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Revisiting cheerful Jane and miserable John: The impact of income, good health, social contacts and education declines with increasing subjective well-being

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1501

**Revisiting Cheerful Jane and Miserable John: The impact of
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with increasing subjective well-being
by**

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Revisiting Cheerful Jane and Miserable John: The impact of
income, good health, social contacts and education declines with
increasing subjective well-being

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Abstract

This short note seeks to replicate the quantile regression analysis in [Binder and Coad \(2011\)](#), but taking into account individual-specific fixed effects (using the BHPS data set). It finds declining effects of the four main variables of interest (health, social life, income, education) over the quantiles of the subjective well-being distribution, with attenuated effect sizes for the fixed-effects model. Equivalized log income has a negative impact on subjective well-being throughout the distribution. Apart from a number of robustness checks, existing research is extended by looking into the quantile effects of the above variables on a set of domain satisfactions.

Keywords: subjective well-being, quantile regressions, heterogeneity, BHPS, life satisfaction

JEL classification: I12, I31, R15

1. Introduction

Subjective well-being has been robustly shown to be influenced by a handful of factors ([Graham, 2009](#); [Helliwell et al., 2013](#)), which can explain up to 75% of the variance in global well-being scores. These factors are income, healthy life expectancy, social support, perception of corruption, prevalence of generosity and freedom of choice ([Helliwell et al., 2013](#), p. 9). However, it is known that there is some heterogeneity with which these factors impact on individuals, depending on a person's personality, preferences and other factors (e.g. [Boyce, 2010](#); [Boyce et al., 2013](#)). Another important factor that moderates the impact of such life events seems to be the level of subjective well-being individuals already have attained. Recent work on this front has shown that in a cross-section of the British populace, income, health and social life decrease in their association with life satisfaction if one moves upward along the quantiles of the well-being distribution ([Binder and Coad, 2011](#)). While for happy individuals, there is still a statistically significant and positive association between life events and subjective well-being in the health and social domains, the coefficient for income is close to zero. In the case of education, an initially positive coefficient even turns negative when moving along the well-being quantiles.

The above-mentioned research, however, reported only associations from a cross-section of respondents and did not account for the panel nature of the data set used. It is the aim of this short research note to remedy this shortcoming and conduct a quantile regression analysis that accounts for individual fixed effects by using a two-step estimator suggested by [Canay \(2011\)](#) that basically transfers the standard Koenker-Basset quantile regression estimator ([Koenker and Bassett, 1978](#)) into a panel data context. In Canay's two-step estimator an individual fixed effect is first removed from the data and then the standard Koenker-Basset estimator is applied. The fixed effect is interpreted as a pure location shifter in Canay's framework. Apart from this main goal of the present research note, a number of robustness checks are provided and the effects of a rich social life, good health, high income and good education on various domain satisfactions are briefly explored.

	mean	sd	min	max
life satisfaction	5.22	1.27	1	7
GHQ-12	24.79	5.49	0	36
health (composite, PCA)	5.64	1.26	-0.4971	7.3048
social (composite, PCA)	7.55	1.16	1.7210	9.5738
satisfaction with...				
health	4.94	1.58	1	7
income of household	4.58	1.57	1	7
house/flat	5.42	1.42	1	7
spouse/partner	6.24	1.18	1	7
job	5.00	1.42	1	7
social life	4.92	1.48	1	7
amount of leisure time	4.81	1.61	1	7
use of leisure time	4.87	1.52	1	7
Subjective health				
very poor	0.02	0.14	0	1
poor	0.07	0.26	0	1
fair	0.21	0.41	0	1
good	0.46	0.50	0	1
excellent	0.23	0.42	0	1
Doctor visits				
1-2	0.37	0.48	0	1
3-5	0.21	0.41	0	1
6+	0.18	0.38	0	1
Accidents				
1	0.09	0.29	0	1
2	0.01	0.09	0	1
3+	0.00	0.06	0	1
log(hospital days)	0.17	0.59	0	5.8608
Social: Frequency of...				
talking to neighbours	4.05	1.00	1	5
meeting people	4.30	0.77	1	5
log(income)	9.98	0.62	-0.4036	13.678
Education (CASMIN)				
1a (none)	0.21	0.41	0	1
1b (elementary)	0.04	0.19	0	1
1c (basic vocational)	0.09	0.28	0	1
2b (middle general)	0.16	0.37	0	1
2a (middle vocational)	0.05	0.23	0	1
2c_gen (high gen.)	0.08	0.26	0	1
2c_voc (high voc.)	0.05	0.23	0	1
3a (low tertiary)	0.18	0.39	0	1
3b (high tertiary)	0.13	0.34	0	1
Marriage status				
never married	0.29	0.45	0	1
married	0.53	0.50	0	1
separated	0.02	0.14	0	1
widowed	0.08	0.26	0	1
divorced	0.08	0.28	0	1
Job status				
employed	0.52	0.50	0	1
unemployed	0.03	0.17	0	1
selfemployed	0.07	0.25	0	1
retired	0.21	0.40	0	1
study/school	0.05	0.22	0	1
maternity leave	0.00	0.07	0	1
long-term sick	0.04	0.20	0	1
family-care	0.06	0.25	0	1
other	0.01	0.08	0	1
gender	0.53	0.50	0	1
age	45.65	18.30	15	100
Number of children				
1	0.15	0.36	0	1
2	0.14	0.34	0	1
3+	0.05	0.23	0	1
Observations	109175			

Table 1: Descriptive statistics

2. Data and analysis

For the following analysis, the well-known British Household Panel Survey data set (BHPS) is used in order to maintain comparability to the cross-sectional study this note seeks to extend. The BHPS offers data on subjective well-being, life events and a large range of pertinent socio-demographic variables for the British populace for a time span from 1991 to 2008. Life satisfaction has been elicited in nearly all waves from 1996 onwards (with the

exception of wave 11, i.e. 2001) so that the sample horizon for the subsequent analysis will effectively cover the period 1996-2008. A second gap year is in wave 9 (1999) because no subjectively assessed health has been elicited then. Missing values in the variables of interest are deleted listwise so that the final data set encompasses 109,175 observations of 22,529 individuals. Apart from life satisfaction, the main variables of interest are a respondent's health, social life, income and educational level (as well as relevant socio-demographic control variables). These are depicted in Table 1. The main dependent variable to measure subjective well-being is an individual's life satisfaction, measured via a standard 7-point Likert scale that records the response to the question "How dissatisfied or satisfied are you with...?" on a scale from "not satisfied at all" (1) to "completely satisfied" (7). These deceptively simple measures have been shown to validly and reliably capture subjective well-being (Krueger and Schkade, 2008; Helliwell and Wang, 2012) and can be usefully treated as cardinal in regression analysis (Ferrer-i-Carbonell and Frijters, 2004). I also redo the analysis for the GHQ-12 measure of "mental well-being" that more broadly captures an individual's mental health (e.g., Goldberg et al., 1997).

To replicate the analysis in Binder and Coad (2011) as closely as possible, I use four main independent variables, namely income, social life, health and educational attainment (for a similar analysis looking in much more detail at the quantile effects of unemployment and volunteering, see also Binder and Coad, 2014; Binder, 2014). The income variable reflects net household income after taxes, properly deflated and equivalized (Levy and Jenkins, 2008). A log specification is chosen in accordance with findings about the log-linear relationship between income and subjective well-being (Layard et al., 2008). Both health and social variables are derived somewhat less straightforwardly by combining a number of indicators into one synthetic composite variable using principal component analysis (PCA). PCA is a technique to reduce the multidimensionality of a data set. Both health and social variable are the first principal component, capturing a large part of the variance of the indicator variables used to construct them. In the health case, the indicator variables used are subjectively-assessed health status (measured on a 5-point Likert scale ranging from "very poor" (1) to "excellent" (5)), the number of serious accidents, the number of visits to a general practitioner (GP), and the (log) number of hospital days. The composite variable explains $\rho = 45.85\%$ of

	(1)		(2)		(3)		(4)	
	life satisfaction		mental well-being		life satisfaction (stricter model)		mental well-being (stricter model)	
health (composite, PCA)	0.1125***	(27.67)	0.9027***	(42.22)				
social (composite, PCA)	0.3141***	(65.38)	0.8238***	(39.11)				
education	0.0121	(1.51)	0.0642	(1.55)				
log(income)	0.0249**	(3.19)	0.0193	(0.50)	0.0216**	(2.65)	0.0112	(0.28)
Doctor visits								
1-2					-0.0158	(-1.93)	-0.1870***	(-5.21)
3-5					-0.0788***	(-7.19)	-0.6895***	(-13.56)
6+					-0.1947***	(-13.71)	-1.6485***	(-24.22)
Accidents								
1					-0.0317**	(-2.74)	-0.1514**	(-2.71)
2					-0.0685	(-1.84)	-0.3156	(-1.72)
3+					-0.0824	(-1.07)	-0.7930*	(-2.04)
log(hospital days)					-0.0407***	(-5.50)	-0.4124***	(-11.82)
Talking to neighbours								
less than once a month					0.0212	(0.71)	0.0818	(0.62)
once or twice a month					0.0734*	(2.54)	0.1974	(1.58)
once or twice a week					0.1154***	(4.02)	0.4030**	(3.28)
on most days					0.1558***	(5.29)	0.5301***	(4.21)
Meeting with friends								
less than once a month					0.0240	(0.24)	0.0221	(0.05)
once or twice a month					0.1005	(1.00)	0.3835	(0.91)
once or twice a week					0.1336	(1.33)	0.4779	(1.14)
on most days					0.1577	(1.58)	0.5392	(1.28)
Education (CASMIN)								
1b (elementary)					-0.0587	(-0.42)	0.0850	(0.12)
1c (basic vocational)					-0.0677	(-0.82)	-0.0361	(-0.08)
2b (middle gen.)					0.1279	(1.47)	0.2673	(0.61)
2a (middle voc.)					0.1630	(1.20)	0.8491	(1.05)
2c-gen (high gen.)					0.1371	(1.57)	0.3191	(0.74)
2c-voc (high voc.)					0.0728	(0.73)	0.5156	(1.04)
3a (low tertiary)					0.1318	(1.40)	0.4719	(1.03)
3b (high tertiary)					0.0743	(0.79)	0.3262	(0.71)
Marriage status								
never married	-0.0651**	(-3.02)	0.2498*	(2.27)	-0.0545*	(-2.42)	0.2869*	(2.56)
separated	-0.1811***	(-4.90)	-1.0981***	(-5.40)	-0.1728***	(-4.34)	-1.0794***	(-5.12)
widowed	-0.3042***	(-6.54)	-1.2990***	(-7.05)	-0.3053***	(-6.00)	-1.2955***	(-6.90)
divorced	-0.0569	(-1.88)	0.2402	(1.60)	-0.0414	(-1.27)	0.2761	(1.77)
Job status								
unemployed	-0.3104***	(-12.18)	-1.8480***	(-14.60)	-0.3316***	(-12.19)	-1.9374***	(-14.81)
self-employed	-0.0217	(-1.08)	-0.1172	(-1.24)	-0.0143	(-0.68)	-0.0872	(-0.89)
retired	0.0003	(0.01)	0.0096	(0.10)	0.0240	(1.03)	0.0236	(0.24)
study/school	-0.0246	(-0.97)	-0.1665	(-1.29)	0.0365	(1.33)	0.0024	(0.02)
maternity leave	0.3701***	(10.09)	0.8530***	(4.06)	0.3344***	(8.43)	0.7315***	(3.33)
long-term sick	-0.3667***	(-11.18)	-2.1390***	(-12.78)	-0.4535***	(-12.56)	-2.5858***	(-14.52)
family-care	-0.0602**	(-2.76)	-0.4757***	(-4.31)	-0.0742**	(-3.21)	-0.5607***	(-4.93)
other	-0.0493	(-1.06)	-0.1004	(-0.41)	-0.0440	(-0.88)	-0.1236	(-0.49)
Number of children								
1	0.0106	(0.76)	0.0359	(0.51)	-0.0012	(-0.08)	0.0006	(0.01)
2	-0.0321	(-1.82)	-0.0438	(-0.49)	-0.0339	(-1.82)	-0.0550	(-0.60)
3+	-0.0025	(-0.09)	0.1566	(1.14)	-0.0228	(-0.77)	0.0925	(0.66)
age	-0.0229	(-1.88)	-0.1160*	(-2.12)	-0.0225	(-1.67)	-0.1143*	(-1.97)
(age-mean age) ²	-0.0000	(-0.88)	0.0003*	(2.15)	-0.0001*	(-2.17)	0.0001	(0.36)
Constant	3.2183***	(5.14)	18.7885***	(6.63)	5.9898***	(8.57)	29.8071***	(9.80)
Observations	109175		109175		109175		109175	
R ²	0.110		0.077		0.021		0.032	
F	119.9587		80.0921		17.6775		24.7920	
df_r	22528		22528		22528		22528	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Regression analysis: Dependent variables are life satisfaction (columns 1 and 3) and mental well-being as measured by GHQ-12 measure (columns 2 and 4). Main variables are income, education and composite health and social life variables in columns 1 and 2; and stricter disaggregated health, education and social life variables in columns 3 and 4) and a range of control variables. Individual fixed-effects with standard errors clustered on the individual. Time dummies omitted.

the variance of these indicators (KMO measure of the goodness of fit is = 0.6226, indicating a mediocre fit). In the case of the social variable, one's satisfaction with social life (measured similar to the life satisfaction variable) as well as the amount of contact to friends and neighbours in a given week (both measured on 5-point Likert scales from "never" (1) to "on

most days” (5)) are chosen as indicator variables (for more information see [Binder and Coad, 2011](#)). The composite variable explains $\rho = 43.51\%$ of the variance of these indicators (KMO measure of the goodness of fit is $= 0.5509$, indicating a barely acceptable fit). The final main variable of interest is an individual’s level of education, as measured by the CASMIN scale. This scale ordinaly ranks education from “none” (1) to “higher tertiary” (9). To treat this variable as cardinal in the subsequent analysis is certainly a strong assumption and care should be exercised in the interpretation of the results later on. Finally, a set of typical covariates is used in the analysis that captures a wide range of control variables, such as age (and its squared term), marital and employment status, number of children as well as regional and time dummies. Looking at the bivariate correlations in our main variables (Table 5 in the Appendix) shows that the signs of the correlation coefficients are in the theoretically expected directions and no problems of multicollinearity are apparent.

The results of the replication exercise can be summed up in one sentence: With one exception (income), accounting for individual-specific time-invariant “fixed” effects does not alter the results obtained in the cross-sectional quantile analysis in many important ways, but the attenuation in coefficient sizes that was to be expected is exhibited. The big diverging finding is that employing a fixed effects quantile regression framework, the (log) income variable consistently exhibits negative coefficients for the highest deciles of the life satisfaction distribution.

It is instructive to look at the results in more detail. Table 2 provides the FE estimates for life satisfaction (columns (1) and (3)) and mental well-being (GHQ-12 measure; columns (2) and (4)) for very similar regression models. The first two columns provide a regression model where a number of health and social variables have been aggregated via principal component analysis into a synthetic measure, whereas the remaining columns provide a similar analysis with these variables not being aggregated. The latter two columns also provide a stricter specification by omitting the subjectively-rated health variable and the satisfaction with social life on the right-hand side of the regression equation. Results in substantive life domains are what would be expected from the literature (e.g., unemployment, separation and widowhood exhibiting strongly negative coefficients, negative impact for objective health variables, positive one for meeting friends regularly, small positive coefficient for income, cf.

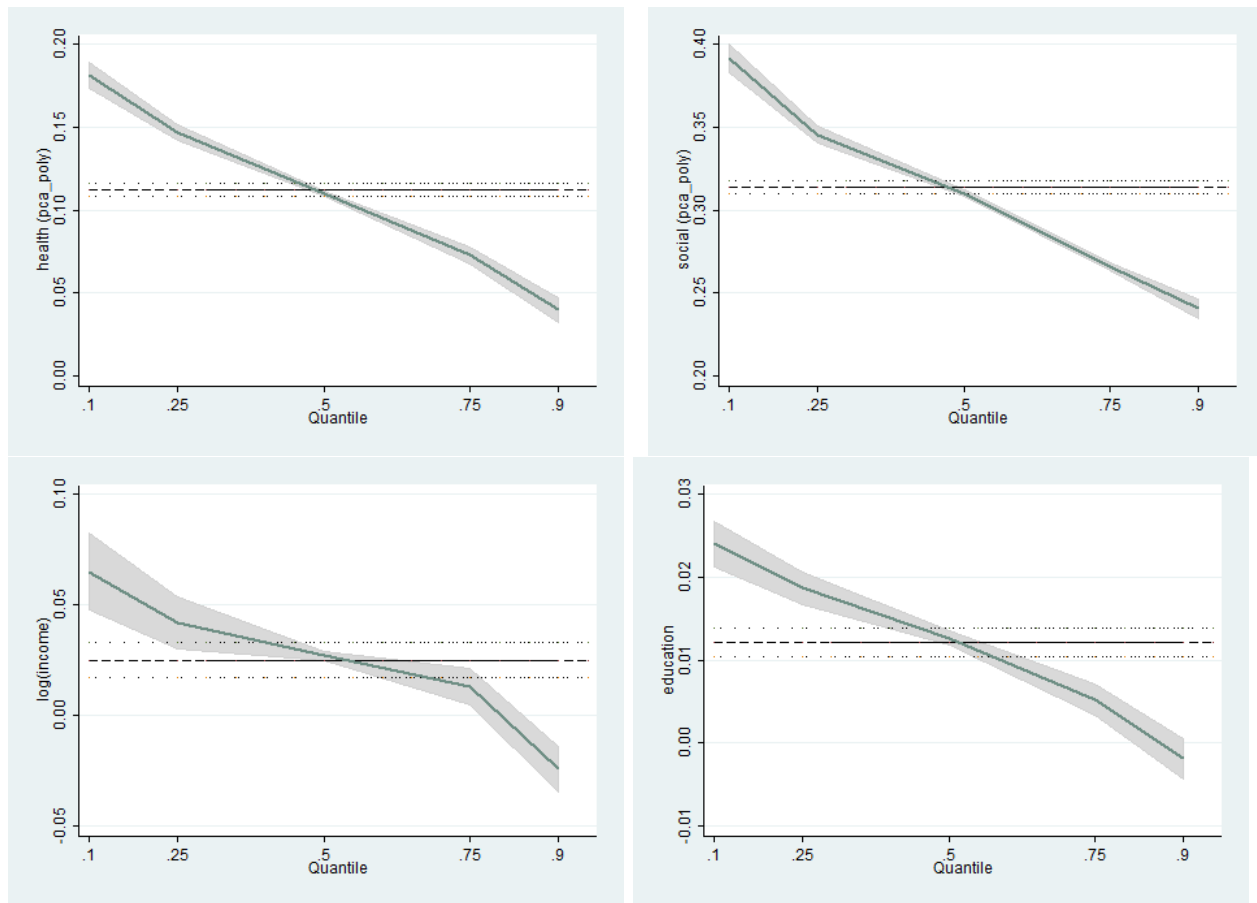


Figure 1: Quantile coefficients depicting coefficients based on the analysis in Table 3, for health (upper left), social life (upper right), log(income) (lower left) and education (lower right). The diagrams show coefficients for life satisfaction as dependent variable. Horizontal lines give (average) regression coefficients. Error bars for regression and quantile coefficients correspond to the 95 percent confidence intervals (with quantile regression error bars depicting bootstrapped 95 percent confidence intervals, with 100 replications).

[Dolan et al., 2008](#); [Helliwell et al., 2012, 2013](#)). For this average analysis, no significant effect of education on subjective well-being can be demonstrated (once one holds constant all domains on which education impacts directly, such as health, income, job, etc.).¹

Of main interest is Table 3, which extends the analysis in [Binder and Coad \(2011\)](#) into the panel context using a similar set of variables (one exception is the use of the CASMIN educational scale as proxy for education). Focussing on the effect of our main variables health, social life, income and education on life satisfaction (first column), we find similar results as in the original study, with coefficient sizes attenuated through the employment of a fixed effects methodology (for a graphical depiction see Figure 1). Coefficients are

	(1) life satisfaction		(2) mental well-being		(3) life satisfaction (females)		(4) life satisfaction (males)		(5) life satisfaction (high MWB)	
q10										
health (composite, PCA)	0.181***	(42.34)	1.518***	(66.47)	0.178***	(32.35)	0.184***	(29.58)	0.0296**	(2.76)
social (composite, PCA)	0.391***	(102.73)	1.186***	(52.57)	0.416***	(61.43)	0.361***	(54.64)	0.223***	(24.92)
log(income)	0.0649***	(6.90)	0.0278	(0.53)	0.0651***	(4.31)	0.0602***	(4.87)	0.0254	(1.45)
education	0.0240***	(13.29)	0.0123	(1.36)	0.0380***	(15.27)	0.00486	(1.91)	0.0322***	(9.26)
q25										
health (composite, PCA)	0.147***	(44.75)	1.092***	(74.47)	0.140***	(34.71)	0.155***	(31.73)	0.0180***	(3.58)
social (composite, PCA)	0.346***	(106.20)	0.889***	(63.53)	0.373***	(86.31)	0.315***	(91.70)	0.173***	(37.33)
log(income)	0.0419***	(7.02)	0.0115	(0.43)	0.0434***	(5.80)	0.0414***	(4.68)	-0.00566	(-0.67)
education	0.0187***	(15.07)	0.0477***	(10.76)	0.0338***	(24.24)	-0.00102	(-0.61)	0.0171***	(10.33)
q50										
health (composite, PCA)	0.110***	(101.65)	0.822***	(99.41)	0.100***	(74.06)	0.120***	(74.60)	-0.00376	(-0.70)
social (composite, PCA)	0.310***	(250.87)	0.771***	(124.27)	0.333***	(249.53)	0.284***	(142.32)	0.136***	(32.85)
log(income)	0.0270***	(25.92)	0.0312***	(4.29)	0.0300***	(21.89)	0.0254***	(13.29)	-0.0123*	(-1.99)
education	0.0127***	(31.07)	0.0705***	(28.93)	0.0278***	(48.96)	-0.00636***	(-9.91)	0.0182***	(10.87)
q75										
health (composite, PCA)	0.0728***	(29.93)	0.551***	(52.50)	0.0642***	(19.10)	0.0833***	(21.84)	-0.0295***	(-4.28)
social (composite, PCA)	0.266***	(111.44)	0.605***	(58.40)	0.283***	(97.65)	0.245***	(59.51)	0.116***	(19.90)
log(income)	0.0131**	(3.25)	0.0465*	(2.42)	0.0171*	(2.26)	0.00866	(1.28)	-0.0503***	(-4.24)
education	0.00520***	(5.45)	0.0923***	(19.08)	0.0197***	(13.60)	-0.0126***	(-9.02)	0.0104***	(4.68)
q90										
health (composite, PCA)	0.0398***	(13.37)	0.378***	(21.03)	0.0299***	(5.11)	0.0533***	(8.98)	-0.0598***	(-6.09)
social (composite, PCA)	0.241***	(74.01)	0.533***	(33.17)	0.259***	(60.23)	0.221***	(44.71)	0.105***	(11.68)
log(income)	-0.0241***	(-3.66)	-0.0240	(-0.82)	-0.0221*	(-1.99)	-0.0207*	(-2.35)	-0.0766***	(-4.06)
education	-0.00184	(-1.38)	0.116***	(16.27)	0.0122***	(6.51)	-0.0199***	(-9.57)	0.00726*	(2.06)
Observations	109175		109175		57896		51279		18382	
0.10 Pseudo R2	.2887		.2571		.344		.2384		.082	
0.25 Pseudo R2	.2855		.2921		.349		.2263		.0878	
0.50 Pseudo R2	.2804		.3206		.347		.2143		.0662	
0.75 Pseudo R2	.2355		.2912		.3007		.1732		.0497	
0.90 Pseudo R2	.1919		.2429		.2475		.1415		.0516	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Quantile analysis: Dependent variables are life satisfaction (columns 1, 3-5) and mental well-being as measured by GHQ-12 measure (column 2). Main variables are composite health, social life variables as well as income and education. The model replicates the model specification of [Binder and Coad \(2011\)](#) within the FE quantile regression context following [Canay \(2011\)](#). Individual fixed-effects with bootstrapped standard errors (100 replications). Time dummies and other control variables as in previous models but output omitted here.

positive for all four variables of interest for the lowest decile and decrease in size over the of the life satisfaction distribution. Where health strongly impacts on the life satisfaction of the unhappiest ten percent (.181***), the effect is much smaller for the happiest individuals (.0398***). This decline in coefficient sizes is heterogeneous for the four variables: the impact of our social (composite) variable decreases over the quantiles but remains strongly positive for the happiest individuals (.391*** to .241***). With income, a small coefficient turns even negative across the quantiles (.0649*** to -0.0241***). Perhaps the most puzzling association in the original study, viz. the positive association between education and life satisfaction on low levels of life satisfaction and its reversal for high life satisfaction is not replicated in this model (the coefficient for the 90% quantile is negative but not significant), but can be found in the stricter model discussed below. This lack of uniform robustness of the reversing relationship of the education variable and life satisfaction certainly warrants further analysis

and education has proven to be a complicated variable for subjective well-being research so far.

	(1) life satisfaction		(2) mental well-being		(3) life satisfaction (females)		(4) life satisfaction (males)		(5) life satisfaction (high MWB)	
q10										
health (strict)	-0.218***	(-31.68)	-1.816***	(-54.07)	-0.209***	(-22.35)	-0.223***	(-22.16)	-0.00417	(-0.33)
social (strict)	0.0732***	(13.53)	0.304***	(10.59)	0.0834***	(9.77)	0.0699***	(9.03)	0.0200	(1.74)
log(income)	0.0852***	(9.20)	0.0967	(1.73)	0.0755***	(5.77)	0.101***	(7.39)	0.00299	(0.17)
education	0.0147***	(8.69)	-0.0193*	(-2.03)	0.0287***	(11.35)	-0.00403	(-1.56)	0.0372***	(9.34)
q25										
health (strict)	-0.159***	(-39.10)	-1.171***	(-68.05)	-0.151***	(-24.23)	-0.169***	(-29.38)	0.00258	(0.55)
social (strict)	0.0624***	(16.82)	0.181***	(13.00)	0.0664***	(12.06)	0.0564***	(10.69)	0.0104*	(2.47)
log(income)	0.0563***	(10.38)	0.0497	(1.64)	0.0563***	(5.90)	0.0585***	(7.77)	-0.0153*	(-2.29)
education	0.00925***	(7.14)	0.0267***	(5.61)	0.0235***	(11.78)	-0.00965***	(-5.82)	0.0197***	(13.01)
q50										
health (strict)	-0.102***	(-57.48)	-0.789***	(-74.80)	-0.0926***	(-37.34)	-0.115***	(-46.97)	0.0293***	(4.43)
social (strict)	0.0513***	(53.83)	0.162***	(26.27)	0.0608***	(42.69)	0.0410***	(26.18)	0.0119*	(2.53)
log(income)	0.0282***	(26.51)	0.0560***	(7.43)	0.0264***	(18.70)	0.0322***	(16.31)	-0.0251**	(-2.98)
education	0.00385***	(9.71)	0.0528***	(21.99)	0.0179***	(30.84)	-0.0139***	(-26.05)	0.0248***	(14.74)
q75										
health (strict)	-0.0544***	(-16.53)	-0.463***	(-30.28)	-0.0455***	(-9.12)	-0.0689***	(-15.40)	0.0598***	(6.69)
social (strict)	0.0382***	(12.17)	0.110***	(8.44)	0.0447***	(8.99)	0.0307***	(6.93)	-0.000695	(-0.11)
log(income)	0.00567	(1.10)	0.0159	(0.63)	0.0145*	(2.04)	0.00397	(0.54)	-0.0596***	(-4.82)
education	-0.00569***	(-5.45)	0.0763***	(16.76)	0.00698***	(4.76)	-0.0227***	(-14.89)	0.0142***	(5.41)
q90										
health (strict)	-0.0112*	(-2.28)	-0.190***	(-7.92)	0.00192	(0.29)	-0.0352***	(-4.47)	0.106***	(7.79)
social (strict)	0.0239***	(5.64)	0.1000***	(4.69)	0.0290***	(4.70)	0.0140*	(2.09)	-0.00997	(-1.07)
log(income)	-0.0287***	(-4.83)	-0.0495	(-1.54)	-0.0343***	(-3.33)	-0.0228*	(-2.40)	-0.0922***	(-4.81)
education	-0.0133***	(-8.63)	0.0891***	(11.99)	-0.000802	(-0.35)	-0.0308***	(-15.46)	0.0105**	(2.82)
Observations	109175		109175		57896		51279		18382	
0.10 Pseudo R2	.1634		.1641		.3019		.0619		.0858	
0.25 Pseudo R2	.1732		.2212		.3293		.0474		.1308	
0.50 Pseudo R2	.1945		.2686		.348		.0528		.1232	
0.75 Pseudo R2	.1475		.2407		.2941		.0317		.0779	
0.90 Pseudo R2	.1179		.1988		.2381		.0291		.0714	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Quantile analysis following [Canay \(2011\)](#): Dependent variables are life satisfaction (columns 1, 3-5) and mental well-being as measured by GHQ-12 measure (column 2). Main variables are composite health (reversed coded, i.e. “bad health”), social life variables as well as income and education. The model uses a stricter model specification with respect to subjective variables on the right-hand side of the regression equation than the model specification of [Binder and Coad \(2011\)](#). Individual fixed-effects with bootstrapped standard errors (100 replications). Time dummies and other control variables as in previous models but output omitted here.

As noted above, the original model specification used satisfaction with social life and subjectively assessed health as right-hand side variables that were part of the social and health variables respectively. From an econometric point of view, this might be considered unfortunate, putting very similar variables on both sides of the regression equation. For that reason, Table 3 provides a stricter specification, using only objective dummy variables for health (such numbers of accidents, visits to GP; health is here reverse coded, i.e. all objective health variables are coded such that higher values denoted higher levels of bad health) and social life (such as contact to neighbours/friends). This stricter model specification is very similar with the exception that both health and social life coefficients are much smaller

without the inclusion of the subjective variables. In this stricter model, education also exhibits a negative impact on life satisfaction for the happiest individuals in the distribution ($-.0133^{***}$ for the higher decile in the life satisfaction distribution).

This note extends the frontiers of our knowledge by also estimating the impact of the afore-mentioned four life domains on the quantiles of a number of life domain satisfactions (see Table 6 in the Appendix). While it is beyond the scope of the present note to discuss these results in full, some expected and some surprising results deserve mention (and further detailed research attention): for instance, bad health has negative but declining influence on health and job satisfaction (columns 2 and 6), whereas a fuller social life impacts positively on one's satisfaction with one's social life but also on one's satisfaction with the use of leisure time (both with decreasing magnitudes of effects over the quantiles). Education again stands in highly nuanced relationships with different domain satisfactions: while it positively (but decreasing) impacts on job satisfaction (column 6), there are a number of life domains, where higher satisfaction implies increasing negative impacts of education, such as income, housing, social and use of leisure time satisfaction. For all four, the negative coefficient of education increases with increasing satisfaction in those domains. If education raises one's aspirations beyond one's means (e.g., [Clark et al., 2015](#)), thus leading to mismatch and disappointment, it would be interesting to find out why such disappointment is more pronounced for individuals that are particularly satisfied. The observed pattern is probably not a mechanical result (e.g., regression to mean) because the patterns observed for different life events are not uniform along the quantiles of the subjective well-being distribution (e.g., the negative effect of unemployment is less strong for happier individuals, [Binder and Coad, 2014](#)).

3. Limitations and outlook

This short replication study has one main limitation: while it certainly is an improvement over purely cross-sectional analyses, one can dispute whether a fixed-effects regression framework can actually tell us convincingly the direction of causality. This is a limitation no observational study can fully overcome and no matter the sophistication of the regression framework, some doubts about reverse causality will remain. To alleviate this concern, it has to be acknowledged that we know from other research that the causality runs more strongly

from the named life events to subjective well-being (e.g., [Dolan et al., 2008](#); [Easterlin, 2003](#)). That being said, however, there is also evidence that subjective well-being has reverse impact in at least the health, social life and income domains ([Graham et al., 2004](#); [Binder and Coad, 2010](#)). Where possible, experimental or quasi-experimental data should complement research results as the ones presented here.

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Notes

¹An additional model was estimated using Ferrer-i-Carbonell and Frijters' method ([Ferrer-i-Carbonell and Frijters, 2004](#)), leading to similar results, which are provided upon request.

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Appendix

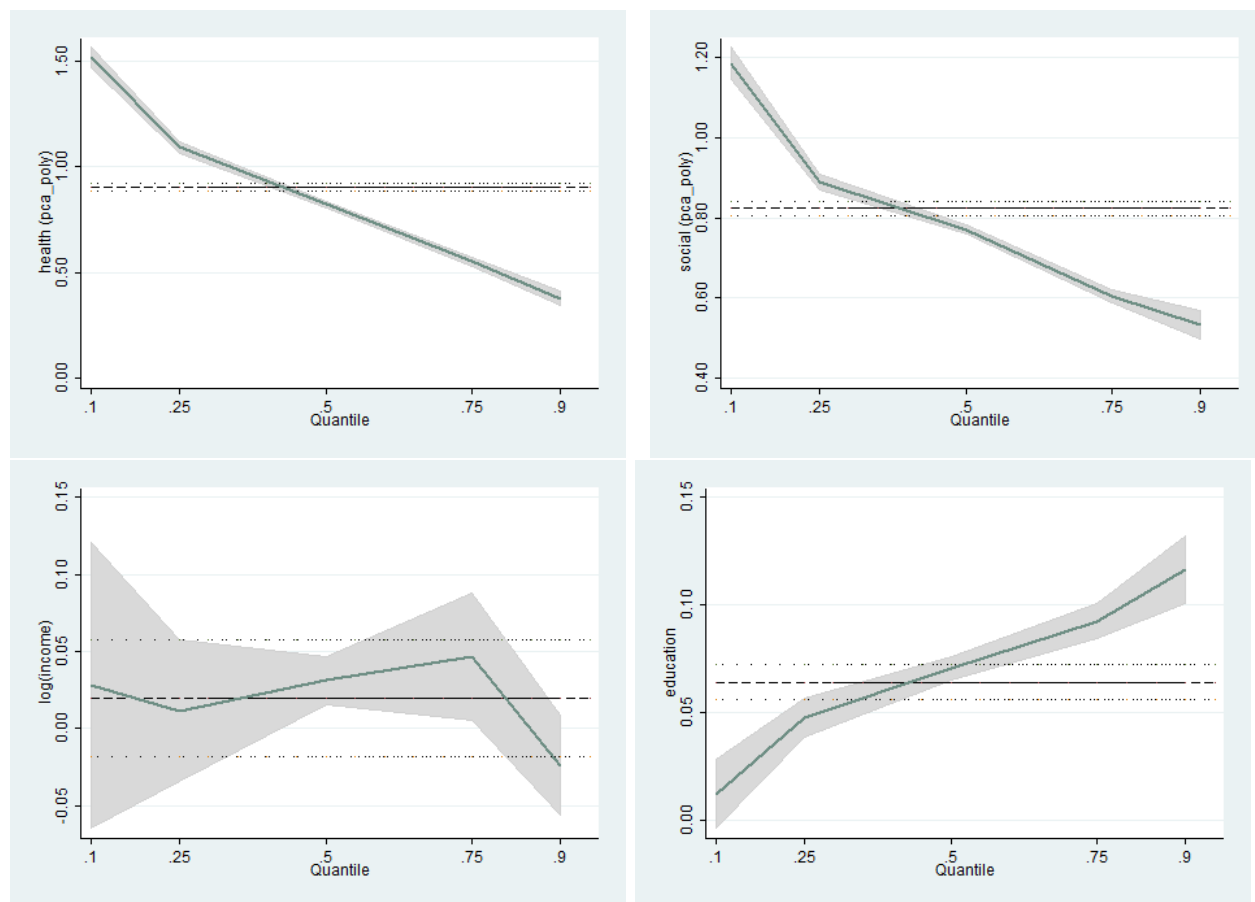


Figure 2: Quantile coefficients depicting coefficients based on the analysis in Table 3, for health (upper left), social life (upper right), log(income) (lower left) and education (lower right). The diagrams show coefficients for mental well-being (GHQ-12) as dependent variable. Horizontal lines give (average) regression coefficients. Error bars for regression and quantile coefficients correspond to the 95 percent confidence intervals (with quantile regression error bars depicting bootstrapped 95 percent confidence intervals, with 100 replications).

	life sat.	GHQ-12	health	social	log(income)	d_unempl.	d_empl.	education	age	gender
life satisfaction	1.0000									
GHQ-12	0.5603*** (0.0000)	1.0000								
health (composite, PCA)	0.2753*** (0.0000)	0.3614*** (0.0000)	1.0000							
social (composite, PCA)	0.4645*** (0.0000)	0.2848*** (0.0000)	0.0990*** (0.0000)	1.0000						
log(income)	0.0775*** (0.0000)	0.0770*** (0.0000)	0.1250*** (0.0000)	-0.0352*** (0.0000)	1.0000					
d_unemployed	-0.0894*** (0.0000)	-0.0574*** (0.0000)	-0.0171*** (0.0000)	-0.0292*** (0.0000)	-0.1141*** (0.0000)	1.0000				
d_employed	0.0135*** (0.0000)	0.0935*** (0.0000)	0.2498*** (0.0000)	-0.0858*** (0.0000)	0.2917*** (0.0000)	-0.1890*** (0.0000)	1.0000			
education	0.0034 (0.2653)	0.0677*** (0.0000)	0.1843*** (0.0000)	-0.1026*** (0.0000)	0.3027*** (0.0000)	-0.0562*** (0.0000)	0.2683*** (0.0000)	1.0000		
age	0.0779*** (0.0000)	-0.0386*** (0.0000)	-0.1902*** (0.0000)	0.0719*** (0.0000)	-0.0198*** (0.0000)	-0.1108*** (0.0000)	-0.3687*** (0.0000)	-0.2514*** (0.0000)	1.0000	
gender	-0.0062* (0.0408)	-0.1301*** (0.0000)	-0.1395*** (0.0000)	0.0343*** (0.0000)	-0.0600*** (0.0000)	-0.0444*** (0.0000)	-0.0689*** (0.0000)	-0.0544*** (0.0000)	0.0215*** (0.0000)	1.0000
Observations	109175									

P-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Correlations

Satisfaction with...	(1) life	(2) health	(3) income	(4) housing	(5) spouse	(6) job	(7) social	(8) leisure (amount)	(9) leisure (use)
q10									
health (strict)	-0.218*** (-31.68)	-0.560*** (-74.89)	-0.154*** (-22.39)	-0.162*** (-21.77)	-0.0625*** (-7.08)	-0.247*** (-18.94)	-0.185*** (-24.45)	-0.126*** (-17.80)	-0.177*** (-24.66)
social (strict)	0.0732*** (13.53)	0.0399*** (5.58)	0.0133* (2.17)	0.106*** (15.67)	0.0336*** (4.57)	0.0388*** (4.47)	0.129*** (17.88)	0.103*** (15.75)	0.132*** (20.31)
log(income)	0.0852*** (9.20)	0.0364* (2.46)	0.399*** (34.43)	0.157*** (12.36)	0.0759*** (4.57)	0.0266 (1.48)	0.0714*** (6.62)	-0.0359** (-3.24)	0.0307*** (3.81)
education	0.0147*** (8.69)	0.0219*** (8.56)	-0.00413 (-1.74)	-0.0204*** (-9.07)	0.0242*** (10.23)	0.0324*** (10.20)	-0.0000957 (-0.05)	0.0121*** (4.84)	-0.00484* (-2.15)
q25									
health (strict)	-0.159*** (-39.10)	-0.465*** (-90.96)	-0.132*** (-27.89)	-0.0821*** (-18.68)	-0.00186 (-1.23)	-0.154*** (-22.47)	-0.139*** (-31.85)	-0.0878*** (-17.43)	-0.126*** (-27.32)
social (strict)	0.0624*** (16.82)	0.0228*** (5.43)	0.0119** (2.97)	0.0818*** (20.45)	0.00897*** (5.18)	0.0205*** (3.50)	0.108*** (24.94)	0.0858*** (17.77)	0.109*** (24.40)
log(income)	0.0563*** (10.38)	0.0147* (2.16)	0.329*** (40.10)	0.0840*** (10.40)	0.0126*** (5.06)	-0.00726 (-0.76)	0.0369*** (5.76)	-0.0469*** (-6.38)	0.00829 (1.23)
education	0.00925*** (7.14)	0.0146*** (10.50)	-0.0124*** (-8.30)	-0.0349*** (-23.29)	0.0127*** (30.20)	0.0300*** (14.36)	-0.0124*** (-9.28)	0.00741*** (3.69)	-0.0155*** (-10.27)
q50									
health (strict)	-0.102*** (-57.48)	-0.381*** (-333.71)	-0.0979*** (-100.38)	-0.0329*** (-22.95)	0.0000945 (0.29)	-0.112*** (-56.43)	-0.0973*** (-114.83)	-0.0369*** (-41.30)	-0.0780*** (-59.09)
social (strict)	0.0513*** (53.83)	0.0255*** (29.38)	0.0139*** (18.19)	0.0557*** (41.50)	0.00289*** (7.78)	0.0214*** (17.77)	0.0915*** (109.26)	0.0734*** (104.01)	0.0879*** (89.23)
log(income)	0.0282*** (26.51)	0.00660*** (5.43)	0.241*** (243.00)	0.0509*** (34.62)	0.0175*** (24.73)	-0.0177*** (-13.10)	0.0118*** (12.57)	-0.0450*** (-49.94)	-0.00361*** (-3.58)
education	0.00385*** (9.71)	0.0103*** (24.13)	-0.0177*** (-43.09)	-0.0380*** (-78.46)	0.0140*** (125.43)	0.0293*** (52.26)	-0.0159*** (-53.06)	0.00551*** (16.93)	-0.0174*** (-41.70)
q75									
health (strict)	-0.0544*** (-16.53)	-0.299*** (-68.86)	-0.0619*** (-16.15)	0.0114*** (3.03)	0.0201*** (5.71)	-0.0733*** (-13.31)	-0.0538*** (-12.11)	0.00342 (0.86)	-0.0325*** (-7.08)
social (strict)	0.0382*** (12.17)	0.0191*** (5.00)	0.00906* (2.27)	0.0355*** (10.06)	-0.00209 (-0.64)	0.00734 (1.66)	0.0752*** (21.22)	0.0646*** (15.84)	0.0708*** (17.85)
log(income)	0.00567 (1.10)	0.00191 (0.31)	0.173*** (22.42)	0.0233*** (4.13)	0.0109 (1.83)	-0.0280*** (-4.27)	-0.00534 (-0.74)	-0.0448*** (-7.06)	-0.00982 (-1.60)
education	-0.00569*** (-5.45)	0.00461*** (3.68)	-0.0252*** (-19.74)	-0.0460*** (-40.87)	0.0112*** (10.96)	0.0258*** (14.84)	-0.0207*** (-15.14)	0.00211 (1.40)	-0.0208*** (-14.75)
q90									
health (strict)	-0.0112* (-2.28)	-0.226*** (-34.41)	-0.0307*** (-5.18)	0.0612*** (12.82)	0.0496*** (8.83)	-0.0407*** (-5.25)	-0.0155* (-2.52)	0.0474*** (7.98)	0.00987 (1.46)
social (strict)	0.0239*** (5.64)	0.0130*** (2.88)	0.00434 (0.87)	0.0212*** (4.52)	-0.0174** (-3.27)	0.0125 (1.73)	0.0571 (10.95)	0.0499*** (7.79)	0.0533*** (9.81)
log(income)	-0.0287*** (-4.83)	-0.0306*** (-4.00)	0.108*** (12.35)	-0.0233*** (-3.36)	-0.0364** (-3.16)	-0.0707*** (-5.30)	-0.0534*** (-5.15)	-0.0538*** (-5.00)	-0.0340*** (-4.63)
education	-0.0133*** (-8.63)	-0.00353 (-1.85)	-0.0348*** (-20.43)	-0.0552*** (-32.68)	0.00175 (0.99)	0.0188*** (8.33)	-0.0325*** (-17.71)	-0.00333 (-1.61)	-0.0319*** (-16.99)
Observations	109175	109175	109175	109175	78125	69270	109175	109175	109175
0.10 Pseudo R2	.1634	.1589	.1741	.0941	.2071	.3157	.1715	.2305	.0934
0.25 Pseudo R2	.1732	.1635	.2111	.1106	.2837	.3158	.1892	.2753	.1036
0.50 Pseudo R2	.1945	.1527	.2551	.1436	.3213	.2609	.2217	.3359	.1298
0.75 Pseudo R2	.1475	.0955	.2462	.1007	.24	.1894	.1939	.3287	.1072
0.90 Pseudo R2	.1179	.0662	.2379	.0797	.1865	.1482	.1644	.3014	.0977

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Quantile analysis following [Canay \(2011\)](#): Dependent variables are life satisfaction (column 1) and a set of domain satisfactions. Main variables are composite health (reversed coded, i.e. “bad health”), social life variables as well as income and education. The model uses a stricter model specification with respect to subjective variables on the right-hand side of the regression equation than the model specification of [Binder and Coad \(2011\)](#). Individual fixed-effects with bootstrapped standard errors (100 replications). Time dummies and other control variables as in previous models but output omitted here.