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INCOME SATISFACTION AND RELATIVE DEPRIVATION: AN EMPIRICAL LINK

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 *relative deprivation*, i.e. the gaps between the individual's income and the incomes of all individuals richer 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 deprivation than on absolute levels of income. This finding holds after controlling for other influential factors in a multivariate setting.

KEY WORDS: relative deprivation, satisfaction, subjective well-being, SOEP

JEL CLASSIFICATION NUMBER: D63, I31, D31

1. INTRODUCTION

There is one question that we often ask: "Are we satisfied with our income?"

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 suggested 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. Berrebi and Silber (1985) showed that many of the commonly used inequality indices can be written as indices of relative deprivation. The interpretation of a generalization of Gini, the s-Ginis, as indices of relative deprivation is due to Duclos (2000). Chakravarty et al. (1995), Chakravarty (1997), Chakravarty and Moyes (2003) have proposed deprivation quasi-orderings.

Following this literature, 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.

Surprisingly, this extensive theoretical literature on deprivation has had, to the best of our knowledge, only little 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 allowing to compare the proposed indices with personal assessments.

Self-reported variables have been increasingly used in the economics literature 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 relative deprivation, i.e. the gaps between the individual's income and the incomes of all individuals richer 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. Their 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 Economics literature: the one on relative deprivation and that on happiness/satisfaction. As an alternative comparison to better off individuals, we use the income rank. The difference between the two

comparison measures implemented in this paper is that the rank is informative only of the *position* of the individual in the income scale while relative deprivation takes also into account the *distances* in incomes.

After a brief review of the theoretical literature on relative deprivation (Section The measurement of deprivation), we describe our measure of subjective well-being (Measuring subjective well-being) and the employed data and methods (The data and methods). Section The results quantifies the degree of relative deprivation in Germany over the period 1990–2004. 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 variation in income and relative deprivation controlling for some other influential factors. Section Conclusion concludes. Results show that relative deprivation is quite stable no matter the economic turbulence associated with the German unification process.[4] Continuing on Easterlin (2001), we confirm a modest simple correlation between subjective well-being and income (equivalized using the square root of the number of household members) of 0.36. However, the simple correlation with relative deprivation is as high as −0.44. The rank is also very highly correlated with subjective well-being, but less so than the relative deprivation measure. This finding holds even after controlling for other influential factors in a multivariate setting. Individuals when assessing their satisfaction with income consider their position in the income distribution as well as the magnitude of their income disadvantages.

2. THE MEASUREMENT OF DEPRIVATION

Following Yitzhaki (1979), income is the object of relative deprivation, as income should be considered an index of the individual's ability to consume commodities. 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 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 $\mathbb{D} = \cup_{n \in \mathbb{N}} \mathbb{D}^n$, 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 $\bar{x} = (\bar{x}_1, \ldots, \bar{x}_n)$, that is $\bar{x}_1 \leq \cdots \leq \bar{x}_n$.

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:

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

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

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

Aggregating (2) we obtain total deprivation, which is actually average deprivation, in the whole society:

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

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

Following this early literature, Chakravarty (1997), building on Kakwani (1984), proposes to look at a relative concept of deprivation,[5] 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:

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

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

$$(5) \qquad D_i^r(x) = 1 - L(x_i) - \frac{(n-i)\bar{x}_i}{n\lambda(x)},$$

where $L(x_i) = \frac{\sum_{j=1}^{i} \bar{x}_i}{n\lambda(x)}$ is the cumulative share of the total income $n\lambda(x)$ enjoyed by the bottom $\frac{i}{n} (0 \leq i \leq n)$ fraction of the population.[6]

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 $\frac{i}{n} (0 \leq i \leq n)$ and $D^r(x_0) = 1$. The relative deprivation curve is downward sloping but no definite conclusion can be drawn regarding its curvature (See Chakravarty et al., 1995).

If the Lorenz curve coincides with the egalitarian line (i.e. in absence of inequality), then the relative deprivation curve coincides with the horizontal line OA, in Figure 1. On the other hand, if there is maximum inequality, the curve coincides with CD in the same figure.[7] The area under the deprivation curve is the Gini coefficient (see Kakwani, 1984).

3. MEASURING SUBJECTIVE WELL-BEING

Generally, subjective well-being is measured by interviewing people in surveys using a single-occasion, self-report question.[8] Papers on this subject
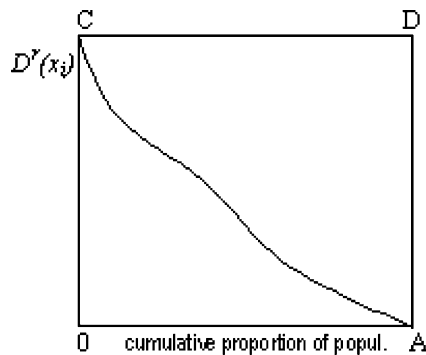
Fig. 1. The relative deprivation curve.

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, the British Household Panel Survey and the European Community Household Panel). We decided to investigate the relationship between subjective well-being and relative deprivation 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 measure of subjective well-being, i.e. 'satisfaction with income' is 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 et al. (2006) confirm this finding for more recent waves of 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 6000 households. A sample of about 2200 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.[9]

The data used in this analysis covers the period 1990 (the first data available for the East German sample) to 2004 (the most recent available data). Due to the above mentioned learning effects, we exclude wave 1 of the more recently started sub-samples. Our overall sample is pooling all adult respondents with valid information on income satisfaction, leaving us with approximately 206,600 observations based on 30,400 individuals in East and West Germany.

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.[10] 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 scale, we apply an equivalence scale with an elasticity of 0.5, given by the square root of household size. All descriptive statistics are based on weighted data correcting for design differences in sampling probabilities and selective non response.

Given the ordinal nature of the dependent variable on subjective well-being (perceived satisfaction with income) an appropriate regression model would be an ordered probit. In order to make full use of the panel nature of our data, controlling for otherwise 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, assuming linearity (see also Hamermesh, 2001, Schwarze and Harpfer, 2006, and Ferrer-i-Carbonell and Frijters, 2004). We also run a random-effects model in order to investigate the effects of time invariant control variables, such as gender and migration status.

5.   THE RESULTS

The relative deprivation curves from 1990 to 2004 are plotted in Figure 2. The years that we are analyzing were of high economic turbulence for Germany since it is the period 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 I and plotted in Figure 3 together with a 93% confidence band.[11] Over the period the Gini coefficient varies little between 0.27 and 0.24 with a tendency towards rising inequality in the most recent years. Table I contains in addition means of the self-reported satisfaction with income. This variable is expressed on an 11 point scale. Over the years we do not observe large aggregate variation: perceived satisfaction with income ranges from 6.045 in 2004 to 6.521 in 2001. Results for most recent years indicate a parallelism of rising inequality and declining subjective well-being. Information on the means of the variables differentiating East from West Germany is contained in Table A-1. Over the first half of the 1990s East Germans improved their income position considerably approaching West Germans levels: the mean income rank rose from 0.27 in 1990 to 0.40 in 1996. From then onwards the convergence process was discontinued. The
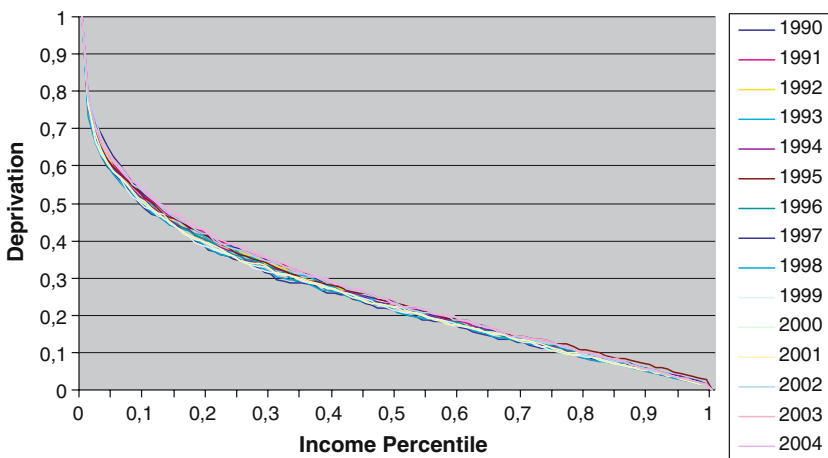
Fig. 2.   Relative deprivation curve for Germany, 1990–2004.

TABLE I

Income inequality and subjective well-being in Germany 1990–2004

Year	Relative deprivation (= Gini)	Subjective well-being: income satisfaction	Equivalent monthly income(1000 €)
	Mean		
1990	0.260	6.448	1.292
1991	0.256	6.469	1.296
1992	0.251	6.359	1.324
1993	0.253	6.329	1.346
1994	0.256	6.159	1.350
1995	0.263	6.272	1.388
1996	0.249	6.256	1.383
1997	0.241	6.067	1.361
1998	0.243	6.148	1.368
1999	0.245	6.255	1.413
2000	0.246	6.419	1.440
2001	0.247	6.521	1.426
2002	0.262	6.294	1.459
2003	0.267	6.181	1.478
2004	0.263	6.045	1.464
Total	0.253	6.281	1.386

Source: Authors' calculation from SOEP.
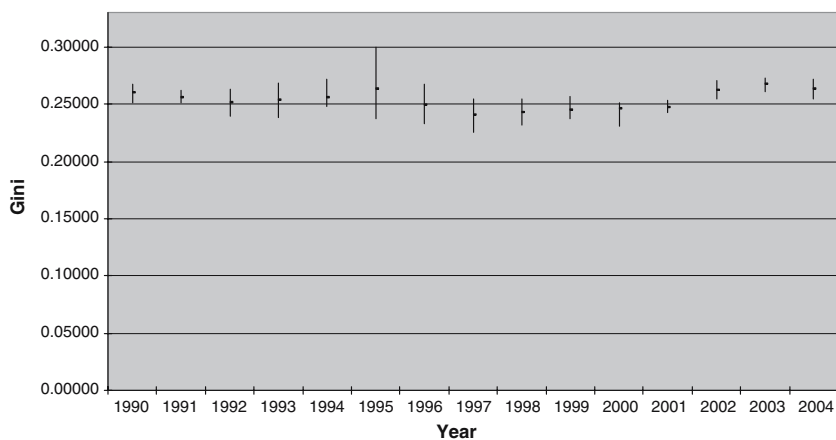
Fig. 3. Income inequality (Gini) in Germany, 1990–2004 (Gini coefficient with confidence interval).

turbulence of the unification process is mirrored in the different development of perceived income satisfaction: in 1991 we observe the highest mean satisfaction level for West Germans (6.88) and the lowest for East Germans (4.73). Parallel to rising incomes in East Germany over the first half of the 1990s, perceived income satisfaction and relative deprivation both approach West German levels, remaining at constant lower levels since then.

Correlation results are presented in Table II and confirm the findings of Easterlin (2001), suggesting that the natural relationship is more between subjective well-being and relative deprivation rather than between subjective well-being and income itself. The rank is also very highly correlated with subjective well-being, but less so than the relative deprivation measure. The difference between the two measures, rank and relative deprivation, is that the former looks only at the position of the individual in the income scale while the latter takes also into account the distances in incomes.[12] It's worth noting the high, but not perfect, correlation values between equivalent income and relative deprivation (−0.77), and between relative deprivation and rank (−0.96).

Obviously, there is need to investigate whether these relationships hold 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, homeownership (as a proxy for household wealth) and unemployment.[13] 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 identifying individuals with 3 and more interviews as a proxy for the interviewing

TABLE II

Correlation of subjective well-being, income, income rank, and relative deprivation in Germany 1990–2004

	Subjective well-being: income satisfaction	Equivalent income	Income rank
Equivalent income	0.3569**	–	–
Income rank	0.4264**	0.8262**	–
Relative deprivation	−0.4386**	−0.7729**	−0.9650**

** Significant at 1%-level. *Source*: Authors' calculation from SOEP.

experience in the panel. In order to capture the effect of the state of the economy, we include regional unemployment rates at the federal state level. We control for the political orientation differentiating individuals with 'strong left', 'left', 'right', 'strong right', and 'no political orientation' (the latter being the reference group). The political orientation variables are informative of preferences and values of the individuals. 'Lefties' might be more interested in an egalitarian society while 'righties' favour private responsibility and economic success, i.e. 'if you work hard, you also should earn more'. As a consequence of this assumption 'strong righties' *ceteris paribus* should be happier with higher incomes than others.[14] We also present all the models without the political orientation variables as not to influence our main results due to a potential reverse causation between income satisfaction and political orientation. Additional control variables include interaction terms on region (East/West Germany) and year of observation (for readability purposes the latter are not reported in Table - III). We first estimate a base model considering only the above mentioned controls (Model 1 and 6). As a second step we introduce separately in the regression equivalent income as an absolute term (Model 2 and 7), income rank (Model 3 and 8), and relative deprivation (Model 4 and 9). Finally Model 5 (and 10) 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 are given in Table III. Starting with the base model on income deprivation, the personal control variables yield in principle the expected results: more educated and newly married people and those who start to live together with dependent children in the house-hold tend to be more satisfied. There is a significant age effect showing that, controlling for the other covariates, aging decreases satisfaction although at decreasing pace (squared effect). By distinguishing on political orientation we conclude that the '(strong) righties' are the only group more satisfied with their income. Homeownership is also positively related to income satisfaction, while the experience of increasing unemployment within an individual's household has the expected detrimental effect on subjective well-being. The latter can be interpreted as follows: the more the household is affected by unemployment, the less satisfied are all household members with their income. The advantage of the household-based index of unem-ployment used in this paper is that it also captures an eventual negative effect of unemployment of third household members.[15] The institutional control variable also 'behaves' as expected: times of high unemployment exert a dampening effect. With respect to the panel or learning effect, our

TABLE III
Correlates of subjective well-being (income satisfaction) in Germany 1990–2004-Results from fixed effects models

	(1) Income satisfaction	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age	-0.057**	-0.069**	-0.060**	-0.056**	-0.057**	-0.057**	-0.069**	-0.060**	-0.056**	-0.057**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Age squared	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**	0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Years of education	0.024**	0.014**	0.008+	0.009+	0.008+	0.025**	0.015**	0.009+	0.009+	0.008+
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
# of children in HH	0.042**	0.125**	0.179**	0.159**	0.163**	0.042**	0.125**	0.179**	0.159**	0.163**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Homeowner	0.118**	-0.001	-0.069**	-0.060**	-0.064**	0.118**	-0.001	-0.069**	-0.060**	-0.064**
	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)
Unemployment index	-0.010**	-0.008**	-0.007**	-0.006**	-0.006**	-0.010**	-0.008**	-0.007**	-0.006**	-0.006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.292**	0.263**	0.237**	0.211**	0.213**	0.292**	0.263**	0.237**	0.211**	0.213**
	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)
3 or more interviews	-0.034*	-0.035*	-0.028+	-0.026	-0.027+	-0.034*	-0.035*	-0.028+	-0.026	-0.027+
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)
Pol. orientation: strong left	0.028	0.035+	0.033+	0.029	0.030	—	—	—	—	—
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)					
Pol. orientation: left	-0.003	-0.006	-0.011	-0.013	-0.012	—	—	—	—	—
	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)					
Pol. orientation: right	0.028+	0.020	0.016	0.015	0.015	—	—	—	—	—
	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)					
Pol. orientation: strong right	0.080**	0.073**	0.067**	0.067**	0.067**	—	—	—	—	—
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)					
Regional unempl. rate	-0.028**	-0.021**	-0.015**	-0.016**	-0.016**	-0.028**	-0.021**	-0.015**	-0.016**	-0.016**
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)

TABLE III
Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Income satisfaction									
Equivalent income/1000	—	0.722**	—	—	0.055**	—	0.722**	—	—	0.055**
		(0.009)			(0.014)		(0.009)			(0.014)
Income rank	—	—	2.442**	—	0.154*	—	—	2.442**	—	0.154*
			(0.024)		(0.075)			(0.024)		(0.075)
Relative deprivation	—	—	—	−4.104**	−3.716**	—	—	—	−4.104**	−3.716**
				(0.038)	(0.111)				(0.038)	(0.111)
Constant	7.993**	7.388**	6.638**	8.825**	8.614**	8.007**	7.403**	6.651**	8.836**	8.626**
	(0.110)	(0.108)	(0.107)	(0.107)	(0.122)	(0.110)	(0.108)	(0.107)	(0.106)	(0.122)
Observations	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578
Individuals	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396
R-squared	0.03	0.06	0.09	0.09	0.09	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 (West/East) and year of observation.*Source:* Authors' calculation from SOEP.

consistently negative coefficient for 'number of interviews' confirm the findings by Landua (1991) and Frick et al. (2006). The interaction terms on region and year of observation (not included in Table III), *ceteris paribus*, indicate a generally higher level of satisfaction among East Germans.

More important to our research question appears to be the comparison of Models 2 (7) to 4 (9), where we include alternatively measures of absolute income, income rank, and relative deprivation, respectively. Confirming our bivariate results from Table II, it appears that after controlling for various personal and institutional characteristics, the highest correlation is given by the relative deprivation. Including income related variables (Models 2 to 5 and 7 to 10) reverses the effect of homeownership on income satisfaction, indicating that net of income effects, new homeowners have higher income aspirations. Including all three measures at the same time (in Model 5 and 10), we find only weak relationships for income level and income rank but a large and highly significant coefficient for relative deprivation. These findings suggest that level and changes in subjective well-being in fact are driven more by the relative deprivation an individual derives from its position in a society than by income level itself. However, not surprisingly, a given sum of money, i.e. the absolute level of income, still retains a slightly significant explanatory power for income satisfaction.

The random-effects models (results contained in Table A-3) show that women are more satisfied than men, and native born persons are more satisfied than immigrants, in all models. However, due to below average income position of migrants in Germany, the latter effect is somewhat reduced once we introduce income.[16]

6. CONCLUSION

Are we satisfied with our income? The answer to the opening question of this paper is that people's satisfaction depends on what they observe around them. Analyzing data for West and East Germany from 1990 to 2004 we showed that happiness/satisfaction indeed is a relative notion indicating that people derive their perceived well-being from being rich*er* not from being simply rich. The idea of Runciman (1966) and its implementation in the Economics literature is confirmed: "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). Future empirical work may relax our basic assumption of a single, i.e. nation wide, reference group.[17] Alternative reference group specifications may be based on e.g. region, family, gender or labor market status.

APPENDIX

TABLE A1

Income measures, relative deprivation and subjective well-being in Germany 1990–2004 by region and year

Year	Equivalent Monthly Income (€)		Relative Income Position (Total = 100)		Income Rank		Subjective Well-Being: Income Satisfaction		Relative Deprivation	
	West Mean	East	West	East	West	East	West	East	West	East
1990	1404	861	108.7	66.6	0.559	0.272	6.679	5.511	0.223	0.400
1991	1398	882	107.9	68.1	0.555	0.278	6.883	4.727	0.222	0.393
1992	1413	955	106.7	72.1	0.546	0.307	6.701	4.886	0.224	0.364
1993	1423	1024	105.7	76.1	0.539	0.337	6.564	5.325	0.230	0.348
1994	1413	1082	104.7	80.2	0.529	0.379	6.329	5.432	0.240	0.323
1995	1450	1129	104.5	81.3	0.526	0.393	6.440	5.549	0.249	0.319
1996	1437	1159	103.9	83.8	0.523	0.407	6.407	5.607	0.238	0.297
1997	1408	1168	103.4	85.8	0.522	0.408	6.219	5.412	0.230	0.286
1998	1412	1185	103.2	86.6	0.520	0.418	6.302	5.497	0.233	0.283
1999	1464	1201	103.6	85.0	0.523	0.405	6.417	5.557	0.233	0.292
2000	1496	1205	103.9	83.6	0.525	0.396	6.577	5.742	0.233	0.302
2001	1481	1202	103.8	84.3	0.523	0.403	6.688	5.805	0.235	0.298
2002	1513	1236	103.7	84.7	0.521	0.412	6.459	5.585	0.250	0.310
2003	1534	1247	103.8	84.3	0.521	0.412	6.357	5.419	0.255	0.316
2004	1522	1217	104.0	83.1	0.524	0.400	6.236	5.214	0.250	0.320
Total	1452	1116	104.7	80.4	0.530	0.375	6.483	5.419	0.236	0.324

Source: Authors' calculation from SOEP.

TABLE A2

Descriptive statistics for variables used in the regressions (random and fixed effects)

Variable	Mean	Std. Dev.	Min	Max
Subjective well-being: income satisfaction	6.193278	2.260359	0	10
Equiv. income / 1000	1.360625	0.6917313	0.1037103	27.06629
Income rank	0.4901253	0.279349	0.0000222	1
Relative Deprivation	0.2569283	0.1673234	0.0	4.9266159
East Germany	0.2823195	0.4501291	0	1
Male	0.483948	0.4997435	0	1
Age	45.24831	16.77437	14	100
Age squared	2328.788	1650.214	196	10000
Native born	0.8444655	0.3624143	0	1
Years of education	11.67672	2.478498	7	18
# of children in HH	0.5876666	0.9258537	0	9
Homeowner	0.4384446	0.4963927	0	5
Unemployment index	7.877417	21.07734	0	100
Married	0.6434277	0.4789881	0	1
3 and more interviews	0.8647242	0.3420187	0	1
East 1990	0.0205201	0.1417714	0	1
East 1991	0.0192857	0.1375276	0	1
East 1992	0.0183224	0.1341147	0	1
East 1993	0.0173833	0.1306949	0	1
East 1994	0.0171606	0.1298699	0	1
East 1995	0.0166717	0.1280383	0	1
East 1996	0.0166426	0.1279286	0	1
East 1997	0.0162554	0.1264563	0	1
East 1998	0.0154857	0.1234745	0	1
East 1999	0.016691	0.1281114	0	1
East 2000	0.0165071	0.1274154	0	1
East 2001	0.0240926	0.1533371	0	1
East 2002	0.0229114	0.1496216	0	1
East 2003	0.0226162	0.1486767	0	1
East 2004	0.0217739	0.1459447	0	1
West 1990	0.0430346	0.2029355	0	1
West 1991	0.0425796	0.2019077	0	1
West 1992	0.0424295	0.2015674	0	1
West 1993	0.0411854	0.1987193	0	1
West 1994	0.0405513	0.1972487	0	1
West 1995	0.042231	0.2011163	0	1
West 1996	0.0410208	0.1983389	0	1
West 1997	0.040469	0.1970569	0	1
West 1998	0.0384988	0.1923975	0	1
West 1999	0.0429281	0.2026955	0	1
West 2000	0.0416743	0.1998444	0	1
West 2001	0.0700462	0.2552254	0	1
West 2002	0.0661009	0.2484591	0	1
West 2003	0.0635692	0.2439845	0	1

TABLE A2
Continued

Variable	Mean	Std. Dev.	Min	Max
West 2004	0.0613618	0.2399934	0	1
Political orientation: strong left	0.0881072	0.2834514	0	1
Political orientation: left	0.1315823	0.3380369	0	1
Political orientation: right	0.098602	0.2981276	0	1
Political orientation: strong right	0.0672724	0.2504938	0	1
Regional unemployment rate	11.06281	4.642153	3.7	23.3

Number of observations (individuals): 206,578 (30,396) Source: Authors' calculation from SOEP.

TABLE A3

Correlates of subjective well-being (income satisfaction) in Germany 1990–2004 – results from random effects models

	(1) Income satisfaction	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male	-0.102**	-0.128**	-0.151**	-0.158**	-0.157**	-0.094**	-0.122**	-0.145**	-0.152**	-0.151**
	(0.019)	(0.018)	(0.018)	(0.017)	(0.017)	(0.019)	(0.018)	(0.018)	(0.017)	(0.017)
Age	-0.040**	-0.048**	-0.052**	-0.049**	-0.050**	-0.039**	-0.047**	-0.051**	-0.049**	-0.050**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age squared	0.000**	0.001**	0.001**	0.001**	0.001**	0.000**	0.001**	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Native born	0.368**	0.278**	0.204**	0.201**	0.200**	0.382**	0.288**	0.213**	0.210**	0.208**
	(0.028)	(0.027)	(0.026)	(0.026)	(0.026)	(0.028)	(0.027)	(0.026)	(0.026)	(0.026)
Years of education	0.080**	0.038**	0.024**	0.029**	0.026**	0.082**	0.039**	0.025**	0.030**	0.027**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
# children	-0.010	0.089**	0.153**	0.135**	0.140**	-0.010	0.089**	0.153**	0.135**	0.140**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Homeowner	0.309**	0.159**	0.087**	0.097**	0.090**	0.313**	0.161**	0.089**	0.100**	0.093**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Unemployment index	-0.013**	-0.010**	-0.008**	-0.007**	-0.007**	-0.013**	-0.010**	-0.008**	-0.007**	-0.007**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.372**	0.338**	0.298**	0.261**	0.265**	0.374**	0.339**	0.299**	0.262**	0.266**
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)
3 + interviews	-0.081**	-0.073**	-0.065**	-0.066**	-0.065**	-0.081**	-0.073**	-0.065**	-0.066**	-0.066**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Strong left	0.053**	0.049**	0.031+	0.027	0.028 +	–	–	–	–	–
	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)					
Left	0.008	-0.001	-0.018	-0.021	-0.021	–	–	–	–	–
	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)					
Right	0.088**	0.058**	0.056**	0.059**	0.057**	–	–	–	–	–
	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)					
Strong right	0.187**	0.140**	0.138**	0.145**	0.141**	–	–	–	–	–
	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)					

TABLE A3
Continued

	(1) Income satisfaction	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regional unempl. rate	-0.016** (0.004)	-0.010** (0.004)	-0.004 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.016** (0.004)	-0.010** (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)
East 1990	-1.284** (0.039)	-0.850** (0.038)	-0.508** (0.038)	-0.500** (0.038)	-0.492** (0.038)	-1.322** (0.039)	-0.877** (0.038)	-0.529** (0.037)	-0.522** (0.037)	-0.514** (0.037)
East 1991	-1.972** (0.041)	-1.598** (0.040)	-1.308** (0.040)	-1.312** (0.039)	-1.304** (0.039)	-2.010** (0.041)	-1.625** (0.040)	-1.330** (0.039)	-1.333** (0.039)	-1.325** (0.039)
East 1992	-1.625** (0.047)	-1.332** (0.045)	-1.089** (0.045)	-1.126** (0.044)	-1.117** (0.044)	-1.642** (0.046)	-1.344** (0.045)	-1.098** (0.045)	-1.136** (0.044)	-1.126** (0.044)
East 1993	-1.151** (0.049)	-0.914** (0.048)	-0.700** (0.047)	-0.737** (0.047)	-0.729** (0.047)	-1.173** (0.049)	-0.930** (0.048)	-0.713** (0.047)	-0.750** (0.047)	-0.742** (0.047)
East 1994	-1.093** (0.050)	-0.899** (0.049)	-0.751** (0.048)	-0.777** (0.048)	-0.770** (0.048)	-1.115** (0.050)	-0.916** (0.049)	-0.764** (0.048)	-0.790** (0.048)	-0.783** (0.048)
East 1995	-1.010** (0.048)	-0.840** (0.047)	-0.680** (0.046)	-0.689** (0.046)	-0.686** (0.046)	-1.027** (0.048)	-0.853** (0.047)	-0.690** (0.046)	-0.699** (0.046)	-0.696** (0.046)
East 1996	-0.903** (0.052)	-0.757** (0.051)	-0.617** (0.050)	-0.682** (0.050)	-0.673** (0.050)	-0.922** (0.052)	-0.771** (0.051)	-0.627** (0.050)	-0.693** (0.050)	-0.683** (0.050)
East 1997	-1.052** (0.059)	-0.912** (0.058)	-0.774** (0.057)	-0.887** (0.056)	-0.873** (0.056)	-1.074** (0.059)	-0.928** (0.058)	-0.786** (0.056)	-0.900** (0.056)	-0.885** (0.056)
East 1998	-1.001** (0.060)	-0.864** (0.058)	-0.727** (0.057)	-0.833** (0.057)	-0.820** (0.057)	-1.025** (0.060)	-0.882** (0.058)	-0.740** (0.057)	-0.847** (0.057)	-0.833** (0.057)
East 1999	-0.903** (0.058)	-0.780** (0.056)	-0.607** (0.055)	-0.701** (0.055)	-0.692** (0.055)	-0.920** (0.058)	-0.793** (0.056)	-0.617** (0.055)	-0.711** (0.055)	-0.702** (0.055)
East 2000	-0.806** (0.057)	-0.689** (0.056)	-0.488** (0.055)	-0.567** (0.054)	-0.561** (0.054)	-0.829** (0.057)	-0.706** (0.056)	-0.501** (0.055)	-0.581** (0.054)	-0.575** (0.054)

TABLE A3
Continued

	(1) Income satisfaction	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
East 2001	-0.759** (0.056)	-0.644** (0.054)	-0.468** (0.053)	-0.552** (0.053)	-0.545** (0.053)	-0.781** (0.056)	-0.661** (0.054)	-0.481** (0.053)	-0.565** (0.053)	-0.558** (0.053)
East 2002	-0.922** (0.057)	-0.840** (0.055)	-0.668** (0.054)	-0.679** (0.054)	-0.681** (0.054)	-0.942** (0.057)	-0.856** (0.055)	-0.680** (0.054)	-0.690** (0.054)	-0.693** (0.054)
East 2003	-1.035** (0.060)	-0.957** (0.058)	-0.779** (0.057)	-0.764** (0.057)	-0.770** (0.057)	-1.053** (0.060)	-0.971** (0.058)	-0.789** (0.057)	-0.773** (0.057)	-0.779** (0.056)
East 2004	-1.152** (0.061)	-1.069** (0.059)	-0.899** (0.058)	-0.901** (0.058)	-0.904** (0.058)	-1.175** (0.061)	-1.086** (0.059)	-0.912** (0.058)	-0.914** (0.058)	-0.917** (0.058)
West 1991	0.192** (0.024)	0.200** (0.024)	0.197** (0.023)	0.184** (0.023)	0.186** (0.023)	0.189** (0.024)	0.197** (0.024)	0.196** (0.023)	0.183** (0.023)	0.185** (0.023)
West 1992	0.013 (0.024)	0.022 (0.024)	0.061** (0.023)	0.029 (0.023)	0.031 (0.023)	0.007 (0.024)	0.017 (0.024)	0.056* (0.023)	0.024 (0.023)	0.026 (0.023)
West 1993	-0.103** (0.025)	-0.114** (0.024)	-0.057* (0.024)	-0.078** (0.024)	-0.079** (0.024)	-0.113** (0.025)	-0.122** (0.024)	-0.064** (0.024)	-0.085** (0.024)	-0.086** (0.024)
West 1994	-0.255** (0.026)	-0.256** (0.025)	-0.195** (0.025)	-0.206** (0.025)	-0.208** (0.025)	-0.264** (0.026)	-0.263** (0.025)	-0.201** (0.025)	-0.212** (0.025)	-0.214** (0.025)
West 1995	-0.215** (0.026)	-0.229** (0.025)	-0.140** (0.025)	-0.121** (0.025)	-0.129** (0.025)	-0.221** (0.026)	-0.234** (0.025)	-0.144** (0.025)	-0.125** (0.025)	-0.133** (0.025)
West 1996	-0.179** (0.027)	-0.199** (0.027)	-0.098** (0.026)	-0.136** (0.026)	-0.138** (0.026)	-0.187** (0.027)	-0.205** (0.027)	-0.103** (0.026)	-0.140** (0.026)	-0.143** (0.026)
West 1997	-0.321** (0.029)	-0.332** (0.028)	-0.259** (0.028)	-0.330** (0.028)	-0.327** (0.028)	-0.331** (0.029)	-0.341** (0.028)	-0.266** (0.028)	-0.337** (0.028)	-0.333** (0.028)
West 1998	-0.302** (0.028)	-0.304** (0.028)	-0.215** (0.027)	-0.282** (0.027)	-0.279** (0.027)	-0.312** (0.028)	-0.312** (0.028)	-0.222** (0.027)	-0.289** (0.027)	-0.286** (0.027)

TABLE A3
Continued

	(1) Income satisfaction	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
West 1999	-0.263**	-0.279**	-0.145**	-0.206**	-0.207**	-0.267**	-0.283**	-0.148**	-0.208**	-0.209**
	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)
West 2000	-0.164**	-0.189**	-0.022	-0.078**	-0.082**	-0.177**	-0.199**	-0.030	-0.087**	-0.090**
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)
West 2001	-0.109**	-0.126**	0.030	-0.020	-0.024	-0.120**	-0.135**	0.023	-0.028	-0.031
	(0.024)	(0.024)	(0.023)	(0.023)	(0.023)	(0.024)	(0.024)	(0.023)	(0.023)	(0.023)
West 2002	-0.287**	-0.347**	-0.168**	-0.161**	-0.174**	-0.295**	-0.353**	-0.173**	-0.166**	-0.180**
	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)
West 2003	-0.389**	-0.460**	-0.279**	-0.253**	-0.270**	-0.393**	-0.463**	-0.281**	-0.255**	-0.272**
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)
West 2004	-0.515**	-0.582**	-0.413**	-0.398**	-0.413**	-0.525**	-0.590**	-0.419**	-0.404**	-0.419**
	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)
Equivalent income/1000	–	0.781**	–	–	0.088**	–	0.783**	–	–	0.090**
		(0.008)			(0.012)		(0.008)			(0.012)
Income rank	–	–	2.621**	–	0.159*	–	–	2.624**	–	0.163*
			(0.021)		(0.070)			(0.021)		(0.070)
Relative deprivation	–	–	–	-4.409**	-3.911**	–	–	–	-4.413**	-3.904**
				(0.033)	(0.103)				(0.033)	(0.103)
Constant	6.049**	5.606**	5.457**	7.846**	7.558**	6.028**	5.589**	5.442**	7.834**	7.540**
	(0.068)	(0.066)	(0.064)	(0.065)	(0.085)	(0.068)	(0.066)	(0.064)	(0.065)	(0.085)
Observations	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578	206,578
Individuals	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396	30,396

Standard errors in parentheses + significant at 10%; * significant at 5%; ** significant at 1% (Standard errors in parentheses). Additional control variables include interaction terms on region (West/East) and year of observation. *Source*: Authors' calculation from SOEP.

NOTES

[1] Exceptions to this are Kakwani (1984), Chakravarty and Mukherjee (1999) and Duclos (2000) with an application to Australian, Indian States 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.

[2] See Easterlin (2002), and Frey and Stutzer (2002) for an extensive survey. For a discussion on the various uses of subjective outcomes as a focus of interest for economists see Hamermesh (2004). See Headey and Wooden (2004) for the relationship between economic measures such as income or wealth and subjective measures of well-being (or happiness) and ill-being (or psychological distress).

[3] The simple correlation between happiness and income in the United States, 1994 data, for example, is only 0.20, as shown by Easterlin (2001) p. 468.

[4] The effects of the turbulence of the reunification process on life satisfaction have been analysed by Frijters et al. (2003).

[5] 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 is 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.

[6] The graph of $L(x_i)$ against $\frac{i}{n}$, where $i = 0,1,..., n$ and $L(x_0) = 0$ is the well known Lorenz curve.

[7] It is clear that there is a link between inequality and deprivation. The connection proceeds further but inequality and deprivation are two different concepts. 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 (Chakravarty, 1994). If y dominates x by the relative deprivation criterion then x dominates y in the Lorenz sense but the converse is not true for $n > 2$.

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

[9] For more information on the SOEP see Haisken-DeNew and Frick (2005) as well as http://www.diw.de/gsoep.

[10] Further research will have to investigate the relationship of self-reported satisfaction and income-related item non-response. Preliminary results indicate that persons with missing income data on average are as satisfied with their income as people who do provide a valid measure of income. However, looking at the extreme values of income satisfaction, i.e. persons with satisfaction values of 0 or 10, the share of observations with missing income data is found to be slightly above average.

[11] This confidence interval is based on a randomization approach, which explicitly considers the regional clustering of the SOEP sample.

[12] See also Brown et al. (2005).

[13] 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.

[14] For a detailed analysis of differences in life satisfaction due to political orientation see Di Tella and MacCulloch (2005).

[15] In other words, it is not only an individual's own faith of becoming unemployed, which has a detrimental effect on his satisfaction, rather, this is also true if other household members experience unemployment.

[16] Breusch and Pagan Lagrangian multiplier tests led to conclude that the appropriate specification of the models is the fixed-effects one.

[17] The identification of the appropriate reference groups is a very difficult, since normative, task. For this reason we decided to be as neutral as possible and not to influence our results with the arbitrary choice of different reference groups for the German society. It could even be possible that the same individual have different reference groups, one for each variable of interest (see Runciman, 1966 for a clear discussion of this issue).

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