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an Empirical Link

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Subjective Well-Being and Relative Deprivation: an Empirical Link[*]

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(Comments welcome)

Abstract

This paper explores the relationship between two well-established concepts of measuring individual well-being: the concept of *happiness*, i.e. self-reported level of satisfaction with income and life, and *relative deprivation/satisfaction*, i.e. the gaps between the individual's income and the incomes of all individuals richer/poorer than him. Operationalizing both concepts using micro panel data from the German Socio-Economic Panel, we provide empirical evidence for subjective well-being depending more on relative satisfaction than on absolute levels of income. This finding holds even after controlling for other influential factors in a multivariate setting.

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1 Introduction

There is one question that we often ask: 'Are we satisfied with income and with our life in general?'

We can be satisfied in absolute terms, but often our level of satisfaction depends on what we see around us. As such, there is a relative notion according to which we compare ourselves to neighbors, colleagues, more generally, to a reference group, and it matters where we perceive ourselves in the social hierarchy. Social status of an individual plays, indeed, an important role in the determination of his well-being (see e.g. Weiss and Fershtman, 1998).

In this context Runciman (1966) defined the concept of relative deprivation as follows: "We can roughly say that [a person] is relatively deprived of X when (i) he does not have X; (ii) he sees some other person or persons, which may include himself at some previous or expected time, as having X; (iii) he sees it as feasible that he should have X". He further adds: "The magnitude of a relative deprivation is the extent of the difference between the desired situation and that of the person desiring it". Building on Runciman, Yitzhaki (1979) considering income as the object of relative deprivation proved that an appropriate index of aggregate deprivation is the absolute Gini index; Hey and Lambert (1980) provided an alternative motivation of Yitzhaki's result. Kakwani (1984) introduced a useful graphical device, the relative deprivation curve, to represent the gaps between the individual's income and the incomes of all individuals richer than him, as a proportion of mean income, and proved that the area under this curve is the Gini coefficient. Duclos (2000) has shown that a generalization of Gini, the s-Ginis, could be interpreted as indices of relative deprivation. Chakravarty, Chattopadhyay and Majumder (1995), Chakravarty (1997), Chakravarty and Moyes (2003), and Chateauneuf and Moyes (2003) have proposed deprivation quasi-orderings. Multidimensional indices of deprivation, on the other hand, have been proposed by Bossert, D'Ambrosio and Peragine (2003), Brandolini and D'Alessio (1998), Tsakloglou and Papadopoulos (2002), Whelan, Layte, Maitre and Nolan (2002) among others.

The focus of this paper is on unidimensional indices of deprivation, i.e. those derived uniquely from income. Absolute individual deprivation is simply the sum of the gaps between the individual's income and the incomes of all individuals richer than him, while in the relative case, the income gaps are normalized by mean income. The concept of satisfaction is generally considered the dual of that of deprivation. Hence, in measuring satisfaction the comparison is conducted over individuals who are poorer.

Surprisingly, this extensive theoretical literature on satisfaction and deprivation has not had, to the best of our knowledge, a relevant impact in the empirical applications.[1] However, there is micro data available constituting unique sources for this purpose, given that these datasets include individuals reporting their perceived level of satisfaction with income and with life in general, allowing to

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[1] Exception to this are Kakwani (1984) and Duclos (2000) with an application to Australian and Canadian data respectively, Duclos and Grègoire (2002) with an application to Belgium, Denmark, Italy and USA focussing only on the lower tail of the income distribution.

compare the proposed indices with personal assessments.

Self-reported variables have been increasingly used in the economics litera-ture on happiness.[2] A significant positive bivariate relationship has been found between happiness/satisfaction and income, holding for household income, both adjusted and unadjusted for household size, as reported by Easterlin (2001). But this relationship is quite "modest",[3] as Easterlin (2001) wrote, and "it is further weakened by the introduction of controls of other variables, such as unemployment and education".

The aim of our paper is to investigate what appeared to us the alternative natural relationship: that between subjective well-being, i.e. self-reported level of satisfaction with income and life, and relative deprivation/satisfaction, i.e. the gaps between the individual's income and the incomes of all individuals richer/poorer than him, as a proportion of mean income. This is similar in spirit to Clark and Oswald (1996) where the link between happiness/satisfaction and a 'comparison' income level is explored. The comparison income level is calculated using a standard form Mincer earnings equation or, alternatively, drawn from an external data source. We, on the other hand, aim at joining two branches of the economic literature on satisfaction/deprivation and happiness/satisfaction.

After a brief review of the theoretical literature on relative deprivation/satisfaction (Section 2), we describe our measures of subjective well-being (Section 3) and the employed data and methods (Section 4). Section 5 quantifies the degree of relative deprivation in Germany over the period 1990 to 2002. More interesting, however, we apply multivariate models making explicit use of the panel nature of the underlying data, to explain the variation in perceived satisfaction by vari-ation in income and relative deprivation controlling for some other influential factors. Section 6 concludes. The most important empirical result is illustrated by the yearly deprivation curves: relative deprivation is quite stable no matter the economic turbulence associated with the German unification process. Con-tinuing on Easterlin (2001), we confirm a modest simple correlation between subjective well-being and income (equivalized using the square root of the num-ber of household members) of 0.35. However, the simple correlation with relative satisfaction is as high as 0.44. This finding holds even after controlling for other influential factors in a multivariate setting.

2   Measuring Relative Deprivation

Following Yitzhaki (1979), income is the object of relative deprivation, as in-come should be considered an index of the individual's ability to consume com-modities. The notation we use throughout the paper is the following. For a population of size n, the set of income distributions is denoted by $\mathbb{D}^n$, the

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non-negative orthant of the Euclidean n-space $\mathbb{R}^n$ with the origin deleted. An income distribution is a vector $x = (x_1, ..., x_n)$ and the set of all possible income distributions is $\mathbb{D} = \bigcup_{n \in \mathbb{N}} \mathbb{D}^n$, where $\mathbb{N}$ is the set of positive integers. For all $n \in \mathbb{N}$, $x \in \mathbb{D}^n$, we indicate the mean of x as $\lambda(x)$, and the illfare ranked permutation of x is $\overline{x} = (\overline{x}_1, ..., \overline{x}_n)$, that is $\overline{x}_1 \leq ... \leq \overline{x}_n$.

Yitzhaki (1979), Hey and Lambert (1980) specify the deprivation felt by a person with income x_i with respect to a person with income x_j as:

$$\begin{aligned} d_i(x) & = (x_j - x_i) & \text{if } x_i < x_j \\ & = 0 & \text{else} \end{aligned} , \tag{1}$$

while the deprivation function of the person with income x_i is:

$$D_i(x) = \frac{\sum_{j=i+1}^{n}(\overline{x}_j - \overline{x}_i)}{n} . \tag{2}$$

Aggregating (2) we obtain total deprivation, which is actually average deprivation:

$$D(x) = \frac{\sum_{i=1}^{n-1}\sum_{j=i+1}^{n}(\overline{x}_j - \overline{x}_i)}{n^2} , \tag{3}$$

which is equal to the product of the mean income $\lambda(x)$ and the Gini coefficient, $G(x)$, i.e. the absolute Gini coefficient.

Analogously, indicating the satisfaction level by S, $S(x) = \lambda(x) - D(x)$ and $S(x) = \lambda(x)(1 - G(x))$.

Chakravarty and Chakraborty (1984) generalize this index proposing a normative index of deprivation.

Following this early literature, Chakravarty (1997), building on Kakwani (1984), proposes to look at a relative concept of deprivation,[4] by taking as a measure of deprivation felt by a person with income x_i with respect to a person with income x_j, their income share differential, $\frac{d_i(x)}{\lambda(x)}$. Now, the total relative deprivation function of the person with income x_i is:

$$D_i^r(x) = \frac{\sum_{j=i+1}^{n}(\overline{x}_j - \overline{x}_i)}{n\lambda(x)} . \tag{4}$$

We can rewrite $D_i^r(x)$ in (4) as:

$$D_i^r(x) = 1 - L_i(x) - \frac{(n-i)\overline{x}_i}{n\lambda(x)}, \tag{5}$$

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[4] A clarification might here be needed on the use of the term 'relative'. Deprivation, whether absolute or relative as defined in the introduction, is always a relative concept in that it "involve(s) a comparison with the imagined situation of some other person or group. This other person or group in the 'reference group', or more accurately the 'comparative reference group'" (Runciman, 1966, p. 11). In what follows we use the term relative as opposed to absolute deprivation as defined in page 2, referring to relative deprivation simply as deprivation.

where $L_i(x) = \dfrac{\sum_{j=1}^{i} \overline{x}_i}{n\lambda(x)}$ is the cumulative share of the total income $n\lambda(x)$ enjoyed by the bottom $\frac{i}{n}$ $(0 \le i \le n)$ fraction of the population.[5] The complement of $D_i^r(x)$ is regarded as the relative satisfaction function of the person with income x_i.

Kakwani defines the relative deprivation curve corresponding to the distribution x as the plot of $D_i^r(x)$ against the cumulative proportion of population $\frac{i}{n}$ $(0 \le i \le n)$ and $D_0^r(x) = 1$. The relative deprivation curve is downward sloping but no definite conclusion can be drawn regarding its curvature (see Chakravarty, Chattopadhyay and Majumder, 1995).
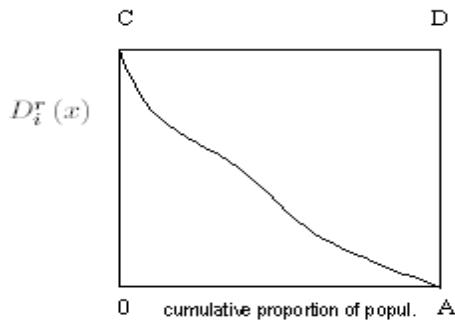
The relative deprivation curve.

If the Lorenz curve coincides with the egalitarian line, then the relative deprivation curve coincides with the horizontal line OA. On the other hand, if there is maximum inequality, the curve coincides with CD. The area under the deprivation curve is the Gini coefficient (see Kakwani, 1984).

It is clear that there is a link between inequality and deprivation. The connection proceeds further but inequality and deprivation are two different concepts.[6] Given two income distributions $x, y \in \mathbb{D}^n$, we say that x dominates y by the relative deprivation criterion if the relative deprivation curve of x lies nowhere below that of y (see Chakravarty, 1994). If y dominates x in the Lorenz sense, this does not imply that x dominates y by the relative deprivation criterion.

[5] The graph of $L_i(x)$ against $\frac{i}{n}$, where $i = 0, 1, ..., n$ and $L_0(x) = 0$ is the well known Lorenz curve.

[6] For a difference in the predictions of these two concepts see Wodon and Yitzhaki (2002).

3   Measuring Subjective Well-Being

Generally, subjective well-being is measured by interviewing people in surveys using a single-occasion, self-report question.[7] Papers on this subject make use of both cross-sectional data (e.g. Eurobarometer Surveys, United States' General Social Survey), and panel data (e.g. the German Socio-Economic Panel and the European Community Household Panel). We decided to investigate the relationship between subjective well-being and relative deprivation/satisfaction focussing on panel data since the latter allow to control for otherwise unobserved individual characteristics. This is especially important if these unobservables are systematically correlated with reported subjective well-being. In particular, the dataset used in the paper is the German Socio-Economic Panel (SOEP, see the following section). Our measures of subjective well-being, i.e. 'satisfaction with income' and 'satisfaction with life in general' are measured on an 11-point scale, ranging from 0 ('completely dissatisfied') to 10 ('completely satisfied').

Landua (1991) argues that there is evidence of panel effects concerning these satisfaction scales, i.e. respondents tend to use these scales differently after 'getting used' to them (especially there is a tendency away from the extreme values such as '10'). This will have to be considered when interpreting the changes in satisfaction over time. Frick, Goebel, Schechtman, Wagner, and Yitzhaki (2004) confirm this finding for the recent SOEP data providing evidence for learning effects on behalf of the respondents with respect to satisfaction as well as income.

4   The Data and Methods

The German Socio-Economic Panel (SOEP) is an ongoing panel survey with a yearly re-interview design. The starting sample in 1984 was almost 6,000 households. A sample of about 2,200 East German households was added in June 1990, half a year after the fall of the Berlin wall. This gives a very good picture of the GDR society on the eve of the German currency, social and economic unification which happened on July 1, 1990. In 1994/95 an additional subsample of 500 immigrant households was included to capture the massive influx of immigrants since the late 1980s. Finally, in 1998 and 2000 two more random samples were added which increased the overall number of interviewed households in 2000 to about 13,000 with approximately 24,000 individuals aged 17 and over.

The data used in this analysis covers the period 1990 (the first data available for the East German sample) to 2002 (the most recent available data). Due to the above mentioned learning effects, we exclude wave 1 of the most recent sample. Our sample is pooling all adult respondents with valid information on income and subjective satisfaction, leaving us with approximately 171,000 observations based on 29,200 individuals in East and West Germany.

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[7]For a detailed description of the various methods used in surveys for the measurement of life satisfaction, see Schyns (2003).

The income measure we investigate is monthly net household income. This so-called 'income screener' is supposed to give a measure of the more regular income components received by all household members at the time of the interview. This variable might be an inferior measure of economic well-being when compared to annual income since it tends to neglect certain irregular income components (like Christmas bonuses, annual bonuses, etc.) but it certainly fits better to our time-dependent measures of subjective well-being.[8] In order to compare income over time, all income measures are deflated to 2000 prices, also accounting for purchasing power differences between East and West Germany. In order to control for differences in household size and the economies of scales, we apply an equivalence scale with an elasticity of 0.5, given by the square root of household size.

Given the ordinal nature of the dependent variables on subjective well-being (perceived satisfaction with income and life in general) an appropriate regression model would be an ordered probit. In order to make full use of the panel nature of our data, controlling for unobserved individual characteristics and potentially different use of the underlying satisfaction scale (running from 0 to 10) across individuals, we should apply a fixed effects estimator. Unfortunately, such a fixed-effects ordered probit estimator does not exist in standard statistical software packages. As an approximation, however, we make use of a fixed-effects regression model (see also Hamermesh, 2001, and Schwarze and Haerpfner, 2003).

5   The Results

The relative deprivation curves from 1990 to 2002 are plotted in Figure 1. The years that we are analyzing were of high economic turbulence for Germany since it is the decade that followed the unification. This process has, surprisingly, very little effect on relative deprivation as shown from the annual total relative deprivation functions of the individuals. The latter over time are almost identical.

The area under the relative deprivation curve is the Gini coefficient, in this framework interpreted as a measure of total relative deprivation. Its value is reported in Table 1. Over the period the Gini coefficient varies little between 0.26 and 0.24. Its complement to 1 is the total relative satisfaction measure. We report its value in the same table, even if it is very easily computable, since in the multivariate analysis we use relative satisfaction as explanatory variable. The same table contains means of the self-reported satisfaction with income and with life in general. These variables are expressed on an 11 point scale. Income satisfaction is on average consistently lower than life satisfaction. Over the years we do not observe large aggregate variation. On the one hand, satisfaction with income ranges from 6.092 in 1997 to 6.523 in 2001; on the other hand, satisfaction with life reaches its minimum in 1997, being equal to 6.778,

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[8]Further research will have to investigate the relationship of self-reported satisfaction and income-related item non-response.

but the maximum value is registered in the year of the German unification, 7.113 in 1990.[9]

Our results, presented in Table 2, confirm the findings of Easterlin (2001), suggesting that the natural relationship is more between subjective well-being and relative satisfaction/deprivation rather than between subjective well-being and income itself.

The next step is to investigate whether this relationship holds once we control for various influential factors such as personal and institutional characteristics. In our following multivariate regression models, we control for sex, age (age squared), marital status, immigration status, education, household composition, home ownership (as a proxy for household wealth) and unemployment.[10] It should be noted that in the fixed-effect specification the time independent variables sex and immigration status are dropped from the estimation (see the Appendix for alternative random effect specifications including these controls). In order to control for potential panel or learning effects, we also include a dummy variable indicating 3 and more interviews as a proxy for the interviewing experience of individuals in the panel. Institutional control variables include the annual GDP growth rates and unemployment rates. Additional control variables include interaction terms on region (East/West Germany) and year of observation (for readability purposes the latter are not reported in Tables 3 and 4). All the regression models are conducted separately with income satisfaction and life satisfaction respectively as dependent variables. In both cases, we first estimate a base model considering only the above mentioned controls (Model 1). As a second step we introduce separately in the regression equivalent income (Model 2), income rank (Model 3), and relative satisfaction (Model 4). Finally Model 5 includes all those measures at once. Appendix table A-2 gives basic descriptive statistics for all relevant data used in the regression estimations.

Results on the fixed-effects estimators for both measures of subjective well-being, satisfaction with income and with life in general, are given in Tables 3 and 4, respectively. Starting with the base model in Table 3 on income satisfaction, the personal control variables yield in principle the expected results: better educated and married people and those who live together with dependent children in the household tend to be more satisfied. Homeownerhip is also positively related to income satisfaction, while the experience of unemployment has the expected detrimental effect on subjective well-being. In principle these results hold also for satisfaction with life (in Table 4). The institutional control variables also 'behave' as expected: in boom periods of the business cycle people are *ceteris paribus* more satisfied, while times of high unemployment exert a dampening effect. With respect to the panel or learning effect, our consistently

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[9]See appendix Table A-1 for a detailed East-West comparison. Results show that average values of West Germany are rather stable for all the variables, while the rapid process of catching up to Western levels in the East of the country almost came to an end in the mid-1990s. Most interestingly, the measures of subjective well-being for East Germany show a drastic decline from 1990 to 1991, indicating a change in the reference group of East Germans.

[10]This unemployment index is calculated at the aggregate household level, relating the number of months in registered unemployment over the previous year to the number of months with potential employment of all adult household members.

negative coefficient for , 'number of interviews' confirm the findings of Landua (1991) and Frick, Goebel, Schechtman, Wagner, and Yitzhaki (2004). The 25 interaction terms on region and year of observation (not included in Tables 3 and 4) indicate a continuously lower level of satisfaction among East Germans, and an overall tendency towards a reduction in satisfaction among West Germans as well.

More important to our research question appears to be the comparison of Models 2 to 4, where we include alternatively measures of absolute income, income rank, and relative satisfaction, respectively. Confirming our bivariate results from Table 2, it appears that after controlling for various personal and institutional characteristics, the highest correlation is given by the relative satisfaction. Including income related variables (Models 2 to 5 in Tables 3 and 4) causes noticeable effects with respect to the control variables: while 'years of education" looses significance for both dependent variables, becoming 'owner occupier' exerts a positive effect on *life* satisfaction, whereas the additional consideration of income reverses the ownership effect on *income* satisfaction. Including all three measures at the same time (in Model 5), we find only weak relationships for income level and income rank but a large and highly significant coefficient for relative satisfaction. These findings suggest that level and changes in subjective well-being in fact are driven more by the relative satisfaction an individual derives from its position in a society than by income level itself. This finding again holds for both, perceived satisfaction with income as well as with life in general. Not surprisingly, a given sum of money, i.e. the absolute level of income, still retains a slightly significant explanatory power for *income* satisfaction (Table 3). On the other hand, the simultaneous inclusion of relative satisfaction measure renders the effect of absolute income on satisfaction with *life* in general insignificant.

6   Conclusion

Are we satisfied with income and with our life in general? The answer to the opening question of this paper is that people's satisfaction depends on what they observe around them. Analyzing German data from 1990 to 2002 we confirm that "If people have no reason to expect or hope for more than they can achieve, they will be less discontent with what they have, or even grateful simply to be able to hold on to it. But if, on the other hand, they have been led to see as a possible goal the relative prosperity of some more fortunate community with which they can directly compare themselves, then they will remain discontent with their lot until they have succeeded in catching up" (Runciman, 1966). Happiness/satisfaction is a relative notion indicating that people derive their perceived well-being from being rich*er* not from being simply rich.

Future work may relax our basic assumption of a single, i.e. nation wide, reference group. Alternative reference group specifications may be based on e.g. region, family, or labor market status. Along these lines, preliminary results for East vs West Germany indicate that the reference group for East Germans in

fact changed over time, converging to West German structure.

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Tables

Table 1: Income inequality, Relative Satisfaction and measures of Subjective Well-Being in Germany 1990-2002

Year	Relative Deprivation (=Gini)	Relative Satisfaction (=1-Relative Deprivation)	Subjective Well-Being: Income Satisfaction	Subjective Well-Being: Life Satisfaction
	Mean			
1990	0.260	0.740	6.455	7.133
1991	0.257	0.743	6.470	7.094
1992	0.251	0.749	6.349	7.023
1993	0.251	0.749	6.322	6.977
1994	0.251	0.749	6.189	6.885
1995	0.260	0.740	6.258	6.858
1996	0.249	0.751	6.272	6.878
1997	0.240	0.760	6.092	6.778
1998	0.241	0.759	6.157	6.837
1999	0.245	0.755	6.257	6.974
2000	0.246	0.754	6.419	6.907
2001	0.247	0.753	6.523	7.095
2002	0.262	0.738	6.293	6.908
Total	0.251	0.749	6.313	6.954

Source: Authors' calculation from SOEP.

Table 2: Correlation of measures of subjective well-being, income, income rank, and relative satisfaction/deprivation in Germany 1990-2002

	Subjective Well-Being: Income Satisfaction	Subjective Well-Being: Life Satisfaction	Equivalent Income	Income Rank
Subjective Well-Being: Life Satisfaction	0.5022	-		
Equivalent Income	0.3540	0.1796	-	
Income Rank	0.4246	0.2158	0.8233	-
Relative Satisfaction = (1-Relative Deprivation)	0.4363	0.2243	0.7706	0.9645

Source: Authors' calculation from SOEP.

Table 3: Correlates of Subjective well-being ("income satisfaction") in Germany 1990-2002 - Results from fixed effects models

Model	1 Income satisfaction	2 Income satisfaction	3 Income satisfaction	4 Income satisfaction	5 Income satisfaction
Male	- -	- -	- -	- -	- -
Age	0.014* (0.007)	-0.012+ (0.007)	-0.013* (0.007)	-0.003 (0.007)	-0.005 (0.007)
Age squared	0.000** (0.000)	0.000** (0.000)	0.001** (0.000)	0.000** (0.000)	0.000** (0.000)
Native Born	- -	- -	- -	- -	- -
Years of Education	0.022** (0.006)	0.013* (0.006)	0.006 (0.006)	0.007 (0.006)	0.006 (0.006)
Number of Children in HH	0.038** (0.009)	0.119** (0.009)	0.176** (0.009)	0.155** (0.009)	0.159** (0.009)
Owner occupier	0.110** (0.019)	-0.004 (0.019)	-0.069** (0.019)	-0.057** (0.019)	-0.061** (0.019)
Unemployment Index	-0.010** (0.000)	-0.008** (0.000)	-0.007** (0.000)	-0.006** (0.000)	-0.006** (0.000)
Married	0.288** (0.021)	0.263** (0.021)	0.238** (0.021)	0.212** (0.021)	0.214** (0.021)
3 and more interviews	-0.026 (0.019)	-0.029 (0.019)	-0.021 (0.018)	-0.019 (0.018)	-0.019 (0.018)
GDP-growth rate	0.202** (0.020)	0.153** (0.020)	0.092** (0.019)	0.081** (0.019)	0.081** (0.019)
Unemployment rate	-0.067** (0.007)	-0.054** (0.007)	-0.058** (0.007)	-0.083** (0.007)	-0.080** (0.007)
Equivalent Income / 1000	- -	0.372** (0.005)	- -	- -	0.021* (0.008)
income rank	- -	- -	2.437** (0.026)	- -	0.207* (0.083)
Relative Satisfaction	- -	- -	- -	4.110** (0.042)	3.688** (0.123)
Constant	4.554** (0.254)	4.672** (0.250)	4.567** (0.246)	2.578** (0.247)	2.789** (0.253)
Observations Number of individuals	170515 29246	170515 29246	170515 29246	170515 29246	170515 29246
R-squared	0.03	0.06	0.09	0.09	0.09
+ significant at 10%; * significant at 5%; ** significant at 1% (Standard errors in parentheses). Additional control variables include interaction terms on region (East/West) and year of observations.					

Fixed-Effects model: y[i,t] = a + B*x[i,t] + u[i] + e[i,t]

Source: Authors' calculation from SOEP.

Table 4: Correlates of Subjective well-being ("life satisfaction") in Germany 1990-2002 - Results from fixed effects models

Model	1 Life satisfaction	2 Life satisfaction	3 Life satisfaction	4 Life satisfaction	5 Life satisfaction
Male	- -	- -	- -	- -	- -
Age	0.032** (0.006)	0.025** (0.006)	0.025** (0.006)	0.028** (0.006)	0.029** (0.006)
Age squared	-0.000** (0.000)	-0.000** (0.000)	-0.000** (0.000)	-0.000** (0.000)	-0.000** (0.000)
Native Born	- -	- -	- -	- -	- -
Years of Education	0.011* (0.005)	0.009+ (0.005)	0.007 (0.005)	0.007 (0.005)	0.007 (0.005)
Number of Children in HH	0.009 (0.008)	0.030** (0.008)	0.044** (0.008)	0.041** (0.008)	0.037** (0.008)
Owner occupier	0.108** (0.016)	0.079** (0.016)	0.062** (0.016)	0.063** (0.016)	0.065** (0.016)
Unemployment Index	-0.005** (0.000)	-0.004** (0.000)	-0.004** (0.000)	-0.004** (0.000)	-0.004** (0.000)
Married	0.228** (0.017)	0.221** (0.017)	0.215** (0.017)	0.207** (0.017)	0.206** (0.017)
3 and more interviews	-0.165** (0.015)	-0.166** (0.015)	-0.164** (0.015)	-0.163** (0.015)	-0.163** (0.015)
GDP-growth rate	0.178** (0.016)	0.165** (0.016)	0.150** (0.016)	0.145** (0.016)	0.145** (0.016)
Unemployment rate	-0.050** (0.006)	-0.047** (0.006)	-0.048** (0.006)	-0.055** (0.006)	-0.057** (0.006)
Equivalent Income / 1000	- -	0.096** (0.005)	- -	- -	0.008 (0.007)
income rank	- -	- -	0.626** (0.022)	- -	-0.269** (0.070)
Relative Satisfaction	- -	- -	- -	1.118** (0.036)	1.480** (0.104)
Constant	6.059** (0.208)	6.089** (0.208)	6.062** (0.208)	5.522** (0.208)	5.348** (0.213)
Observations Number of individuals	170515 29246	170515 29246	170515 29246	170515 29246	170515 29246
R-squared	0.03	0.03	0.03	0.03	0.03
+ significant at 10%; * significant at 5%; ** significant at 1% (Standard errors in parentheses). **Additional control variables include interaction terms on region (East/West) and year of observations.**					

Fixed-Effects model: $y[i,t] = a + B*x[i,t] + u[i] + e[i,t]$

Source: Authors' calculation from SOEP.

Figures

Figure 1: Relative Deprivation Curve for Germany, 1990-2002
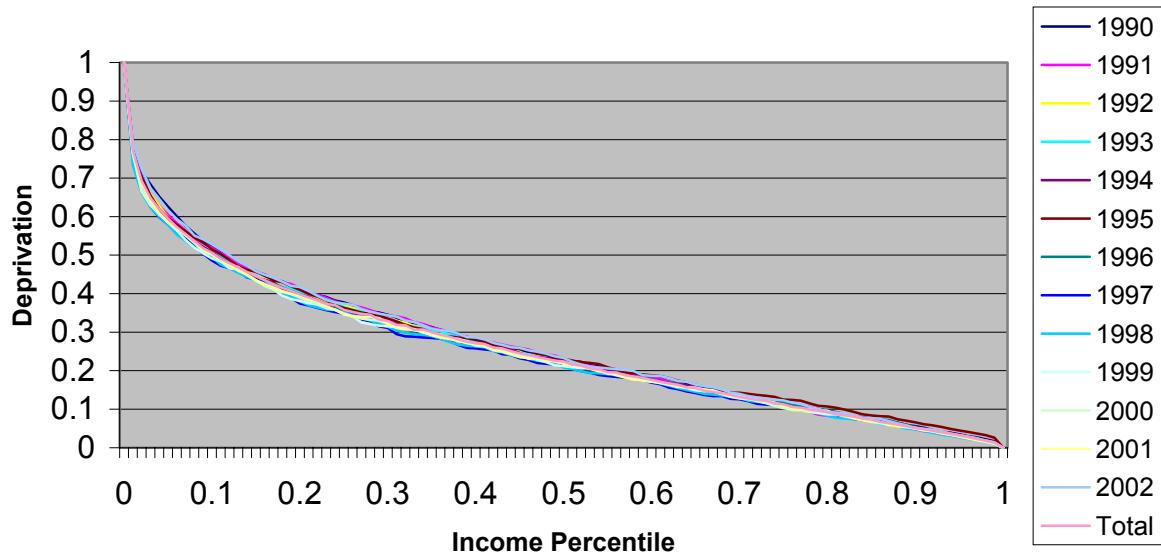
Source: Authors' calculation from SOEP.

Figure 2: Relative Satisfaction Curve for Germany, 1990-2002
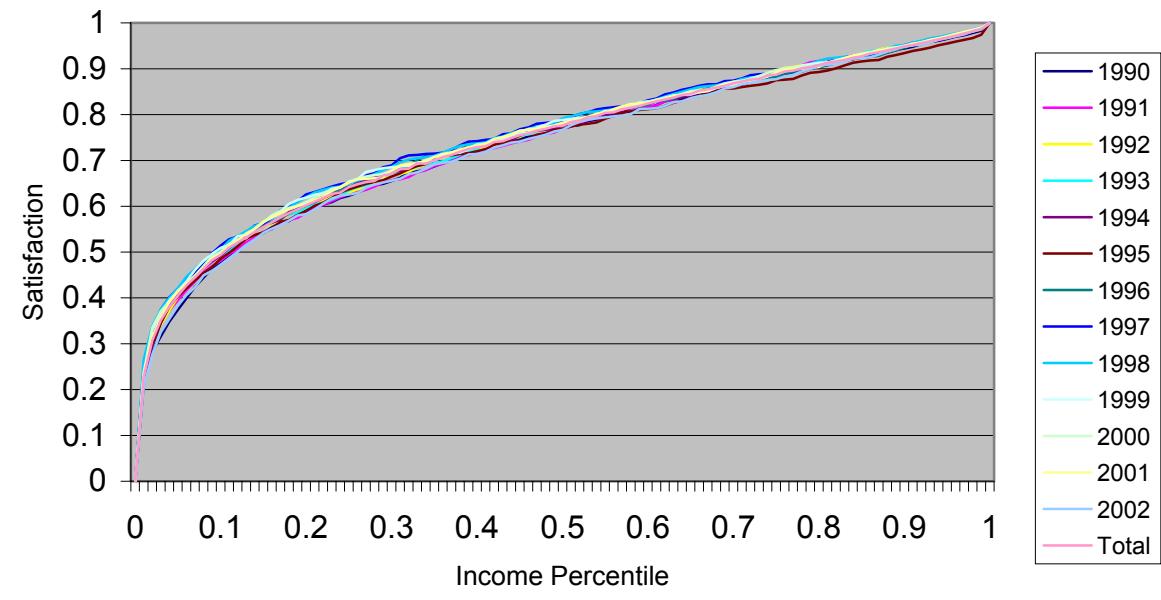
Source: Authors' calculation from SOEP.

Appendix

Table A-1: Equivalent income, relative satisfaction/deprivation, and measures of Subjective Well-Being in Germany 1990-2002 by region and year

Year	Equivalent Income		Relative Satisfaction (=1-Relative Deprivation)		Subjective Well-Being: Income Satisfaction		Subjective Well-Being: Life Satisfaction	
	West	East	West	East	West	East	West	East
	Mean							
1990	2751	1682	0.777	0.599	6.693	5.511	7.277	6.565
1991	2742	1725	0.778	0.606	6.897	4.727	7.356	6.018
1992	2766	1868	0.777	0.636	6.704	4.886	7.249	6.091
1993	2781	2001	0.773	0.654	6.569	5.321	7.172	6.182
1994	2766	2116	0.766	0.680	6.379	5.433	7.044	6.247
1995	2835	2207	0.754	0.683	6.434	5.548	6.980	6.368
1996	2807	2274	0.763	0.706	6.437	5.619	7.004	6.379
1997	2759	2289	0.771	0.716	6.259	5.434	6.893	6.325
1998	2764	2318	0.770	0.719	6.324	5.513	6.942	6.432
1999	2870	2350	0.767	0.708	6.433	5.567	7.089	6.521
2000	2926	2356	0.767	0.698	6.577	5.742	7.015	6.446
2001	2897	2356	0.765	0.703	6.687	5.817	7.210	6.597
2002	2959	2423	0.750	0.691	6.460	5.579	7.022	6.415
Total	2815	2140	0.767	0.675	6.531	5.427	7.102	6.350

Source: Authors' calculation from SOEP.

Table A-2: Descriptive Statistics for variables used in regressions (random and fixed effects)

Variable	Mean	Std.Dev.	Min	Max
Subj. Well-Being : Income	6.207143	2.259586	0	10
Subj. Well-Being : Life	6.922312	1.7987	0	10
Equivalent Income / 1000	2.616736	1.306965	.1239157	37.94129
income rank	.486884	.2799407	.0000235	1
Relative Satisfaction	.7439501	.1669308	.0490249	1
Relative Deprivation	.2560499	.1669308	0	.9509751
East Germany	.2874586	.4525786	0	1
Male	.4851949	.4997822	0	1
Age	44.63021	16.68196	14	99
Age squared	2270.142	1628.382	196	9801
Native Born	.8380084	.3684442	0	1
Years of Education	11.39602	2.479183	7	18
Number of Children in HH	.6066622	.9349976	0	9
Owner occupier	.4253057	.4943907	0	1
Unemployment Index	7.722097	20.74568	0	100
Married	.6523062	.4762396	0	1
3 and more interviews	.84426	.3626097	0	1
East 1990	.0247896	.1554838	0	1
East 1991	.0231886	.1505025	0	1
East 1992	.0221095	.1470401	0	1
East 1993	.0209366	.1431725	0	1
East 1994	.020702	.1423852	0	1
East 1995	.0201859	.1406362	0	1
East 1996	.0201449	.1404961	0	1
East 1997	.0196346	.1387416	0	1
East 1998	.0187374	.1355964	0	1
East 1999	.0202035	.1406963	0	1
East 2000	.0199631	.1398737	0	1
East 2001	.0291411	.1682025	0	1
East 2002	.0277219	.1641754	0	1
West 1990	.0518723	.2217698	0	1
West 1991	.0510454	.2200909	0	1
West 1992	.0509281	.2198515	0	1
West 1993	.0494619	.2168311	0	1
West 1994	.0485353	.2148951	0	1
West 1995	.0505351	.2190471	0	1
West 1996	.0492215	.2163308	0	1
West 1997	.0484825	.2147842	0	1
West 1998	.0460957	.2096929	0	1
West 1999	.0513914	.2207953	0	1
West 2000	.0503709	.2187098	0	1
West 2001	.0846964	.2784301	0	1
West 2002	.079905	.2711469	0	1
GDP-growth rate	1.536165	1.136005	-1.09	3.22
Unemployment rate	8.65941	1.478465	5.1	10.6

Source: Authors' calculation from SOEP.

Table A-3: Correlates of Subjective well-being ("income satisfaction") in Germany 1990-2002 - Results from random effects models

Model	1	2	3	4	5
	Income satisfaction	Income satisfaction	Income satisfaction	Income satisfaction	Income satisfaction
male	-0.091**	-0.118**	-0.142**	-0.150**	-0.149**
	(0.020)	(0.019)	(0.018)	(0.018)	(0.018)
age	-0.042**	-0.050**	-0.054**	-0.052**	-0.053**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
age2	0.001**	0.001**	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Native Born	0.372**	0.278**	0.207**	0.203**	0.201**
	(0.029)	(0.027)	(0.027)	(0.027)	(0.027)
Years of Education	0.082**	0.037**	0.022**	0.028**	0.025**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Number of Children in HH	-0.021**	0.081**	0.147**	0.130**	0.135**
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)
Owner occupier	0.322**	0.171**	0.103**	0.116**	0.109**
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Unemployment Index	-0.013**	-0.011**	-0.008**	-0.007**	-0.007**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
married	0.383**	0.351**	0.312**	0.274**	0.278**
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)
3 and more interviews	-0.090**	-0.083**	-0.076**	-0.076**	-0.076**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
east1990	-1.329**	-0.877**	-0.541**	-0.531**	-0.522**
	(0.039)	(0.039)	(0.038)	(0.038)	(0.038)
east1991	-1.703**	-1.367**	-1.132**	-1.107**	-1.102**
	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)
east1992	-1.177**	-0.942**	-0.766**	-0.758**	-0.754**
	(0.032)	(0.031)	(0.031)	(0.031)	(0.031)
east1994	-0.342**	-0.248**	-0.199**	-0.156**	-0.158**
	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)
east1995	-0.187**	-0.146**	-0.112**	-0.053+	-0.060+
	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
east1996	0.200**	0.158**	0.119**	0.140**	0.137**
	(0.034)	(0.033)	(0.033)	(0.033)	(0.033)
east1997	0.116**	0.080*	0.048	0.049	0.048
	(0.039)	(0.039)	(0.038)	(0.038)	(0.038)
east1999	-0.007	-0.006	0.043	0.052	0.049
	(0.037)	(0.036)	(0.036)	(0.036)	(0.036)
east2000	-0.155**	-0.103**	0.025	0.038	0.033
	(0.038)	(0.038)	(0.037)	(0.037)	(0.037)
east2001	0.187**	0.150**	0.188**	0.174**	0.172**
	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
east2002	0.228**	0.112**	0.106**	0.176**	0.162**
	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
west1991	0.569**	0.499**	0.425**	0.438**	0.436**
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
west1992	0.607**	0.503**	0.433**	0.449**	0.444**
	(0.024)	(0.024)	(0.023)	(0.023)	(0.023)
west1993	1.184**	0.884**	0.685**	0.708**	0.697**

	(0.038)	(0.038)	(0.037)	(0.037)	(0.037)
west1994	0.630**	0.482**	0.400**	0.468**	0.455**
	(0.033)	(0.032)	(0.032)	(0.031)	(0.032)
west1995	0.722**	0.538**	0.469**	0.560**	0.541**
	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
west1996	1.048**	0.796**	0.679**	0.734**	0.719**
	(0.035)	(0.034)	(0.033)	(0.033)	(0.033)
west1997	1.003**	0.762**	0.617**	0.667**	0.654**
	(0.041)	(0.040)	(0.039)	(0.039)	(0.039)
west1998	0.862**	0.665**	0.565**	0.612**	0.600**
	(0.040)	(0.039)	(0.038)	(0.038)	(0.038)
west1999	0.803**	0.605**	0.565**	0.615**	0.600**
	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)
west2000	0.669**	0.513**	0.551**	0.593**	0.577**
	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
west2001	1.025**	0.786**	0.743**	0.771**	0.756**
	(0.030)	(0.029)	(0.028)	(0.028)	(0.028)
west2002	1.049**	0.722**	0.664**	0.759**	0.732**
	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
GDP-growth rate	0.149**	0.104**	0.068**	0.060**	0.060**
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
Unemployment rate	-0.204**	-0.173**	-0.141**	-0.167**	-0.164**
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Equivalent Income / 1000		0.411**			0.042**
		(0.005)			(0.007)
income rank			2.635**		0.197**
			(0.023)		(0.076)
Relative Satisfaction				4.451**	3.916**
				(0.037)	(0.112)
Constant	6.539**	6.111**	5.975**	4.079**	4.289**
	(0.093)	(0.091)	(0.089)	(0.091)	(0.101)
Observations	170515	170515	170515	170515	170515
Number of individuals	29246	29246	29246	29246	29246
Standard errors in parentheses **+ significant at 10%; * significant at 5%; ** significant at 1%**					

Source: Authors' calculation from SOEP.

Table A-4: Correlates of Subjective well-being ("life satisfaction") in Germany 1990-2002 - Results from random effects models

Model	1	2	3	4	5
	Life satisfaction	Life satisfaction	Life satisfaction	Life satisfaction	Life satisfaction
male	-0.041*	-0.048**	-0.055**	-0.057**	-0.057**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
age	-0.027**	-0.030**	-0.031**	-0.030**	-0.030**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
age2	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Native Born	0.145**	0.119**	0.100**	0.096**	0.097**
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Years of Education	0.040**	0.027**	0.023**	0.024**	0.025**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Number of Children in HH	-0.022**	0.008	0.026**	0.023**	0.020**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Owner occupier	0.199**	0.155**	0.136**	0.137**	0.139**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Unemployment Index	-0.007**	-0.006**	-0.005**	-0.005**	-0.005**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
married	0.271**	0.261**	0.250**	0.238**	0.236**
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
3 and more interviews	-0.240**	-0.238**	-0.236**	-0.236**	-0.236**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
east1990	-0.999**	-0.871**	-0.780**	-0.766**	-0.772**
	(0.032)	(0.032)	(0.033)	(0.033)	(0.033)
east1991	-1.246**	-1.150**	-1.087**	-1.072**	-1.074**
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
east1992	-0.767**	-0.700**	-0.652**	-0.644**	-0.647**
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
east1994	-0.373**	-0.346**	-0.333**	-0.318**	-0.315**
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
east1995	-0.175**	-0.163**	-0.154**	-0.136**	-0.132**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
east1996	0.077**	0.065*	0.054+	0.059*	0.062*
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
east1997	0.050	0.040	0.032	0.031	0.032
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
east1999	0.007	0.007	0.021	0.024	0.023
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
east2000	-0.244**	-0.229**	-0.194**	-0.188**	-0.190**
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
east2001	0.052*	0.042+	0.053*	0.049+	0.046+
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
east2002	0.124**	0.091**	0.090**	0.109**	0.113**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
west1991	0.354**	0.334**	0.314**	0.316**	0.319**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
west1992	0.404**	0.375**	0.356**	0.358**	0.361**
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
west1993	0.942**	0.857**	0.803**	0.803**	0.808**

	(0.031)	(0.032)	(0.032)	(0.031)	(0.032)
west1994	0.425**	0.383**	0.361**	0.377**	0.384**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
west1995	0.463**	0.411**	0.392**	0.415**	0.423**
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
west1996	0.699**	0.628**	0.597**	0.608**	0.613**
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
west1997	0.612**	0.543**	0.504**	0.514**	0.520**
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
west1998	0.552**	0.496**	0.470**	0.479**	0.484**
	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
west1999	0.504**	0.448**	0.438**	0.449**	0.452**
	(0.030)	(0.030)	(0.030)	(0.029)	(0.030)
west2000	0.257**	0.213**	0.225**	0.235**	0.235**
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
west2001	0.607**	0.540**	0.529**	0.533**	0.534**
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
west2002	0.681**	0.588**	0.574**	0.596**	0.602**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
GDP-growth rate	0.150**	0.137**	0.128**	0.124**	0.124**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Unemployment rate	-0.133**	-0.124**	-0.115**	-0.122**	-0.125**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Equivalent Income / 1000		0.117**			0.020**
		(0.004)			(0.006)
income rank			0.734**		-0.309**
			(0.019)		(0.064)
Relative Satisfaction				1.300**	1.662**
				(0.031)	(0.095)
Constant	7.819**	7.700**	7.664**	7.103**	6.949**
	(0.076)	(0.076)	(0.076)	(0.078)	(0.086)
Observations	170515	170515	170515	170515	170515
Number of individuals	29246	29246	29246	29246	29246
Standard errors in parentheses **+ significant at 10%; * significant at 5%; ** significant at 1%**					

Source: Authors' calculation from SOEP.