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**Working Paper**

## A note on the high stability of happiness: the minimal effects of a nuclear catastrophe on life satisfaction

DIW Discussion Papers, No. 803

**Provided in Cooperation with:**

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*Suggested Citation:* Berger, Eva M. (2008) : A note on the high stability of happiness: the minimal effects of a nuclear catastrophe on life satisfaction, DIW Discussion Papers, No. 803, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

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# Discussion Papers

# 803

Eva M. Berger

**A Note on the High Stability  
of Happiness: The Minimal Effects  
of a Nuclear Catastrophe on Life Satisfaction**

Berlin, July 2008

Opinions expressed in this paper are those of the author and do not necessarily reflect views of the institute.

## IMPRESSUM

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ISSN print edition 1433-0210  
ISSN electronic edition 1619-4535

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# **A Note on the High Stability of Happiness:**

## **The Minimal Effects of a Nuclear Catastrophe on Life Satisfaction**

**Eva M. Berger\***

### **Abstract**

Using life satisfaction as a direct measure of individual utility has become popular in the empirical economic literature. In this context, it is crucial to know what circumstances or changes the measure is sensitive to. Is life satisfaction a volatile concept that is affected by minor changes in life circumstances? Or is it a reliable measure of personal happiness? This paper will analyze the impact of a catastrophe, namely the nuclear catastrophe of Chernobyl, on life satisfaction. I use longitudinal data from the German Socio-Economic Panel Study and especially information collected on a monthly basis which allows the researcher to study calendar effects. The following clear-cut results are found. While concern about the environment rose immediately after the nuclear incident, life satisfaction changed little. This suggests that although people were aware of the severity of the catastrophe, they did not feel that their individual well-being had been affected. This finding is highly relevant to the life satisfaction literature as it shows that the life satisfaction measure is very stable and robust against societal and global events. It is shown to predominantly reflect personal life circumstances like health, employment, income, and the family situation and this relationship is apparently not disturbed by global events. Thus, my results reinforce previous findings on the relationship between life satisfaction and individual life characteristics as the stability of their outcome measure is approved.

**JEL classification:** I31, A12, A19

**Keywords:** Subjective Well-Being, Happiness, Environmental Protection, Household Panel, SOEP

### **Acknowledgement**

I am grateful to Daniela Glocker, Catherine Müller, and Gert G. Wagner for comments on a first draft of this paper.

Berlin, April 2008

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## **1. Introduction**

Research in the field of subjective well-being (happiness studies) has increased remarkably in recent decades. In order to draw conclusions from the analysis of subjective well-being, one needs to know what kind of changes and circumstances they mainly depend on. Especially the question is important if minor events disturb the measured values of satisfaction with life. This paper will demonstrate that life satisfaction – a cognitive measure (which is distinguished from affective well-being measures, cf. Schimmack et al. 2008) – was not sensitive to the nuclear catastrophe in Chernobyl on April 26, 1986, although people were fully aware of its severity. The subjective measure of satisfaction with life is, however, closely related to individual life circumstances like health, income, employment, and family status.

For the following analysis, I use data from the German Socio-Economic Panel (SOEP), an annual household panel study. It spreads fieldwork over a period of several months, allowing researchers to analyze abrupt events and their impact on living conditions and well-being. The present paper exploits this feature of SOEP, which has been used surprisingly rarely in the research to date (Dittmann 2005).

The paper is organized as follows: Section 2 provides some methodological background of the life satisfaction literature and the econometric method I used. Section 3 describes the SOEP data. Section 4 gives estimation results for the analysis of life satisfaction and people's concerns about environmental protection. Section 5 concludes.

## **2. Methodological background**

A comprehensive general survey of the happiness research dealing in particular with conceptual and methodological issues has been provided by Kahneman, Diener, and Schwarz (1999) and also by Frey and Stutzer (2002). The concept of subjective well-being presents a contrast to standard economic theory, which employs an “objectivist” position based on observable individual choices. Frey and Stutzer (2002, p. 405) argue in favor of the life satisfaction concept, saying that “a subjective view of utility recognizes that everybody has their own ideas about happiness and the good life” and that “people are reckoned to be the best judges of the overall quality of their lives, and it is a straightforward strategy to ask them about their well-being”. The authors explain that behind a person's score lies a cognitive assessment of their life circumstances compared to other individuals, to future expectations, as well as to past experiences.

Several authors have approached the validity question, i.e., whether happier people actually report higher life satisfaction scores than less happy individuals. They found subjective well-being correlated with physical evidence of affect such as smiling, laughing, heart rate measures, and electrical activity in the brain. Also, satisfaction measures are found to have relatively high test-retest correlations, which further points to the validity and stability of the concept (see, e.g., the review in Frey and Stutzer 2002).

As a further stability test, it is now interesting to know how sensitive subjective well-being is to global events that do not directly affect individual lives but could influence the answers to the satisfaction question. This issue is approached in this paper.

The method I use for the life satisfaction estimation is Ordinary Least Squares (OLS), interpreting the life satisfaction variable as a cardinal scale and comparable across respondents.<sup>1</sup> Ferrer-i-Carbonell and Frijters (2004) have shown the importance of accounting for individual heterogeneity, which may be correlated with the error term and may thus cause some coefficients to be biased. However, in the present analysis I am interested in the effect of an exogenous event, the Chernobyl incident. It is very unlikely that the date of the interview, i.e., either before or after the Chernobyl incident, is correlated with individual characteristics. Hence, using OLS should be the adequate method for my purpose.<sup>2</sup>

For the estimation of the environmental worries equation (see below), I use a logit model, estimated by common maximum likelihood techniques (e.g., Greene 2003, ch. 17 and 21, Cameron and Trivedi 2005, ch. 5 and 14).

### **3. Data**

The analysis is based on the German Socio-Economic Panel (SOEP), a household panel study started in 1984. While being multi-disciplinary, it is clearly centered on the analysis of the life course and well-being. In the field of subjective well-being, the survey contains questions on general life satisfaction, satisfaction with certain life domains, as well as worries in particular domains. The original sample size was just below 6,000 households and included slightly

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<sup>1</sup> The methodologically correct regression approach for an 11-point satisfaction scale would be ordered logit or ordered probit because they do not presume cardinality of the scores. However, Frey and Stutzer (2000) as well as Ferrer-i-Carbonell and Frijters (2004) have demonstrated that using ordinary least squares regression leads to negligible differences in results. In line with these findings and for the benefit of a more obvious interpretation, I have decided to use this regression method.

<sup>2</sup> Also, the data do not provide information for the same individual interviewed immediately before and after the incident which would make it possible to compare outcomes in both situations. Using the pooled data from the year 1986 allows us to divide the respondents exactly into “asked before“ and “asked after the incident.”

more than 12,000 individual respondents in West Germany. The sample was enlarged several times and reached a number of 12,499 households and 22,639 adult respondents in East and West Germany in 2006 (Wagner, Frick, and Schupp 2007).

For my regression analysis, I use data from the waves 1986 and 1987, providing a total of 16,355 observations after dropping those with missings in the relevant items.

Table A3 in the appendix gives the distribution of the observations across the months. Since about 95% of the interviews each year are completed until May, it is not possible to analyze on a monthly basis events that took place later in the year. Since the Chernobyl incident took place in the month of April, the monthly analysis of the data was possible.

The dependent variable in my first regression is general life satisfaction, rated on an 11-point scale. The question on this topic in the survey is:

“Finally, we would like to ask you about your satisfaction with your life in general. Please answer using the following scale, in which 0 means completely dissatisfied and 10 means completely satisfied. How satisfied are you at present with your life as a whole?”

The mean value of this life satisfaction measure in the sample is 7.23; in the subsample interviewed before the Chernobyl incident the mean is 7.32; in the subsample after the Chernobyl incident it is 7.16.

In a further estimation, I use a binary dependent variable indicating if a respondent reported being very worried about environmental protection. The question in the survey, which appears in the context of questions about other particular worries, is:

“Are you worried about the protection of the natural environment?”

The potential answers are “very worried”, “slightly worried”, or “not worried”. I code a binary variable as 1 if the respondent reported being very worried about environmental protection and 0 if he/she reported being slightly or not worried about environmental protection.

The probability of this variable being 1 in my sample is 47 percent; in the subsample before the Chernobyl incident it is 39 percent; and in the subsample after the Chernobyl incident it is 53 percent.

To analyze the nuclear incident in Chernobyl, I code a dummy variable taking on the value 1 if the observation dates to April 26 or later and 0 otherwise. Data from the year 1987 (in

addition to 1986) are included in my sample in order to have enough observations dating to the months after the nuclear incident. This is necessary because more than 80% of the yearly interviews are usually completed before the end of April.

To control for confounding factors, I include a number of socio-economic variables that are common in a life satisfaction context.<sup>3</sup> These control variables are sex, age, age squared, nationality, the logarithm of the net household income<sup>4</sup>, marital status, number of children, employment status, educational degree, disability, and a dummy if a person in need of long-term care lives in the respondent's household. Descriptive statistics are given in Tables A1 to A3 in the appendix.

#### 4. Results

Model (1) in Table 1 (the first two columns) gives the result of an OLS regression of life satisfaction on the Chernobyl dummy variable and a number of socio-economic control variables (described above). One observes that life satisfaction declined on average by 0.15 points after the nuclear catastrophe. This corresponds to a decrease of 2.1 percent for the average respondent reporting a life satisfaction value of 7.23.

The coefficients of most control variables are significant and show the same sign as in most previous life satisfaction studies.<sup>5</sup> The conformity of these results with previous findings points to their validity. Hence, the Chernobyl effect should be meaningful as well.

To look at the evolution of life satisfaction in the years 1986 and 1987 in more detail, I introduce monthly time dummies to the model in substitution for the Chernobyl dummy variable. Results for this second specification are shown in model (2) in Table 1 (third and fourth column).

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<sup>3</sup> See, e.g., Clark and Oswald 1994, Frijters, Hasken-DeNew, and Shields 2004a and 2004b, Winkelmann 2005, Layard, Mayraz, and Nickell 2007; for a review of the life satisfaction literature see, e.g., Easterlin 2001, Frey and Stutzer 2002, Kahneman et al. 2006.

<sup>4</sup> In DM and inflation-adjusted on the 1986 level.

<sup>5</sup> Positive effects are identified here for the coefficients of income and for being married and living together (while the reference category is living alone). Negative effects are found for being male, living in a household with a person in need of long-term care, being disabled, being separated, divorced, or widowed, and for having children. The status of being in part-time employment, in (involuntary) unemployment, in military or civilian service (compared to being employed full-time) all have negative effects. The same is true for people not having completed any vocational degree (compared to having any vocational or higher educational degree). The negative sign of the age coefficient combined with the positive sign of the coefficient related to age squared point to a U-shaped age effect on life satisfaction. This phenomenon has been analyzed recently by Easterlin (2006), Blanchflower and Oswald (2007), as well as Clark (2007).



**Table 1: The nuclear incident in Chernobyl on April 26, 1986 and life satisfaction: Results of an OLS regression with robust standard errors**

| Variable   |   | (1)       |       | (2)       |       |
|--|---|-----------|-------|-----------|-------|
|  |   | b         | s.e.  | b         | s.e.  |
| Monthly time dummies, reference category is April 1986 (without April 26-30, 1986) | Feb '86   |           |       | 1.229***  | 0.295 |
|  | Mar '86   |           |       | 0.027     | 0.049 |
|  | May '86 (incl. April 26-30, 1986)                 |           |       | 0.030     | 0.069 |
|  | Jun '86   |           |       | 0.081     | 0.111 |
|  | Jul '86   |           |       | 0.187     | 0.225 |
|  | Aug '86   |           |       | -0.159    | 0.408 |
|  | Jan '87   |           |       | -1.539    | 1.168 |
|  | Feb '87   |           |       | -0.048    | 0.066 |
|  | Mar '87   |           |       | -0.189*** | 0.047 |
|  | Apr '87   |           |       | -0.148**  | 0.069 |
|  | May '87   |           |       | -0.121    | 0.106 |
|  | Jun '87   |           |       | -0.299*   | 0.173 |
|  | Jul '87   |           |       | -1.629*** | 0.558 |
| Chernobyl (Dummy = 1 after April 25, 1986)   |   | -0.152*** | 0.029 |           |       |
| Male   |   | -0.081**  | 0.035 | -0.082**  | 0.035 |
| Age  |   | -0.036*** | 0.006 | -0.035*** | 0.006 |
| Age_squared  |   | 0.001***  | 0.000 | 0.001***  | 0.000 |
| Non-German nationality   |   | 0.043     | 0.039 | 0.037     | 0.041 |
| Log of monthly net household income  |   | 0.372***  | 0.033 | 0.381***  | 0.033 |
| Person in need of long-term care in the hh   |   | -1.351*** | 0.098 | -1.344*** | 0.097 |
| Disabled   |   | -1.007*** | 0.033 | -1.006*** | 0.033 |
| Marital status (reference category: lone)  | Married and living together                       | 0.167***  | 0.054 | 0.161***  | 0.054 |
|  | Married and living separated                      | -0.782*** | 0.164 | -0.801*** | 0.163 |
|  | Divorced  | -0.303*** | 0.089 | -0.309*** | 0.089 |
|  | Widowed   | -0.167*   | 0.089 | -0.176**  | 0.089 |
| Number of children (reference category: no children)                               | 1 child in household (age 0-15)                   | -0.115*** | 0.041 | -0.112*** | 0.041 |
|  | 2 children in household (age 0-15)                | -0.039    | 0.048 | -0.031    | 0.048 |
|  | 3 or more children in household (age 0-15)        | -0.221*** | 0.076 | -0.212*** | 0.076 |
| Employment status (reference category: full-time employed)                         | Part-time employed                                | -0.135**  | 0.061 | -0.135**  | 0.061 |
|  | In education <sup>a</sup>                         | -0.032    | 0.069 | -0.030    | 0.069 |
|  | Marginally <sup>b</sup> or not regularly employed | -0.093    | 0.104 | -0.095    | 0.104 |
|  | (Voluntarily) not employed                        | -0.017    | 0.047 | -0.018    | 0.047 |
|  | In military or civilian service                   | -0.557*** | 0.194 | -0.537*** | 0.197 |
|  | Registered as unemployed                          | -1.098*** | 0.095 | -1.093*** | 0.095 |
| Educational degree (reference category: vocational degree <sup>c</sup> )           | University degree <sup>d</sup>                    | 0.024     | 0.055 | 0.017     | 0.055 |
|  | No vocational degree                              | -0.096*** | 0.034 | -0.098*** | 0.034 |
| _cons  |   | 5.282***  | 0.295 | 5.185***  | 0.298 |
| Number of obs  |   | 16,355    |       | 16,347    |       |
| F( 23, 16331)  |   | 80.19     |       | 54.38     |       |
| Prob > F   |   | 0.000     |       | 0.000     |       |
| R-squared  |   | 0.1199    |       | 0.1223    |       |
| Root MSE   |   | 1.805     |       | 1.804     |       |

<sup>a</sup> This refers to being in vocational training, in higher education, in voluntary service, or doing an internship.

<sup>b</sup> “Marginal employment” (*geringfügige Beschäftigung*) in Germany means working a low number of hours and having earnings not or only partially subject to social security contributions.

<sup>c</sup> This category includes degrees from *Lehre, Berufsfachschule, Schule für Gesundheitswesen, Fachschule, Beamtenausbildung*, and other vocational degrees.

<sup>d</sup> This category includes degrees from a University, *Fachhochschule, Technische Hochschule (TH)*, and equivalent degrees from other countries.

\* Statistically significant at the level  $\alpha = 10\%$ .

\*\* Significant at the level  $\alpha = 5\%$ .

\*\*\* Significant at the level  $\alpha = 1\%$ .

Source: Data from the German Socio-Economic Panel Study, waves 1986 and 1987, author’s calculations.

It was not possible to include every month as a dummy variable in the model since interviews were not conducted in each month. Completely unavailable months are November and December 1986 as well as August and October 1987.<sup>6</sup> Other monthly dummies are removed from the specification because there were very few observations available; these are January, September, and October 1986 as well as September, November, and December 1987. April 1986 serves as reference category in this set of time dummies.<sup>7</sup>

Substituting the Chernobyl dummy by monthly time dummies does not change the coefficients of the controls visibly. In this respect, they are robust.

Most coefficients of the monthly dummies for the year 1986 are not significantly different from zero. An exception is that of February 1986, but a look at Table A3 in the appendix reveals that there are only nine observations dating to this month. Thus, in this case, the coefficient should be considered with caution. A remarkable and robust finding is the lack of any effect in the months immediately after the catastrophe (especially in May 1986, there are certainly enough observations). However, life satisfaction was negatively affected by the time dummies almost one year later, in March and April 1987. The average satisfaction level declined by 0.19 and 0.15 points, in March and April respectively, on the life satisfaction score. It is hard to say what circumstances caused this decline. In any case, it is not at all straightforward to argue that the decline was caused by the nuclear catastrophe one year before.<sup>8</sup> In any case, the data support the statement that the global catastrophe did not disturb the relationship of the cognitive well-being measure with other (individual) variables.

Now, one could argue that people in Germany simply did not pay attention to the Chernobyl event or did not place any major importance on it. This could be the simple reason that the incident did not show any effect on the life satisfaction outcome. In order to rule out this hypothesis, in the next step I will look at the impact of the Chernobyl incident on people's concerns about environmental protection. For this purpose, I estimate a logit model using as dependent variable a dummy taking on the value 1 if a respondent reported being very worried about environmental protection. A similar range of control variables as above is

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<sup>6</sup> See Table A3 in the appendix, where frequencies of monthly observations are given.

<sup>7</sup> The dummy variable for April 1986 is coded as one only if the interview took place between April 1 and 25. For interviews that took place between April 26 and 30, the 1 is delayed to the May 1986 dummy.

<sup>8</sup> A downward-sloping business cycle, however, is not a reasonable explanation either, since the next economic recession took place only in 1993. Unfortunately, it is not possible to determine the exact point in time in which life satisfaction declined because few interviews were conducted during the winter months.

included in the model.<sup>9</sup> The results are given for a model with a single Chernobyl dummy (model (1) in Table 2) and a further model containing monthly time dummies analogue to those above (model (2) in Table 2).

The coefficient of the Chernobyl dummy is highly significant. The probability (marginal effect = m.e.) of a respondent reporting being very worried about the environment increased on average by about 16 percentage points after April 26, 1986 compared to the three months before.

Some further notes on the resulting marginal effects related to the control variables: men are less concerned about environmental issues than women, and non-Germans are also less concerned than Germans. This is plausible as especially in the 1980s, the awareness of environmental issues was much more pronounced in Germany than in other countries.

Furthermore, the better educated people are, the more they worry about the natural environment. This is suggested by the positive marginal effect related to the variable of having a university degree and the negative effect related to the variable of having no vocational degree.

Respondents in part-time employment, education, marginal employment, and unemployment are significantly more worried about environmental protection than respondents in full-time employment. The reason could be that all these categories of people—who do not work a full day—simply have more time to consider environmental issues. In contrast, people who are voluntarily not employed seem not to be more concerned about the environment than full-time workers. This could be due to the fact that these people are busy with other activities than employment (e.g., child care). However, one could expect that parents are more concerned about the environment than people without children because children are generally more vulnerable to environmental problems—for example, due to the time they spend playing outside. However my results suggest that parents are significantly less worried about the environment, and the effects (in absolute values) even increase with the number of children.

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<sup>9</sup> However, the controls “disabled” and the dummy variable indicating whether a person in need of long-term care lives in the respondent’s household are removed from the model because they are judged to be of little importance in the context of environmental worries. Indeed, when included in the analysis, the related coefficients are statistically not significant and the coefficients of the other regressors do not change much.

**Table 2: The nuclear incident in Chernobyl on April 26, 1986, and worries about environmental protection: Marginal effects (m.e.) and standard errors (s.e.) of a logit estimation<sup>a</sup>**

| Variable   |   | (1)       |          | (2)       |       |
|--|---|-----------|----------|-----------|-------|
|  |   | m.e.      | s.e.     | m.e.      | s.e.  |
| Monthly time dummies, reference category is April 1986 (without April 26-30, 1986) | Feb '86   |           |          | -0.243*   | 0.143 |
|  | Mar '86   |           |          | -0.040*** | 0.014 |
|  | May '86 (incl. April 26-30, 1986)                 |           |          | 0.088***  | 0.019 |
|  | Jun '86   |           |          | 0.093***  | 0.031 |
|  | Jul '86   |           |          | 0.028     | 0.057 |
|  | Aug '86   |           |          | 0.043     | 0.115 |
|  | Jan '87   |           |          | 0.215     | 0.264 |
|  | Feb '87   |           |          | 0.143***  | 0.018 |
|  | Mar '87   |           |          | 0.154***  | 0.013 |
|  | Apr '87   |           |          | 0.070***  | 0.020 |
|  | May '87   |           |          | 0.083**   | 0.033 |
|  | Jun '87   |           |          | 0.050     | 0.051 |
|  | Jul '87   |           |          | 0.299***  | 0.095 |
|  | Chernobyl (Dummy = 1 after April 25, 1986)        |           | 0.157*** | 0.008     |       |
|  | Male  | -0.031*** | 0.010    | -0.031*** | 0.010 |
|  | Age   | 0.002     | 0.002    | 0.002     | 0.002 |
|  | Age_squared                                       | 0.000***  | 0.000    | 0.000***  | 0.000 |
|  | Non-German nationality                            | -0.158*** | 0.010    | -0.150*** | 0.011 |
|  | Log of monthly net household income               | -0.014    | 0.009    | -0.016*   | 0.009 |
| Marital status (reference category: lone)  | Married and living together                       | -0.011    | 0.016    | -0.010    | 0.016 |
|  | Married and living separated                      | -0.104*** | 0.039    | -0.102*** | 0.039 |
|  | Divorced  | 0.016     | 0.025    | 0.016     | 0.025 |
|  | Widowed   | 0.010     | 0.024    | 0.012     | 0.024 |
| Number of children (reference category: no children)                               | 1 child in household (age 0-15)                   | -0.026**  | 0.012    | -0.026**  | 0.012 |
|  | 2 children in household (age 0-15)                | -0.040*** | 0.014    | -0.041*** | 0.014 |
|  | 3 or more children in household (age 0-15)        | -0.070*** | 0.020    | -0.071*** | 0.020 |
| Employment status (reference category: full-time employed)                         | Part-time employed                                | 0.029*    | 0.018    | 0.029     | 0.018 |
|  | In education <sup>a</sup>                         | 0.145***  | 0.019    | 0.143***  | 0.019 |
|  | Marginally <sup>b</sup> or not regularly employed | 0.058**   | 0.029    | 0.057**   | 0.029 |
|  | (Voluntarily) not employed                        | 0.004     | 0.013    | 0.003     | 0.013 |
|  | In military or civilian service                   | 0.067     | 0.059    | 0.063     | 0.060 |
|  | Registered as unemployed                          | 0.044**   | 0.021    | 0.042**   | 0.021 |
| Educational degree (reference category: vocational degree <sup>c</sup> )           | University degree <sup>d</sup>                    | 0.116***  | 0.016    | 0.119***  | 0.016 |
|  | No vocational degree                              | -0.074*** | 0.010    | -0.073*** | 0.010 |
| Number of obs  |   | 16,355    |          | 16,347    |       |
| LR chi2(21)  |   | 1,171.3   |          | 1230.24   |       |
| Prob > chi2  |   | 0.000     |          | 0.000     |       |
| Pseudo R2  |   | 0.052     |          | 0.0544    |       |
| Log likelihood   |   | -10,728   |          | -10,693   |       |

<sup>a</sup> The binary dependent variable takes on the value of one if the respondent reported being very worried, and the value of zero if he/she reported not being worried or only slightly worried about environmental protection. The figures shown in the first and second column are marginal effects at the mean.

<sup>b</sup> This refers to being in vocational training, in higher education, in voluntary service, or doing an internship.

<sup>c</sup> "Marginal employment" in Germany (*geringfügige Beschäftigung*) means working a low number of hours and having earnings not or only partially subject to social security contributions.

<sup>d</sup> This category includes degrees from *Lehre*, *Berufsfachschule*, *Schule für Gesundheitswesen*, *Fachschule*, *Beamtenausbildung*, and other vocational degrees.

<sup>e</sup> This category includes degrees from a University, *Fachhochschule*, *Technische Hochschule (TH)*, and equivalent degrees from other countries.

\* Statistically significant at the level  $\alpha = 10\%$ .

\*\* Significant at the level  $\alpha = 5\%$ .

\*\*\* Significant at the level  $\alpha = 1\%$ .

Source: Data from the German Socio-Economic Panel Study, waves 1986 and 1987, author's calculations.

This supports my hypothesis that parents do not have much time left to care about “invisible” things—at least not at that time where environmental protection were less present in the public debate than it is today.

The estimation of the Chernobyl effect with monthly dummies shows that in the two months after the incident, the probability of a respondent reporting being very worried is *ceteris paribus* nine percentage points higher than in the month before the incident. The effects of the following three months are not significant, which is likely related to the small sample size interviewed in these months. Only 90 interviews were conducted in July 1986, 20 in August 1986, and three in January 1987<sup>10</sup>. In the months February, March, and April 1987, the effects are again highly significant. The probabilities of being very concerned about the environment in these months is 14 (February), 16 (March), and seven (April) percentage points higher than in April 1986 (before the nuclear incident). In the following month, May 1987, the probability is still eight percentage points higher compared to the reference month and the effect is still significant on a 5% level. For the months June and July 1987, there are only 111 and 19 observations respectively, with the latter nevertheless showing a significant effect on environmental concerns.

One can conclude that concern about the environment increased immediately after the nuclear incident and did not decline after several months but rather increased further over the course of time. The impact of the catastrophe on worries about the environment was very pronounced—unlike the impact on general life satisfaction. This suggests that life satisfaction is on the one hand closely related to individual life circumstances but does not visibly react to a global incident like an environmental catastrophe—which has in fact almost no real impact on personal life in (West) Germany.

The impact of Chernobyl on environmental concerns shows that people definitely were aware of the severity of the accident. But at the same time, it did not directly touch their individual lives. This gives evidence for the high stability of the subjective life satisfaction measure, which, on the one hand, is highly sensitive to individual and household characteristics like health, income, employment, and family situation, but on the other, does not react to even large-scale environmental incidents like the Chernobyl catastrophe—as long as people’s personal lives are not directly involved. The subjective life satisfaction concepts included in SOEP have once again proven to be useful as a measure of individual well-being, which is not

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<sup>10</sup> See Table A2 in the appendix for the number of observations in each month.

susceptible to the distortions of global events but rather the product of individual life circumstances.

## **5. Conclusion**

In this paper, I have demonstrated that the subjective well-being measure “life satisfaction” was not affected by the nuclear catastrophe in Chernobyl. The measure does, however, strongly depend on individual and household characteristics like health, income, employment and family life.

This result has been found by analyzing the impact of the nuclear incident in Chernobyl of April 26, 1986, on individual life satisfaction as well as on people’s worries about the environment. While life satisfaction did not change visibly, worries about the natural environment increased sharply just after the catastrophe. The incident appeared to be responsible for a nine percentage point increase in the probability of reporting being “very worried about environmental protection” in May 1986 and by even 14 and 15 percentage points in February and March 1987, respectively.

As satisfaction with life was not sensitive to the environmental incident, it has been demonstrated to be a stable measure of individual well-being. Furthermore, it has been shown to be highly correlated to individual characteristics while not being prone to distortions by a global catastrophe—even though people were well aware of the severity of the incident.

## Appendix

**Table A1: Descriptive Statistics: Absolute and relative frequencies of the dummy variables included in the regression models**

|                    | Variable  | Absolute frequency | Relative frequency |
|--------------------|---|--------------------|--------------------|
|                    | Being very worried about the environmental protection | 7,746              | 47.4%              |
|                    | Chernobyl (Dummy = 1 from April 26,1986)              | 9,622              | 58.8%              |
|                    | Male  | 8,078              | 49.4%              |
|                    | Non-German nationality                                | 4,059              | 24.8%              |
|                    | Person in need of long-term care living in the hh     | 639                | 3.9%               |
|                    | Disabled  | 6,049              | 37.0%              |
| Marital status     | Married and living together                           | 11,177             | 68.3%              |
|                    | Married and living separated                          | 185                | 1.1%               |
|                    | Lone  | 3,286              | 20.1%              |
|                    | Divorced  | 677                | 4.1%               |
|                    | Widowed   | 1,030              | 6.3%               |
| Number of children | 1 child in household (age 0-15)                       | 3,189              | 19.5%              |
|                    | 2 children in household (age 0-15)                    | 2,269              | 13.9%              |
|                    | 3 or more children in household (age 0-15)            | 867                | 5.3%               |
| Employment status  | Full-time employed                                    | 7,945              | 48.6%              |
|                    | Part-time employed                                    | 1,097              | 6.7%               |
|                    | In education <sup>a</sup>                             | 1,211              | 7.4%               |
|                    | Marginally <sup>b</sup> or not regularly employed     | 350                | 2.1%               |
|                    | In military or civilian service                       | 84                 | 0.5%               |
|                    | (Voluntarily) not employed                            | 5,074              | 31.0%              |
|                    | Registered as unemployed                              | 678                | 4.1%               |
| Educational degree | University degree <sup>c</sup>                        | 1,172              | 7.2%               |
|                    | Vocational degree <sup>d</sup>                        | 8,730              | 53.4%              |
|                    | No vocational degree                                  | 6,453              | 39.5%              |

Number of obs = 16,355

<sup>a</sup> This refers to being in vocational training, in higher education, in voluntary service, or doing an internship.

<sup>b</sup> “Marginal employment” in Germany (*geringfügige Beschäftigung*) means working a low number of hours and having earnings not or only partially subject to social security contributions.

<sup>c</sup> This category includes degrees from *Lehre*, *Berufsfachschule*, *Schule Gesundheitswesen*, *Fachschule*, *Beamtenausbildung*, and other vocational degrees.

<sup>d</sup> This category includes degrees from a University, *Fachhochschule*, *Technische Hochschule (TH)*, and equivalent degrees from other countries.

Source: Data from the German Socio-Economic Panel Study, waves 1986 and 1987, author’s calculation.

**Table A2: Descriptive Statistics for metric variables included in the regression models**

| Variable                                  | Mean  | Std. Dev. | Min | Max    |
|---|-------|-----------|-----|--------|
| Life satisfaction                         | 7.23  | 1.92      | 0   | 10     |
| Monthly net household income <sup>a</sup> | 3,285 | 2,579     | 50  | 96,207 |
| Age                                       | 43.2  | 16.4      | 16  | 94     |

Number of obs = 16,355

<sup>a</sup> In DM and inflation-adjusted on the 1986 level.

Source: Data from the German Socio-Economic Panel Study, waves 1986 and 1987, author’s calculation.

**Table A3: Descriptive Statistics: Absolute and relative frequencies of observations in each month**

| Month                             | Absolute frequency | Relative frequency |
|-----------------------------------|--------------------|--------------------|
| Jan '86                           | 1                  | 0.0%               |
| Feb '86                           | 9                  | 0.1%               |
| Mar '86                           | 4,542              | 27.8%              |
| Apr '86                           | 2,181              | 13.3%              |
| May '86 (incl. April 26-30, 1986) | 1,052              | 6.4%               |
| Jun '86                           | 306                | 1.9%               |
| Jul '86                           | 86                 | 0.5%               |
| Aug '86                           | 20                 | 0.1%               |
| Sep '86                           | 1                  | 0.0%               |
| Oct '86                           | 2                  | 0.0%               |
| Nov '86                           | 0                  | 0.0%               |
| Dec '86                           | 0                  | 0.0%               |
| Jan '87                           | 3                  | 0.0%               |
| Feb '87                           | 1,317              | 8.1%               |
| Mar '87                           | 5,394              | 33.0%              |
| Apr '87                           | 1,030              | 6.3%               |
| May '87                           | 278                | 1.7%               |
| Jun '87                           | 110                | 0.7%               |
| Jul '87                           | 19                 | 0.1%               |
| Aug '87                           | 0                  | 0.0%               |
| Sep '87                           | 1                  | 0.0%               |
| Oct '87                           | 0                  | 0.0%               |
| Nov '87                           | 1                  | 0.0%               |
| Dec '87                           | 2                  | 0.0%               |

Number of obs = 16,355

Source: Data from the German Socio-Economic Panel Study, waves 1986 and 1987, author's calculation.



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