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Abstract

This paper examines a common explanation why participants of panel surveys may report declining life satisfaction over time. In line with the argument of developing trust relationships between interviewers and interviewees, the analysis reveals positive effects in reported life satisfaction when the person conducting the interview changes to an unfamiliar individual. Yet, the evidence also shows that the overall decline is determined by years in the panel, rather than by number of encounters with one specific interviewer. The realization that such response artifacts can affect the analysis of life satisfaction leads to some important conclusions.

JEL Classification Codes: C8, I3

Keywords: Life satisfaction, panel effect, survey design, response bias, interviewer effects

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1. Introduction

Panel data is the preferred type of data for empirical researchers of life satisfaction. Among other things, it allows researchers to consider personality-related baseline levels of happiness for each individual, which due to the seminal work by Ferrer-i-Carbonell and Frijters (2004) has become a standard requirement in research on the determinants of subjective well-being. While longitudinal data permits analyses which are impossible to do with cross-sectional data, it also reveals potential flaws in the information coming from survey participants. One phenomenon that receives increased attention is the so-called “panel effect” in life satisfaction responses (see e.g. D’Ambrosio and Frick 2012, Frijters and Beatton 2012, Kassenboehmer and Haisken-DeNew 2012, Wunder et al. 2013). Also known by the term “panel conditioning” it is simply defined as an effect resulting from answering the same question several times. For life satisfaction, the common finding is a negative trend in the data (e.g. van Landeghem 2012). Yet, due to a lack of research on the actual causes of this phenomenon, researchers often give rather ad-hoc explanations, and they do not apply a uniform solution to this problem.

One explanation for the panel effect of declining life satisfaction responses is the so-called “learning effect” (see e.g. Frick et al. 2006, Wooden and Li forthcoming).¹ Another argument often given by researchers relates to people’s desire to not report honestly on their unhappiness when there is a lack of trust. In this vein, Frijters and Beatton (2012) point to increased honesty as driving force behind the negative time-in-panel trend, which they consider as an important factor to reveal the true relationship between well-being and age. Like Baetschmann (2011), they conclude that previous findings in the literature may be biased when such response artifacts are ignored. Kassenboehmer and Haisken-DeNew (2012) also point out the significance of considering years in the panel and elaborate on the aspect of increasing honesty. They argue that over time there is a growing trust relationship between interviewee and interviewer.

The motivation for the present paper builds specifically upon this argument. On closer inspection, the idea of developing trust in an interviewer requires interviewees to be confronted with the same person each year. However, for many panel participants, this assumption may not be true. For instance, a respondent automatically encounters a different person as soon as there is interviewer attrition. Besides, participants may not be confronted

¹ This idea implies that data quality generally increases over time, as participants make use of the life satisfaction scale in a way that they do not in the first few times. Resulting from a learning process, participant answers become more accurate year by year, while at first they report too high levels of life satisfaction.

with any person, if a visit-free interview mode is allowed by survey organizers. The advantage of having such kinds of variation in people's panel careers is that it allows a deeper analysis of the trust-in-interviewer argument. It is possible to compare the effects from being visited by a specific interviewer with the potential effect from overall time in the panel, which may affect life satisfaction responses via the above-mentioned learning process or be due to a general trust-in-institution effect.

In addition to the potential explanation for the overall trend of declining life satisfaction, a specific phenomenon can be expected to emerge in the data if interviewer encounters play a significant role for people's response behavior. Imagine a survey participant who reports dishonestly when being visited by an interviewer for the first time. This bias of reporting too positively about life satisfaction may change as individuals become more familiar with each other in the following years. But what happens if at one point a different interviewer is present? The trust-in-interviewer hypothesis would suggest that life satisfaction responses go up again. As all previous studies have only considered overall panel participation time, the present study is the first to test whether this is true and how significant such an effect may be.

The standard approach in dealing with the panel effect of declining life satisfaction is to expand empirical models with a linear counter variable, which increases by one with every year of participation (see e.g. Frijters et al. 2004, Headey et al. 2010). As one may expect the relationship between participation years and life satisfaction to be non-linear, there are alternatives to this. Whereas Kassenboehmer and Haisken-DeNew (2012) additionally include years in panel squared, a rather resolute option is dropping the data that is probably most biased. In this vein, Wunder et al. (2013) exclude all information from first and second interviews of each person. D'Ambrosio and Frick (2012) implement a mixed approach in their dynamic analysis of well-being and income, as they drop first years of observation and include dummy variables for the number of interviews. While this heterogeneity indicates an uncertainty about the nature of the bias, all approaches are more or less problematic if the trust-in-interviewer factor does cause the panel effect, as they do not capture the full magnitude of the bias.

Following a brief description of the panel data used, some graphical illustrations help to clarify the main points of this investigation. Results of multiple regression analyses substantiate the interpretation of the panel effect in life satisfaction responses. The final section discusses results and draws conclusions for future empirical research.

2. Empirical Application

This analysis of the panel effect in life satisfaction responses exploits data from the German Socio-Economic Panel Study (SOEP), a large representative survey of households in Germany (see Wagner et al., 2007).² While it is their goal to reduce respondent attrition by fostering personal relationships between interviewees and interviewers (Haisken-DeNew and Frick 2005), survey organizers cannot prevent attrition of the latter e.g. when an interviewer decides to quit the job at the data collecting agency. In such cases, interviewees necessarily experience an exogenous change in the person conducting the interview. A second aspect of the survey design is a differentiation between interview modes, as the SOEP allows participants to fill out the questionnaire on their own without any interviewer being present. Thus, in someone's panel career, there can be over time variation in the interviewer person ("who") and in the interviewer presence ("if").

Thanks to available identification numbers, interviewers are identifiable in all interview modes with the interviewer present.³ To determine the number of times an interviewee encounters a specific interviewer, identifiers must be available for all interviews during one's panel career.⁴ This leads to a different sample than in previous studies using SOEP data. Nevertheless, the application of the same methodological approach as in Frijters and Beaton (2012) as well as in Kassenboehmer and Haisken-DeNew (2012) allows the comparison of results regarding the panel effect. Accordingly, the analyses here also make use of pooled ordinary least squares (OLS) and OLS with fixed individual effects.

[Figure 1 about here]

The results of the regression analyses are prefaced with some graphical illustrations of life satisfaction averages. Figure 1 (a) shows the standard pattern of declining life satisfaction responses for all participants in the sample. For some first evidence on the role of the

² Life satisfaction is obtained in the SOEP on a scale ranging from 0 to 10, with higher scores indicating greater well-being. The original wording is: "How satisfied are you with your life, all things considered?"

³ These modes are oral and partly oral interviews (either with paper and pencil or with computer assistance) as well as self-completed questionnaires *with* an interviewer being present. In about one third of all cases, SOEP participants fill out questionnaires *without* an interviewer being present, which happens when a household member is not at home during the visit or when there is contact via mail only (see Table A.1 in the Appendix). Note that there are also a few atypical modes, such as telephone interviews. These are dropped from the analysis, just like interviews in presence of interpreters. Such data out of the "foreigner sample" is not useful for the purpose here, as the role of the interviewer may be biased by other aspects.

⁴ Note that there are no interviewer identification numbers available for the first SOEP wave of 1984.

interviewee-interviewer relationship, the decline is also shown for encounters with the first (c) and the second interviewer (d). Yet, the picture is very similar when examining the quasi control group of interviewees who solely fill out questionnaires on their own, i.e. without interviewers (b). The comparison of these illustrations suggests that it is overall participation in the panel that determines the decline in reported well-being.

What cannot be observed in such a graphical analysis are potential differences in reported well-being when an interviewee meets a different interviewer than before. For this purpose, Figure 2 shows life satisfaction averages for those participants in the sample who are visited at least four times in a row by one interviewer but prior to that four times in a row by a different person. The finding of a remarkable shift in the overall trend of declining life satisfaction responses substantiates the above expectation.

[Figure 2 about here]

Multiple regression analyses verify whether the findings remain significant when potentially relevant factors are considered as controls. In particular, there is a good reason for interviewer changes, which is when SOEP participants move to a different location. Thus, the standard control variables commonly used in previous studies (income, education, employment status, registered unemployment, number of children, age, family status, partnership status) are expanded with a dummy variable for a recent move as well as an additional “shock” variable for moving together with a partner (in addition to dummies for other recent life events, i.e. divorce, separation, death of spouse and child birth). Also included are variables capturing potential differences in living quality (federal state, owner of dwelling, household member needing care, number of household members, housing condition, and living area).⁵

[Table 1 about here]

The first step is to reproduce the standard finding in the literature. Table 1 does that by showing a linear years-in-panel effect, yet, with one important objection. As soon as year effects are considered, the negative effect disappears in fixed-effects models. The explanation for this is closely related to the discussion of why linear age cannot be used in such models

⁵ For more information on the variables used, see Table A.2 in the Appendix.

(see Ferrer-i-Carbonell and Frijters 2004). Only the fact that some interviewees refuse to participate every year allows use of a linear variable for years in panel together with wave dummies, whereas perfect collinearity would result when those persons with breaks in their panel careers are excluded. This suggests using dummy variables to capture the panel effect in life satisfaction responses if both fixed individual and fixed year effects are considered simultaneously.

[Table 2 about here]

The outcomes presented in Table 2 demonstrate whether interviewer changes trigger increases in reported well-being when a variety of potential influencing factors are controlled for.⁶ The key dummy variable here reflects all initial interviews with different interviewers to the first one. The significantly positive effect substantiates the above expectation that unfamiliarity with an interviewer can affect people's response behavior. As shown in the table's last column, this finding is robust to inclusion of full sets of year-in-panel and interview mode dummy variables.

The next part of the analysis checks whether there is a particular trend in reported life satisfaction that is related to increasing familiarity with the interviewer. Due to the above findings, a full set of interviewer encounter dummy variables is used together with dummies to control for the overall participation effect. Results presented in Table 3 confirm the expectations suggested by the graphical analysis. While there is a decline in reported well-being linked to interviewee-interviewer encounters that is still robust when including control variables (first column), this trend disappears as soon as the overall participation time is considered (second column). Therefore, the latter appears as the more relevant factor in explaining the panel effect. For the sake of clarity, the basic gap in life satisfaction responses between interviews with and without interviewer presence is controlled for in the next specifications. Consequently, the reference category changes from "no interviewer presence" to "first interview with the first interviewer". The insignificant outcomes indicate that there is no original response trend related to actual interviewee-interviewer encounters, suggesting that the panel effect of declining life satisfaction is dominated by overall time spent in the panel.

⁶ The discussion from here on is limited to individual fixed effects models as those are standard in the research on well-being. Also note that the complete results of all tables are available from the author upon request.

[Table 3 about here]

However, the importance of the interviewee-interviewer aspect appears again in cases of interviewer changes. The final two columns of Table 3 show significantly positive effects on life satisfaction responses when panel participants are confronted with a second interviewer, even more so in case of a third interviewer, while smaller effects are found for encounters with interviewers beyond that.⁷ A plausible explanation is that truly unhappy people give less honest answers to questions from unfamiliar interviewers. The results are robust to a significantly negative “comeback effect” when interviewees are revisited by an earlier interviewer, possibly indicating a special trust effect when encountering a familiar face. As a robustness check, the same analysis is conducted on the basis of a more homogenous data sample with only interviewees who participated more than eight times and without any break, leading to very similar outcomes.⁸

3. Discussion

This paper investigates the panel effect of declining life satisfaction responses by testing a widespread but so far untested explanation, which is the possibility of a developing trust relationship between interviewee and interviewer. The analysis substantiates the expectation of a positive effect from an interviewer change, indicating that the level of familiarity with the interviewer affects respondent behavior. As interviewer attrition is an unavoidable aspect of panel surveys, the finding of an upwards bias in life satisfaction responses similar to the one at the beginning of people’s panel career is an intriguing and yet unknown phenomenon. With respect to the other expectation proposed in the literature, according to which trust towards an interviewer may also explain the overall decline in reported well-being, the evidence suggests that the negative trend is mostly determined by the overall time spent in the panel. Whether this points to a learning effect or to a general trust-in-the-institution effect is up to further research.

The question of how to deal with such response bias phenomena depends on the research objective. Researchers have identified the age-happiness discussion as an important case, in

⁷ Note that only a few hundred participants in the sample are visited by more than three different persons.

⁸ See Table A.3 in the Appendix. The reference category for years in panel is all participations after the eighth time. This illustrates the upwards bias in life satisfaction responses for the beginning of people’s panel careers.

which panel effects require particular attention.⁹ There are other satisfaction determinants which one can think of, such as tenure, in which a variable of interest increases over time. In addition to this, there are also research objectives for which interviewer changes may pose a serious threat to the validity of empirical outcomes if not considered in the investigation. One example is the analysis of mobility and its impact on life satisfaction. As a possible scenario, a researcher ignores interviewer changes and finds a significant but biased increase in reported life satisfaction in the year of a move. The consideration of the familiarity-with-the-interviewer factor appears necessary to convince an informed reader of the results' validity.

To capture such response bias effects, the use of dummy variables appears as the only available option in case of interviewer changes and as the better alternative in case of the overall panel effect.¹⁰ Conversely, the results found here suggest not using linear variables, as a simple years-in-panel counter does not seem capable of reliably capturing the bias. The inclusion of years in panel squared may lead to significant outcomes but it is not clear what is measured in the case of the positive quadratic trend found here. While this study focuses rather on the beginning of people's panel careers and not the end, the relation between panel attrition and life satisfaction responses may help in understanding such phenomena but this is also up to further research.

A more general implication from this study relates to the significant role of the interview mode, which needs to be taken into account when empirically analyzing life satisfaction but also in further research on the role of survey methodology. While the very large positivity bias for interviewer presence seems remarkable, it has been found that even the presence of third persons during the interview can trigger increases in reported life satisfaction (Chadi 2013). These findings from studying SOEP data are quite similar to those by Conti and Pudney (2011) for British panel data. Whereas they emphasize people's desire to report more positively when being confronted with visitors, Wooden and Li (forthcoming) find only little evidence for panel effects when studying Australian data, suggesting a need of further research on how different survey characteristics affect life satisfaction responses. In this vein, the final but probably most important suggestion is to always check a data set's underlying survey design in order to make the most suitable decisions concerning potential response artifacts.

⁹ Additional regressions with linear age and age squared variables for a working age sample suggest that the analysis of the so-called "u-shape effect" is not only affected from the panel effect but also from the way that it is considered. Since an investigation into the age effect would require a more comprehensive discussion, e.g. with respect to potential collinearity problems, the results are not examined further here. Moreover, the analysis of the effect of becoming older may also be biased by additional response artifacts (see Chadi 2012).

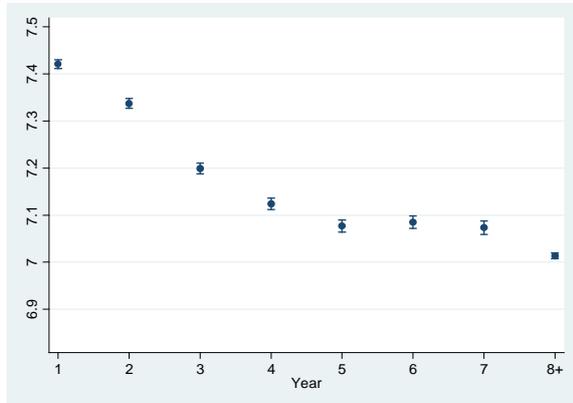
¹⁰ Note that throughout the analyses, there is a quite robust finding of a strong upwards bias in life satisfaction responses from the first few interviews. After approximately three years, a relatively stable level is reached.

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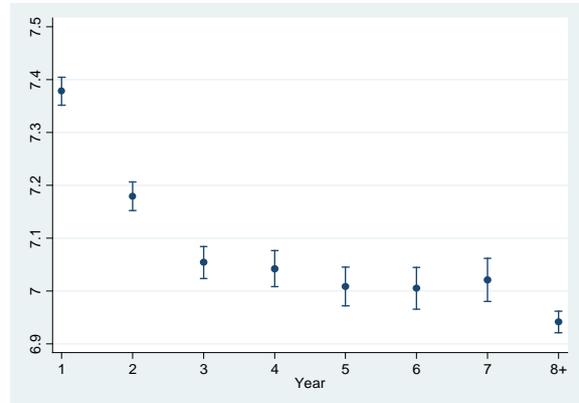
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Figure 1 Average life satisfaction over time

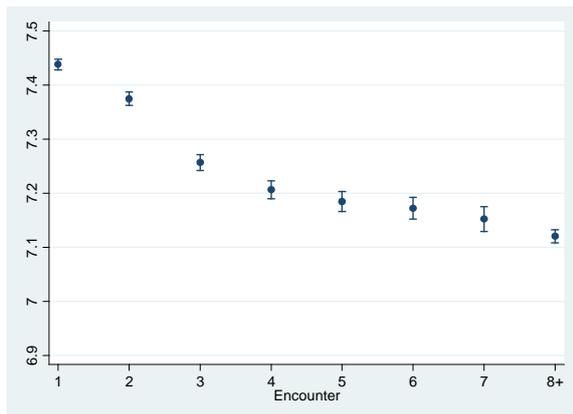
a) Years in panel (all participants)



b) Years in panel (no interviewer presence)



c) Encounters with the first interviewer



d) Encounters with the second interviewer

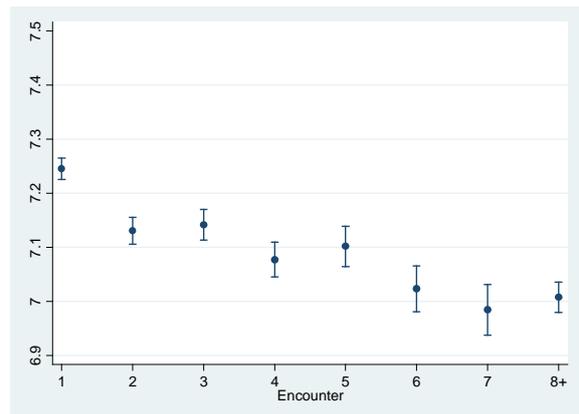


Figure a) shows unweighted averages of life satisfaction reported by all panel participants in their first, second, etc. year of participation, independent from interview mode and interviewer.

Figure b) shows unweighted averages of life satisfaction reported by those participants in their first, second, etc. year of participation who always fill out questionnaires without interviewer presence.

Figure c) shows unweighted averages of life satisfaction reported by participants in their first, second, etc. interview with the first interviewer that they encounter during their panel careers.

Figure c) shows unweighted averages of life satisfaction reported by participants in their first, second, etc. interview with the second interviewer that they encounter during their panel careers.

Source: SOEP data from 1985 to 2011

Figure 2 Average life satisfaction over time and different interviewers (change in $t = 0$)

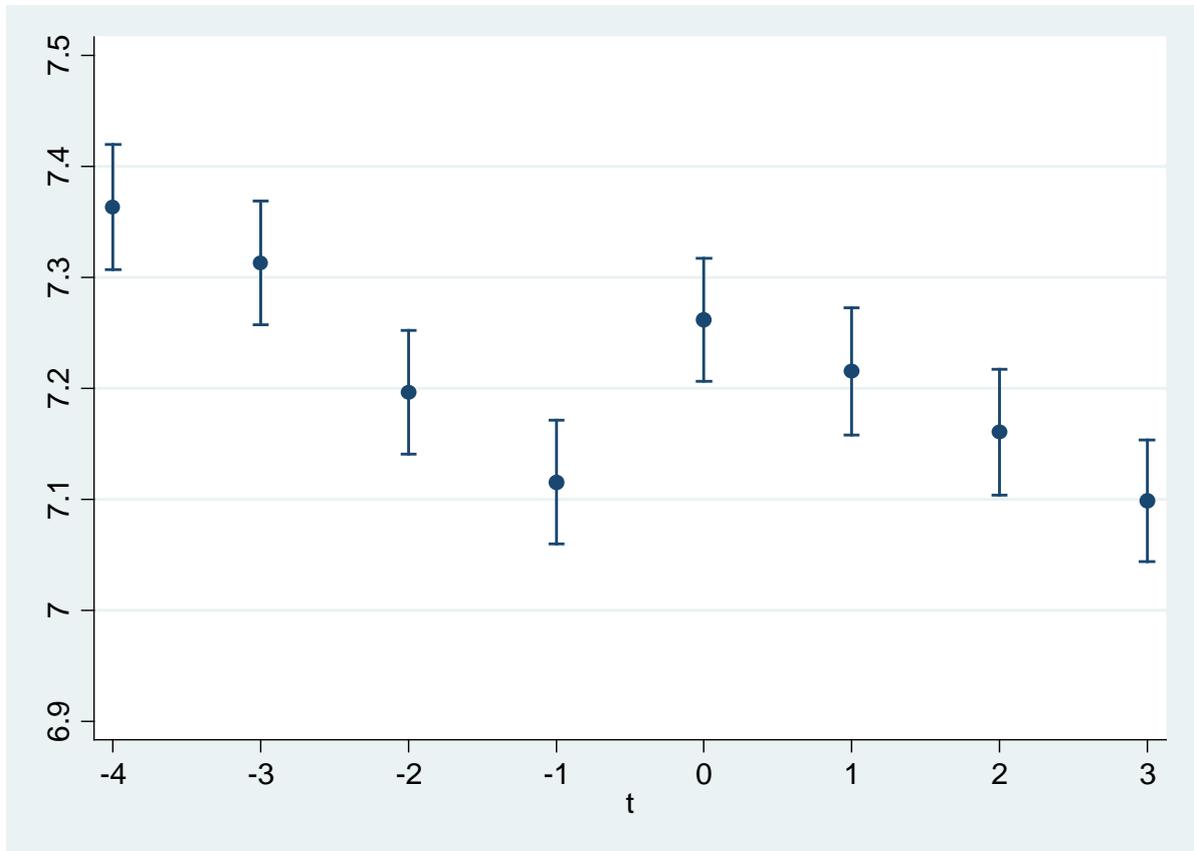


Figure shows unweighted averages of life satisfaction reported by participants in their fourth last, third last, second last and last interview with an interviewer ($t = -4$ to $t = -1$) and life satisfaction averages from the first four interviews with a different interviewer ($t = 0$ to $t = 3$) who replaced the former one.

Source: SOEP data from 1985 to 2011

Table 1 Life satisfaction and years of participation in panel

a)	Pooled OLS regressions					
	Years in panel	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.053*** (0.002)	-0.045*** (0.002)
Years in panel squared				0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Observations	171,052	171,052	171,052	171,052	171,052	171,052
Adj. R ²	0.005	0.130	0.132	0.006	0.130	0.133
Control variables	No	Yes	Yes	No	Yes	Yes
Year effects	No	No	Yes	No	No	Yes

b)	Individual fixed effects OLS					
	Years in panel	-0.040*** (0.001)	-0.036*** (0.003)	0.020 (0.027)	-0.069*** (0.003)	-0.063*** (0.003)
Years in panel squared				0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Observations	171,052	171,052	171,052	171,052	171,052	171,052
Adj. R ²	0.016	0.045	0.051	0.018	0.046	0.052
Control variables	No	Yes	Yes	No	Yes	Yes
Year effects	No	No	Yes	No	No	Yes

***|**|* denotes significance at 10%|5%|1% level. Robust standard errors are in parentheses.

Source: SOEP data from 1985 to 2011

Table 2 Life satisfaction and interviewer changes (OLS with individual fixed effects)

1st encounters with other interviewers than the first	0.095*** (0.017)	0.098*** (0.016)	0.108*** (0.016)	0.051*** (0.016)
Observations	171,052	171,052	171,052	171,052
Adj. R ²	0.023	0.051	0.052	0.057
Year effects	Yes	Yes	Yes	Yes
Control variables	No	Yes	Yes	Yes
Year in panel dummies	No	No	Yes	Yes
Interview mode controls	No	No	No	Yes

***|**|* denotes significance at 10%|5%|1% level. Robust standard errors are in parentheses.

Source: SOEP data from 1985 to 2011

Table 3 Life satisfaction and interviewer encounters (OLS with individual fixed effects)

<i>First interviewer</i>				
1st encounter	0.343*** (0.018)	0.251*** (0.021)	<i>Reference category</i>	
2nd encounter	0.287*** (0.019)	0.249*** (0.021)	-0.011 (0.022)	0.006 (0.023)
3rd encounter	0.252*** (0.020)	0.253*** (0.022)	-0.013 (0.024)	-0.003 (0.024)
4th encounter	0.244*** (0.021)	0.284*** (0.023)	0.016 (0.026)	0.024 (0.026)
5th encounter	0.258*** (0.022)	0.304*** (0.024)	0.037 (0.028)	0.044 (0.028)
6th encounter	0.198*** (0.023)	0.262*** (0.025)	-0.005 (0.029)	0.002 (0.029)
7th encounter	0.181*** (0.025)	0.228*** (0.027)	-0.036 (0.030)	-0.031 (0.030)
8th encounter or more	0.178*** (0.024)	0.210*** (0.025)	-0.055* (0.029)	-0.050* (0.029)
<i>Second interviewer</i>				
1st encounter	0.312*** (0.022)	0.323*** (0.022)	0.060** (0.026)	0.062** (0.026)
2nd encounter	0.280*** (0.026)	0.308*** (0.026)	0.041 (0.030)	0.049 (0.030)
3rd encounter	0.302*** (0.028)	0.341*** (0.029)	0.070** (0.033)	0.075** (0.033)
4th encounter or more	0.270*** (0.029)	0.305*** (0.029)	0.034 (0.034)	0.037 (0.034)
<i>Third interviewer</i>				
1st encounter	0.401*** (0.041)	0.428*** (0.041)	0.163*** (0.044)	0.162*** (0.044)
2nd encounter	0.395*** (0.048)	0.421*** (0.048)	0.154*** (0.051)	0.161*** (0.051)
3rd encounter	0.460*** (0.058)	0.486*** (0.058)	0.215*** (0.060)	0.219*** (0.060)
4th encounter or more	0.373*** (0.058)	0.388*** (0.058)	0.115* (0.061)	0.117* (0.061)
Encounters with further interviewers	0.366*** (0.059)	0.365*** (0.059)	0.101* (0.060)	0.100* (0.060)
Reencounter with a familiar interviewer				-0.094*** (0.024)
Observations	171,052	171,052	171,052	171,052
Adj. R ²	0.055	0.056	0.058	0.058
Year effects	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Year in panel dummies	No	Yes	Yes	Yes
Interview mode controls	No	No	Yes	Yes

*|**|*** denotes significance at 10%|5%|1% level. Robust standard errors are in parentheses.

Reference category in the first two specifications is all interviews without interviewer presence.

Source: SOEP data from 1985 to 2011

Appendix

Table A.1 Interview mode and average life satisfaction

Interview mode	Interviewer presence	Mean LSF	Std. Dev.	Obs.
Oral interview with paper and pencil	X	7.19	1.76	49,544
Oral interview with computer assistance	X	7.25	1.64	48,341
Self-written with interviewer	X	7.19	1.68	6,275
Partly oral interview	X	7.04	1.85	6,169
Self-written without interviewer		6.99	1.79	43,634
Self-written by mail		6.94	1.87	17,089
Total observations		7.13	1.75	171,052

Source: SOEP data from 1985 to 2011

Table A.2 Descriptive information

Variable	Mean	Std. Dev.	Min	Max
Age	48	16.2	18	101
Years of education	12.24	2.70	7	18
Primary education	0.15	0.35	0	1
Secondary education	0.56	0.50	0	1
Tertiary education	0.29	0.45	0	1
Unemployed	0.06	0.24	0	1
Full-time employment	0.44	0.50	0	1
Regular part-time employment	0.11	0.32	0	1
Marginal, irregular part-time employment	0.04	0.20	0	1
Other forms of employment	0.02	0.12	0	1
Out of labour force	0.39	0.49	0	1
Equalised real income	1921.32	1400.26	1	76172.24
Owner of dwelling	0.53	0.50	0	1
House in a good condition	0.73	0.45	0	1
Some renovation needed	0.25	0.43	0	1
Full renovation needed	0.02	0.15	0	1
Living area	106.64	47.01	6	938
Person needing care in household	0.04	0.19	0	1
Number of persons in household	2.73	1.26	1	14
Number of children in household	0.57	0.94	0	10
Single	0.19	0.39	0	1
Married	0.66	0.47	0	1
Married but separated	0.02	0.14	0	1
Divorced	0.07	0.26	0	1
Widowed	0.06	0.23	0	1
Partnership	0.83	0.38	0	1
Recent move	0.11	0.31	0	1
Shock: moved together with partner	0.03	0.17	0	1
Shock: divorce	0.01	0.08	0	1
Shock: separation	0.02	0.13	0	1
Shock: spouse died	0.00	0.06	0	1
Shock: child birth	0.04	0.18	0	1

Source: SOEP data from 1985 to 2011

Table A.3 Life satisfaction and interviewer encounters (OLS with individual fixed effects)

<i>Year dummies</i>				
Year 1985	<i>Reference category</i>			
Year 1986	0.015 (0.073)	0.060 (0.078)	0.053 (0.078)	0.037 (0.079)
Year 1987	-0.284*** (0.072)	-0.205*** (0.076)	-0.215*** (0.076)	-0.230*** (0.076)
Year 1988	-0.287*** (0.078)	-0.207** (0.083)	-0.217*** (0.083)	-0.229*** (0.083)
Year 1989	-0.264*** (0.078)	-0.188** (0.084)	-0.206** (0.084)	-0.217*** (0.084)
Year 1990	-0.008 (0.076)	0.085 (0.082)	0.069 (0.082)	0.057 (0.082)
Year 1991	-0.022 (0.077)	0.060 (0.083)	0.042 (0.083)	0.031 (0.083)
Year 1992	-0.086 (0.077)	0.020 (0.084)	0.001 (0.084)	-0.009 (0.084)
Year 1993	-0.147* (0.079)	-0.040 (0.086)	-0.057 (0.086)	-0.068 (0.086)
Year 1994	-0.252*** (0.078)	-0.151* (0.085)	-0.167** (0.085)	-0.178** (0.085)
Year 1995	-0.315*** (0.080)	-0.215** (0.086)	-0.230*** (0.086)	-0.240*** (0.086)
Year 1996	-0.275*** (0.082)	-0.170* (0.088)	-0.185** (0.088)	-0.195** (0.089)
Year 1997	-0.458*** (0.083)	-0.343*** (0.090)	-0.357*** (0.090)	-0.367*** (0.090)
Year 1998	-0.342*** (0.084)	-0.234** (0.091)	-0.254*** (0.091)	-0.264*** (0.091)
Year 1999	-0.318*** (0.084)	-0.204** (0.091)	-0.227** (0.091)	-0.237*** (0.091)
Year 2000	-0.414*** (0.084)	-0.317*** (0.092)	-0.351*** (0.092)	-0.360*** (0.092)
Year 2001	-0.403*** (0.086)	-0.292*** (0.093)	-0.330*** (0.093)	-0.342*** (0.093)
Year 2002	-0.563*** (0.087)	-0.436*** (0.097)	-0.473*** (0.097)	-0.484*** (0.097)
Year 2003	-0.638*** (0.090)	-0.488*** (0.099)	-0.526*** (0.099)	-0.536*** (0.099)
Year 2004	-0.787*** (0.092)	-0.624*** (0.102)	-0.661*** (0.102)	-0.672*** (0.102)
Year 2005	-0.642*** (0.093)	-0.472*** (0.104)	-0.508*** (0.104)	-0.519*** (0.104)
Year 2006	-0.741*** (0.095)	-0.554*** (0.108)	-0.594*** (0.108)	-0.604*** (0.108)
Year 2007	-0.713*** (0.097)	-0.531*** (0.110)	-0.570*** (0.110)	-0.581*** (0.110)
Year 2008	-0.695*** (0.099)	-0.489*** (0.115)	-0.530*** (0.114)	-0.540*** (0.115)
Year 2009	-0.797*** (0.100)	-0.592*** (0.117)	-0.632*** (0.116)	-0.643*** (0.116)
Year 2010	-0.671*** (0.102)	-0.459*** (0.119)	-0.499*** (0.119)	-0.509*** (0.119)
Year 2011	-0.790*** (0.104)	-0.577*** (0.121)	-0.614*** (0.121)	-0.625*** (0.121)

Age brackets
Aged 18 to 22

Reference category

Aged 23 to 27	0.036 (0.054)	0.060 (0.055)	0.060 (0.054)	0.059 (0.054)
Aged 28 to 32	0.001 (0.064)	0.040 (0.064)	0.040 (0.064)	0.040 (0.064)
Aged 33 to 37	-0.003 (0.073)	0.039 (0.073)	0.038 (0.073)	0.038 (0.073)
Aged 38 to 42	-0.018 (0.080)	0.018 (0.081)	0.019 (0.080)	0.020 (0.080)
Aged 43 to 47	-0.058 (0.087)	-0.025 (0.087)	-0.022 (0.087)	-0.020 (0.087)
Aged 48 to 52	-0.081 (0.096)	-0.049 (0.095)	-0.049 (0.095)	-0.047 (0.095)
Aged 53 to 57	-0.119 (0.105)	-0.091 (0.104)	-0.090 (0.104)	-0.088 (0.104)
Aged 58 to 62	0.022 (0.114)	0.047 (0.114)	0.046 (0.114)	0.048 (0.114)
Aged 63 to 67	0.129 (0.123)	0.151 (0.123)	0.151 (0.123)	0.153 (0.123)
Aged 68 to 72	0.022 (0.133)	0.042 (0.133)	0.043 (0.133)	0.044 (0.133)
Aged 73 to 77	-0.068 (0.144)	-0.050 (0.144)	-0.049 (0.144)	-0.047 (0.144)
Aged 78 to 82	-0.181 (0.157)	-0.164 (0.157)	-0.164 (0.157)	-0.163 (0.157)
Aged 83 to 87	-0.419** (0.176)	-0.404** (0.175)	-0.409** (0.175)	-0.408** (0.175)
Aged 88 to 92	-0.691*** (0.223)	-0.676*** (0.223)	-0.682*** (0.222)	-0.679*** (0.222)
Aged 93 and older	-0.583* (0.323)	-0.580* (0.321)	-0.586* (0.320)	-0.585* (0.320)

Region dummies

Region: Schleswig-Holstein

Reference category

Region: Hamburg	-0.002 (0.158)	0.003 (0.156)	0.004 (0.154)	0.004 (0.154)
Region: Lower Saxony	-0.345** (0.166)	-0.336** (0.166)	-0.324** (0.163)	-0.322** (0.163)
Region: Bremen	-0.678*** (0.260)	-0.678*** (0.259)	-0.654** (0.258)	-0.652** (0.257)
Region: North Rhine- Westphalia	-0.357** (0.163)	-0.353** (0.163)	-0.343** (0.162)	-0.341** (0.162)
Region: Hessen	-0.132 (0.193)	-0.124 (0.192)	-0.122 (0.191)	-0.121 (0.192)
Region: Saarland and Rhineland-Palatinate	-0.466** (0.199)	-0.459** (0.199)	-0.442** (0.199)	-0.441** (0.199)
Region: Baden-Wuerttemberg	-0.305* (0.181)	-0.298 (0.181)	-0.288 (0.180)	-0.289 (0.180)
Region: Bavaria	-0.250 (0.178)	-0.237 (0.178)	-0.231 (0.176)	-0.233 (0.177)
Region: Berlin	-0.550*** (0.203)	-0.538*** (0.204)	-0.517** (0.202)	-0.515** (0.203)
Region: Brandenburg	-0.460* (0.245)	-0.451* (0.244)	-0.429* (0.243)	-0.432* (0.244)
Region: Mecklenburg- West Pomerania	-0.644** (0.268)	-0.633** (0.269)	-0.594** (0.273)	-0.593** (0.273)
Region: Saxony	-0.164 (0.187)	-0.151 (0.187)	-0.147 (0.186)	-0.149 (0.186)
Region: Saxony-Anhalt	-0.191 (0.216)	-0.180 (0.214)	-0.168 (0.213)	-0.168 (0.213)
Region: Thuringia	-0.157 (0.260)	-0.138 (0.261)	-0.115 (0.259)	-0.116 (0.259)

<i>Education</i>				
Years of education	-0.019 (0.015)	-0.019 (0.015)	-0.020 (0.015)	-0.019 (0.015)
Primary education	<i>Reference category</i>			
Secondary education	-0.050 (0.057)	-0.048 (0.057)	-0.050 (0.056)	-0.049 (0.056)
Tertiary education	0.003 (0.079)	0.012 (0.079)	0.011 (0.079)	0.012 (0.079)
<i>Employment</i>				
Registered as unemployed	-0.552*** (0.034)	-0.554*** (0.034)	-0.553*** (0.034)	-0.553*** (0.034)
Full-time employment	<i>Reference category</i>			
Regular part-time employment	-0.036 (0.025)	-0.037 (0.025)	-0.035 (0.025)	-0.035 (0.025)
Marginal, irregular part-time employment	-0.082** (0.034)	-0.082** (0.034)	-0.078** (0.034)	-0.078** (0.034)
Other forms of employment	0.014 (0.068)	0.011 (0.068)	0.012 (0.068)	0.012 (0.068)
Out of labour force	-0.093*** (0.026)	-0.092*** (0.026)	-0.094*** (0.026)	-0.094*** (0.026)
<i>Living conditions and family</i>				
Log equalised real income	0.321*** (0.023)	0.320*** (0.023)	0.321*** (0.023)	0.321*** (0.023)
Owner of dwelling	0.033 (0.023)	0.035 (0.023)	0.037 (0.023)	0.037 (0.023)
House in a good condition	<i>Reference category</i>			
House needs some renovation	-0.138*** (0.015)	-0.136*** (0.015)	-0.132*** (0.015)	-0.131*** (0.015)
House needs full renovation	-0.264*** (0.041)	-0.265*** (0.041)	-0.265*** (0.041)	-0.266*** (0.041)
Living area	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Person needing care in household	-0.497*** (0.052)	-0.499*** (0.052)	-0.501*** (0.051)	-0.502*** (0.051)
Number of persons in household	-0.020 (0.013)	-0.021 (0.013)	-0.017 (0.013)	-0.017 (0.013)
Number of children in household	0.030** (0.015)	0.032** (0.015)	0.029* (0.015)	0.028* (0.015)
Single	<i>Reference category</i>			
Married	0.147*** (0.038)	0.158*** (0.038)	0.156*** (0.038)	0.156*** (0.038)
Married but separated	0.167** (0.068)	0.174*** (0.068)	0.169** (0.067)	0.169** (0.067)
Divorced	0.298*** (0.063)	0.309*** (0.063)	0.304*** (0.063)	0.304*** (0.063)
Widowed	0.389*** (0.088)	0.393*** (0.088)	0.386*** (0.088)	0.385*** (0.088)

Partnership	0.326*** (0.031)	0.322*** (0.031)	0.325*** (0.031)	0.325*** (0.031)
Recent move	0.071*** (0.017)	0.067*** (0.017)	0.066*** (0.017)	0.067*** (0.017)
Shock: moved together with partner	0.157*** (0.032)	0.133*** (0.033)	0.133*** (0.033)	0.133*** (0.033)
Shock: divorce	-0.051 (0.063)	-0.054 (0.063)	-0.055 (0.063)	-0.054 (0.063)
Shock: separation	-0.256*** (0.049)	-0.254*** (0.050)	-0.252*** (0.049)	-0.251*** (0.049)
Shock: spouse died	-0.976*** (0.089)	-0.978*** (0.089)	-0.977*** (0.089)	-0.976*** (0.089)
Shock: child birth	0.159*** (0.026)	0.158*** (0.026)	0.158*** (0.026)	0.158*** (0.026)
<i>Year in panel dummies</i>				
1st year in panel		0.229*** (0.044)	0.209*** (0.044)	0.210*** (0.044)
2nd year in panel		0.178*** (0.039)	0.166*** (0.040)	0.153*** (0.040)
3rd year in panel		0.116*** (0.035)	0.108*** (0.036)	0.101*** (0.036)
4th year in panel		0.059* (0.032)	0.053 (0.033)	0.050 (0.033)
5th year in panel		0.044 (0.030)	0.038 (0.030)	0.035 (0.030)
6th year in panel		0.044 (0.027)	0.041 (0.027)	0.039 (0.027)
7th year in panel		0.022 (0.023)	0.019 (0.023)	0.019 (0.023)
8th year in panel		0.037* (0.020)	0.034* (0.020)	0.034* (0.020)
9th year in panel and beyond				
			<i>Reference category</i>	
<i>Interview mode and interviewer encounters</i>				
Oral interview with paper and pencil			<i>Reference category</i>	
Oral interview with computer assistance			0.031 (0.019)	0.031 (0.019)
Self-written questionnaire with interviewer			-0.195*** (0.028)	-0.186*** (0.028)
Partly oral interview			-0.236*** (0.030)	-0.225*** (0.030)
Self-written without interviewer			-0.322*** (0.031)	-0.326*** (0.031)
Self-written questionnaire by mail		<i>Reference category</i>	-0.215*** (0.058)	-0.215*** (0.058)
<i>First interviewer</i>				
1st encounter	0.314*** (0.024)	0.232*** (0.028)	<i>Reference category</i>	
2nd encounter	0.272*** (0.025)	0.226*** (0.028)	-0.016 (0.030)	0.008 (0.031)
3rd encounter	0.247*** (0.025)	0.245*** (0.028)	-0.005 (0.032)	0.011 (0.033)
4th encounter	0.244*** (0.026)	0.275*** (0.029)	0.025 (0.034)	0.036 (0.034)

5th encounter	0.255*** (0.027)	0.289*** (0.029)	0.040 (0.035)	0.051 (0.035)
6th encounter	0.219*** (0.027)	0.249*** (0.029)	-0.000 (0.035)	0.010 (0.036)
7th encounter	0.202*** (0.028)	0.238*** (0.030)	-0.010 (0.036)	-0.001 (0.036)
8th encounter or more	0.178*** (0.026)	0.207*** (0.027)	-0.040 (0.035)	-0.033 (0.035)
<i>Second interviewer</i>				
1st encounter	0.313*** (0.027)	0.320*** (0.027)	0.074** (0.034)	0.078** (0.034)
2nd encounter	0.262*** (0.031)	0.283*** (0.031)	0.034 (0.038)	0.046 (0.038)
3rd encounter	0.288*** (0.033)	0.317*** (0.033)	0.064 (0.040)	0.072* (0.040)
4th encounter or more	0.258*** (0.032)	0.285*** (0.033)	0.032 (0.040)	0.039 (0.041)
<i>Third interviewer</i>				
1st encounter	0.398*** (0.046)	0.418*** (0.046)	0.169*** (0.052)	0.169*** (0.052)
2nd encounter	0.380*** (0.053)	0.400*** (0.053)	0.148** (0.058)	0.157*** (0.058)
3rd encounter	0.389*** (0.063)	0.411*** (0.063)	0.156** (0.067)	0.163** (0.067)
4th encounter or more	0.363*** (0.062)	0.376*** (0.062)	0.122* (0.067)	0.126* (0.067)
Encounters with further interviewers	0.359*** (0.065)	0.361*** (0.064)	0.114* (0.067)	0.115* (0.067)
Reencounter with a familiar interviewer				-0.107*** (0.027)
Constant	5.421*** (0.282)	5.172*** (0.288)	5.462*** (0.288)	5.469*** (0.288)
Observations	110,172	110,172	110,172	110,172
Number of persons	8,881	8,881	8,881	8,881
Adj. R ²	0.059	0.059	0.061	0.061

***|**|* denotes significance at 10%|5%|1% level. Robust standard errors are in parentheses.

Source: SOEP data from 1985 to 2011

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