7.627	0.572	7.645	0.594	0.018	-0.0013
monthly at church	0.077	[0.000]***	0.488	0.500	0.459	0.498	-0.029	-0.0022
monthly at cultural events	0.128	[0.000]***	0.659	0.474	0.691	0.462	0.031	0.0040
monthly at cinema	0.028	[0.183]	0.647	0.478	0.689	0.463	0.041	
monthly playing sport	0.067	[0.000]***	0.518	0.500	0.610	0.488	0.091	0.0061
monthly at soc. gathering	0.190	[0.000]***	0.778	0.416	0.789	0.408	0.011	0.0022
monthly helping friends	0.073	[0.000]***	0.411	0.492	0.437	0.496	0.025	0.0019
monthly volunteering	-0.020	[0.290]	0.293	0.455	0.303	0.460	0.011	
monthly political active	-0.016	[0.533]	0.111	0.314	0.082	0.274	-0.029	
unemployed	-0.554	[0.000]***	0.061	0.239	0.056	0.231	-0.004	0.0025
student	0.021	[0.679]	0.030	0.171	0.029	0.167	-0.001	
non working	-0.045	[0.147]	0.133	0.339	0.091	0.288	-0.041	
retired	0.050	[0.240]	0.177	0.382	0.206	0.404	0.028	
military/civil service	-0.243	[0.055]*	0.003	0.054	0.001	0.030	-0.002	0.0005
west	-0.159	[0.779]	0.813	0.390	0.815	0.388	0.003	

Table 3: First column shows the coefficients of the baseline SWB regression (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%). Second and third columns report, respectively, mean values of regressors in 1996 and their standard errors. Fourth and fifth columns report, respectively, mean values of regressors in 2007 and their standard errors. Sixth column reports the difference between average values of regressors in 2007 and average values in 1996. Last column reports the change in predicted probability of reporting to be “satisfied with own life” which is imputed to each regressor (it comes from the product of the values in column seven and the coefficients reported in column one). Reported numbers are relative to coefficients that are significant at least at the 10% level.

**Predicting the trend of life satisfaction in 1996-2007, partial sums**

Variables	Coeff.	$\Delta 96-07$	Predicted $\Delta SWB$		
			all	partial sums	total
life satisfaction (observed)		<b>-0.069</b>			
married	0.097	-0.039	-0.0038		
separated	-0.332	0.003	-0.0010	<b>Marital status</b>	
widowed	-0.211	-0.018	0.0037	-0.001	
age	-0.021	1.842	-0.0389	<b>Age</b>	
age squared	-0.0003	177.211	-0.0503	-0.089	
household size	-0.125	-0.151	0.0189		
1 child	0.128	-0.019	-0.0024	<b>Household</b>	
2 children	0.155	-0.020	-0.0031	<b>characteristics</b>	
3 or more children	0.367	-0.011	-0.0039	0.010	
log monthly income	0.421	0.050	0.0212		
log reference income	-0.272	0.053	-0.0143	<b>Income</b>	
log income 3 years before	-0.075	0.018	-0.0013	0.006	
monthly at religious events	0.077	-0.029	-0.0022		
monthly at cultural events	0.128	0.031	0.0040		
monthly playing sport	0.067	0.091	0.0061		
monthly at social gathering	0.190	0.011	0.0022	<b>Sociability</b>	
monthly helping friends	0.073	0.025	0.0019	0.012	
unemployed	-0.554	-0.004	0.0025	<b>Work status</b>	
military/civil service	-0.243	-0.002	0.0005	0.003	<b>-0.06</b>

Table 4: First column reports the estimated coefficient which are significant at least at 10% level. Second column reports the variation of the regression between 1996 and 2007, properly weighted to represent German population. Third column reports the predicted change in life satisfaction associated with each regressor. Fourth column reports partial sums of predictions while last column reports the total sum. Observed variation of life satisfaction is displayed at the top of second column.



## Varying the lag of past household income: East and West Germany

Variables	(1) Coeff.	(2) Coeff.	(3) Coeff.	(4) Coeff.	(5) Coeff.	(6) Coeff.	(7) Coeff.
married	0.0867**	0.0978**	0.0968**	0.0989**	0.0935**	0.0752	0.0944*
separated	-0.333***	-0.336***	-0.332***	-0.334***	-0.328***	-0.373***	-0.337***
divorced	0.0410	0.0235	-0.00142	0.000190	0.0230	-0.0130	-0.00196
widowed	-0.190**	-0.157**	-0.211***	-0.192**	-0.219***	-0.292***	-0.253***
age	-0.0223***	-0.0231***	-0.0211***	-0.0207***	-0.0222***	-0.0199***	-0.0194***
age2	-0.000268***	-0.000253***	-0.000284***	-0.000289***	-0.000277***	-0.000289***	-0.000292***
household size	-0.134***	-0.133***	-0.125***	-0.124***	-0.110***	-0.111***	-0.121***
1 child	0.144***	0.144***	0.128***	0.144***	0.114**	0.122**	0.126***
2 children	0.183***	0.180***	0.155***	0.176***	0.121**	0.118**	0.102*
3 or more children	0.401***	0.384***	0.367***	0.381***	0.312***	0.317***	0.326***
years of education	0.00593	0.00737	0.00954	0.00962	0.00977	0.00597	0.00639
living with parents when 16	0.00864	0.0119	-0.000920	0.0179	-0.00287	0.00499	-0.00487
log of monthly household income	0.442***	0.435***	0.421***	0.405***	0.380***	0.365***	0.382***
log of reference income	-0.217***	-0.227***	-0.272***	-0.243***	-0.226***	-0.235***	-0.211**
log of monthly household income 1 year before	-0.0350						
log of monthly household income 2 year before		-0.0434**					
log of monthly household income 3 year before			-0.0751***				
log of monthly household income 4 year before				-0.0578***			
log of monthly household income 5 year before					-0.0727***		
log of monthly household income 6 year before						-0.0761***	
log of monthly household income 7 year before							-0.0424**
at least monthly attending religious events	0.0924***	0.0964***	0.0766***	0.0697***	0.0718***	0.0733***	0.0697***
at least monthly attending cultural events	0.125***	0.125***	0.128***	0.129***	0.132***	0.140***	0.137***
at least monthly attending cinema, pop concerts, etc	0.0352*	0.0354*	0.0276	0.0265	0.0240	0.0123	0.00747
at least monthly actively participating in sports	0.0767***	0.0766***	0.0671***	0.0716***	0.0771***	0.0780***	0.0861***
at least monthly volunteering	0.179***	0.183***	0.190***	0.186***	0.191***	0.183***	0.193***
at least monthly participating in social gatherings	0.0628***	0.0628***	0.0733***	0.0747***	0.0757***	0.0830***	0.0889***
at least monthly helping out friends	-0.0111	-0.00624	-0.0200	-0.0125	-0.0135	-0.00492	-0.00828
at least monthly participating in local political activities	-0.0264	-0.0269	-0.0160	-0.0164	-0.0202	-0.0224	-0.0257
unemployed	-0.586***	-0.593***	-0.554***	-0.566***	-0.547***	-0.548***	-0.560***
student	0.0315	0.0438	0.0214	0.0170	0.0283	0.0304	0.0722
not working for other reasons	-0.0362	-0.0427	-0.0446	-0.0405	-0.0435	-0.0404	-0.0459
retired	0.0567	0.0442	0.0495	0.0507	0.0273	0.0159	0.0207
doing military or civil service	-0.219*	-0.243**	-0.243*	-0.219*	-0.248*	-0.149	-0.164
living in West Germany	-0.190	-0.194	-0.159	-0.192	-0.198	-0.149	-0.372
Year dummies	yes	yes	yes	yes	yes	yes	yes
Lander dummies	yes	yes	yes	yes	yes	yes	yes
constant	7.265***	7.404***	8.144***	7.871***	8.114***	8.241***	7.914***
number of observations	64999	64054	59527	58560	54338	50221	49412
R2 overall	0.0317	0.0325	0.0273	0.0260	0.0251	0.0258	0.0261
F	37.49	36.58	35.34	34.56	32.33	30.01	29.62
prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 5: OLS regression with robust standard errors and individual fixed effects. The omitted categories are: employed, living in East Germany, without children, and single. Year and Lander dummies included. Column from (1) to (7) report estimates for different lags of past income, respectively, from 1 to 7. Column (3) replicates baseline results. (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%.)

## 4. Robustness checks

In this section we explore the robustness of our findings by varying the specification of the baseline equation and, where necessary, adjusting predictions accordingly.

### 4.1. *Alternative specifications of adaptation*

As anticipated in section 2.4, we re-estimated equation (2) with different year lags for the variable recording past household income. In particular, we re-estimate (2) with  $k = 1, 2, 4, 5, 6, 7,$  and 8. The estimates are reported in table 5. In each regression we include a different specification of lagged income. The numbers reported in the top row of table 5 identify the regressions and also indicate the number of years used to calculate lagged household income. For the sake of comparison, we report also the estimation with  $k = 3$ .

Overall, previous results seem confirmed. Almost all coefficients of non-income variables turn out to be extremely stable to this change in specification. One exception is the coefficient associated with the sociability indicator “at least monthly attending cinema, pop concerts, etc” which, by increasing the lag of past income, becomes smaller and eventually statistically insignificant. This may be mainly due to the fact that with a longer lag we lose observations on young people which are more likely to go and benefit from such activities. Another exception is military/civil service. This also may be driven by the progressive exclusion of young people. Further investigation on descriptives - that we do not report here - confirms these guesses.

Turning our attention to the coefficients of income variables, we notice that those associated with absolute income and reference income show a remarkable robustness to changes in the lag of past income. The coefficient of reference income is substantially invariant while the coefficient of absolute income slightly decreases in the length of the lag, but differences are neither statistically nor economically significant.

The coefficients of lagged income show some variability but, with the exclusion of the 1-year lag, all have the expected sign and roughly a similar magnitude. The coefficient of lagged income obtained in the regression with 1-year lag of past income is not statistically significant. However, its magnitude is in line with other estimates.

Summing up, this check supports the robustness of the baseline estimation of equation 2.

#### *4.2. West Germany between 1988 and 2007*

In section 3 we clarified that in order to consider a time period longer than 1996-2007 one has to restrict the analysis to the West Germany sample only. In this sub-section we illustrate the repetition of our analysis under such a restriction while extending the time period to 1988-2007.

One limitation of focusing on this longer period is that we have to drop the sociability indicator about religious activities. This is because the question about religious activities has been asked since 1991 only. Nevertheless, estimates for Westerns turn out to be rather similar to those of the baseline regression, hence supporting our hypothesis. Table 6 reports these figures. Sociability indicators have coefficients that are remarkably similar to those estimated for equation (2). The only difference is that also participating to popular events has a statistically significant coefficient, with magnitude similar to that of participating to cultural events. If anything, this reinforces the relevance of sociability indicators.

The only remaining differences which are worth mentioning come from work status, and income variables. Unemployment is still the most important among work status variables, but now, in the place of civil/military service, results suggest that being retired and not working for other reasons are important. For what concerns income, we observe a smaller size of coefficients (in absolute value). In particular, reference income is sensibly smaller with the result that the overall contribution of income growth to SWB might be greater than what observed in our baseline estimation. Indeed, the sum of the coefficients of reference income and past income is only about one half of the coefficient of absolute income, while in our baseline regression they sum up to about four fifths of absolute income.

Since we changed both sample and time period, calculating again predicted changes of SWB is a good robustness check for our previous findings. We report this check in table 7. In the period considered the SWB of Westerns decreased substantially more – almost twice as much – than Germany’s average SWB during 1996-2007. Of this decrease, our estimates predict about one half. This is a good enough prediction, especially in the light of the fact that we miss the indicator for religious activities that, as shown in our baseline predictions, has been decreasing.

Turning our attention to marital status, age, and household characteristics, we see that, despite some differences, our results are substantially in line with what seen for the baseline predictions. An interesting difference is that the change in household characteristics predicts a larger increase in SWB. We believe this is due to the fact that during the period consid-

**OLS with individual fixed effects, West Germany in 1988-2007**

Dependent variable: Life satisfaction (1-10)	Coefficient	p-value
married	0.109	[0.001]***
separated	-0.460	[0.000]***
divorced	-0.034	[0.560]
widowed	-0.337	[0.000]***
age	-0.022	[0.059]***
age squared	0.000	[0.059]*
household size	-0.123	[0.000]***
1 child	0.132	[0.001]***
2 children	0.170	[0.001]***
3 or more children	0.379	[0.000]***
years of education	0.001	[0.980]
living with parents when 16	-0.002	[0.962]
log of monthly household income	0.393	[0.000]***
log of reference income	-0.149	[0.063]*
log of monthly household income 3 years before	-0.033	[0.067]*
at least monthly attending cultural events	0.103	[0.000]***
at least monthly attending cinema, pop concerts and similar	0.063	[0.001]***
at least monthly actively participating in sports	0.068	[0.000]***
at least monthly volunteering	-0.005	[0.767]
at least monthly participating in social gatherings	0.221	[0.000]***
at least monthly helping out friends	0.071	[0.000]***
at least monthly participating in local political activities	-0.018	[0.475]
unemployed	-0.571	[0.000]***
student	0.065	[0.163]*
not working for other reasons	-0.075	[0.006]***
retired	0.015	[0.717]
doing military or civil service	-0.272	[0.047]**
Year dummies	yes	.
Lander dummies (West Germany)	yes	.
constant	6.559	[0.000]***
Number of observations	80337	
Overall R-square	0.03	
F-stat	44.410	p < 0.000

Table 6: OLS regression with robust standard errors and individual fixed effects. The omitted categories are: employed, without children, and single. Year and Western Lander dummies included. First column shows the coefficients from the regression (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%). The last column reports the p-value.

**West Germany: Predicting the trend of life satisfaction in 1988-2007**

Variables	Coeff.	$\Delta 88-07$	Predicted $\Delta$ SWB		
			all	partial sums	total
life satisfaction (observed)		<b>-0.130</b>			
married	0.127	-0.033	-0.0036		
separated	-0.460	0.002	-0.0012	<b>Marital status</b>	
widowed	-0.337	0.001	-0.0002	-0.005	
age	-0.022	4.964	-0.1102	<b>Age</b>	
age squared	-0.0003	451.431	-0.0479	-0.158	
household size	-0.123	-0.333	0.0410		
1 child	0.132	-0.061	-0.0080	<b>Household</b>	
2 children	0.170	0.004	0.0007	<b>characteristics</b>	
3 or more children	0.379	-0.001	-0.0004	0.033	
log monthly income	0.393	0.039	0.0154		
log reference income	-0.149	0.090	-0.0133	<b>Income</b>	
log income 3 years before	-0.033	0.147	-0.049	-0.003	
monthly at culture events	0.103	0.134	0.0138		
monthly at cinema	0.063	0.118	0.0075		
monthly sport activities	0.069	0.174	0.0119		
monthly at social gathering	0.221	0.033	0.0074	<b>Sociability</b>	
monthly helping friends	0.071	0.137	0.097	0.051	
unemployed	-0.571	-0.001	0.0007	<b>Work status</b>	
not working formother reasons	-0.075	-0.087	-0.0065		
doing military or civil service	-0.272	-0.006	0.0017	0.009	<b>-0.073</b>

Table 7: First column reports the estimated coefficient which are significant at least at 10% level. Second column reports the variation of the regression between 1988 and 2007, properly weighted to represent West German population. Third column reports the predicted change in life satisfaction associated with each regressor. Fourth column reports partial sums of predictions while last column reports the total sum. Observed variation of life satisfaction is displayed at the top of second column.

ered Westerns experienced a more marked change in household characteristics. A similar argument applies to the slightly more negative prediction due to marital status.

Coming to income variables, the net prediction is negative. This is due to the fact that reference income grew substantially more than absolute income. Further investigation suggests that this is a result of a change in reference groups which progressively become composed of high income households. This might explain the more marked decline in SWB.

Once more sociability indicators come out as the main predictor of a positive change in SWB. In this case, however, the predicted change is much greater. One reason is certainly the absence of the indicator of participation to religious activities. Another reason is that

Westerns have been experiencing a more intense rise in sociability than Easterns. At any rate, these figures suggest that West Germany have been experiencing a constant and fruitful rise in sociability during the last twenty years.

Finally, the prediction associated with work status does not appear to deserve any special comment.

#### 4.3. Lagged and average social capital

One potential issue in our baseline estimation of equation (2) is that sociability indicators may be endogenous to SWB. Indeed, there is now some supporting evidence that the causal relationship between sociability and SWB might go both ways (Becchetti et al., 2008).

We stress that such a potential endogeneity problem does not make our predictions useless. The co-movements that we document do not hinge on a causal interpretation. However, the scope of our analysis would be greatly extended if we could provide some evidence in favor of a causal relationship going from sociability to SWB. In particular, this is a crucial issue to evaluate and design policy interventions. To this aim we investigate an alternative specification of (2) in which we replace current individual-level sociability indicators with 1-year lag individual-level sociability indicators. Formally, we estimate

$$SWB_{i,t}^R = \alpha + \beta_1 \cdot X_{i,t}^d + \gamma_1 \cdot \ln(y_{i,t}) + \gamma_2 \cdot \ln(\bar{y}_{i,t}) + \gamma_3 \cdot \ln(y_{i,t-k}) + \delta \cdot SC_{i,t-1} + e_{i,t} \quad (4)$$

where the only difference with respect to equation (2) is represented by the index of  $SC_{i,t-1}$  which stands for a 1-year lag of the sociability indicators.

Estimates are reported in table 8 and show a remarkable invariance with respect to our baseline regression. The only relevant difference is that helping out friends becomes insignificant while volunteering becomes both positive and significant. It appears that volunteering is correlated with SWB more persistently than just helping out friends. At any rate, the overall picture that comes out of this check is not in contrast with the hypothesis that sociability causes SWB.

A further issue is that sociability might be relevant to SWB not only at the individual level, but also at the aggregate level. To investigate this we estimated a further specification of (2) where individual-level sociability indicators are replaced by Land-level indicators, namely the Land averages of sociability indicators. In this case we estimate the following equation:

$$SWB_{i,t}^R = \alpha + \beta_1 \cdot X_{i,t}^d + \gamma_1 \cdot \ln(y_{i,t}) + \gamma_2 \cdot \ln(\bar{y}_{i,t}) + \gamma_3 \cdot \ln(y_{i,t-k}) + \delta \cdot \bar{SC}_{i,t} + e_{i,t} \quad (5)$$

where  $\bar{SC}_{i,t}$  stands for the Land averages of sociability proxies.

Detailed estimates are reported in table 9. As one can see, Land averages work almost as well as individual level indicators suggesting that spillovers and relational environment might be playing an important role. The only exception is participating in sport activities, which seems to be irrelevant at the aggregate level. In conclusion, we have to admit that estimates do not allow us to make a clear point on whether sociability is more relevant at the individual or aggregate level.

**Lagged sociability indicators: East and West Germany in 1994-2007**

Dependent variable: Life satisfaction (1-10)	Coeff	p-value
married	0.058	[0.218]
separated	-0.239	[0.007]***
divorced	-0.048	[0.478]
widowed	-0.297	[0.001]***
age	-0.014	[0.050]**
age squared	-0.0004	[0.000]***
household size	-0.095	[0.000]***
1 child	0.077	[0.097]*
2 children	0.100	[0.084]*
3 or more children	0.149	[0.057]*
years of education	0.025	[0.005]***
living with parents when 16	-0.063	[0.174]
log of monthly household income	0.393	[0.000]***
log of reference income	-0.116	[0.146]
log of monthly household income 3 years before	-0.063	[0.003]***
at least monthly at church 1 year before	0.044	[0.052]*
at least monthly at cultural events 1 year before	0.042	[0.033]**
at least monthly to cinema, pop concerts, etc. 1 year before	-0.001	[0.966]
at least monthly participating in sports 1 year before	0.059	[0.002]***
at least monthly volunteering 1 year before	0.043	[0.034]**
at least monthly at social gatherings 1 year before	0.049	[0.014]**
at least monthly helping out friends 1 year before	0.013	[0.419]
at least monthly local political participation 1 year before	-0.031	[0.242]
unemployed	-0.603	[0.000]***
student	0.088	[0.139]
not working for other reasons	-0.0377	[0.256]
retired	0.061	[0.199]
doing military or civil service	-0.183	[0.138]
West	-0.392	[0.111]
Year dummies	yes	.
Lander dummies	yes	.
constant	7.133	[0.000]***
Number of observations	53929	
Overall R-square	0.0215	
F-stat	26.88	p > 0.000

Table 8: OLS regression with robust standard errors and individual fixed effects. The omitted categories are: employed, living in East Germany, without children, and single. Year and Lander dummies included. First column shows the coefficients from the regression (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%). The last column reports the p-value.



**Average sociability indicators: East and West Germany in 1994-2007**

Dependent variable: Life satisfaction (1-10)	Coeff.	p-value
married	0.074	[0.078]*
separated	-0.336	[0.000]***
divorced	-0.023	[0.726]
widowed	-0.215	[0.008]***
age	-0.018	[0.002]***
age squared	0.000	[0.000]***
household size	-0.136	[0.000]***
1 child	0.122	[0.004]***
2 children	0.160	[0.002]***
3 or more children	0.393	[0.000]***
years of education	0.009	[0.264]
living with parents when 16	-0.011	[0.797]
log of monthly household income	0.426	[0.000]***
log of reference income	-0.309	[0.000]***
log of monthly household income 3 years before	-0.073	[0.000]***
average at least monthly at church 1	0.058	[0.024]***
average at least monthly at cultural events	0.101	[0.000]***
average at least monthly to cinema, pop concerts and similar	-0.021	[0.466]
average at least monthly participating in sports 1 year before	0.020	[0.438]
average at least monthly volunteering	-0.043	[0.119]
average at least monthly at social gatherings 1 year before	0.197	[0.000]***
average at least monthly helping out friends	0.076	[0.001]***
average at least monthly local political participation	-0.044	[0.272]
unemployed	-0.549	[0.000]***
student	0.034	[0.509]
not working for other reasons	-0.035	[0.250]
retired	0.046	[0.270]
doing military or civil service	-0.187	[0.137]
West	-0.112	[0.846]
Year dummies	yes	.
Lander dummies	yes	.
constant	7.133	[0.000]***
Number of observations	60692	
Overall R-square	0.0218	
F-stat	33.89	p > 0.000

Table 9: OLS regression with robust standard errors and individual fixed effects. The omitted categories are: employed, living in East Germany, without children, and single. Year and Lander dummies included. First column shows the coefficients from the regression (\* means significant at 10%, \*\* means significant at 5%, \*\*\* means significant at 1%). The last column reports the p-value.

## 5. Conclusions

The trend of SWB in Germany is slightly decreasing between 1996 and 2007, even considering Westerns and Easterns separately. In this paper, we quantified the extent to which the main correlates of SWB predict such a trend. In particular, we focused on four forces that can potentially be responsible for the SWB trend: the growth of absolute income, income adaptation, income comparisons, and sociability.

Our findings are consistent with the hypothesis that all four forces help to predict the trend of SWB. In particular, we obtain a precise prediction as the result of contrasting tendencies on different life domains. The moderate increase in social relations, or relational goods, has gone with a moderate increase in SWB. Substantial income growth has gone with a small but non-negligible increase in SWB. This is consistent with the hypothesis that income comparisons and income adaptation wiped out most of the benefits of income growth. As regards socio-demographic controls, we found that aging of the population predicts a large decrease in SWB. This latter result appears to crucially hinge on the loss of satisfaction experienced in the old age. Moreover, an improvement of work status predicts a slight increase in SWB that is just offset by the slight decrease predicted by the worsening of marital status.

[to be extended]

## A. Appendix: Definition of Variables

**satisfaction with life** a scale of 11 degrees ranging from 10, if respondent declares to be “completely satisfied”, to 0, if respondent declares to be “completely dissatisfied” (GSOEP source variable: p1110107)

**married** 1 if respondent reports to be currently married, 0 otherwise (GSOEP source variable: d1110407)

**separated** 1 if respondent reports to be currently separated, 0 otherwise (GSOEP source variable: d1110407)

**divorced** 1 if respondent reports to be currently divorced, 0 otherwise (GSOEP source variable: d1110407)

**widowed** 1 if respondent reports to be currently widowed, 0 otherwise (GSOEP source variable: d1110407) **female** 1 if subject is female, 0 otherwise (GSOEP source variable: d1110211)

**age** number of years since born, 0 otherwise (GSOEP source variable: d1110107)

**age squared** age to the power of 2, 0 otherwise (GSOEP source variable: d1110107)

**household size** number of reported household members, 0 otherwise (GSOEP source variable: d1110607)

**1 child** 1 if in the household there is one child, 0 otherwise (GSOEP source variable: d1110707)

**2 children** 1 if in the household there is two children, 0 otherwise (GSOEP source variable: d1110707)

**3 or more children** 1 if in the household there is three or more children, 0 otherwise (GSOEP source variable: d1110707)

**years of education** number of years the respondent declared to have attended school, 0 otherwise (GSOEP source variable: d1110907)

**living with parents at 16** 1 if respondent declares to be living with own parents at 16 years old, 0 otherwise (GSOEP source variable: xh61)

**Absolute income** natural logarithm of Adjusted Monthly Household Net Income (Euro 2000) as provided in the GSOEP, 0 otherwise (variable name: ahinc07)

**Reference income** natural logarithm of average Adjusted Monthly Household Net Income (Euro 2000) for a reference group as provided in the GSOEP, 0 otherwise (variable name: ahinc07)

**Past income** Lag3 Three years temporal lag of the natural logarithm of Adjusted Monthly

Household Net Income (Euro 2000) as provided in the GSOEP, 0 otherwise (variable name: ahinc07)

**monthly at church** 1 if respondent reports to attend at least once a month church or religious institutions, 0 otherwise (GSOEP source variable: xp0309)

**monthly at culture events** 1 if respondent reports to attend at least once a month cultural events, 0 otherwise (GSOEP source variable: xp0301)

**monthly at cinema** 1 if respondent reports to go at least once a month to the cinema, 0 otherwise (GSOEP source variable: xp0302)

**monthly doing sport activities** 1 if respondent reports to participate at least once a month to sport activities, 0 otherwise (GSOEP source variable: xp0303)

**monthly at social gatherings** 1 if respondent reports to visit at least once a month friends, relatives or neighbours, 0 otherwise (GSOEP source variable: xp0305)

**monthly helping friends** 1 if respondent reports to help at least once a month friends, relatives or neighbours, 0 otherwise (GSOEP source variable: xp0306)

**monthly volunteering** 1 if respondent perform volunteer work at least once a month in clubs, associations or social services, 0 otherwise (GSOEP source variable: xp0307)

**monthly local political participation** 1 if respondent reports to participate at least once a month in citizens' action groups, political parties, local government, 0 otherwise (GSOEP source variable: xp0308)

**unemployed** 1 if respondent declares to be unemployed, 0 otherwise (GSS source variable: lfs07)

**student** 1 if respondent declares to be student, 0 otherwise (GSS source variable: lfs07)

**non working** 1 if respondent declares to be non-working, 0 otherwise (GSS source variable: lfs07)

**retired** 1 if respondent declares to be retired, 0 otherwise (GSS source variable: lfs07)

**military/civil service** 1 if respondent declares to be in military of civil service, 0 otherwise (GSS source variable: lfs07)

**west** 1 if respondent declares to live in West Germany, 0 otherwise (GSOEP source variable: l1110207)

## B. Appendix: Descriptives

Variable	Obs	Mean	Std. Dev.	Min	Max
life satisfaction	338757	6.96	1.84	0	10
married	338757	0.62	0.49	0	1
separated	338757	0.02	0.13	0	1
divorced	338757	0.06	0.24	0	1
widowed	338757	0.06	0.24	0	1
age	338757	44.84	17.29	14	100
household size	338757	2.91	1.38	1	17
1 child	338757	0.19	0.39	0	1
2 children	338757	0.13	0.34	0	1
3 or more children	338757	0.05	0.22	0	1
years of education	327098	11.49	2.58	7	18
living with parents at 16	338730	1.65	0.48	1	2
monthly at church	185066	0.39	0.49	0	1
monthly at cultural events	215958	0.48	0.5	0	1
monthly at cinema	215769	0.53	0.5	0	1
monthly sport activities	215148	0.47	0.5	0	1
monthly at social gathering	159673	0.78	0.41	0	1
monthly help from friends	159378	0.4	0.49	0	1
monthly volunteering	215353	0.23	0.42	0	1
monthly local political participation	215135	0.07	0.26	0	1
unemployed	338757	0.05	0.23	0	1
student	338757	0.04	0.2	0	1
non working	338757	0.13	0.34	0	1
retired	338757	0.14	0.34	0	1
military/civil service	338757	0	0.05	0	1
west	338757	0.78	0.41	0	1

Table 10: Descriptive statistics over all GSOEP samples and available years up to 2007.

### C. Appendix: Construction of Reference Groups

We defined reference group of individual  $i$  in year  $t$  as the sub-sample of individuals in Germany living in  $i$ 's region (west or east) in year  $t$  same year with education and age similar to  $i$ 's. More precisely, reference groups are defined using the following four different variables:

- **Year**  
a scalar containing all years between 1984 and 2007;
- **West**  
a dummy variable indicating living in West Germany;
- **Age\_cls**  
a scalar indicating whether individuals are younger than 30, between 31 and 60 and 61 or older;
- **Yreduc\_cls**  
a three-value variable indicating whether individuals went through less than 11 years of education, between 11 and 12 years, or 13 or more years of education.

We used the following Stata 9.0 syntax to construct groups:

```
egen Ref.Group = group(year west age_cls2 yreduc_cls2)
if !missing(year,west,age_cls2,yreduc_cls2)
```

In this way, we generated a new variable assuming a different value for each possible group. This procedure generated 378 reference groups. Subsequently, we computed the income of the reference group as the mean value of the incomes of all the individuals in each reference group:

```
bys Ref.Group: egen ref.income = mean(income) if !missing(income)
```

Finally, we took the log of reference income:

```
gen lnref.income = ln(ref.income)
```

## D. Appendix: Analysis of Sociability Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) monthly at religious events	1							
(2) monthly at cultural events	0.15	1						
(3) monthly at cinema	0	0.42	1					
(4) monthly playing sport	0.07	0.34	0.44	1				
(5) monthly at social gathering	0.09	0.18	0.22	0.2	1			
(6) monthly helping friends	0.05	0.1	0.12	0.12	0.3	1		
(7) monthly volunteering	0.22	0.24	0.18	0.25	0.1	0.15	1	
(8) monthly political active	0.13	0.16	0.1	0.13	0.03	0.08	0.39	1

Table 11: Correlation matrix of sociability indicators

<b>Principal components/correlation</b>		<b>Observations: 115581</b>						
<b>Component</b>	<b>Eigenvalue</b>	<b>Difference</b>	<b>Proportion</b>				<b>Cumulative</b>	
Comp1	2.32	1.07	0.29				0.29	
Comp2	1.25	0.14	0.16				0.45	
Comp3	1.11	0.2	0.14				0.58	
Comp4	0.91	0.24	0.11				0.7	
Comp5	0.67	0.01	0.08				0.78	
Comp6	0.66	0.08	0.08				0.86	
Comp7	0.58	0.06	0.07				0.94	
Comp8	0.52	.	0.06				1	

<b>Principal components (eigenvectors)</b>								
<b>Variable</b>	<b>Comp1</b>	<b>Comp2</b>	<b>Comp3</b>	<b>Comp4</b>	<b>Comp5</b>	<b>Comp6</b>	<b>Comp7</b>	<b>Comp8</b>
(1) monthly at religious events	0.2	0.43	0.24	0.79	-0.12	-0.08	0.25	0.14
(2) monthly at cultural events	0.44	-0.09	-0.27	0.22	-0.08	0.68	-0.2	-0.41
(3) monthly at cinema	0.44	-0.32	-0.33	-0.02	-0.03	0.05	0.17	0.75
(4) monthly playing sport	0.44	-0.2	-0.27	0	-0.11	-0.64	0.23	-0.46
(5) monthly at social gathering	0.3	-0.34	0.5	0.12	0.7	-0.06	-0.16	-0.03
(6) monthly helping friends	0.25	-0.19	0.66	-0.28	-0.58	0.14	0.17	-0.02
(7) monthly volunteering	0.39	0.46	0.04	-0.2	-0.11	-0.24	-0.71	0.15
(8) monthly political active	0.29	0.55	0	-0.44	0.35	0.18	0.51	-0.05

Table 12: Principal component analysis of sociability indicators



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