Selected Issues Concerning Life Satisfaction:

Measuring Non-Pecuniary Gains and Losses with Panel Data of the Socio-Economic Panel (SOEP)

Dissertation

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Chapter 1

Selected Issues on Life Satisfaction - An Introduction

1.1 Introduction to Happiness Research

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness." (Thomas Jefferson, The United States Declaration of Independence of 1776)

It belongs to the "unalienable Rights" of every American to pursue his or her happiness, as mentioned in The United States Declaration of Independence (1776) by Thomas Jefferson. In his 1894 *Essay Concerning Human Understanding* John Locke, the forefather of liberalism, formulated the thought of "The Pursuit of Happiness." This basic position of political philosophy with which a liberal political, economic, and social order has been sought could be regarded as one of the first attempts to combine happiness and economics. Easterlin (1974), who was one of the first economists to examine the topic of happiness, stated that if a country's absolute income increases, this does not necessarily translate into an increase in life satisfaction. Rather, he was able to show that relative income is a more appropriate predictor of life satisfaction than absolute income. This empirical evidence appears in the economic literature as the so-called "Easterlin Paradox."

The interest of psychology, politics and sociology in happiness or life satisfaction is reflected by the vast and still growing number of scientific publications. Writing scholarly articles about happiness has also become very popular in the field of economics in recent

years. The database EconLit shows that published articles about happiness and economic issues has exponentially increased over the last ten years (c.f. Stutzer and Frey, 2012). The high number of published articles indicates that the influence of the subjective concept of happiness has changed outdated views and provided informative insights in the fields of micro- and macroeconomics (c.f. Frey and Stutzer, 2002). The following reviews show us the current status of happiness research from an economic perspective: Diener et al. (2010), Di Tella and MacCulloch (2006), Dolan et al. (2008), Layard and Layard (2011), Stutzer and Frey (2010), Van Praag and Ferrer-i-Carbonell (2008).

Furthermore, the importance of happiness research is indicated by conventions like the Conference on Happiness and Well-Being first held in April 2012, whose chairman was the prime minister of Bhutan, the annual World Happiness Report, or the so-called "Gücksatlas" (Happiness Atlas) for Germany. Both the World Happiness Report and the "Glücksatlas" continue the political search of alternative welfare measures (c.f. Helliwell et al., 2013; Raffelhüschen and Köcher, 2013). In particular the World Happiness Report, which is based on the largest dataset on the topic of happiness ever collected, highlights the necessity of political action being more directed toward people's real needs. More and more countries have begun to measure economic progress by the subjective sense of well-being of their own population. It is telling that in July 2011 the UN General Assembly passed a resolution inviting the member states to measure the happiness of their own population in order to use that information for the political and economic direction of their policies. As mentioned above, all of this underlines that the pursuit of happiness is not only a personal matter but also of national and international political and economic interest, and that at the same time it should lead to the well-being of the people (Helliwell et al., 2013). The German government has appointed a "Study Commission on Growth, Well-being and Quality of Life – Paths to Sustainable Economic Activity and Social Progress in the Social Market Economy" with the aim to question traditional perceptions of our welfare state and to develop alternative welfare indicators. In its final report in 2013 it advises a new kind of welfare measurement which should indicate social and ecological dimensions of wealth, amongst others, and thus not only include objective facts but also subjective views (Deutscher Bundestag, 2013).

Furthermore, on the one hand the following thoughts are intended as a brief outline of how to define and measure happiness and as a critical closer examination of the basic concept of subjective happiness; on the other hand it will give an overview of important literature on happiness research of recent years.

Microeconomic research traditionally viewed utility objectively, as something which

nonetheless allowed for meaningful inferences regarding human behavior. In this approach the utility of something for individuals was derived from the decisions they made. In other words, these decisions provided all the information that was necessary to make statements about human behavior. For this reason there was no need for a "cardinal and interpersonal comparable measure" (Frey and Stutzer, 2002). So-called "anomalies" regarding the estimated utility for individuals are responsible, among other factors, for the transition to a subjective view of the utility concept. This approach questioned the objective view and its assumption that utility can always be correctly derived from the decisions taken by the individuals (c.f. Frey and Stutzer, 2002; Kahneman et al., 1997). Moreover, the empirical concept of happiness has further evolved to a revolutionary degree and focused on the subjective view of usefulness. This modern view of "happiness" in economics refers to the concept of "experienced utility," thus expanding the traditional view of the utility of decisions. Consequently, allowing for a direct link with the subjective sense of well-being, the "subjective" view introduces the assumption that people are best able to assess their degree of happiness themselves, so one can simply ask them how satisfied they are with their life (Frey and Stutzer, 2002).

This so-called subjective life satisfaction is reflected in the concept of subjective well-being (SWB). In the scholarly research SWB is seen as a broad category that includes different dimensions. Affective and cognitive measures are the main dimensions. The affective components include positive (joy, elation, contentment, pride, affection, and ecstasy) and negative (guilt and shame, sadness, anxiety and worry, stress, depression, and envy) affects. The cognitive measures include overall subjective life satisfaction and various domain satisfactions, for example satisfaction with Work, Family, Health and Finances (Diener et al., 1999). In this concept, life satisfaction as a separate measurable category includes the subdivisions of wanting to change one's life and of being satisfied with the past, the present and the future. Subjective well-being is defined "as a general area of scientific interest rather than a single specific construct" (Diener et al., 1999). Therefore it is a higher-level construct combining affective and cognitive assessments. In his book "The Psychology of Happiness," in the chapter about life satisfaction, Argyle (2001) discussed several characteristics to get an exact and precise description of life satisfaction. He defines life satisfaction as the cognitive part of well-being, as a retrospective assessment and appraisal of how good the current (life) situation was and is. Furthermore, he argues that life satisfaction can be inquired in terms of how life is assessed in general.

Below, additional criteria will be discussed that are characteristic for the measurement of subjective life satisfaction. Here the frame of reference must be mentioned with which

life satisfaction is to be measured. A person's life satisfaction can either be judged by himself or herself, or by external assessment (Argyle, 2001). In contrast to previous studies, Diener and Lucas (1999) note that there is empirical evidence that an external assessment of a person's happiness is inappropriate and methodically not justifiable. A further characteristic of satisfaction measurements is that each decision is based on a standard of comparison. This standard can be selected individually, but also interindividually. Individual satisfaction measurements can be expressed in comparison with previous events inside the person himself or herself. Interindividual assessments can be located outside of a person, for example in acquaintances or relatives (c.f. Frey and Stutzer, 2002; Veenhoven, 2009). A further important criterion for the suitable measurement of life satisfaction is the stability or sensitivity of the satisfaction measurements over time. States (changes in sensitivity) as well as traits (temporal stability) are needed for the measurement or the detection of changes in life satisfaction. To investigate and to detect changes in life satisfaction which are caused by drastic events in life, for example, stability and sensitivity to changes should be in balance (Veenhoven, 1994). To operationalize happiness, I apply in this cumulative dissertation the single item measurement of the "Socio-Economic Panel" (SOEP). The questionnaire (SOEP) asks: *"In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer according to the following scale: 0 means 'completely dissatisfied', 10 means 'completely satisfied'. How satisfied are you with your life, all things considered?"*

Although happiness research is currently celebrating tremendous scientific successes with these so-called self-reported measures, reviewers keep questioning the effects and the impact and the consequences of the concept of happiness and life satisfaction respectively. Di Tella and MacCulloch (2006) question whether so-called subjective happiness assessments allow inferences as to the "true utility" for persons. However, the authors of the study also point out that their methods only touch the surface of the topic and at the same time encourage others to further investigate these interdisciplinary relationships. Hence, the use of subjective indicators has led to the establishment of a new research field. In this field new methods for measuring happiness have been established (c.f. Krueger and Schkade, 2008; Oswald and Wu, 2010), and a debate about public welfare and the responsibility of business and politics has been reopened (Stutzer and Frey, 2012).

This dissertation deals with the topic of happiness, investigating the subject from different angles. The central issue of the entire analysis is if different life events entail pecuniary and non-pecuniary gains or losses. Hence, this thesis can be interpreted as a research contribution at the interface between economics, psychology and sociology on crucial issues

and problems of society. Furthermore, it is shown that research at this interface will be increasingly important and meaningful, as economic action and decision-making not only affect our own happiness, life satisfaction also conversely has an impact on the economy. It is this idea that connects the individual articles of this dissertation.

1.2 The Selected Issues

The following four articles of this cumulative dissertation are in the growing field of happiness research. The first three articles (Sections II to IV) examine the concept of life satisfaction, whereas the focus of the fourth article (Section V) is on subjective indicators, such as concerns about environmental issues. Thematically, the first two articles show the impact of becoming unemployed or employed on a person's life satisfaction. Hence, the questions arise whether these labor market events lead to asymmetric behavior and whether it is possible to identify any adaptation effects. Article three deals with the approach when there are any systematic life satisfaction experiences in a person's daily life. Article four furthermore examines the public perception in Germany of the Fukushima accident and the subsequent government decision on the phase-out of nuclear power. All articles have in common that they analyze the concept of non-pecuniary gains and losses and estimate the effects and examine the strengths of the coefficients.

1.2.1 Overview and Results

The first article in chapter 2, "Becoming (Un)employed and Life Satisfaction: Asymmetric Effects and Potentially Omitted Variable Bias in Empirical Happiness Studies," belongs to the field of labor economics. In this article we examine the labor market transitions from employment to unemployment and from unemployment to employment with data from the Socio-Economic Panel. The significant negative effects of the loss of one's job on happiness are richly documented (c.f. Blanchflower and Oswald, 2004; Powdthavee, 2010; Stutzer, 2004). Our general implicit assumption in this study is that becoming unemployed or employed respectively has an impact on happiness of the same absolute size (c.f. Grün et al., 2010; Winkelmann and Winkelmann, 1998). First, our descriptive analysis shows evidence of an asymmetric behavior between the subgroups of employed to unemployed and unemployed to employed individuals (cf. Figure 2.1 in Chapter 2). For our parametric analysis we run first difference estimates which show that the change in employment status from employed to unemployed has a significantly negative effect on life satisfaction,

as expected. Previously job-seeking individuals who become full-time employed exhibit significantly positive effects in terms of changes in their life satisfaction (cf. Table 2.1 in Chapter 2). In absolute terms the latter effect is significantly larger, constituting an asymmetry between leaving and joining the labor market. This effect is the non-pecuniary impact of the transition to unemployment or employment, because the study controls for the (significant) influence of net household income. We conclude that the loss of a job can be associated with significantly smaller non-pecuniary losses in life satisfaction than the corresponding gains realized when moving from unemployment to employment. Empirical research, which does not control for such asymmetries, has a potential "omitted variable bias," with the consequence of possibly underestimating the effects of unemployment to employment on life satisfaction.

The second article in Chapter 3, titled "(Un)employment Track and Life Satisfaction: Habituation to (Un)employment?", deals with the issue of adaptation processes in the labor market. This chapter takes up the ongoing discussion whether or not one can find adaptation effects to unemployment on life satisfaction. There are a growing number of studies examining adaptation processes to different kinds of life events, such as marriage, divorce, widowhood, layoff, and unemployment. Almost all studies find significant and clear evidence for or against adaptation processes on life satisfaction in those life events (c.f. Angeles, 2010; Clark, 2006; Clark et al., 2008; Clark and Georgellis, 2012; Khan and Yousaf, 2013; Lucas, 2005; Lucas and Clark, 2006; Lucas et al., 2003; Rudolf and Kang, 2011; Van Praag and Ferrer-i-Carbonell, 2008). An exception is the subject area of unemployment. The studies of Winkelmann and Winkelmann (1998), Lucas et al. (2004), Oesch and Lipps (2011), Clark (2006) and Clark et al. (2008) are not able to identify systematic "adaptation effects" to unemployment on life satisfaction. In this article I place the focus on changes in the labor market with information of a person's previous continuous labor market experience to examine those adaptation effects to unemployment and to extend the current debate by looking at the issue of adaptation to employment. To capture the previous unemployment or employment length respectively, I split the transitions from unemployed to employed and employed to unemployed into different dummy variables [1] For the parametric analysis I am able to show three main results regarding habituation to employment or unemployment: As to the full sample, there is evidence for systematic habituation to employment (cf. top half of column 2 in Chapter 3, Table 3.1). This means that

[1]The dummy variable "unemployed to employed" may take the values: "unemployed to employed and less than one year/one year/two years/three or more years previous unemployment." In a similar fashion, the variable "employed to unemployed" may take the values: "employed to unemployed and less than one year/one year/two and three years/four and five years/six or more years previous employment."

persons with several continuous employment periods – here for the short to medium term – get accustomed to the work itself and develop self-assurance and self-confidence. For this reason job loss shows only a minor negative impact for persons with a continuous job history. Persons with a history of non-continuous employment have to expect larger losses in life satisfaction. When testing men and women separately, both groups show evidence for adaptation to employment (cf. Table 3.2 in Chapter 3). Men experience systematic but incomplete habituation to employment after six or more years, and women show non-systematic adaptation to employment. No evidence for both groups can be found regarding adaptation to unemployment. This suggests that particularly for men, unemployment has a persistent negative impact on life satisfaction. There is a further subdivision of labor market changes with respect to gender and educational background (cf. Table 3.3 in Chapter 3). The results indicate that non-systematic adaptation to unemployment takes place for women with a medium educational level. The results for low and high educational background should be interpreted cautiously, due to the low number of cases. In addition, the estimates reconfirm that men and women with a medium level of education show a systematic adaptation to employment. Women report complete adaptation after four years of previous employment. Men, on the other hand, get used to employment, but there is incomplete adaptation even if it is controlled for six or more years of past employment.

In Chapter 4 the article "Rhythms and Cycles in Happiness" investigates time-dependent rhythms in happiness. We demonstrate significant cyclical and rhythmic effects of weekdays as well as of monthly and yearly patterns on life satisfaction. Potential time-specific factors, however, are aspects that have been largely ignored by economic studies. Exceptions to this, which are based on studies using data from the British Household Panel Survey (BHPS) and the German Socio-Economic Panel Study (SOEP), Taylor (2006) and Akay and Martinsson (2009) found that the day of the week can influence happiness. Using pooled panel data of SOEP, we show a significantly negative effect on weekends, particularly on Sundays (Sunday neurosis), in anticipation of the upcoming stresses of the working week. Our descriptive results (cf. Figure 4.1 a-b) indicate lower life satisfaction on weekends among both men and women with a medium and higher level of education. The figures do not show any such Sunday neurosis for people with a low level of education. For them, happiness is more variable during a month (cf. Figure 4.1 c-d). Men with a medium and higher level of education see a growing trend in happiness over the course of a year, and for women, the average happiness increases during the year across all levels of education (cf. Figure 4.1 e-f). For the parametric analysis we can demonstrate that the Sunday neurosis, as reported in other studies, does not apply to the lower education segment

(cf. Tables 4.1 and 4.2). Moreover, it can be shown that negative effects on weekends vary by educational background and gender, which is why it is impossible to make generalized statements about the Sunday neurosis. The effects throughout the month, analyzed here for the first time, reveal significant effects only for the lower education segments, which at least in the case of men are obviously driven by liquidity issues. The ambiguous effects over the course of the year may be attributable to a lack of sufficient data, particularly towards the end of the year. With regard to future research, it would be desirable in this context if more surveys included the entire span of a year.

The last article in Chapter 5, titled "The Fukushima Accident and Policy Implications: Notes on Public Perception in Germany," focuses on the impact of the Fukushima disaster and the nuclear phase-out in Germany on the subjective perception of individuals. In addition to Berger (2010), who analyzed the effects of the 1986 Chernobyl accident on happiness and environmental concerns in Germany , we investigate the impact of the Fukushima accident and the subsequent decision on the nuclear phase-out on three different single-item measurements included in the SOEP: worries about environmental protection, about the reliability of energy supply without the use of nuclear energy, and about the security of nuclear power plants. The main independent variables consist of dummy structures describing the various time periods of interest. The weeks before the Fukushima accident are considered as control group, and the effect periods include (1) the weeks after the Fukushima disaster until the day before the decision on the nuclear phase-out (03/11/2011 – 06/05/2011) and (2) the months after the government resolution (06/06/2011 – 09/30/2011). Therefore, our working hypothesis is that the accident has a significant impact on environmental concerns, i.e., leads to an increase in concerns. In contrast, the nuclear phase-out could increase worries about reliable energy supply but lead to a decrease in concerns concerning nuclear power plant security. Furthermore, we extend the preceding analysis to study if the size of potential effects depends on regional differences, especially the distance to the nearest nuclear power plant. We include a distance measure and the interaction between our effect variables and the distance indicator. Our main findings suggest that the Fukushima accident itself led to an increase in the probability of reporting high concerns about environmental protection of about +4.7 percentage points (cf. Table 5.2 in Chapter 5). Moreover, worries about the safety of nuclear power plants are strongly affected by the government's decision on the nuclear power phase-out, resulting in a decline in the probability of being very worried about power plant security by −9.1 percentage points (cf. Table 5.2 in Chapter 5). We also show that the magnitude of the detected effects on environmental concerns as well as worries about nuclear power plant safety appears to

depend on regional characteristics, with people living near an active nuclear power station generally showing a more sensitive reaction than those living at greater distances (cf. Table 5.3 in Chapter 5).

1.2.2 Résumé

After summarizing the four articles of this cumulative dissertation, I will now describe the connection between the individual articles. The first two articles (about happiness and the employment market), the third article (about rhythms and cycles in happiness) and the last article (about the Fukushima accident) examine the individual subjective perception of life satisfaction and further subjective indicators respectively. As a consequence, the cumulative dissertation shows the importance of non-pecuniary gains and losses in different life events and puts the strength of these effects in relation to the pecuniary effects. It turns out that in contrast to the pecuniary effects, the so-called non-pecuniary effects have a potential influence on individual subjective life satisfaction. The standard economic literature ignored the subjective perspective for a long time and only looked at the pecuniary aspects. Therefore, introducing these subjective indicators in major surveys show important issues of our contemporary society more accurately and from a different angle. Hence, it is recommended for future research that politics should include the results of happiness research in the political debate and put greater emphasis on the so-called subjective welfare measures. Another thread that connects these articles is their interdisciplinary placement between the research fields of economics, psychology, and sociology. Over the past few years, economic analysis has opened up more and more towards other research fields. As a result of this opening-up process, I have been able to include the issues of my investigation, which previously were difficult to analyze, in the analytic process. This development has allowed me to make more precise and more realistic statements about the well-being of individuals in various life situations. The modern approach of capturing subjective indicators has advanced, expanded, and strengthened economic research. It is to be hoped that in the future, research in the field of economics becomes even more actively involved in further topics in the interdisciplinary discourse so it can produce results that are "closer to life."

Chapter 2

Becoming (Un)employed and Life Satisfaction: Asymmetric Effects and Potential Omitted Variable Bias in Empirical Happiness Studies*

Abstract: Becoming unemployed has negative effects on life satisfaction; a transition from unemployment to employment, however, has stronger positive effects in absolute terms. The asymmetry of the non-pecuniary effect indicates a potential "omitted variable bias" in previous empirical happiness studies.

Keywords: *happiness; life satisfaction; asymmetric effect; labor status; employment; unemployment*
JEL: *I31, J01, Z13*

*Coauthored with Wolfgang Maennig (University of Hamburg). Published in *Applied Economics Letters,* 2012, 19(17), 1719-1722.

2.1 Introduction

The significant negative effects of "involuntary" loss of one's job on happiness have been documented multiple times.[2] This study challenges the usual implicit assumption that a transition from employment to unemployment and a transition from unemployment to employment have effects on happiness of the same absolute size, as supported by descriptive statistics of, for example, Winkelmann and Winkelmann (1998) or Grün et al. (2010). Our parametric analyses, which indicate asymmetries, also control for changes in income in order to isolate potential pecuniary and non-pecuniary costs. We also control for other usual determinants as well as for gender-specific differences (Winkelmann and Winkelmann, 1995).

To operationalize happiness, we apply the single item measurement of the "Socio-Economic Panel" (SOEP)[3] and follow the trends of most of the literature, which interpret the general life satisfaction as a separately measurable category (Diener et al., 1999) and assume that individuals are best placed to judge their "happiness" (Stutzer and Frey, 2010).

2.2 Data and Empirical Strategy

We use the LONG Beta-Version 2010 of the "SOEP" for the following analysis: a population-representative panel survey conducted in Germany.[4] The primary data set consists of 14 transitions (1994–1995 and 2007–2008).[5] For the respective starting year, hereinafter designated as t, only such entities have been selected as were reported as in either fulltime employment or unemployed both at the start of the survey and a year later (hereinafter $t + 1$).[6] We restrict the analysis to persons aged between 20 and 65 years. We generate as an endogenous variable ΔHAPP the annual change in the SOEP variable general life satisfaction, which ranges from 0 ("completely dissatisfied") to 10 ("completely satisfied"). By differentiating, a range of values arises from -10 to+10 (Grün et al., 2010).

We establish our estimates using a pooled cross-section, controlling for different sam-

[2] Cf. Blanchflower and Oswald (2004); Powdthavee (2010) and Stutzer (2004).

[3] The question is: *"In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer according to following scale: 0 means 'completely dissatisfied', 10 means 'completely satisfied'. How satisfied are you with your life, all things considered?"*, http://panel.gsoep.de/soepinfo2009/.

[4] See: http://www.diw.de/en/diw_02.c.238121.en/changes_in_the_soep_data_set.html.

[5] The analysis is for the period 1994 to 2008, because this is the only period where all necessary variables are available.

[6] For both points in time, therefore, people without jobs, part-time workers and the self-employed have been excluded.

ple sizes in the SOEP by means of longitudinal and cross-sectional weighting. Against the background of the single-peaked distribution of the endogenous variable, we estimate OLS models like most of the relevant studies (Ferrer-i-Carbonell and Frijters, 2004). To test the robustness of the estimates, we use "ordered logit estimates."

The set of exogenous variables includes initially the variables frequently tested as being significant for life satisfaction, such as household income, health, number of children and partnership (Stutzer, 2004), which are used for changes in the same way as the endogenous variable.[7] We also control for changes in uncertainties about the future with the variables own and overall economic situation.

The operationalization of the variable *change in employment status* between the periods *t* and *t + 1* yields four manifestations: *Employed - Employed, Unemployed – Unemployed, Employed → Unemployed and Unemployed → Employed*, with the latter two being at the centre of this study. The reference category is *Employed – Employed*.

2.3 Results

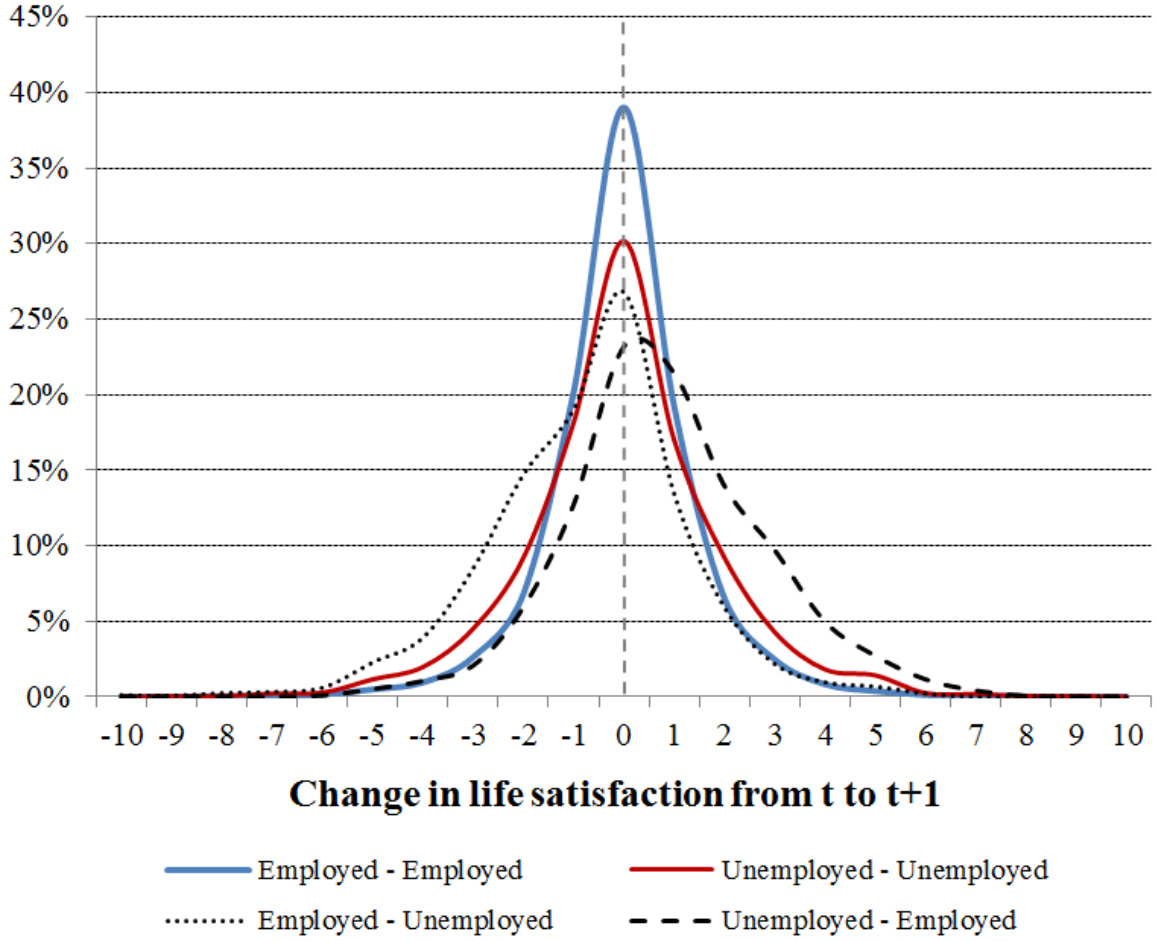
Figure 2.1 shows the distribution of change in general life satisfaction at the transition from *t* to *t+1* for the four types of employment status. The distributions of changes in life satisfaction of the subpopulations of *Employed – Employed* and *Unemployed – Unemployed* are relatively symmetrical around zero, although the continuously employed exhibit significantly less change in their life satisfaction than the continuously unemployed. Among the continuously unemployed, there are both more positive and more negative changes in life satisfaction.

The transition from employment to unemployment is associated with a right-skewed distribution (υ =-0.264), that is, with more (probability) mass in the negative range. People who move from unemployment to full-time employment are characterized by a left-skewed distribution with increased mass in the positive range (υ = 0.185). Table 2.1 summarizes the regression results.

Our estimates on the influence of variables not in the foreground are consistent with results from other studies. Thus, health has a significantly positive impact on life satisfaction (Knabe and Rätzel, 2010). The influence of marital status or nonmarital unions shows significant effects (Ferrer-i-Carbonell and Frijters, 2004). We found no significant effect on happiness resulting from the number of children, which, at least, matches the findings of

[7] Concerning changes in household income, the equivalence-weighted monthly net household income in *t* is compared to that in *t+1*, and the growth rate is calculated.

Fig. 2.1 Change in life satisfaction by labor status. Pooled cross-section, 1994–2008, with two transitions each



Source: Own analysis, calculation and illustration, LONG Beta-Version SOEP, 2010.

most of the relevant studies (Luechinger et al., 2010).

As far as the central object of the study is concerned, the *change in employment status*, *Employed* → *Unemployed*, as expected, has a significantly negative effect on life satisfaction (β = -0.554), generally confirming the results of most of the other relevant studies. Previously job-seeking individuals who start fulltime employment in *t+1* (*Unemployed* → *Employed* with β=0.719) exhibit significantly positive effects in terms of changes in their life satisfaction. In absolute terms the latter effect is significantly larger, constituting an asymmetry between leaving and joining the labor market.[8] This effect is the non-pecuniary

[8]For the asymmetric effects of the OLS models A, B and C, see the significant f-tests between *Employed* → *Unemployed* and *Unemployed* → *Employed* (see Table 2.1).

Table 2.1 Determinants of change of happiness; regression results

	OLS			Ordered-logit		
Models	*A*	*B*	*C*	*A*	*B*	*C*
Employment status t → t+1						
Employed → Employed	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unemployed → Unemployed	-0.001	-0.001	-0.019	-0.014	-0.019	-0.019
	(0.026)	(0.025)	(0.036)	(0.035)	(0.036)	(0.050)
Employed → Unemployed	-0.554***	-0.439***	-0.487***	-0.706***	-0.573***	-0.650***
	(0.055)	(0.059)	(0.071)	(0.069)	(0.077)	(0.089)
Unemployed → Employed	0.719***	0.555***	0.560***	0.907***	0.699***	0.694***
	(0.062)	(0.067)	(0.080)	(0.085)	(0.093)	(0.111)
Employed → Unemployed * female			0.151			0.247*
			(0.112)			(0.144)
Unemployed → Employed * female			-0.014			0.019
			(0.127)			(0.162)
Δ HHInc. t → t+1 (growth rate)	0.214***	0.122***	0.123***	0.247***	0.159***	0.160***
	(0.036)	(0.043)	(0.043)	(0.048)	(0.054)	(0.054)
Unempl. → Unempl. * Δ HHInc. (growth rate)		0.091	0.088		0.062	0.057
		(0.092)	(0.091)		(0.131)	(0.130)
Empl. → Unempl. * Δ HHInc. (growth rate)		0.540***	0.522***		0.644**	0.617**
		(0.176)	(0.177)		(0.271)	(0.272)
Unempl. → Empl. * Δ HHInc. (growth rate)		0.318**	0.321***		0.403***	0.404***
		(0.123)	(0.123)		(0.152)	(0.152)
Δ Health t → t+1	0.371***	0.357***	0.337***	0.470***	0.457***	0.439***
	(0.016)	(0.016)	(0.017)	(0.020)	(0.020)	(0.022)
Δ Health * female			0.059*			0.056
			(0.036)			(0.048)
Δ Own economic situation t → t+1		0.282***	0.283***		0.350***	0.351***
		(0.019)	(0.019)		(0.024)	(0.024)
Δ Overall economic situation t → t+1		0.058***	0.059***		0.079***	0.081***
		(0.016)	(0.017)		(0.022)	(0.022)
Δ Children t → t+1 (ref.: no or negative change)						
Positive change	0.039	0.018	-0.003	0.030	0.005	-0.018
	(0.089)	(0.091)	(0.096)	(0.103)	(0.105)	(0.111)
Δ Partnership t → t+1 (ref. no change)						
Positive change	0.372***	0.362***	0.281***	0.443***	0.436***	0.302***
	(0.057)	(0.057)	(0.073)	(0.074)	(0.075)	(0.095)
Positive change * female			0.213*			0.356**
			(0.116)			(0.145)
Negative change	-0.170***	-0.159***	-0.112	-0.185**	-0.170**	-0.108
	(0.064)	(0.064)	(0.089)	(0.086)	(0.087)	(0.127)
Negative change * female			-0.108			-0.137
			(0.127)			(0.169)
Year dummies (1994/95,..., 2007/08)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	No	No	No
Adjusted R^2/LR index (Pseudo R^2)	0.0525	0.0685	0.0690	0.0153	0.0201	0.0203
F-Statistic/ Probability (LR stat.)	47.26***	53.57***	41.47***	0.000	0.000	0.000
N	67 357	67 357	67 357	67 357	67 357	67 357
Test (Empl. → Unempl. = Unempl. → Empl.)	201.38***	141.00***	89.72***			
Test (Empl. → Unempl. * Δ HHInc. = Unempl. → Empl. * Δ HHInc.)		1.21	0.98			

Source: Own analysis, calculation and illustration, LONG Beta-Version SOEP (2010).
Notes: Dependent variable: Δ life satisfaction between *t* and *t+1*; robust variance estimator with clustering for persons; robust SEs in brackets; coefficients of the models, with error probability in parentheses: ***p,0.01; **p,0.05; *p,0.1; cross-section weights for all waves; weighted household net income by the modified OECD scale.

effect of the transition to unemployment or employment, because the study controls for the (significant) influence of net household income.

Model B tests whether changes in income also have asymmetric effects on happiness, but does not provide such evidence.[9] The asymmetric non-pecuniary effects of the *change of employment status* (measured by the difference of the absolute size of the coefficients of the *change in employment status*) remain fully intact. Furthermore we test for the changes in the (perceived) own economic situation and overall economic situation. Both variables are significant, the first determinant being more influential.

Model C tests for gender-specific differences. First, it should be noted that a positive change in health has a slightly significant larger positive effect for women. Finding a partner is significantly more positive for women; however, no significant differences were found in connection with the loss of a partner. We did not find gender-specific differences for the other variables (not reported in Table 2.1).

In the gender-specific version of the "ordered logit estimation," the asymmetric effects between *Employment* $\rightarrow$ *Unemployment* and *Unemployment* $\rightarrow$ *Employment* on happiness remain exclusively for women.

We note that the loss of a job can be associated with significantly smaller non-pecuniary losses in life satisfaction than the corresponding gains realized when moving from unemployment to employment. Empirical research, which does not control for such asymmetries, has a potential "omitted variable bias," with the consequence of possibly underestimating the effects of *Unemployment* $\rightarrow$ *Employment* on life satisfaction.

[9]The f-tests in the OLS models B and C between the income associated with the transition to unemployment and the transition to employment show no significant results.

Chapter 3

(Un)employment Track and Life Satisfaction: Habituation to (Un)employment?

Abstract: Becoming unemployed respectively employed has asymmetric effects on life satisfaction. Hence, the present study questions whether there are indications of potential habituation effects to unemployment or employment on life satisfaction. The transitions to employment or to unemployment are therefore splitted by continuous unemployment duration respectively continuous employment duration. Estimating *first differences* models for the full sample shows constant effects with increasing duration of past unemployment, but there is evidence for habituation regarding previous periods of employment. Further analysis shows, that habituation to employment is particularly important for men. Men with a medium educational background also show systematic adaption to employment, but only women with the same educational level adapt completely. In addition, the study reveals slight evidence for adaption to unemployment on life satisfaction for women with a medium level of education, but the effects are of non-systematic nature.

Keywords: *life satisfaction, employment, unemployment, adaptation, habituation, duration*
JEL: *I3; J01, J64*

3.1 Introduction

There is substantial evidence that unemployment has a negative impact on life satisfaction compared to being employed full-time or part-time (cf. Powdthavee, 2010; Stutzer, 2004, amongst others). By contrast there is hardly any evidence for the relationship between the duration of unemployment or employment and life satisfaction. There are a growing number of studies examining adaption processes to different kinds of life events such as marriage, divorce, widowhood, layoff and unemployment. Almost all studies find significant and clear evidence for or against adaption processes on life satisfaction in those life events (cf. Angeles, 2010; Clark, 2006; Clark et al., 2008; Clark and Georgellis, 2012; Ferrer-i-Carbonell and Van Praag, 2008; Khan and Yousaf, 2013; Lucas, 2005; Lucas and Clark, 2006; Lucas et al., 2003; Rudolf and Kang, 2011). An exception is the field of unemployment: Winkelmann and Winkelmann (1998), Lucas et al. (2004), and Oesch and Lipps (2011) are not able to detect signs of so-called "adaption effects" with respect to unemployment duration. Furthermore, Clark (2006), Clark et al. (2008), and Clark and Georgellis (2012) detect time-dependent effects of unemployment on happiness, but do not identify systematic adaption effects. Georgellis et al. (2008) show that there is evidence for adaptation to unemployment in a non-linear way: Those with a high income, high happiness indicators, and great job satisfaction prior to their unemployment adapt the fastest.

The current study takes up the results of the existing empirical literature, and examines the issue of whether people get accustomed to unemployment or employment from a different angle. Hence, the analysis captures the impact on life satisfaction of a person entering or dropping out of the job market depending on the length of his or her previous unemployment or employment. The transitions to employment and unemployment are differentiated by the number of previous periods of employment and unemployment. The approach provides the opportunity to test whether there are indications that people get accustomed to employment and unemployment. The study uses *first differences* to show that the change to employment with varying past periods of unemployment has a persistent impact on life satisfaction for the full sample. The assumed adjustment effects in the case of previous periods of unemployment cannot be confirmed. Rather, it becomes apparent that being employed has a highly positive effect on life satisfaction, and that the number of previous periods of unemployment has a positive persistent impact. In contrast, the estimates for becoming unemployed with varying previous periods of employment show evidence that people get used to employment. Generally, the transition to unemployment has a strongly negative impact on life satisfaction. Yet, the transition to unemployment is

more negative for people with less than one year of previous employment than for people with six or more years of previous employment.

The preceding results are confirmed, when testing separately for men and women. Men show indications of getting used to employment and no habituation to unemployment. The estimates also show that there are signs of habituation to employment for women and persistent effects for unemployment. The results indicate evidence for a habituation effect to employment among men and women with a medium educational level. There is also slight evidence for adaption to unemployment for women with a medium educational level.

Altogether, the study finds that the longer the previous periods of employment last, the more people get accustomed to being employed, and consequently the losses in life satisfaction are alleviated when people lose their job. Furthermore one can recognize that there is a tendency towards adaptation to previous periods of employment and unemployment by including educational background in the study.

3.2 Data and Empirical Strategy

The study uses the single-item measurement of the "Socio-Economic Panel" (SOEP) to operationalize happiness and follows the literature, which interprets general life satisfaction as a separately measurable category (Diener et al., 1999) and assumes that individuals are best placed to judge their "happiness" (Stutzer and Frey, 2010). The questionnaire (SOEP) asks: *"In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer according to following scale: 0 means 'completely dissatisfied', 10 means 'completely satisfied'. How satisfied are you with your life, all things considered?"*

Furthermore, the study uses panel data of the SOEP v27-edition (SOEP, 2011) for the following analysis. The "SOEP" is a population-representative panel survey conducted in Germany.[1] The analysis is restricted to the period 1994 to 2010, since this is the only time frame where all necessary exogenous variables are available. Hence, the primary data set consists of a maximum of 16 transitions for each respondent, between 1994/1995 and 2009/2010. For the respective starting year, hereinafter designated as *t*, only such entities are selected that are reported as in either fulltime employment, part-time employment or unemployment at the start of each observation period and one year later (hereinafter *t + 1*) (cf. Grün et al., 2010).[2] Furthermore the analysis is also limited to persons aged between

[1] See: http:// http://www.diw.de/en/soep/.

[2] For both points *t* and *t+1*, therefore, all other labor market characteristics have been excluded.

20 and 65 years. To adequately assess the transitions between employment and unemployment (and vice versa), the author employs a *first differences* linear pooled panel estimation with robust standard errors and clustering for persons. In this type of estimation, all exogenous variables and the endogenous variable between *t* and *t + 1* are differentiated, allowing to control for inter- and intra-individual correlation. Consequently, the model only contains time-variable exogenous impacts. As a sensitivity analysis of the results, the overall model is replicated by way of an "ordered logit estimate." Moreover, the study checks for longitudinal and crosssectional weighting to account for different sample sizes in the SOEP.

The original variable general life satisfaction ranges from 0 ("completely dissatisfied") to 10 ("completely satisfied"). The endogenous variable ΔHAPP is generated as the annual change in the SOEP variable general life satisfaction. By differentiating, a range of values arises from -10 to+10.[3] The set of exogenous variables includes the variables frequently tested as being significant for life satisfaction, such as (differences of) household income, health, children in household and partnership (Stutzer, 2004).[4] The exogenous variable *change in employment status* is modeled using dummy variables, taking the four values *Employed – Employed*, *Unemployed – Unemployed*, *Employed – Unemployed*, and *Unemployed – Employed*, with the latter two being the focus of this study. The two manifestations *Employed – Unemployed* and *Unemployed – Employed* of the variable *change in employment status* are each split into dummy variables in order to control for a continuous duration of a persons (un)employment periods. The dummy variable *Unemployed – Employed* may take the values *Unemployed → Employed + < 1 year unemployed, Unemployed → Employed + 1 year unemployed, Unemployed → Employed + 2 years unemployed and Unemployed → Employed + 3 or more years unemployed.* In a similar fashion, the variable *Employed-Unemployed* may take the values *Employed → Unemployed + < 1 year employed, Employed → Unemployed + 1 year employed, Employed → Unemployed + 2 and 3 years employed, Employed → Unemployed + 4 and 5 years Employed and Employed → Unemployed + 6 or more years employed.*[5] The reference category in all estimates is *Employed – Employed.*[6]

In a second step subsamples are formed to control for gender-specific characteristics and/or educational background via the variable ISCED. Due to the small number of cases,

[3] Differentiating an ordinal variable like life satisfaction generates a variable which should be interpreted as metric.

[4] Concerning changes in household income, the equivalence-weighted monthly net household income in *t* is compared to that in *t + 1*, and then the growth rate is calculated.

[5] Several categories are combined, because of a low number of cases.

[6] It is ensured that the number of cases for any of the manifestations of the variable *change in employment status* (broken down by length of unemployment and employment) is below a cell frequency of 40 persons.

the categories inadequate and general elementary are combined in the category low educational level, the middle vocational, and vocational plus general qualification for university entrance, are combined in the category medium educational level and the last two higher vocational and higher education are combined in the category high educational level. Subsamples are formed in order to estimate the previous (un)employment periods by qualification level and gender. Moreover, due to the small number of cases, each of the four subsamples - men with low and high educational background and women with low and high educational background - is estimated with a different specification for the variable *change in employment status*. For the change to unemployment the categories for 1 year and 2 or 3 years past employment are pooled. For the change to employment the categories 2 years and 3 or more years past unemployment are pooled. In contrast the category medium educational level shows an acceptable number of cases and so the full subsamples for men and women are estimated with all previously described categories (cf. Table 3.3).

3.3 Parametric Analyses

Table 3.1 shows the OLS results of the estimation of the variable *change in employment status* without taking the length of the previous periods of employment or unemployment into account. The estimation confirms the results of almost all empirical studies that dropping out of the job market has a highly significant and strongly negative impact (e.g. Clark and Oswald, 1994; Luechinger et al., 2010; Oesch and Lipps, 2011; Winkelmann and Winkelmann, 1998). The control variables change in household income, change in health, change in the number of children in household and positive or negative change in the partnership have highly significant impacts consistent in the literature on empirical happiness research (cf. Blanchflower and Oswald, 2004; Ferrer-i-Carbonell and Frijters, 2004; Knabe and Rätzel, 2010; Luechinger et al., 2010).[7] It also confirms an asymmetry between the impacts of *employed* $\rightarrow$ *unemployed* and *unemployed* $\rightarrow$ *employed* (Maennig and Wilhelm, 2012). The (absolute) impact of finding employment has a significantly stronger impact on the change in life satisfaction than losing the job (column 1).[8]

Column 2 in Table 3.1 controls for labor market changes with previous duration of em-

[7] As in all models of the study the exogenous variables are not listed. The estimated parameters show the expected signs and magnitudes. The full estimates are available upon request.

[8] The test for differences in the coefficients yields results which are highly significantly different from 0, which confirms the asymmetry. Column 3 shows the estimation based on an ordinal model, which makes the results even more solid.

ployment and unemployment. The estimated coefficients of getting unemployment show evidence that people get accustomed to employment with increasing length of continuous past periods of employment. F-tests between the coefficients suggest that they are significantly different from each other. The estimated coefficients show that the subgroup with six or more years previous employment experiences a negative shock of -0.490 scale points and the subgroup of less than one year previous employment experiences a negative shock of -0.846 scale points. This implicates, that persons with more years of previous employment periods can gain smaller losses in life satisfaction when getting unemployed. The current study interprets these results as signs of adaption to employment.

Contrary evidence arises when looking at the transition from unemployment to employment. The positive impact on the change in life satisfaction does not decline with increasing length of past unemployment periods. There is no evidence of any - systematic or unsystematic - habituation effect to unemployment. Unemployment thus has a persistent negative impact on life satisfaction. Column 4 in Table 3.1 shows the sensitivity analysis of the model of the second column (ordered logit estimation) and confirms the results in significance and direction of the impact.

Table 3.2 shows the results of estimates for separate subsamples for women and men. Men experience significantly larger losses in happiness if their previous period of employment was only brief. As the previous duration of employment increases, the transitions to unemployment cause smaller losses in life satisfaction. For example, the coefficient for becoming unemployed with previous employment of less than one year is at -0.982 scale points (column 1). Becoming unemployed after a continuous six or more years employment period, the effect is down to −0.512 scale points. An F-test for differences between the pertinent coefficients confirms that there are significant differences. The estimates for men reveal that there is adaption to employment but the adaption process is incomplete. The evidence for women in Table 3.2 column 2 is slightly different; becoming unemployed with previous periods of employment shows indications for adaption to employment on life satisfaction. But in comparison to men these effects are of non-systematic nature. The loss of job has a non-systematic negative effect on women, also when taking several past employment periods into account. The F tests between the pertinent coefficients are not significant from each other.

In summary the preceding estimates suggest that persons with a continuous job history are better able to handle the loss of their job. Persons with a history of non-continuous employment have to expect larger losses in life satisfaction.

For persons who undergo a change from unemployment to employment, the situation

Table 3.1 Determinants of change of happiness; regression results

	OLS		Ordered-logit	
Models	Without duration	With duration	Without duration	With duration
Δ Employment status t → t+1				
Employed - Employed	Ref.	Ref.	Ref.	Ref.
Unemployed → Unemployed	-0.006	-0.006	-0.010	-0.010
	(0.034)	(0.034)	(0.047)	(0.047)
Employed → Unemployed	-0.616***		-0.720***	
	(0.063)		(0.078)	
Employed → Unemployed + *< 1 year employed*		-0.846***		-0.993***
		(0.108)		(0.128)
Employed → Unemployed + *1 year employed*		-0.373*		-0.412
		(0.202)		(0.264)
Employed → Unemployed + *2 and 3 years employed*		-0.620***		-0.780***
		(0.108)		(0.140)
Employed → Unemployed + *4 and 5 years employed*		-0.474***		-0.569***
		(0.145)		(0.187)
Employed → Unemployed + *6 or more years employed*		-0.490***		-0.539***
		(0.094)		(0.116)
Unemployed → Employed	0.703***		0.876***	
	(0.065)		(0.082)	
Unemployed → Employed + *< 1 year unemployed*		0.707***		0.868***
		(0.082)		(0.108)
Unemployed → Employed + *1 year unemployed*		0.752***		0.993***
		(0.188)		(0.235)
Unemployed → Employed + *2 years unemployed*		0.738***		0.890***
		(0.135)		(0.179)
Unemployed → Employed + *3 or more years unemployed*		0.511***		0.609*
		(0.282)		(0.323)
Controls (Δ HHInc., Δ Health, Δ Child and Δ Partnership)	Yes	Yes	Yes	Yes
Year dummies (1994/1995,..., 2009/2010)	Yes	Yes	Yes	Yes
Constant	Yes	Yes	No	No
Adjusted R^2/LR index (Pseudo R^2)	0.0543	0.0548	0.0159	0.0160
F-Statistics/Probability (LR stat.)	55.09***	45.09***	0.000	0.000
N	117 600	117 600	117 600	117 600

Source: Own analysis, calculation and illustration, LONG Beta-Version SOEP (2011).
Notes: Dependent variable: life satisfaction (coded: 0 – 10); robust variance estimator with clustering for persons; robust standard errors in brackets; coefficients of the models, with error probability in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross and section weights for all waves; weighted household net income by the modified OECD scale.

is such that both men and women achieve significantly positive gains in life satisfaction (cf. Table 3.2 – columns 1 and 2). However, the size of the impacts does not depend on or

Table 3.2 Change of happiness by change in employment status with different labor status durations - subsample regressions for gender

Models	Male	Female
Δ Employment status t → t+1		
Employed - Employed	Ref.	Ref.
Employed → Unemployed + < 1 year employed	-0.982***	-0.671***
	(0.151)	(0.141)
Employed → Unemployed + 1 year employed	-0.643**	-0.032
	(0.254)	(0.296)
Employed → Unemployed + 2 and 3 years employed	-0.582***	-0.692***
	(0.147)	(0.146)
Employed → Unemployed + 4 and 5 years employed	-0.643***	-0.264
	(0.216)	(0.176)
Employed → Unemployed + 6 or more years employed	-0.512***	-0.456***
	(0.122)	(0.143)
Unemployed → Employed + < 1 year unemployed	0.701***	0.709***
	(0.115)	(0.103)
Unemployed → Employed + 1 year unemployed	0.955***	0.470
	(0.234)	(0.303)
Unemployed → Employed + 2 years unemployed	0.909***	0.503***
	(0.181)	(0.191)
Unemployed → Employed + 3 or more years unemployed	0.717*	0.266
	(0.411)	(0.343)
Controls (Δ HHInc., Δ Health, Δ Child and Δ Partnership)	Yes	Yes
Year dummies (1994/1995,..., 2009/2010)	Yes	Yes
Constant	Yes	Yes
Adjusted R^2	0.0498	0.0690
F-Statistics	28.02***	23.90***
N	65 252	52 348

Source: Own analysis, calculation and illustration, LONG Beta-Version SOEP (2011).
Notes: Dependent variable: life satisfaction (coded: 0 – 10); robust variance estimator with clustering for persons; robust standard errors in brackets; coefficients of the models, with error probability in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross and section weights for all waves; weighted household net income by the modified OECD scale; unemployed – unemployed not listed in all subsamples - all coefficients insignificant.

does not vary with the number of previous periods of unemployment. There is no habituation effect to unemployment either among women or men. The F-tests of the differences in the coefficients between the different categories of *unemployed → employed* are not significantly different from 0. Therefore, the length of unemployment – here the short to medium term – effects no crucial change in the impact on life satisfaction. According to that unemployment has a persistent negative impact on life satisfaction.

Finally, one can find in Table 3.3 the analysis splitted in subsamples for gender and different levels of education.[9] Men with a medium educational level experience once again

[9]Educational background is broken down into three educational subgroups. Moreover, due to the small number of cases, low and high educational background is estimated with a different specification. For the

a systematic but incomplete habituation effect to employment. Furthermore, no evidence is shown for adaptation to unemployment (cf. Table 3.3 – column 3).

In comparison to the previous estimates, it becomes evident that habituation to employment takes also place for women with the same educational level. Compared to men the adaption process is faster and complete. Moreover there is slight evidence that women with medium education get used to unemployment (cf. Table 3.3 – column 4).

In detail, the first differences estimates in column 3 for men with a medium educational level indicate a negative shock of -0.983 scale points on life satisfaction when losing their job with less than one year previous employment. The following coefficients for higher periods of past employment decline with the last coefficient (-0.479 scale point) for six or more years previous employment. Confirming habituation to employment for men with a medium educational level, the F-test of these coefficients is significantly different from zero. As a consequence, there is systematic – but not complete - adaption to employment. Concerning adaption to unemployment the different coefficients for men with a medium level of education are not significantly different from 0 and thus the hypothesis of adaption can be rejected.

For women there is a negative shock of -0.809 scale points when losing their job with a previous employment period of less than one year (cf. Table 3.3 – column 4). This negative shock decreases to -0.764 scale points by achieving two or three year of employment before losing their job. The next coefficients show no more significant changes in comparison to the reference group of the continuously employed people. Furthermore the F-tests between the duration coefficients are significant different from zero. These results show that there is evidence for a complete adaption process to employment after four or more than four years of previous employment exclusively for women with a medium educational background. In addition for women with a medium educational level, the estimated coefficients suggest an adaption process to unemployment. But the estimated coefficients are not significantly different from each other and therefore the hypothesis of a systematic adaption process cannot be confirmed. The results for further educational levels are the following: Men with a low educational background indicate signs of slight non-systematic adaptation to employment and persistent effects for adaptation to unemployment. Regarding high education the effects for adaptation to employment are the same but on a higher level and the effects for adaptation to unemployment are reversed. Becoming employed

change to unemployment the categories for 1 year and 2 or 3 years past employment are pooled. To the change to employment the categories 2 years and 3 or more years past unemployment are pooled. The subsample for men and women with a medium level of education are estimated full.

shows slight non-systematic evidence for higher gains in life satisfaction if men are more than one year unemployed. For women with a low and high level of education there are no signs of adaption effects to employment and unemployment.

Table 3.3 Change of happiness by change in employment status with different labor status durations - subsample regressions for educational background

	ISCED (1 & 2)		ISCED (3 & 4)		ISCED (5 & 6)	
Models	Male	Female	Male	Female	Male	Female
Δ Employment status t → t+1						
Employed - Employed	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Employed → Unemployed +	-0.924***	-0.413	-0.983***	-0.809***	-1.210***	-0.542
< 1 year employed	(0.354)	(0.266)	(0.265)	(0.185)	(0.378)	(0.351)
Employed → Unemployed +			-0.620*	-0.474		
1 year employed			(0.355)	(0.440)		
Employed → Unemployed +			-0.688**	-0.764***		
2 and 3 years employed			(0.140)	(0.183)		
Employed → Unemployed +			-0.619**	-0.240		
4 and 5 years employed			(0.289)	(0.173)		
Employed → Unemployed +			-0.479***	-0.305		
6 or more years employed			(0.120)	(0.196)		
Employed → Unemployed +	-0.889***	-0.538**			-0.278	0.454*
1 to 3 years employed	(0.289)	(0.274)			(0.308)	(0.269)
Employed → Unemployed +	-0.551**	-0.084			-0.805***	-0.871***
4 or more years employed	(0.266)	(0.251)			(0.245)	(0.254)
Unemployed → Employed +	0.780***	0.696***	0.634***	0.596***	0.883***	0.875***
< 1 year unemployed	(0.222)	(0.234)	(0.153)	(0.130)	(0.192)	(0.236)
Unemployed → Employed +			1.001***	0.681***		
1 year unemployed			(0.276)	(0.162)		
Unemployed → Employed +			0.882***	0.477**		
2 years unemployed			(0.213)	(0.249)		
Unemployed → Employed +			0.568	0.283		
3 or more years unemployed			(0.535)	(0.437)		
Unemployed → Employed +	0.754***	0.118			1.045***	0.255
1 or more years unemployed	(0.210)	(0.187)			(0.276)	(0.712)
Controls (Δ HHInc., Δ Health, Δ Child and Δ Partnership)	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies (1994/1995,..., 2009/2010)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.0571	0.0591	0.0581	0.0724	0.0598	0.0998
F-Statistics	6.70***	6.41***	19.59***	15.83***	14.14***	13.69***
N	8 099	6 561	35 978	29 286	20 562	15 959

Source: Own analysis, calculation and illustration, LONG Beta-Version SOEP (2011).

Notes: Dependent variable: life satisfaction (coded: 0 – 10); robust variance estimator with clustering for persons; robust standard errors in brackets; coefficients of the models, with error probability in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross and section weights for all waves; weighted household net income by the modified OECD scale; unemployed – unemployed not listed in all subsamples - all coefficients insignificant.

3.4 Conclusion

This paper takes up the ongoing discussion whether or not one can find adaption effects to unemployment on life satisfaction. It introduces a different strategy of empirical modeling (*first differences* models) to analyze adaption effects to unemployment on life satisfaction in order to provide new evidence in this field. Furthermore, focus is set on changes in the labor market with information of a persons previous continuous labor market experience to examine those adaption effects to unemployment and to extend the current debate through looking at the topic of adaption to employment. The author uses an unbalanced panel data set (SOEP) which consists of a maximum of 16 transitions for each respondent (1994/1995 – 2009/2010) to examine whether these labor market changes to unemployment respectively employment – splitted by previous periods of unemployment or employment – alleviate or intensify with increased duration. The main empirical literature in this field can confirm adaption effects to many life events such as marriage, widowhood or divorce with the exception of systematic habituation to unemployment (cf. Clark, 2006; Clark et al., 2008, amongst others). The current study shows three main results regarding habituation to employment or unemployment: First, as to the full sample, there is evidence for systematic habituation to employment. This means that persons with several continuous employment periods – here the short to medium term – get accustomed to the work itself and develop self-assurance or self-confidence. For this reason job loss shows only a minor negative impact for persons with a continuous job history. Persons with a history of non-continuous employment have to expect larger losses in life satisfaction. When separately testing for men and women both groups show evidence for adaptation to employment. Men experience systematic but incomplete habituation to employment after six or more years, and women show non-systematic adaption to employment. No evidence for both groups can be found regarding adaption to unemployment. As to this perspective, unemployment particularly for men has a persistent negative impact on life satisfaction. There is a further subdivision of labor market changes for gender and educational background. The results indicate that non-systematic adaption to unemployment takes place for women with a medium educational level. The results for low and high educational background should be interpreted cautiously, due to the low number of cases. In addition, the estimates confirm again that men and women with a medium level of education show a systematic adaptation to employment. Women report complete adaptation after four years of previous employment. Meanwhile men get used to employment but there is incomplete adaption even if it is controlled for 6 or more years of past employment.

Chapter 4

Rhythms and Cycles in Happiness*

Abstract: This study analyses time-dependent rhythms in happiness in three aspects. We show that the Sunday neurosis exists exclusively for men with a medium level of education and both men and women with high levels of education. Men with high levels of education may even experience a weekend neurosis. This study is the first to test for intra-monthly rhythms and to demonstrate that men with a lower educational background may suffer from negative effects on happiness towards the end of the month, potentially because of liquidity problems. The study is also the first to demonstrate that happiness exhibits seasonal effects over the annual period, depending on gender and education.

Keywords: *happiness; life satisfaction; weekend neurosis; rhythms in time*
JEL: *I31; J16; I21; D12*

*Coauthored with Malte Steenbeck (University of Hamburg) and Wolfgang Maennig (University of Hamburg). Published in *Applied Economics,* 2014, 46(1), 70-78.

4.1 Introduction

In search of nonmonetary welfare measures, the focus of social and economic research has recently shifted to the analysis of happiness. In contrast to the affective components of subjective well-being, reference is made in this context to "cognitive judgments of life satisfaction" (Lucas et al., 1996, p. 616).[2] Aside from socio-economic characteristics, such as age (Frijters and Beatton, 2012), marital status and health, particularly economic aspects proved significant, such as labor market status (Clark and Oswald, 1994; Winkelmann and Winkelmann, 1998) and income (Easterlin, 1995). Potential time-specific factors, however, are aspects that have been largely ignored by economic studies. As exceptions, based on studies using data from the British Household Panel Survey (BHPS) and the German Socio-Economic Panel Study (SOEP), Taylor (2006) and Akay and Martinsson (2009) found that the day of the week can influence happiness. In Britain, the existence of Monday blues has been discussed, while the SOEP data show a significantly negative effect on weekends, particularly on Sundays, in anticipation of the upcoming stresses of the working week.

Outside economic research, especially in psychological literature, there have been some, partly experimental, studies on time-specific weekday influences on happiness and mood as a rather affective component (Areni and Burger, 2008; Clark and Watson, 1988; Croft and Walker, 2001; Csikszentmihalyi and Hunter, 2003; Mihalcea and Liu, 2006). Other psychological studies have also discussed potential seasonal factors. Concerning seasonal influences, Smith (1979) does not find much evidence, but Murray et al. (2001) identifies some indicators of seasonal influences on mood, with highs in summer and lows in winter.

This study adds to the findings thus far on potential rhythms in happiness in three ways: first, using pooled panel data, in addition to studying the previously examined effects of weekdays and seasons, potential monthly rhythms are tested, too. Such monthly rhythms can emerge, for example, from liquidity problems at the end of the month. Second, as liquidity problems affect people with different levels of education differently, we control for individual educational background. Third, to the previous analyses, we add the question as to whether the rhythms in happiness expressed are gender-specific.[3]

[2] According to Diener et al. (1999), subjective well-being can be divided into the separately measurable components of life satisfaction/happiness, positive and negative affect, as well as the domain satisfactions.

[3] A differentiation according to the level of education seems appropriate particularly in connection with the relatively high stability over time of the issues analysed here. The inclusion of gender, thus, results in stable subgroups.

4.2 Data and Empirical Strategy

We use the data for the period 1994–2010 from the v27 Long Beta version of the SOEP (2011). We limit our analysis to the months between January and September, because only 2.0% of the SOEP surveys were conducted in the last quarter of any year. Our random sample for the following analysis comprises a total of 250 734 observations and 34 451 respondents. To avoid any distortions resulting from the differently sized sub-samples of the SOEP, all values are included taking into account their individual cross-section weighting, and we control for inter-individual correlation.

The endogenous variable of subjective life satisfaction is analysed according to its source coding in the SOEP as an expression along an 11-point scale ranging from 0 (completely dissatisfied) to 10 (completely satisfied).[4] To study the time-dependent happiness rhythms, the weekdays of the respective surveys are considered by way of dummy variables, while the respective day of the month is included in the analysis on a scale of 1 to 31. In addition, the respective day of the year of the survey is taken into account as an expression on a scale of 1 to 274 so as to map any potential seasonal factors in the course of a year.[5]

To ensure maximum variation in view of weekday, monthly and annual influences, a pooled approach is employed in the subsequent analyses. The division into subgroups differentiated by the education attained, as applied to the analyses, is based on the ISCED categories contained in the SOEP. As such, the levels of education are condensed to low (ISCED 1 and 2), medium (ISCED 3 and 4) and high (ISCED 5 and 6) (Boertien et al., 2012; Muffels and Headey, 2013). We use the usual control variables, such as centred household income, age (linear and quadratic), health, marital status, presence of children in the household, year of the survey and control for regional aspects (Stutzer and Frey, 2010).

Starting with the descriptive analysis, Fig. 4.1(a–f) show average life satisfaction values over time in terms of gender and level of education. Figure 4.1(a) and (b) indicate a lower life satisfaction on weekends among both men and women with a medium and higher level of education. The figures do not show any such Sunday neurosis for people with a low level of education. Figure 4.1(c) and (d), which represent 7-day moving averages of happiness, show that there is only little variability among those with medium and high levels of education in the course of a month. For people with a low level of education,

[4] The text of the subsequent underlying variable is: “How satisfied are you with your life, all things considered?”.

[5] N = 274 is the number of days from January to September in the case of a leap year.

happiness is more variable during a month; Fig. 4.1(c) suggests a nonlinear trend for men. Figure 4.1(e) and (f) plots 30-day moving averages of happiness for the first 274 days of the year. Men with a medium and higher level of education see a growing trend in happiness over the course of a year. For women, the average happiness increases during the year across all levels of education.

To account for any nonlinear relationships, quadratic terms were included in the analysis for the days of the month and year. Where linear and quadratic correlations are not significant, models of multivariate analysis (Tables 4.1 and 4.2) show linear effects throughout. Similar to most studies on happiness, the first step involves performing OLS estimates (Ferrer-i-Carbonell and Frijters, 2004). In addition, as a further robustness check, all models are estimated using the ordered logit method – not least to also account for the ordinal character of the dependent variable (Maennig and Wilhelm, 2012).

4.3 Results

Tables 4.1 and 4.2 summarize the results of the pooled estimates for men and for women. For clarity, we only present those estimates where the highest polynomial is significant.

The two tables first show the OLS estimates on which the interpretation of the coefficients is based. The column following the OLS estimate shows the results of the corresponding ordered logit estimate. The top half of each table shows the respective base models with the potential influencing factors of the different rhythms that impact life satisfaction. The bottom half represents the related interaction model (Aiken and West, 1991). In the interaction model, the days of the month are interacted with the household income to uncover potential compensatory effects caused by income.[6] The division according to levels of education is the same as in the descriptive analysis.

The tables do not show coefficients for the influences of the other exogenous characteristics, such as age, marital status or labor market status. The directions and significances exhibit the influences known from extensive empirical research.[7] The R^2 values are between 27% and 30% for OLS estimates, which can be considered high in terms of explanatory value compared to the empirical literature. However, this should not be over-

[6] In the interaction models, only the coefficients of the variables of the interaction effect involved are reported (income × day of the month). The remaining effects of weekdays and annual rhythms are not affected and correspond to the original models in terms of direction and significance.

[7] Details are available from the authors on request.

Fig. 4.1 (a) Life satisfaction by weekday and level of education: men 1994–2010. (b) Life satisfaction by weekday and level of education: women 1994–2010. (c) Life satisfaction by day of the month and level of education: men 1994–2010. (d) Life satisfaction by day of the month and level of education: women 1994–2010. (e) Life satisfaction by day of the year and level of education: men 1994–2010. (f) Life satisfaction by day of the year and level of education: women 1994–2010

Source: Own analysis, calculation and illustration, SOEP LONG v27 Beta-Version (2011).
Notes: Life satisfaction by gender and educational level: weighted mean (month: 7 days average; year: 30 days average).

interpreted (Diener et al., 1999).

According to Table 4.1, men – compared to Mondays, which are used as a reference – exhibit in some cases a negative effect on life satisfaction towards the weekend, as indicated in the descriptive statistics. In men with a medium level of education, this effect is observed only on Sundays; in men with a higher level of education, this effect is observed both on Saturdays and on Sundays. Men with less education do not experience such an effect at all. Over the course of a month, men with a low level of education exhibit a quadratically degressive influence: in other words, they experience an increase in life satisfaction, followed by a decrease, in the course of the month. Figure 4.2(c) shows that effects on life satisfaction of around 0.1 scale points can be expected in the middle of the month. The lower part of Table 4.1 shows for men with a low level of education a highly significant positive coefficient for the interaction variable between income and day of the month, which suggests that household income over the course of the month exerts a significant influence on the stated level of life satisfaction. Aboveaverage household incomes produce positive effects on happiness over the course of the month and, thus, have a compensatory effect on the decrease in life satisfaction towards the end of the month. Men with a medium and higher level of education are not subject to any significant happiness rhythm over the course of the month. The corresponding happiness effect for men with a low level of education may thus be subject to liquidity constraints.

Rhythms depending on the level of education have also been observed over the course of the year. Men with a low level of education experience a significant linear negative impact on life satisfaction over the course of the year, with negative effects of up to 0.25 scale points at the end of the period observed (Fig. 4.2(e)). However, it must be stressed at this point that the estimated results may be distorted because of the limited data available. Men with a higher level of education exhibit a U-shaped pattern of life satisfaction over the course of the year. For men with a medium level of education, there are no significant seasonal effects on life satisfaction. Table 4.2 summarizes the estimated results for women; Fig. 4.2(b), (d) and (f) visualizes the effects. First, like among men, there are education-differentiated negative weekend effects on life satisfaction. However, these are limited to Sundays for women with a higher level of education and to Saturdays for women with a medium level of education. Over the course of the month, women of all levels of education do not exhibit any significant linear and quadratic effects.[8] During the year, no significant

[8] An additional check for polynomials of the third order reveals highly significant tertiary effects for women with a low level of education over the course of the month. For example, this may be interpreted as an anticipatory effect in relation to the upcoming payment of salary. Details are available from the authors upon request.

Table 4.1 Life satisfaction by day of the week, month and year: level of education – men (interaction effect between day of the month – linear and household income); cross pool section, 1994–2010, OLS and Ordered-logit regression results

	ISCED 1 & 2		ISCED 3 & 4		ISCED 5 & 6	
Models	OLS	Ordered-logit	OLS	Ordered-logit	OLS	Ordered-logit
Day of the year (linear)	-0.000858*	-0.001083**	-0.000052	-0.000061	-0.002120**	-0.002926**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Day of the year (squared)					0.000008**	0.000011**
					(0.000)	(0.000)
Day of the month (linear)	0.014544*	0.018410*	-0.000336	-0.000506	0.000675	0.001447
	(0.008)	(0.009)	(0.001)	(0.001)	(0.001)	(0.002)
Day of the month (squared)	-0.000496*	-0.000568**				
	(0.000)	(0.000)				
Household income [a]	0.000239***	0.000282***	0.000174***	0.000225***	0.000115***	0.000171***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	-0.032237	-0.025181	-0.013763	-0.020039	-0.011460	-0.003736
	(0.058)	(0.065)	(0.028)	(0.032)	(0.037)	(0.047)
Wednesday	-0.075487	-0.064407	-0.003943	-0.016441	-0.049336	-0.042647
	(0.058)	(0.066)	(0.029)	(0.034)	(0.038)	(0.046)
Thursday	-0.007251	-0.013000	-0.009515	-0.014923	0.003796	0.032440
	(0.057)	(0.063)	(0.030)	(0.035)	(0.040)	(0.049)
Friday	0.020400	0.028291	-0.015047	-0.037699	-0.003011	0.004098
	(0.061)	(0.069)	(0.029)	(0.034)	(0.038)	(0.048)
Saturday	-0.016689	0.001528	-0.043890	-0.055836	-0.109437**	-0.103337*
	(0.066)	(0.075)	(0.033)	(0.039)	(0.045)	(0.055)
Sunday	-0.086190	-0.086864	-0.085921**	-0.088538*	-0.144144***	-0.139574**
	(0.081)	(0.087)	(0.042)	(0.049)	(0.055)	(0.068)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16 761	16 761	65 699	65 699	38 960	38 960
Adjusted R^2	0.302		0.289		0.279	
Pseudo R^2		0.089		0.084		0.088
Interaction model:						
Day of the month (linear)	0.017337**	0.021733**	-0.000327	-0.000098	0.000849	0.001655
	(0.008)	(0.009)	(0.001)	(0.001)	(0.001)	(0.002)
Day of the month (squared)	-0.000506*	-0.000585**				
	(0.000)	(0.000)				
Household income [a]	0.000176***	0.000207***	0.000173***	0.000213***	0.000123***	0.000182***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Day of the month (linear) *	0.000004**	0.000005**	0.000000	0.000001	-0.000001	-0.000001
Household income	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16 761	16 761	65 699	65 699	38 960	38 960
Adjusted R^2	0.303		0.289		0.279	
Pseudo R^2		0.089		0.084		0.088

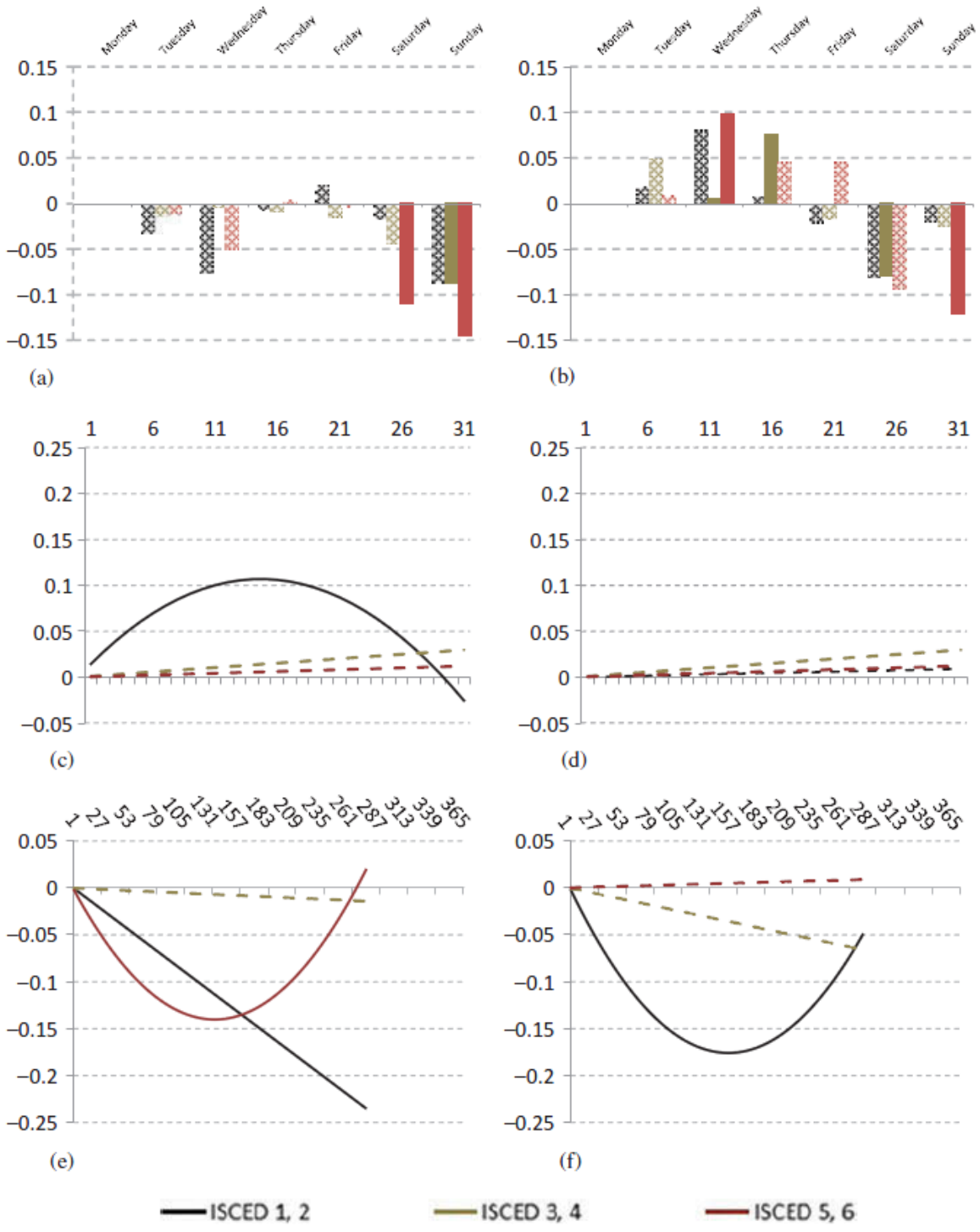
Source: Own analysis, calculation and illustration, SOEP LONG v27 Beta-Version (2011).
Notes: Dependent variable: life satisfaction (coded: 0–10); marginal effects; robust variance estimator with clustering for persons; robust SEs in brackets; coefficients of the models, with error probability in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1; cross section weights for all waves; [a] Household income (centred); controlled for other exogenous variables: health, age, age (squared), child in household, east, household size, marital status, weekly working hours and employment status.

Table 4.2 Life satisfaction by day of the week, month and year: level of education – women (interaction effect between day of the month – linear and household income); cross pool section, 1994–2010, OLS and Ordered-logit regression results

	ISCED 1, 2		ISCED 3, 4		ISCED 5, 6	
Models	OLS	Ordered-logit	OLS	Ordered-logit	OLS	Ordered-logit
Day of the year (linear)	-0.002372**	-0.002406**	-0.000240	-0.000349	0.000033	-0.000100
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Day of the year (squared)	0.000008*	0.000008*				
	(0.000)	(0.000)				
Day of the month (linear)	0.000293	0.000111	0.000948	0.001632	0.000396	-0.000144
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Household income [a]	0.000249***	0.000294***	0.000156***	0.000195***	0.000125***	0.000175***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.018383	0.010984	0.049241*	0.062959**	0.008178	0.005832
	(0.044)	(0.048)	(0.029)	(0.032)	(0.046)	(0.056)
Wednesday	0.080106*	0.058321	0.005697	0.002785	0.098911**	0.122535**
	(0.043)	(0.048)	(0.030)	(0.032)	(0.045)	(0.055)
Thursday	0.007237	-0.015983	0.074981**	0.083362**	0.045034	0.037765
	(0.048)	(0.052)	(0.029)	(0.033)	(0.046)	(0.056)
Friday	-0.020337	-0.050531	-0.017097	-0.005102	0.045736	0.045928
	(0.047)	(0.051)	(0.031)	(0.034)	(0.046)	(0.057)
Saturday	-0.081144	-0.099049*	-0.078771**	-0.080471**	-0.093004*	-0.075281
	(0.055)	(0.059)	(0.034)	(0.038)	(0.053)	(0.062)
Sunday	-0.019429	-0.019106	-0.024113	-0.027349	-0.119883**	-0.145009**
	(0.066)	(0.072)	(0.045)	(0.051)	(0.059)	(0.073)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29 436	29 436	69 994	69 994	29 884	29 884
Adjusted R^2	0.293		0.255		0.252	
Pseudo R^2		0.085		0.075		0.076
Interaction model:						
Day of the month (linear)	0.000248	0.000626	0.000280	0.001046	0.000321	-0.000172
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Household income [a]	0.000250***	0.000285***	0.000176***	0.000213***	0.000109***	0.000166***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Day of the month (linear) *	-0.000000	0.000001	-0.000001	-0.000001	0.000001	0.000001
Household income	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29 436	29 436	69 994	69 994	29 884	29 884
Adjusted R^2	0.293		0.255		0.252	
Pseudo R^2		0.085		0.075		0.076

Source: Own analysis, calculation and illustration, SOEP LONG v27 Beta-Version (2011).
Notes: Dependent variable: life satisfaction (coded: 0–10); marginal effects; robust variance estimator with clustering for persons; robust SEs in brackets; coefficients of the models, with error probability in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1; cross section weights for all waves; [a] Household income (centred); controlled for other exogenous variables: health, age, age (squared), child in household, east, household size, marital status, weekly working hours and employment status.

Fig. 4.2 (a) Life satisfaction by weekday and level of education: men 1994–2010. (b) Life satisfaction by weekday and level of education: women 1994–2010. (c) Life satisfaction by day of the month and level of education: men 1994–2010. (d) Life satisfaction by day of the month and level of education: women 1994–2010. (e) Life satisfaction by day of the year and level of education: men 1994–2010. (f) Life satisfaction by day of the year and level of education: women 1994–2010



Source: Own analysis, calculation and illustration, SOEP LONG v27 Beta-Version (2011).
Note: Life satisfaction by gender and educational level: reported beta-coefficients (solid: significance in OLS and ologit).

rhythms or cycles of life satisfaction have been identified for women with a medium level of education, which is the same for men with the same level of education. In the segment of low level of education, these effects are only slightly significant, but unlike for men form a U-shaped pattern. In contrast to men, there are no significant effects for women with a higher level of education.

4.4 Summary and Conclusion

We demonstrate significant cyclical and rhythmic effects of weekdays as well as of monthly and yearly patterns on life satisfaction. These effects – up to −0.14 scale points for weekdays and up to 0.21 scale points for the month and up to −0.23 scale points over the course of the year – are thus of considerable significance. Specifically, we can demonstrate that the Sunday neurosis, as reported in other studies, does not apply to the lower education segment. Moreover, it can be shown that negative effects on weekends vary by educational background and gender, which is why it is impossible to generalize about the Sunday neurosis. In terms of medium and higher education levels, it would be more appropriate to speak of a weekend neurosis.

The effects throughout the month, analysed here for the first time, reveal significant effects only for the lower education segments, which at least in the case of men are obviously driven by liquidity issues. As for life satisfaction throughout the year, there are no significant effects among men and women with a medium level of education. In segments with little or no education, men experience a decrease in life satisfaction over the course of the year; women experience such an effect only at the start of the year, but it gradually levels off from mid-April. Men of the higher education segment exhibit such a U-shaped pattern, too; women in that segment show no significant effect. The ambiguous effects over the course of the year may be attributable to a lack of sufficient data, particularly towards the end of the year.With regard to future research, it would be desirable in this context if more surveys included the entire span of a year.

Chapter 5

The Fukushima Accident and Policy Implications: Notes on Public Perception in Germany*

Abstract: Major nuclear accidents as recently in Fukushima set nuclear power plant security at the top of the public agenda. Using data of the German Socio-Economic Panel we analyze the effects of the Fukushima accident and a subsequent government decision on nuclear power phase-out on several measures of subjective perception in Germany. We find that the Fukushima accident increases the probability to report greater worries about the environment. Furthermore, we find evidence for a decrease in the probability to be very worried about the security of nuclear power plants following the government's resolution on nuclear phase-out. Finally we find that the probabilities of reporting very high concerns are related to the distance between the respondents' place of residence and the nearest nuclear power station.

Keywords: *Fukushima, nuclear accident, nuclear energy, nuclear phase-out, environment, subjective perception*
JEL: *I3, N7, Q4, R1*

*Coauthored with Felix Richter (University of Hamburg) and Malte Steenbeck (University of Hamburg). Revised Version of the article: Nuclear Accidents and Policy: Notes on Public Perception, 2013, SOEPpapers, 590.

5.1 Introduction

Access to reasonably priced energy is often regarded as a major determinant for the competitiveness of an economy. With many fossil resources such as coal being criticized in terms of their sustainability and renewable energy sources still being expensive and not yet fully established, many countries worldwide regard nuclear energy as a key technology in the struggle for affordable electricity. However, major nuclear accidents as recently in Fukushima set nuclear power plant security on top of the public agenda and increase pressure on policy makers to provide adequate reactions. In the case of Germany, the origins of these discussions and the formation of an anti-nuclear movement can be traced back to the 1970s. Following the 1986 Chernobyl nuclear disaster with large areas of Germany being affected by radioactive fallout, public opinion increasingly turned against this source of energy generation. A first act on nuclear phase-out passed by the Social Democratic/Green party coalition in 2002 was dismissed by the Christian Democratic/Liberal coalition in September 2010. However, increasing opposition towards nuclear energy after the Fukushima catastrophe in March 2011 resulted in a sudden change in policy. On June 6th 2011, the Christian Democratic/Liberal German government decided on a new accelerated phase-out with the final shutdown of eight power plants in August 2011 and a complete abandoning of nuclear energy by 2022.

In the light of substantial public opposition against the use of nuclear energy the question arises as to what extend far-reaching events such as nuclear accidents or changes in nuclear policy are reflected in subjective assessment. Regarding ongoing public discussions in Germany, such an analysis is of particular interest since nonmonetary gains in measures of subjective perception might provide further aspects to be taken into consideration when evaluating the economic costs of the energy turnaround. Using data of the German Socio-Economic Panel (SOEP), we investigate the impact of the Fukushima accident and the subsequent decision on nuclear phase-out on reported concerns about the environment. Taking advantage of a set of new variables included in the SOEP directly after the Fukushima accident, we further analyze the effects of the phase-out on worries about nuclear power plant security as well as on the reliability of energy supply without the use of nuclear energy. In order to control for personal involvement, we complement our analysis by additional models that account for the distance from the respondents' place of residence to the nearest active nuclear power plant. The remainder of the article is organized as follows: Section 2 looks into the relevant literature followed by a presentation of the data source and empirical strategy in Section 3. Section 4 discusses the results of our

baseline models whereas Section 5 presents the findings of the extended models including regional characteristics. The paper closes with a conclusion.

5.2 Literature

There is a growing field of economic literature looking into potential effects of disasters such as the attacks of 9/11 in the United States, Hurricane Katrina, the earthquake 2005 in Pakistan, and the nuclear accidents in Chernobyl or in Fukushima on measures of subjective perception. Most of the existing studies focus on individual life satisfaction but there are also a number of studies that focus on subjective concerns.

Berger (2010) analyzes effects of the 1986 Chernobyl accident on happiness and environmental concerns in Germany. While her results support the thesis that environmental concerns are affected by nuclear accidents, no such evidence is found concerning an impact on reported happiness. Danzer and Danzer (2011) test the long run influence of the Chernobyl accident on subjective life satisfaction in the Ukraine. As expected they find a negative impact on happiness for individuals exposed to the catastrophe. Remennick (2002) analyzes the health of Chernobyl survivors that immigrated into Israel whereas Bromet et al. (2000) focus on the happiness of local children that were infants or unborn at the time of the accident. Further economic or socio-economic literature on the relationships between subjective life satisfaction respectively concerns about the environment and nuclear accidents is on the rise.

A number of current studies focus on the impact of the Fukushima accident on subjective perception. Hommerich (2012) investigates the effects of the Fukushima accident on trust and happiness in two Japanese regions and Rehdanz et al. (2013) use Japanese panel data in combination with regional information about the respondents' place of residence to analyze the effects of the Fukushima nuclear catastrophe on individual well-being in Japan. They find that individual well-being declined after the catastrophe with increasing proximity to the site of the accident. Goebel et al. (2013) discuss the Fukushima accident in relation to the people's mental well-being in Germany. They find that the Fukushima accident has negative effects on people's environmental concerns and that the subsequent nuclear phase out decision in Germany shows compensatory effects. Related to the different well-being measures minor evidence is found.

Using US data, Greenberg (2009) examines differences between people who live near nuclear facilities and a control group from other regions. The findings suggest that people who live near reactors have greater concerns about nuclear issues than the control group.

Poortinga et al. (2013) look into the differences between the UK and Japan regarding the public perception of future energy use before and after the Fukushima incident. Furthermore, there exists a body of literature evaluating the effects of nuclear accidents on the public attitude towards nuclear energy and the risk of nuclear accidents (Eiser et al., 1989; Lindell and Perry, 1990; Verplanken, 1989; Visschers and Siegrist, 2013) and on energy policy (Csereklyei, 2014).

Thematically related, Luechinger and Raschky (2009) analyze the effect of natural disasters on life satisfaction, but focus on flood catastrophes. Their findings point out that flood catastrophes are negatively related with life satisfaction. Carroll et al. (2009) estimate the effects of droughts on happiness in Australia in order to quantify arising costs. Hinman et al. (1993) and Cha (2000) assemble a list of environmental risks. By means of international data they find out that risks about nuclear issues such as nuclear accidents are top ranked. The studies of Kimball et al. (2006) and Metcalfe et al. (2011) investigate the impact of catastrophes on happiness in the country of the accident and in other countries. Kimball et al. show amongst others that the earthquake in Pakistan in the year 2005 has an impact on life satisfaction in America. Metcalfe et al. provide evidence that the terror attacks of 9/11 have a significant impact on people's life satisfaction in the UK. For an overview about socio-economic determinants of environmental concerns in general see e.g. Berger (2010) or Shen and Saijo (2007).

5.3 Data and Empirical Strategy

We model the effects of the Fukushima nuclear accident and the subsequent change in nuclear policy on concerns about the environment as well as on concerns about the reliability of energy supply without the use of nuclear energy and on worries about the safety of nuclear power plants. Our working hypothesis is that the accident has a significant impact on environmental concerns, i.e. leads to an increase in concerns. In contrast, the nuclear phase-out could increase worries about reliable energy supply but lead to a decrease in concerns concerning nuclear power plant security.

We use data from the SOEP v28-edition (SOEP, 2012), a population-representative panel survey conducted in Germany (Wagner et al., 2007). Our constructed data set comprises the year 2011. To operationalize subjective perception we use three different single-item measurements included in the SOEP: worries about environmental protection, about the reliability of energy supply without the use of nuclear energy, and about the security of nuclear power plants. All items are captured on an ordinal three category scale, originally

coded "very worried", "slightly worried" and "not worried." For ease of interpretation, all variables are mirrored.[2] While the variable concerning environmental protection is available for all waves of the panel, both the question on worries about the reliability of energy supply and the question on security of nuclear power plants have only been included in the 2011 SOEP surveys following the Fukushima accident (April to December).

The main independent variables consist of dummy structures describing the various time periods of interest. For the models on environmental concerns, we divide the observation period into three sub-periods. The questionnaires completed before the Fukushima accident are considered as control group, and the effect periods include (1) the weeks after the Fukushima catastrophe until the day before the decision on nuclear phase-out (03/11/2011 – 06/05/2011) and (2) the months after the government resolution (06/06/2011 – 09/30/2011). Regarding the questions on concerns about the reliability of energy supply and about nuclear power-station safety we use a modified layout in the corresponding models, where the period from April 1st until June 5th is used as reference period. The effect period between June 6th and September 30th should thus reflect the effects of the government resolution on nuclear phase-out. Additionally we control for a set of common socio-economic variables including age, age squared, gender, log of monthly household income, marital status, children in household, educational level, and labor market status in addition to regional dummies. A table with full summary statistics can be found in Appendix 5.A.1.

The empirical strategy consists of the following steps: Throughout the model setup described above, we assume that both the Fukushima accident as well as the subsequent decision on nuclear phase-out can be regarded as quasi-exogenous shocks that should be reflected in changes in our measures of subjective perception. In order to verify this assumption and as an initial test for the presence of the suspected effects, we pool the 2011 data for each sub-period with the observations for the same time span in 2010. We than perform separate ordered logit regressions for each of the three time-subsamples, using a year dummy variable as an indicator for potential differences between the same time periods in 2010 and 2011.[3] If the assumption of quasi-exogenous shocks holds true, one would expect to see statistical significant differences between the 2010 and 2011 data for the post-Fukushima and post-nuclear phase-out time spans whereas no such difference should be

[2]The exact passages in the questionnaire are: *"What is your attitude towards the following areas – are you concerned about them (Environmental Protection; Security of Nuclear Power Plants; Reliability of Energy Supply Without the Use of Nuclear Energy)?" Possible answers are "Very worried", "Slightly worried" and "Not worried."*

[3]Since the question on environmental concern is the only of our three measures of interest included in the 2010 SOEP questionnaire, we rely on this variable in our initial annual comparison.

present for the reference period. Given the existence of such differences in between the two years, this could also be seen as evidence that potential in-year effects in the subsequent analyses are indeed caused by exogenous events instead of being a consequence of recurring seasonal variation.

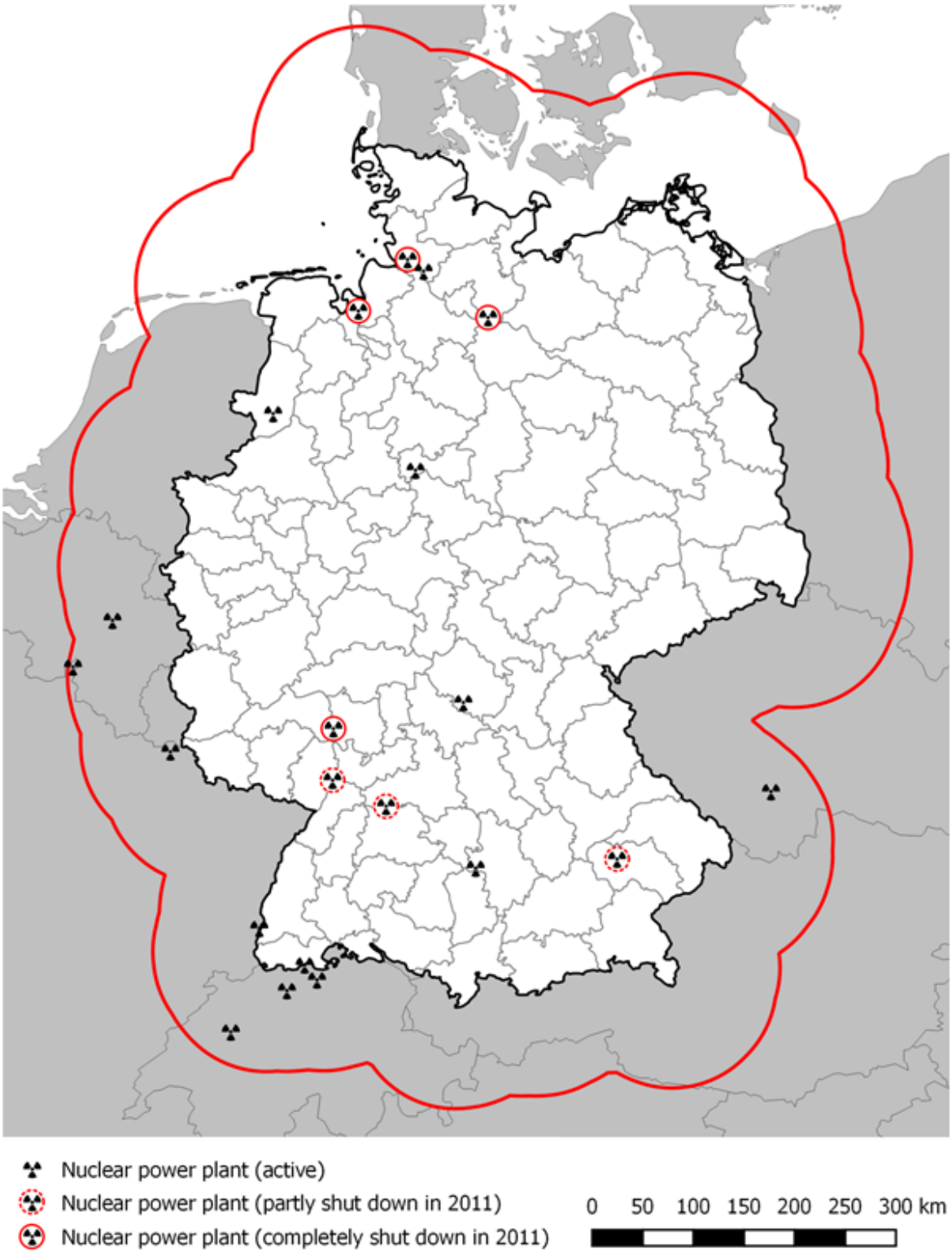
After this initial year-over-year comparison for each of the three time periods, we focus on the data for the year 2011. Depending on the variable at question we employ the corresponding dummy structures described above to test for changes in the self-reported worries throughout the year 2011, in particular following the Fukushima accident and the subsequent decision on nuclear phase out. Given the ecological impact of a major nuclear accident, one would expect that environmental concerns increase during the weeks after the Fukushima accident. On the other hand, the government decision on nuclear phase-out with the immediate shut down of eight nuclear reactors and the complete abandoning of nuclear energy by the year 2022 could be anticipated by a decrease in respective subjective worries. Due to the ordinal character of the dependent variables, we stick to the ordered logit estimation procedure throughout the analyses. In order to control for a possible bias due to differently sized subsamples of the SOEP, all observations are included taking into account their cross-sectional weights.

Finally one might argue that the size of potential effects depends on regional differences, especially the distance to the nearest nuclear power plant. To account for this possibility, we extend the preceding analysis by including a distance measure and the interaction between our effect variables and the distance indicator. In the SOEP, access to the respondents' geographical location is limited for privacy protection. However, the data at hand for this analysis allows regional identification on a Raumordnungsregion (ROR) level – planning units that divide Germany into 96 regions of an average size of 3 720 square kilometres (1 436 square miles) and an average population of 852 539. Hence, for each ROR z with a population of POP_z, we calculate a population-weighted average distance to the nearest active nuclear power station:

$$DIST_z = \sum_{i=1}^{n} \left(\frac{POP_i}{POP_z} \cdot DIST_i \right) \tag{5.1}$$

where POP_i is the population in municipality i of ROR z with a distance of $DIST_i$ to the nearest active power station. The population data is obtained from the Statistisches Bundesamt (2012). We also take into account active nuclear power plants in directly neighbouring countries within a 100-km radius around Germany. Figure 5.1 shows the various RORs and the location of the nuclear power sites included in the subsequent analyses.

Fig. 5.1 Regional planning units (ROR) and nuclear power plant sites



Notes: Own illustration. Following the decision on nuclear phase-out, a total of eight nuclear reactors were denominated for immediate shut down (Biblis A, Biblis B, Brunsbüttel, Isar 1, Krümmel, Neckarwestheim 1, Philippsburg 1, Unterweser). However, at three of these sites other reactors remain operational for the time being (Isar 2, Neckarwestheim 2 and Philippsburg 2).

5.4 Baseline Results

Table 5.1 shows the results for our initial tests on the validity of the assumption that both the Fukushima accident and the subsequent nuclear power phase out can be seen as quasi-exogenous shocks which should be reflected in a change in the measures of subjective perception. In order to ensure that potential in-year effects detected in the latter analyses are not caused by recurring seasonal trends, we pool the 2011 data for each of the three periods described above with data from the same time periods in 2010 and test whether there are statistical significant differences in between the two years. As only the question on worries about the environmental protection is available for both years, we run these tests using this variable as our dependent measure.

Table 5.1 Fukushima accident and nuclear power phase-out in Germany: time period subsamples

Worries about environmental protection	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Reference period (02/01 – 03/10)			
Year 2010	Ref.	Ref.	Ref.
Year 2011	0.0049	0.0050	-0.0099
	(0.0054)	(0.0055)	(0.0108)
Observations		12 276 (6 409/5 867)	
Pseudo R^2		0.0139	
Fukushima accident (03/11 - 06/05)			
Year 2010	Ref.	Ref.	Ref.
Year 2011	-0.0121***	-0.0160***	0.0281***
	(0.0047)	(0.0061)	(0.0108)
Observations		13 997 (6 070/7 927)	
Pseudo R^2		0.0163	
Nuclear power phase-out (06/06 - 09/30)			
Year 2010	Ref.	Ref.	Ref.
Year 2011	0.0169*	0.0130	-0.0299*
	(0.0101)	(0.0081)	(0.0181)
Observations		4 645 (1 234/3 411)	
Pseudo R^2		0.0227	

Source: Own analysis, calculation and illustration, SOEP LONG v28 Version (2012).
Notes: Ordered-logit estimates; dependent variable: Worries about environmental protection (coded 1 – 3); marginal effects; robust standard errors in brackets, error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights; other exogenous variables: Gender, age, age (squared), log household income, child in household, marital status, employment status, education, east and state dummies.

The upper part of Table 5.1 shows the marginal effects of the 2011 year dummy for each of the three outcomes of the variable on environmental worries during the first few weeks of the year. As mentioned before, this time span will serve as our reference period in the latter in-year analyses for 2011. Since all three corresponding marginal effects proof to be insignificant, our working hypothesis that the first few weeks of 2011 should not differ significantly from previous years appears to hold true. However, as expected, this changes for the time period after the Fukushima accident. Following the events of March 11th, 2011, people appear to be significantly more worried about the environment compared to the same time period in the year before. In particular, the probability of being very concerned increases by +2.81 percentage points whereas both, the probabilities of being somewhat worried and not worried at all show a highly significant decrease. Systematic differences in self-reported environmental concerns in between the two years are also present for the time following the government's decision on nuclear phase-out (06/06/2011 - 09/30/2011). Though on a less significant level, environmental worries appear to be lower in 2011 than during the same time of the previous year.

As shown in Table 5.1, there appear to be significant year-over-year differences in the level of environmental concerns for both the weeks following the Fukushima accident and the subsequent resolution on nuclear phase-out. Building upon this initial evidence we now turn to our in-year analysis for the year 2011, using the dummy structures described above. Table 5.2 shows the main results for our baseline specification in which we assess the effects on reported worries about the environment, the reliability of energy supply without the use of nuclear energy and the security of nuclear power plants. All reported parameters are marginal effects calculated from pooled cross-section ordered logit regressions for the year 2011. We report the marginal effects for all outcomes as "not worried", "slightly worried" and "very worried" to display shifts between the different outcome groups. Based on the previous findings, it is expected that any changes in worries related to the nuclear accident would predominantly appear in the category "very worried."

Concerning the worries about environmental protection, highly significant effects can be observed for the weeks immediately after the Fukushima catastrophe. In particular, as reported in the upper part of Table 5.2, the probability of reporting very high concerns about environmental protection increases by up to +4.7 percentage points compared to the reference period. A closer inspection of the estimated probabilities for the other two outcomes further reveals that this increase in very high concerns does not just rely on answers by respondents with some already-existing ecological sensitivity (-2.5 percentage points) but also seems to be a result of a changed perception among people who previously

Table 5.2 Fukushima accident and nuclear power phase-out in Germany: Ordered-logit estimates

	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Worries about environmental protection			
Before Fukushima accident:			
02/01/2011 – 03/10/2011	Ref.	Ref.	Ref.
Fukushima accident:	-0.0224***	-0.0248***	0.0471***
03/11/2011 – 06/05/2011	(0.0049)	(0.0055)	(0.0103)
Nuclear power phase-out:	0.0094*	0.0104*	-0.0198*
06/06/2011 – 09/30/2011	(0.0056)	(0.0063)	(0.0119)
Observations		17 205	
Pseudo R^2		0.0164	
Worries about the reliability of energy supply without the use of nuclear energy			
Fukushima accident:			
04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out:	0.0226	-0.0113	-0.0113
06/06/2011 – 09/30/2011	(0.0162)	(0.0081)	(0.0081)
Observations		4 269	
Pseudo R^2		0.0190	
Worries about the security of nuclear power plants			
Fukushima accident:			
04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out:	0.0742***	0.0163***	-0.0906***
06/06/2011 – 09/30/2011	(0.0118)	(0.0036)	(0.0144)
Observations		4 278	
Pseudo R^2		0.0384	

Source: Own analysis, calculation and illustration, SOEP LONG v28 Version (2012).
Notes: Dependent variables: Worries about environmental protection (coded 1 – 3); worries about the reliability of energy supply without the use of nuclear energy (coded 1 – 3), worries about the security of nuclear power plants (coded 1 – 3); marginal effects; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights; other exogenous variables: Gender, age, age (squared), log household income, child in household, marital status, employment status, education, state dummies and regional dummy (east).

reported no worries about environmental protection (-2.2 percentage points). Regarding the months after the government resolution on nuclear phase-out, there are some indications of a decrease in environmental concerns among the German population. Whereas the probability that people report very high concerns decreases by about -2 percentage points compared to the reference period, both other categories become respectively more likely. However, the effects for the time after the decision on nuclear phase-out are only slightly significant and should therefore be interpreted with caution. Overall the in-year effects for concerns about the environmental protection correspond nicely to the previous findings from the year-over-year comparison. We note that the ecological awareness among the

German public is sensitive about international environmental disasters such as the one in Fukushima, potentially leading to non-pecuniary costs for the German public (c.f. Berger, 2010).

The middle panel of Table 5.2 presents the findings on self-reported concerns about the reliability of energy supply without the use of nuclear energy. Since this variable was only included in the SOEP-questionnaires following the Fukushima events, we only observe the period from April 1st, 2011 until the end of 2011, using the weeks before the decision on nuclear phase-out as reference. Somewhat expectantly, no significant effects appear to be present after the announcement on June 6th, 2011. Nonetheless, the fact that the actual decision on immediate permanent shut down of eight nuclear reactors and complete phase-out by the year 2022 does not reflect in related worries can be seen as a pronounced sign of confidence in the compensability of nuclear energy.

The lower panel of Table 5.2 shows the results of our baseline models on concerns about the security of nuclear power plants. As before, data availability restricts our analysis to the post Fukushima periods, using the same dummy structure as described in the previous paragraph. Yet, contrary to the findings concerning the reliability of energy supply, in this case highly significant effects appear to be present following the announcement of nuclear phase-out. In particular, the probability of being very worried drops by up to -9.1 percentage points. This surprisingly strong decrease is accompanied by respective increases in the probabilities of being slightly worried (+1.6 percentage points) and of being not concerned at all (+7.4 percentage points). We conclude that the phase-out decision reduces the probability to report greater worries about nuclear power plant security. Considering the fact that the complete phase-out will not be completed until the year 2022, both the magnitude of the changes and the pattern of deferrals in the two extreme outcomes can be considered as somewhat surprising. Yet, these findings provide some evidence for a rather strong relief in the German public caused by the anticipated phase-out. The results are in line with our previous findings, indicating nonmonetary gains generated by the phase-out decision.

5.5 Regional Models

As shown in the preceding analyses, both the Fukushima accident and the announcement of nuclear phase-out appear to have a significant influence on subjective perception in the German public. One might argue, however, that the effects are predominantly determined by regional influences, especially the varying proximity to active nuclear power

plants, resulting in different levels of sensitivity. To account for this possibility, we alter our models by including the population-weighted distance proxy described in Section 3 and considering possible interactions with our effect variables. Table 5.3 reports the estimated results of all regional interaction models for each endogenous variable used in the previous analyses. As before, we use ordered logit models and present marginal effects for all variables of interest. The interaction effects are reported at means.[4]

Concerning the worries about environmental protection, the corresponding marginal effects presented in the upper part of Table 5.3 pretty much resemble those of the baseline specifications shown in the previous section (c.f. Table 5.2). In particular, the results of the regional model suggest that, when living at a mean distance to an active nuclear power station, the sole probability of being very concerned about the environment increases by up to +4.5 percentage points following the Fukushima accident. Whereas the absolute distance to the nearest power plant appears to be statistically insignificant, the highly significant interaction term between the variable on the Fukushima accident and the population weighted distance measure indicates that there appears to be a conditional relationship between the two variables. Concretely, each additional kilometer in between a respondent's place of residence and the nearest active reactor appears to have an average compensatory effect of about -0.04 percentage points, meaning that the increase in the probability of reporting very high concerns is of less magnitude, the further one lives away from an active nuclear power plant. In contrast, the Fukushima accident leads to a drop in the probabilities of reporting slight or no concerns about the environmental protection by about -2.4 percentage points, respectively -2.2 percentage points. Each additional kilometer to the nearest active power plant increases the probability of reporting one of these two outcomes by about +0.2 percentage points.

Consistent with our earlier findings, neither the decision on the nuclear power phase-out nor the absolute distance to an active nuclear power plant appears to be statistically significant in the regional specification on the concerns about the reliability of energy supply without the use of nuclear energy. However, as shown in the lower panel of Table 5.3, highly significant effects are present in the regional model using the concerns about the security of nuclear power plants as the dependent measure. In line with our earlier findings

[4]The use of interaction terms in non-linear models might lead to biased estimates in both, marginal effects and standard errors. As a robustness check of our ordered logit results, we also replicate the models shown in Table 5.3 using a standard logit approach, thus allowing for the application of the procedure suggested by Norton et al. (2004) for the calculation of corrected interaction term values in logit and probit specifications. In each case, the results of the ordered logit specifications are generally confirmed. For details please consult Appendix, section 5.A.3.

from the baseline specifications (c.f. Table 5.2), the probability of reporting very high concerns about the security of nuclear power plants drops noticeably following the decision on nuclear phase-out with the immediate closure of eight power plants and the anticipated shut down off all German nuclear power stations by the year 2022. However, as indicated by the significant interaction term, once again the actual magnitude of this effect appears to depend crucially on the distance between the respondent's place of residence and the nearest active power station. Whereas concerns decrease by about -9 percentage points at a mean distance, each additional kilometer has an additional reinforcing effect of -0.04 percentage points, i.e. the probability of being very worried about the security of nuclear power plants decreases the more, the further one lives away from an active nuclear power plant. Naturally, this relief is also nicely reflected in the corresponding effects on the other two outcomes, in particular in the marginal effect of not being worried at all: Following the government's resolution on nuclear phase out, the probability of not being worried increases by about +7.4 percentage points with each additional kilometer adding another +0.04 percentage points.

While the regional specifications generally confirm the results of our baseline models in both size and significance, they add to the earlier findings by indicating that the magnitudes of the detected effects depend conditionally on a respondent's distance to an active nuclear power station. On the one hand, the increase in worries about the environmental protection following the Fukushima accident appears to be the more pronounced the nearer one lives to an active nuclear power plant. On the other hand, people living in the periphery of an active reactor show less relief concerning the security of nuclear power stations following the decision on nuclear phase-out than individuals that live at a greater distance. Taking into account that the process of complete nuclear phase-out in Germany is supposed to last until the year 2022, these results can also be interpreted as a reflection of a higher general sensitivity towards atomic energy when one lives in the vicinity of a nuclear power station.

Table 5.3 Fukushima accident and nuclear power phase-out in Germany – distance to the nearest active power plant: Ordered-logit estimates

	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Worries about environmental protection			
Before Fukushima accident:			
02/01/2011 – 03/10/2011	Ref.	Ref.	Ref.
Fukushima accident:	-0.0215***	-0.0239***	0.0454***
03/11/2011 – 06/05/2011	(0.0049)	(0.0055)	(0.0103)
Nuclear power phase-out:	0.0093	0.0103	-0.0195
06/06/2011 – 09/30/2011	(0.0057)	(0.0064)	(0.0121)
Distance to the nearest active power plant (weighted)	-0.0001 (0.0001)	-0.0001 (0.0001)	0.0002 (0.012)
*Fukushima accident * Distance (weighted)*	0.0002** (0.0001)	0.0002** (0.0001)	-0.0004** (0.0002)
*Nuclear power phase-out * Distance (weighted)*	0.0002** (0.0001)	0.0002** (0.0001)	-0.0004** (0.0002)
Observations		17 205	
Pseudo R^2		0.0169	
Worries about the reliability of energy supply without the use of nuclear energy			
Fukushima accident:			
04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out:	0.0246	-0.0123	-0.0123
06/06/2011 – 09/30/2011	(0.0166)	(0.0083)	(0.0083)
Distance to the nearest active power plant (weighted)	-0.0002 (0.0004)	0.0001 (0.0002)	0.0001 (0.0002)
*Nuclear power phase-out * Distance (weighted)*	0.0006** (0.0002)	-0.0003** (0.0001)	-0.0003** (0.0001)
Observations		4 269	
Pseudo R^2		0.0197	
Worries about the security of nuclear power plants			
Fukushima accident:			
04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out:	0.0744***	0.0164***	-0.0908***
06/06/2011 – 09/30/2011	(0.0120)	(0.0036)	(0.0147)
Distance to the nearest active power plant (weighted)	-0.0001 (0.0002)	-0.00002 (0.0001)	-0.0001 (0.0003)
*Nuclear power phase-out * Distance (weighted)*	0.0004** (0.0002)	0.0001** (0.0000)	-0.0004** (0.0002)
Observations		4 278	
Pseudo R^2		0.0391	

Source: Own analysis, calculation and illustration, SOEP LONG v28 Version (2012).
Notes: Dependent variables: Worries about environmental protection (coded 1 – 3); worries about the reliability of energy supply without the use of nuclear energy (coded 1 – 3), worries about the security of nuclear power plants (coded 1 – 3); marginal effects; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights; centered distance measure; other exogenous variables: Gender, age, age (squared), log household income, child in household, marital status, employment status, education, state dummies and regional dummy (east).

5.6 Conclusion

The use of nuclear power is often controversially discussed. While widely accepted as a civil power source in many countries throughout the world, it also faces strong public opposition in some other nations. Major nuclear accidents as in Chernobyl or recently in Fukushima set nuclear power plant security on top of the public agenda. In Germany, facing public pressure, a rather abrupt nuclear power phase-out plan was passed by the government in the aftermath of Fukushima 2011.

In this article, we analyze the effects of the Fukushima nuclear accident and the subsequent phase-out on subjective perceptions in Germany, using three single item measurements from the SOEP: concerns about the environmental protection, worries about the reliability of energy supply without the use of nuclear energy and concerns about the safety of nuclear power stations.

Our findings suggest that the Fukushima accident itself led to an increase in the probability of reporting high concerns about environmental protection of about +4.7 percentage points. Moreover, worries about the safety of nuclear power plants are strongly affected by the government's decision on nuclear power phase-out, resulting in a decline in the probability of being very worried about power plant security of -9.1 percentage points. It is also shown that the magnitude of the detected effects for environmental concerns as well as worries about nuclear power plant safety appears to depend on regional characteristics with people living nearby an active nuclear power station generally showing a more sensible reaction than those living at greater distance.

In summary, our results are conclusive that catastrophes and changes in policies can have an immediate impact on public perception. While these results are consistent with reasonable prior beliefs, this study adds to the literature that provides empirical evidence, and provides an approximation of the magnitude of such effects. Moreover, one can conclude that the German government's decision on an energy turnaround in the weeks after the Fukushima accident had an immediate significant positive influence on the German public perception. Even though the corresponding effects are of nonmonetary nature and are thus difficult to compare with the classical monetary costs associated with the accelerated nuclear phase-out, they should probably still be taken into consideration when evaluating the total economic welfare effect of this change in policy.

These positive subjective externalities appear even more pronounced when taking into consideration that no evidence was found for an increase in concerns about the reliability of energy supply without the use of nuclear energy during the weeks after the actual gov-

ernment resolution. However, it should be noted that the analysis presented here focuses on a short to medium time horizon after the actual events. It is up to future research to look into longer term effects that could for instance be caused by continuously rising energy prices as observed in recent years.

Appendix 5.A Technical Appendix

5.A.1 Descriptive Statistics

Table 5.4 shows summary statistics for all variables used in the analyses. Percentage shares are displayed for all categorical variables whereas mean and standard deviation values are presented for metric variables. If not stated otherwise, all data shown for the period of the Fukushima accident relates to the period between March 11th and May 5th, 2011 as used in the specification on worries about environmental protection. Due to data availability this time span varies in the models concerning energy supply and the security of nuclear power plants.

Table 5.4 Descriptive statistics

	Before Fukushima accident: 02/01/2011 – 03/10/2011	Fukushima accident: 03/11/2011 – 06/05/2011	Nuclear power phase-out: 06/06/2011 – 09/30/2011
Worries about environmental protection:			
Not worried	12.58 %	10.31 %	13.37 %
Slightly worried	60.17 %	56.18 %	58.19 %
Very worried	27.25 %	33.52 %	28.44 %
*Worries about the reliability of energy supply without the use of nuclear energy:**			
Not worried		41.21 %	43.42 %
Slightly worried		42.99 %	41.20 %
Very worried		15.80 %	15.38 %
*Worries about the security of nuclear power plants:**			
Not worried		21.12 %	26.30 %
Slightly worried		40.53 %	43.27 %
Very worried		38.35 %	30.43 %
Female:			
Mean	0.528	0.523	0.529
SD	(0.499)	(0.500)	(0.499)
Age:			
Mean	54.893	51.952	51.342
SD	(17.096)	(16.296)	(16.907)
Household income:			
Mean	3104.797	3334.208	3025.248
SD	(2,032.408)	(2,257.719)	(2,249.317)
East:			
Mean	0.293	0.236	0.175
SD	(0.455)	(0.425)	(0.380)
Child in household:			
Mean	0.217	0.276	0.290
SD	(0.413)	(0.447)	(0.454)
Distance to nearest active nuclear power plant:			
Mean	106.13	99.288	104.313
SD	-66.79	-63.812	(65.864)
Labor status:			
Full-time employment	32.20%	36.99%	35.12%
Part-time employment	10.12%	12.25%	11.32%
Not employed	6.32%	6.27%	7.86%
Unemployed	4.40%	4.28%	5.66%
Retired	36.41%	27.43%	27.97%
Self-employed	4.74%	6.84%	6.24%
Irregular employment	4.06%	4.28%	3.87%
In education	1.76%	1.68%	1.96%
Marital status:			
Married	67.46%	68.05%	63.41%
Single	17.91%	19.26%	21.81%
Divorced	5.98%	6.26%	8.53%
Widowed	8.64%	6.43%	6.24%
Educational level (ISCED):			
ISCED 1 & 2	15.36%	13.60%	16.36%
ISCED 3 & 4	54.00%	54.69%	56.93%
ISCED 5 & 6	30.65%	31.71%	26.71%
Observations	5 867	7 927	3 411

Notes: *The variables Worries about the reliability of energy supply without the use of nuclear energy and worries about the security of nuclear power plants are available for the period from April 2011 to December 2011. We divide the observation period into two sub-periods: Fukushima accident: 04/01/2011 – 06/05/2011, Nuclear power phase-out: 06/06/2011 – 09/30/2011.

5.A.2 Baseline Models, Full Results

Tables 5.5, 5.6 and 5.7 correspond to the upper, middle, and lower panel of Table 5.2 and present the full results of our ordered logit baseline specifications. Most of the covariates show the expected signs and magnitudes well established in the literature.

Table 5.5 Fukushima accident and nuclear power phase-out in Germany: Ordered-logit estimates Worries about environmental protection: full results

	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Worries about environmental protection			
Before Fukushima accident: 02/01/2011 – 03/10/2011	Ref.	Ref.	Ref.
Fukushima accident: 03/11/2011 – 06/05/2011	-0.0224*** (0.0049)	-0.0248*** (0.0055)	0.0471*** (0.0103)
Nuclear power phase-out: 06/06/2011 – 09/30/2011	0.0094* (0.0056)	0.0104* (0.0063)	-0.0198* (0.0119)
Exogenous variables:			
Female	-0.0344*** (0.0048)	-0.0381*** (0.0052)	0.0724*** (0.0097)
Age	-0.0064*** (0.0010)	-0.0071*** (0.0010)	0.0136*** (0.0019)
Age (squared)	0.0001*** (0.0000)	0.0001*** (0.0000)	-0.0001*** (0.0000)
Log household income	0.0031 (0.0044)	0.0035 (0.0049)	-0.0066 (0.0092)
East	0.0012 (0.0210)	-0.0013 (0.0233)	0.0024 (0.0443)
Labor status			
Full-time employment	Ref.	Ref.	Ref.
Part-time employment	-0.0161** (0.0075)	-0.0178** (0.0083)	0.0338** (0.0159)
Not employed	0.0113 (0.0089)	0.0125 (0.0099)	-0.0239 (0.0188)
Unemployed	-0.0209* (0.0112)	-0.0232* (0.0124)	0.0441* (0.0236)
Retired	-0.0126 (0.0078)	-0.0139 (0.0087)	0.0265 (0.0165)
Self-employed	0.0147 (0.0099)	0.0163 (0.0110)	-0.0310 (0.0209)
Irregular employment	-0.0180 (0.0114)	-0.0199 (0.0127)	0.0379 (0.0240)
In education	0.0058 (0.0214)	0.0064 (0.0237)	-0.0121 (0.0451)
Marital status			
Married	Ref.	Ref.	Ref.
Single	-0.0114 (0.0072)	-0.0126 (0.0080)	0.0239 (0.0151)
Divorced	0.0076 (0.0086)	0.0084 (0.0095)	-0.0161 (0.0181)
Widowed	0.0143* (0.0084)	0.0158* (0.0093)	-0.00053277
Child in household	-0.0022 (0.0058)	-0.0024 (0.0064)	0.0047 (0.0122)
Educational level (ISCED)			
ISCED 1 & 2	Ref.	Ref.	Ref.
ISCED 3 & 4	-0.0097 (0.0064)	-0.0107 (0.0070)	0.0204* (0.0134)
ISCED 5 & 6	-0.0215*** (0.0074)	-0.0238*** (0.0082)	0.0453*** (0.0155)
State dummies	Yes	Yes	Yes
Observations		17 205	
Pseudo R^2		0.0164	

Notes: Dependent variable: Worries about environmental protection (coded 1 – 3); marginal effects; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights.

Table 5.6 Fukushima accident and nuclear power phase-out in Germany: Ordered-logit estimates Worries about the reliability of energy supply without the use of nuclear energy: full results

	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Worries about the reliability of energy supply without the use of nuclear energy			
Fukushima accident: 04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out: 06/06/2011 – 09/30/2011	0.0226 (0.0162)	-0.0113 (0.0081)	-0.0113 (0.0081)
Exogenous variables:			
Female	-0.0107 (0.0182)	0.0054 (0.0091)	0.0054 (0.0091)
Age	0.0015 (0.0034)	-0.0008 (0.0017)	-0.0008 (0.0017)
Age (squared)	-0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
Log household income	0.0241 (0.0188)	-0.0120 (0.0094)	-0.0120 (0.0094)
East	-0.1461 (0.969)	0.0730 (0.0485)	0.0731 (0.0485)
Labor status			
Full-time employment	Ref.	Ref.	Ref.
Part-time employment	0.0092 (0.0288)	-0.0046 (0.0144)	-0.0046 (0.0144)
Not employed	-0.0406 (0.0354)	0.0203 (0.0177)	0.0203 (0.0177)
Unemployed	-0.0320 (0.0454)	0.0160 (0.0226)	0.0160 (0.0228)
Retired	-0.0233 (0.0322)	0.0117 (0.0161)	0.0117 (0.0161)
Self-employed	0.0419 (0.0404)	-0.0209 (0.0203)	-0.0209 (0.0202)
Irregular employment	-0.0119 (0.0450)	0.0060 (0.0225)	0.0060 (0.0225)
In education	0.0399 (0.0724)	-0.0200 (0.0362)	-0.0200 (0.0362)
Marital status			
Married	Ref.	Ref.	Ref.
Single	0.0906*** (0.0275)	-0.0453*** (0.0141)	-0.0453*** (0.0136)
Divorced	0.0623** (0.0303)	-0.0312** (0.0153)	-0.0312** (0.0151)
Widowed	0.0548* (0.0329)	-0.0274* (0.0165)	-0.0274* (0.0164)
Child in household	0.0480** (0.0228)	-0.0240** (0.0115)	-0.0240** (0.0114)
Educational level (ISCED)			
ISCED 1 & 2	Ref.	Ref.	Ref.
ISCED 3 & 4	0.0422* (0.0230)	-0.00024265	-0.00024265
ISCED 5 & 6	0.1367*** (0.0282)	-0.0684*** (0.0144)	-0.0683*** (0.0142)
State dummies	Yes	Yes	Yes
Observations		4 269	
Pseudo R^2		0.019	

Notes: Dependent variable: Worries about the reliability of energy supply without the use of nuclear energy (coded 1 – 3), marginal effects; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights.

Table 5.7 Fukushima accident and nuclear power phase-out in Germany: Ordered-logit estimates Worries about the security of nuclear power plants: full results

	$\frac{\partial Pr(y_i=not\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=slightly\ worried)}{\partial x_i^j}$	$\frac{\partial Pr(y_i=very\ worried)}{\partial x_i^j}$
Worries about the security of nuclear power plants			
Fukushima accident: 04/01/2011 – 06/05/2011	Ref.	Ref.	Ref.
Nuclear power phase-out: 06/06/2011 – 09/30/2011	0.0742*** (0.0118)	0.0163*** (0.0036)	-0.0906*** (0.0144)
Exogenous variables:			
Female	-0.0683*** (0.0132)	-0.0150*** (0.0034)	0.0833*** (0.0158)
Age	-0.0161*** (0.0026)	-0.0035*** (0.0007)	0.0196*** (0.0032)
Age (squared)	0.0001*** (0.0000)	0.0000*** (0.0000)	-0.0001*** (0.0000)
Log household income	0.0265* (0.0138)	0.0058* (0.0032)	-0.0323* (0.0169)
East	-0.0497 (0.0577)	-0.0109 (0.0128)	0.0606 (0.0704)
Labor status			
Full-time employment	Ref.	Ref.	Ref.
Part-time employment	-0.0203 (0.0212)	-0.0044 (0.0047)	0.0247 (0.0258)
Not employed	-0.0107 (0.0245)	-0.0024 (0.0054)	0.0131 (0.0298)
Unemployed	-0.0030 (0.0307)	-0.0007 (0.0067)	0.0037 (0.0374)
Retired	0.0238 (0.0236)	0.0052 (0.0052)	-0.0290 (0.0288)
Self-employed	0.0376 (0.0278)	0.0083 (0.0062)	-0.0458 (0.0339)
Irregular employment	0.0403 (0.0319)	0.0089 (0.0071)	-0.0492 (0.0389)
In education	0.0694 (0.0512)	0.0152 (0.0115)	-0.0847 (0.0624)
Marital status			
Married	Ref.	Ref.	Ref.
Single	-0.0190 (0.0199)	-0.0042 (0.0044)	0.0232 (0.0243)
Divorced	0.0252 (0.0221)	0.0055 (0.0049)	-0.0307 (0.0269)
Widowed	0.0158 (0.0268)	0.0035 (0.0059)	-0.0192 (0.0327)
Child in household	-0.0159 (0.0160)	-0.0035 (0.0036)	-0.0194 (0.0196)
Educational level (ISCED)			
ISCED 1 & 2	Ref.	Ref.	Ref.
ISCED 3 & 4	-0.0085 (0.0166)	-0.0019 (0.0037)	0.0103 (0.0202)
ISCED 5 & 6	0.0159 (0.0201)	0.0035 (0.0044)	-0.0194 (0.0245)
State dummies	Yes	Yes	Yes
Observations		4 278	
Pseudo R^2		0.0384	

Notes: Dependent variable: Worries about the security of nuclear power plants (coded 1 – 3); marginal effects; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights.

5.A.3 Regional Models, Logit Estimates

The use of interaction terms in nonlinear models bears the potential risk of biased results in both marginal effects and standard errors. Table 5.8 therefore resembles the regional specifications shown in in-text Table 5.3, using a standard logit approach with the dependent dummy variables being recoded as "very worried" (1) vs. all other outcomes (0). The use of a binary dependent measure allows for the application of the procedure suggested by Norton et al. (2004) for the calculation of corrected marginal effects and standard errors in nonlinear models.[5] When comparing the standard and the corrected marginal effects and standard errors, one finds that for our data both procedures lead to near identical results. Given the expected tolerance in between the more differentiated ordered logit estimates presented in in-text Table 5.3 and the pooled logit estimates shown above, all alternatives lead to very similar results. Thus it seems fair to assume that one can rely on the standard procedure for the calculation of marginal effects and standard errors in the ordered logit setup shown in in-text Table 5.3.

[5] According to Norton et al. (2004) the correct magnitude of an interaction term in binary logit and probit models should be calculated as the cross derivate of the dependent variable's expected value whereas the corresponding test for statistical significance should be based on the estimated cross-partial derivate rather than on the coefficient of the interaction term.

Table 5.8 Fukushima accident and nuclear power phase-out in Germany – distance to the nearest active power plant: logit estimates

	Worries environment		Worries energy supply		Worries power plant security	
	Standard interaction terms	Corrected interaction terms[a]	Standard interaction terms	Corrected interaction terms[a]	Standard interaction terms	Corrected interaction terms[a]
Before Fukushima accident: 02/01/2011 – 03/10/2011	Ref.	Ref.				
Fukushima accident: 03/11/2011 – 06/05/2011	0.0505*** (0.0115)	0.0505*** (0.0115)	Ref.[b]	Ref.[b]	Ref.[b]	Ref.[b]
Nuclear power phase-out: 06/06/2011 – 09/30/2011	-0.0098 (0.0137)	-0.0098 (0.0137)	-0.0135 (0.0120)	-0.0135 (0.0120)	-0.1065*** (0.0167)	-0.1065*** (0.0167)
Dist. to nearest active reactor (weighted)	0.0003 (0.0002)	0.0003 (0.0002)	0.0003 (0.0003)	0.0003 (0.0003)	0.0002 (0.0004)	0.0002 (0.0004)
Fukushima accident * *Distance* (weighted)	-0.00042** (0.00018)	-0.00041** (0.00018)				
Nuclear power phase-out * *Distance* (weighted)	-0.00035* (0.00020)	-0.00035* (0.00020)	-0.00033* (0.00019)	-0.00035* (0.00021)	-0.00057* (0.00026)	-0.00055** (0.00027)
Observations	17 205	17 205	4 269	4 269	4 278	4 278
Pseudo R^2	0.0159	0.0159	0.0305	0.0305	0.0477	0.0477

[a] Corrected marginal effects and standard errors of the interaction terms according to Norton et al. (2004)
[b] Reference Period: (04/01/2013 – 06/05/2013)
Notes: Dependent variables: Worries about environmental protection (0/1), worries about the reliability of energy supply without the use of nuclear (0/1), worries about the security of nuclear power plants (0/1); marginal effects: Probability of being "very worried"; robust standard errors in brackets; coefficients of the models, with error probabilities in parentheses: ***p<0.01 - **p<0.05 - *p<0.1; cross section weights; centered distance measure; other exogenous variables: Gender, age, age (squared), log household income, child in household, marital status, employment status, education, state dummies and regional dummy (east).

Figure 5.2 visualizes the influence of the respondents' distance to the nearest active power plant on worries about the environment and on worries about the security of nuclear power plants. Both models are visualized because of detected regional influences and all graphs are based on the logit results shown in Table 5.8. In detail, Figures 5.2 a, c and e correspond to the main effects of the estimates reported in Table 5.8, columns 2 and 6. The corresponding interaction terms can be located as the difference of the slopes of the effect lines minus the slopes of the reference lines (Mitchell and Chen, 2005). Figures 5.2 b, d and f show the distribution of each corresponding interaction effect. To avoid possible biased estimates arising from the use of interaction terms in nonlinear models, the visualizations also take into account the corrected marginal effects and standard errors calculated according to the procedure suggested by Norton et al. (2004).

Fig. 5.2 Regional models: logit estimates and correction in interaction terms

Fig. a: Fukushima accident: Predicted probability of being "very worried" about the environment

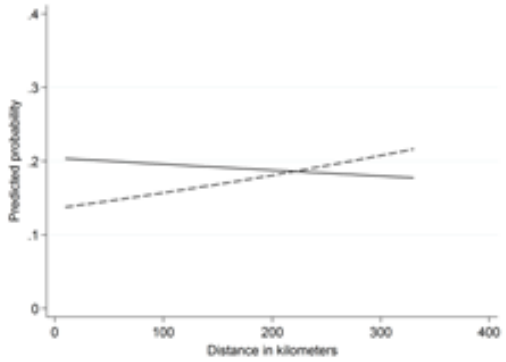


Fig. b: Interaction effect: Fukushima accident * distance – probability "very worried" about the environment

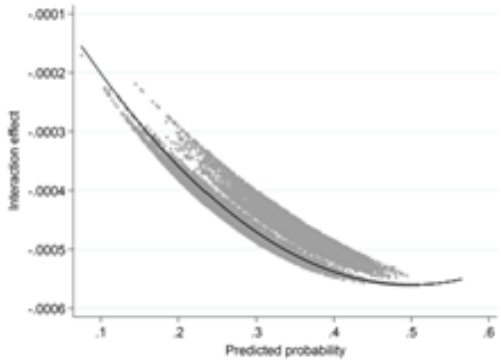


Fig. c: Phase-out: Predicted probability of being "very worried" about the environment

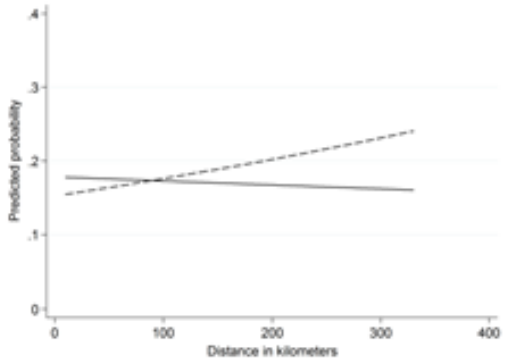


Fig. d: Interaction effect: Phase-out * distance – probability "very worried" about the environment

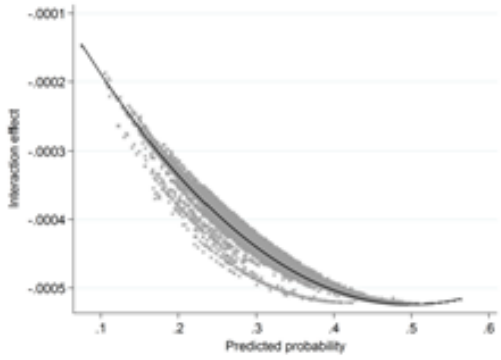


Fig. e: Phase-out: Predicted probability of being "very worried" about the security of nuclear plants

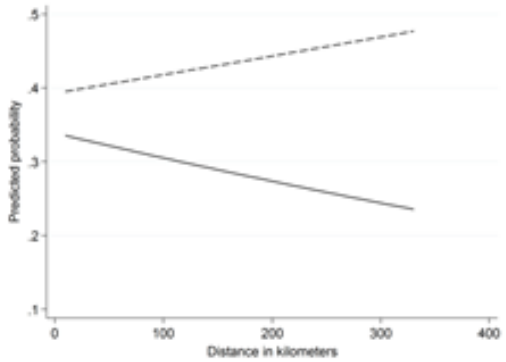
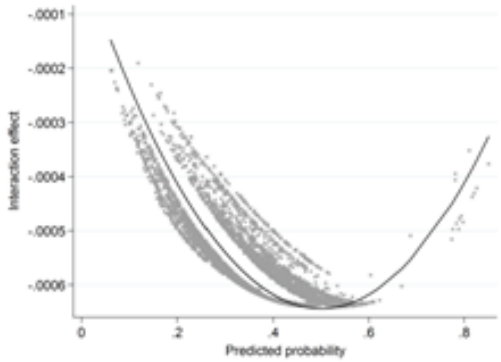


Fig. f: Interaction effect: Phase-out * distance – probability "very worried" about the security of nuclear plants



Notes: All Fig.: logit estimates (controlled for correct marginal effects in non-linear equations with interaction terms). Fig. 5.2 a: Dashed line, reference period (before Fukushima accident) - solid line, effect period (Fukushima accident). Fig. 5.2 c: Dashed line, reference period (before Fukushima accident) - solid line, effect period (nuclear phase-out). Fig. 5.2 e: Dashed line, reference period (Fukushima accident) - solid line, effect period (nuclear phase-out). Fig. 5.2 b, d, f: Solid line, standard marginal effects - crosses, correct marginal effects.

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EIDESSTATTLICHE VERSICHERUNG

Hiermit erkläre ich, Markus Wilhelm, an Eides statt, dass ich die Dissertation mit dem Titel: „Selected Issues Concerning Life Satisfaction: Measuring Non-Pecuniary Gains and Losses with Panel Data of the Socio-Economic Panel (SOEP)“ selbständig und ohne fremde Hilfe verfasst habe. Andere als die von mir angegebenen Quellen und Hilfsmittel habe ich nicht benutzt. Die den herangezogenen Werken wörtlich oder sinngemäß entnommenen Stellen sind als solche gekennzeichnet.

Hamburg, den 25. August 2014

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