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ABSTRACT

Does Job Satisfaction Improve the Health of Workers? New Evidence Using Panel Data and Objective Measures of Health*

This paper evaluates the relationship between job satisfaction and measures of health of workers using the German Socio-Economic Panel (GSOEP). Methodologically, it addresses two important design problems encountered frequently in the literature: (a) cross-sectional causality problems and (b) absence of objective measures of physical health that complement self-reported measures of health status. Not only does using the panel structure with individual fixed effects mitigate the bias from omitting unobservable personal psycho-social characteristics, but employing more objective health measures such as health-system contacts and disability addresses such measurement problems relating to self-report assessments of health status. We find a positive link between job satisfaction (and changes over time therein) and subjective health measures (and changes therein); that is, employees with higher or improved job satisfaction levels feel healthier and are more satisfied with their health. This observation also holds true for more objective measures of health. Particularly, improvements in job satisfaction over time appear to prevent workers from (further) health deterioration.

JEL Classification: I18, I19, J28

Keywords: job satisfaction, well-being, health, panel data analysis

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DOES JOB SATISFACTION IMPROVE THE HEALTH OF WORKERS?
NEW EVIDENCE USING PANEL DATA AND OBJECTIVE MEASURES OF HEALTH

1. Introduction

Some research evidence suggests that the average workplace in several industrialized countries has become less stable and more insecure and that, in general, employment conditions have deteriorated (e.g., Schmidt, 1999; Swinnerton and Wial, 1995). Research also indicates that levels of job satisfaction have declined in the past decades (Hamermesh, 2001; Sousa-Poza and Sousa-Poza, 2003). Suggested reasons for this apparent trend include globalization, flexible employment, technological advancements (IT coverage), higher mobility, and in many countries, a deep recession in the 1990s. Even though to some extent such worries may be inflated (Wanner, 1999; Winkelmann and Zimmermann, 1998), the public at large is somewhat concerned that deteriorating job conditions and the resulting decline in job satisfaction may influence worker health. Thus, understanding the effects of job dissatisfaction (or stress) on an individual's health is important not only from a medical but also from an economic perspective. For example, while job satisfaction plays an important role at the employee level as a determinant of individual well-being, at the aggregate level, it equally affects worker productivity and retirement decisions, and ultimately, a society's economic prosperity (Faragher et al., 2005). Knowing whether such components of subjective well-being affect individual health can thus provide valuable information on key policy issues like the rise in healthcare costs and the economic performance in many industrialized nations. Therefore, this study tests whether job satisfaction determines worker health.

Because of the topic's obvious relevance and importance, a large body of literature has already evolved on the relationship between employee job satisfaction and ill health (see Faragher et al., 2005, for a meta-analysis of over 450 studies). Arguments for the existence of such a link are many and varied. Recent research by organizational psychologists suggests

that job satisfaction may have an indirect influence on workers' health through both physical and psycho-social employment conditions like workplace safety, lightening, quality of air, degree of automation, but equally harassment, hierarchical position, network support, responsibility, effort-reward imbalance, work stress, and job security (e.g. Stansfeld et al., 1997, 1998).

However, most of the literature on the subjective well-being–health link is hampered by methodological and design problems (Spector, 1997), including the use of cross-sectional data, unrepresentative datasets, and unreliable statistical methods reporting simple correlation coefficients. Whereas simple correlations fail to take into account the impact of other potential determinants of health, regression analyses on cross-sectional data allow no conclusion of causality because of omitted and unobservable personal characteristics. In addition, since most studies rely on self-reports rather than objective health measures, the finding that job satisfaction is conducive to subjective health may be driven by 'third factors' like personality traits such as neuroticism, hardiness, extroversion, or negative affectivity (Brief et al., 1988; Watson et al., 1988). For example, individuals high in negative affectivity[2] tend, other things being equal, to be more discontented at work and equally more likely to self-assess their health problems negatively (Stansfeld et al., 1998). Moreover, as most studies only analyze specific populations, it is often impossible to generalize results to the entire working/active population.

Thus, this paper contributes to the research stream by examining the relationship between health and job satisfaction—a specific subjective measure of well-being—in a manner that remedies the shortcomings of previous research in the following respects**:**

First, our use of regression analysis partially eliminates the impact of other potential worker health determinants that may correlate with job satisfaction. Second, our use of panel

[2] The personality trait of negative affectivity reflects a person's tendency to experience negative emotions like anxiety or depression across a wide variety of situations (Spector, 1997, p. 52).

data from the German Socio-Economic Panel (GSOEP)[3] to test for causality between job satisfaction and health permits – through using individual fixed effects - the controlling for unobservable individual characteristics such as affectivity, thereby enabling more convincing conclusions on causality. Third, employing objective health measures such as the degree of disability and the Body Mass Index (BMI) should yield more reliable results than using subjective measures of health only.[4]

The remainder of the paper is organized as follows. Section 2 discusses the empirical literature relating to job satisfaction and health. Section 3 introduces the model and data, and describes the estimation techniques. Section 4 discusses the estimation results and presents the robustness test, after which Section 5 summarizes the findings and concludes the paper.

2. Previous Research

To date, economists have concentrated primarily on analyzing the determinants of job satisfaction, which are influenced by many personal facets including gender (Clark, 1997; Clark and Oswald, 1996; Sousa-Poza and Sousa Poza, 2000a), age (Clark et al., 1995), education (Clark and Oswald, 1996; Tsang et al., 1991), as well as workplace characteristics, employment conditions, and career perspectives (for an overview, see Sousa-Poza and Sousa-Poza, 2000b). However, job satisfaction as an explanatory variable appears infrequently in the economic literature, with the notable exception of research on the job satisfaction's effect on quitting behaviour and retirement decisions. Nonetheless, limited recent empirical evidence does exist that current job satisfaction influences future labour turnover (see, e.g., Clark, 2001; Clark et al., 1998; Freeman, 1978).

In contrast, the relationship between job satisfaction and health has been extensively studied by health scientists and organizational psychologists. For example, one

[3] See Wagner et al (1993) for a detailed description.

[4] For a study using the cross-sectional SHARE data which contains a wide array of objective measures of health, see Fischer and Sousa-Poza (2007).

comprehensive meta-analysis of 485 predominantly cross-sectional studies with mostly small sample sizes (although with a combined sample size of 267,995 individuals) based on self-report measures of both job satisfaction and health show an overall (simple) correlation across all health measures of 0.312 (Faragher et al., 2005). Even though this analysis shows a strong correlation between job satisfaction and psychological problems like burnout ($\rho = 0.478$), self-esteem issues ($\rho = 0.429$), depression ($\rho = 0.428$), and anxiety ($\rho = 0.420$); correlations with subjective evaluations of physical illness are much smaller ($\rho = 0.287$). Attempts to reveal a relationship between more objective measures of physical health and job satisfaction have been less fruitful (Spector, 1997, p. 67).

3. Data

To analyze the relationship between job satisfaction and health, we employ panel data of persons active in the labour market based on the German Socio-Economic Panel (GSOEP). The GSOEP, a longitudinal panel survey with representative data for the population in Germany, has been conducted annually since the eighties, and covers the personal, economic, social, and political aspects of the respondent and her family. The GSOEP data contain various self-report measures of health, which all form our set of dependent variables in this study. In particular, they include assessments of individual general health status or satisfaction with health, as well as items relating to more specific health problems such as impediments to daily activities. It also provides information on personal recall of hospital stays, doctor visits and longer periods of illnesses, which are all good indicators of more severe health problems among respondents. Finally, it also contains a few objective measures of health such as BMI and the officially recognized disability status.

In this study, we employ all these available physical health variables in the GSOEP data, thereby covering the widest range possible to ensure the robustness of our results. However, not all health measures are available for all waves of the GSOEP. Our variable of interest, the

job satisfaction indicator, is measured on an 11-point scale (from 0, "not at all satisfied" to 10, "completely satisfied") and reported in each wave in our sample for all who are currently employed, either full-time, regular part-time, through a vocational training or irregular part-time.

To estimate our model with German panel data, we use the waves following German unification from 1992 until 2005, resulting in an unbalanced panel with a maximum of about 17,000 individuals in each wave. To mitigate the impact of selection effect of dissatisfied individuals leaving the labour market (either into early retirement or occupation as houseman/housewife), we have restricted the sample to (self-) employed respondents aged between 16 and 60 years, far below the official retirement age of 65 years.[5] Table A1 of the Appendix provides actual variable definitions used and Table A2 descriptive statistics.

4 Model

We test the hypothesis that a worker's job satisfaction affects her health status by estimating two models: first, we assess the causal relationship between her degree of job satisfaction and levels of self-report health. Second, in the tradition of an 'intervention' analysis, we attempt to relate changes in individual health status over time to changes in her job satisfaction during the same period. For both models, we exclude all work-related factors that might determine job satisfaction (and changes thereof) such as industry sector, type of work, employment contract, wage level, match of skills with job requirements, reputation gains and career prospects, etc. Thus, in a first step, we estimate the following model:

[5] In general, the effect of job dissatisfaction on labour market exits is relatively small (see Sousa-Poza and Sousa-Poza, 2007). The official retirement age of 65 applies to both genders and has not been changed since the 1970ies.

$$y_{it} = \beta x_{it} + \chi' g_{it} + \varepsilon_{it} \text{ with } \varepsilon_{it} = \upsilon_i + \varpi_{it} \qquad \text{for t = 1992 - 2005} \qquad (1)$$

where y_{it} denotes individual i's health state at time t, x_{it} the variable of interest (i.e., job satisfaction), g_{it} a vector of additional control variables, while ϖ_{it} and v_i are the time-variant and time-invariant components, respectively, of the error term. Individual fixed effects (contained in g_{it}) account for individual heterogeneity caused by unobservable characteristics such as negative and positive affectivity that might give rise to a positive (but ultimately spurious) relationship between job satisfaction and self-assessed health in a purely cross-sectional setting.[6] Thus, inclusion of individual fixed effects, the so-called within-transformation, prevents the biasing of the estimated coefficient vector caused by omitted variables that are correlated with both job satisfaction and health. [7]

To ease interpretation of the fixed effects model, equation (1) can be transformed into and estimated as:

$$(y_{it} - \theta Y_i) = \beta(x_{it} - \theta X_i) + \chi'(g_{it} - \theta G_i) + (\varpi_{it} - \Omega_i) \qquad (2)$$

where capital letters (Y_i, X_i, G_i, Ω_i) denote individual-specific averages over all time periods t in the sample. Thus, in a fixed effects model only the impact of time-varying determinants (in form of deviations from the average over time) are identifiable. The individual fixed effects capture not only genetically shaped psychological traits or innate health risks of the observed person, but also other (potentially observable) time-invariant

[6] That personality traits play an important role for self-report measures in general (such as happiness) has been shown by several researchers (e.g. Brebner et al., 1995; Cheny & Furnham, 2001; Lonigan, 1994; Watson & Pennebaker, 1998). In addition, personal traits also appear to be responsible for the development of health problems (see Alamada et al., 1991; Costa,1987; Kohler et al., 1993).

[7] Ultimately, the direction of the bias is not clear-cut in a model with more than two independent variables, as the bias depends not only on the correlations between the omitted and the included variables but also on the correlations among the included variables, and their variances (e.g. Clarke, 2005). However, assuming a two-variables model, the bias is likely to be positive in case job satisfaction and the omitted factor 'personality traits' are positively correlated and the latter is also partially positively correlated with the outcome health in the true model.

socio-demographic characteristics of the respondent such as gender, being foreign-born, early childhood conditions, level of schooling, and religious-cultural background.[8] As additional (time-varying) controlling variables that are not mediated by job satisfaction we include a respondent's age and marital status ('married', 'widowed', 'separated', 'divorced', with 'single' as the reference category). In addition, we add household income; with its correlation with wage earnings being relatively low (0.3) it thus accounts for a common pool of financial resources for the family that facilitates the maintenance of a good health state for all its members. Year dummies controlling for systematic shocks and state of the macro-economy that pertain to all respondents of the same wave complete this model. This vector of control variables is *identical* for all estimated models.

In a second step we relate alterations in job satisfaction from one period to the next (y_{it} - y_{it-1}) to changes in health state over the same period (x_{it} - x_{it-1}). Again, unobservable psychological traits of an individual may not only affect how she perceives her current health and job satisfaction states, but equally how she assesses changes in either of them. For example, positive affectivity might cause an upward bias in the perception and evaluation of health improvements. For this reason, we take account of unobserved individual heterogeneity by first differencing of model (1). This approach has the advantage that the difference of time-invariant characteristics across two subsequent waves equal zero so that the presence of unobservable personal traits will not bias the estimator. As in the first model, we also include age, marital status, family income in form of their first differences over time. Time dummies complete the model specification, which looks as follows:

$$y_{it} - y_{it-1} = \beta(x_{it} - x_{it-1}) + \chi'(g_{it} - g_{it-1}) + (\upsilon_i - \upsilon_i) + (\varpi_{it} - \varpi_{it-1}) \qquad (3)$$

[8] In addition, they might equally reflect (unobservable but time-invariant) workplace characteristics and job types, as well as a general propensity to exercise regularly, that might potentially confound the analysis in a cross-section of data.

For both models (equations (2) and (3)), the estimation techniques are selected according to the type of dependent variable. For estimating the first model, we employ individual-specific fixed-effects GLS (FGLS) or a conditional fixed-effects logit model for panel data[9] in case the dependent variable is of a dichotomous nature; in contrast, for estimating first differences random effects panel estimators are employed, in case that more than two waves are available.[10] Heteroscedasticity and intra-group correlation (namely arbitrary serial correlation as the 'group' is the identical individual observed over time) corrected standard errors are obtained through clustering at the individual level.[11]

Since we estimate the relationship between two categorical variables with an estimator that assumes cardinality, we will focus on the direction of impact and, in most cases, abstain from drawing conclusions with respect to the size of influence. The alternative would be to risk a more severe bias by not taking into account unobserved individual heterogeneity when employing a random effects (ordered) probit panel estimator (see also Ferrer-i-Carbonell and Frijters, 2004). Indeed, Ferrer-i-Carbonell and Frijters (2004) showed that the estimation results for the self-report happiness question are qualitatively identical (in terms of direction, significance, and trade-offs among regressors) when assuming either cardinality or ordinality of the dependent variable.

Nevertheless, although this approach constitutes an important improvement compared to approaches used in previous studies, we should note that we do not account for the fact that health state itself might influence job satisfaction. Usage of an instrumental variable technique, however, is not feasible due to a lack of suitable instruments that satisfy the

[9] Estimated with Stata 9.2's xtreg and clogit commands, which allow for clustering at the individual level even in the presence of individual fixed effects.

[10] An ordered probit or logit individual fixed effects estimator that yields consistent estimates has not been developed yet. As we are interested in the direction of the effect rather than its magnitude, using FGLS for a categorical dependent variable with more than 2 categories is feasible. In principle, the bias caused by assuming cardinality diminishes with the number of categories. Results based on ordered probit random effect estimators for panels using the Swiss Household Panel are shown in Fischer and Sousa-Poza (2007).

[11] Stock and Watson (2006) show that using Sandwich robust standard errors yields inconsistent estimates in a fixed effects context. In contrast, the number of clusters (often > 5,000) is sufficiently large for being regarded as close to 'infinity'.

exclusion restriction requirement. In other words, we were not able to find a time-varying variable that was correlated with job satisfaction only, but not with the health measure.

As robustness check and to account for selection into and out of the labour market, we have estimated both models for gender- and age-specific subsamples. In particular, in Germany, according to the traditional role model, most of the male population is not given the option of becoming inactive housemen before reaching an (early) retirement age (of 55), while the female population under the age of 25 exhibits a labour force participation rate similar to that of the male population. Given the more robust health of younger persons, we expect more sizeable effects in the full sample. In principle, a most flexible functional form with regards to job satisfaction is chosen, that includes its squared term, but we provide F-tests or Wald-tests on the joint significance of the jobs satisfaction variables due to their considerable correlation.[12]

4. Empirical results

Satisfaction with health and self-assessed state of health

Table 1 reports the results for a first subjective measure of health state, as indicated by satisfaction with one's own health, which ranges from 0 (low) to 10 (high). This specific health measure is recorded in our unbalanced GSOEP panel for up to 10,000 (self-)employed per wave observed over a maximum period from 1992 to 2002, varying for each person from 1 to 11 years (average: 4.3 years), giving rise to up to 75,000 observations.[13]

The results in column (1) for the whole working population show that the level of job satisfaction is positively associated with satisfaction with one's own health (significant at the 0.1% level). The positive sign of the estimated coefficient of the squared term suggests that satisfaction with one's health increases over-proportionally in job satisfaction (equally

[12] The correlation is $\rho = 0.97$ for the levels and $\rho = 0.96$ for the differences. The reader should note that despite this high correlation both variables often turn out independently significant in the regression analysis if the sample is sufficiently large (at least 30000 observations in Table 1).

[13] The maximum number of active persons covered by one wave is 11,000.

significant at the 0.1% level). Assuming cardinality of both regressand and focal regressor, an increase in job satisfaction by one category raises one's own health category by about 0.15 points or one sixth of one health category. In other words, the effect is rather small: a positive change in one health category would require an approximate change in job satisfaction by 7 categories. The results for the controlling variables indicate that older persons are more satisfied with their health state, while marital status and household income are not significant in this sample.[14] Most of the year effects (not reported) are individually significant so that they should not be omitted from the model. In the remaining part of the paper, we always include these controlling variables in our regressions and report them in the output tables (Tables 1 – 7), but will not discuss their observed effects in the main text.

It should be noted that all our results for our job satisfaction variable prevail when the most parsimonious specification, only controlling for year and individual fixed effects, is employed. Whether the job satisfaction variables turn out significant or not is reported in the lower part of the Tables 1 through 7. Contrary to expectations, for all models the previously observable significant impact can be corroborated, while for two models significant relations become evident that are disguised in the full specification (Table 4 column 3 and Table 6 column 3). This robustness test shows that our results presented in this paper are not caused by a so-called over-identification problem.

Through the inclusion of individual fixed effects we account for unobservable personality traits such as negative or positive affectivity (but also job characteristics and type of work) that might give rise to a spurious positive relationship between the variable of interest and

[14] This insignificance can, most possibly, be attributed to the inclusion of individual fixed effects. First, they capture all time-invariant socio-demographic characteristics, such as marital status for most persons during the observational period. Analogously, the individual fixed effects might also capture a ‚base wage' effect, given that taking the natural logarithm of income filters out wage increases due to inflation or contract renegotiations at the national level, which are reflected by the year fixed effects estimates. Indeed, estimation of a random effects model shows a positive association of income with satisfaction with one's health, significant at the 0.1% level. The results for age are sensitive to employing them in their natural log form. The effect is negative (health satisfaction declines with age) when their unlogarithmized form is used, or when a random effects model is employed (irrespective of functional form). However, correlation between age and its logarithmized form is 0.98. On the other hand, a lowering of aspiration levels with regards to health as age increases might equally explain such result (e.g., Clark and Warr, 1995).

health in a purely cross-sectional setting or when estimating a random effects model. Based on the fixed-effects (FE) panel analysis we can therefore confirm the finding of previous cross-sectional studies, namely that job satisfaction is conducive to individual health satisfaction, and that is effect is unrelated to an individual's (time-invariant) personality characteristics.

Estimations for subpopulations (only men below 55 years and only persons below the age of 25 years) corroborate this positive relationship, suggesting that it is not restricted to samples pertaining to a particular age group, gender or to those who selected into/did not select out of the labour market. However, we should note that the slope is rather constant for younger persons while it is increasing for men, as already observed in the full sample.

The second part of the health-job satisfaction analysis is carried out for changes in the regressand that may be triggered by changes in job satisfaction (potentially non-linearly, therefore we included the change of the squared term), also controlling for changes in the remaining variables of the model. In the full sample (column 4), a strong positive relationship of (contemporaneous) changes in job satisfaction with changes in satisfaction with one's own health state emerges. The effect is more sizeable than that observed for the levels, as a change in roughly five job satisfaction categories appears sufficiently large to induce a change by one health satisfaction category.

Again, regressing differences on differences accounts for unobserved individual heterogeneity, so that a positive association between the two change variables reflects a true causal relationship. Once again, a similar relationship is identifiable in our male worker subsample (column 5), suggesting that this finding is not caused by happy workers who stay in the labour market. Moreover, this positive relationship is equally evident in the sample of the 25 year old (column 6), as the Wald-test on the joint significance indicates, despite of a potentially stronger stress resistance in this age group so that changes in job satisfaction are not expected to necessarily translate into actual changes in health satisfaction.

Insert Table 1 about here

In Table 2 we employ a widely-used categorical health-state variable for whether respondents consider their own health as 'very good' up to 'bad', on a 5-point scale. In the full sample, we again observe a positive relationship between levels of job satisfaction and degree of self-assessed health state (column 1) – even after controlling for individuals' unobservable time-invariant characteristics. The coefficients suggest that the health returns to job satisfaction are slightly increasing; however, the marginal effect is negligibly small.[15] In support, the estimation for the male sample in column 2 indicates that this positive health effect is independent of older workers' early retirement decision, and also prevails in the younger age groups.

Turning to the results for changes in self-assessed health (Table 2 columns 4 to 6), we find for the full sample that positive changes in job satisfaction trigger positive changes in self-assessed health, again at an increasing rate, but with a quantitatively small total marginal impact. In the male employee and the younger age group samples, we also observe a positive relationship, as the Wald-tests suggest.

To sum up, the results of both Tables 1 and 2 show that there is a strong and robust relationship between job satisfaction and (satisfaction with) one's own health state, both in terms of levels and changes, and both for the full sample and specific population groups that are less subject to selection effects. In the remaining analyses we will therefore omit the

[15] Assuming cardinality, it would require a change in job satisfaction of (theoretically) 34 categories to observe a change in self-assed health state by one category.

analysis for these subsamples as they do not appear to differ significantly in their behaviour from that observed in the full sample.[16]

Insert Tables 2 about here

Contacts with the health care system

Table 3 presents the coefficients of levels of the job satisfaction variable for frequency and type of contact with the health care system – including doctor visits and overnight stays in hospitals. It also includes measures relating to sick days taken off from work and accidents at the work place.

In general, the results in Table 3 show that job satisfaction leads to less health care facility contacts (hospital stays and doctor visits), reduces the likelihood of work accidents that require medical treatment, and lowers the frequency of sick leave from work (both minor as well as more severe illnesses); as the either independently or jointly significant job satisfaction variables indicate. Among the six different measures tested, only for 'in patient treatment' no relation with job satisfaction exists.

Most of these effects are quantified through the coefficient sizes (except for column 4 in which a conditional fixed effects estimator is reported); for example, to describe the most sizeable ones, a rise in satisfaction with one's work by two categories decreases the number of annual doctor visits by more than 1 time (column 1), and the number of sick days by at least 2 working days (column 5). It is important to note once again that this negative relationship is then not driven by innate personality traits such as optimism that may decrease the probability of seeking professional medical advice in case of an injury or disease compared to not so an

[16] The significance of the coefficient of job satisfaction, lagged by one year, is observable for all populations and models (levels and differences) of Tables 1 and 2. An exception pertains to the group of young employees for which past job satisfaction levels exert no impact on present-time self-assessed health state (cf. Table 2 column 3).

optimistic person. Moreover, this approach also controls for the fact that an overly optimistic person may not only underestimate the severity of an illness, but equally may also systematically not be able to recall doctoral visits and number of sick days of the past year. Thus, we can conclude that persons who are more satisfied with their jobs are less severely sick and less vulnerable, independent of their personality traits.[17]

For the identical measures of health we have also investigated the impact of changes in job satisfaction over time. The results in Table 4 show that the relationship is less robust than the one observed for the levels (Table 3). In general, only for changes in the number of annual doctor visits and (shorter and longer lasting) sick leaves (columns 1, 5 and 6) do we observe that changes in job satisfaction do matter. To quantify these effects, a positive change of job satisfaction by one category over time halves the number of annual doctor visits across the two periods, the number of sick leaves from work by more than one entire working day, while the quantitative impact on long-term diseases is only negligible (-0.007 times). For the remaining measures pertaining to *changes* in health service contacts the change in job satisfaction is not significant.[18]

Insert Tables 3 and 4 about here

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[17] Moreover, given that most workers do not switch the type of job (e.g. working in an office or having a physically demanding occupation), the observed impact of job satisfaction is also independent of one's time-invariant job characteristics. For the impact of psycho-social work characteristics and employment grade on short work absences due to 'back pain', see Hemingway et al. (1997). Using job satisfaction lagged by one period, we find workers' satisfaction in the past to lower the present-time number of in patient nights in hospital (at the 1% level) and sick leaves exceeding 6 weeks (at the 5% level), while the remaining measures of health care contacts remain unaffected. This finding might indicate that past job satisfaction impacts the development of severe illnesses stronger than present-time job satisfaction.

[18] Lagging the job satisfaction variable by one period leaves the coefficient in model (1) ('number of annual doctor visits') insignificant, whereas the significance for 'number of days out sick' persists at the 5 percent level (model 5). Moreover, positive changes in job satisfaction from *t-2* to *t*-1 lead to decreases in inpatient nights in hospital between *t-1* and *t* by 0.04, at the 5% level.

Health Impairment (self-assessed)

Finally, we turn to self-reported measures of daily impairment. Here we face the problem that most types of impairment reported in the GSOEP are so severe that they inhibit participation in the labour market. This applies to difficulties with daily activities such as dressing oneself alone or getting out of bed. As a result, there are too few observations (about 40 – 70 in the whole panel of active labor market participants) to robustly estimate the relationship between job satisfaction and such measures of health impairment.

An exception applies to the variable 'having troubles with climbing stairs'; about 5000 workers report that they experience such problems, which makes it suitable for our analysis. Unfortunately, however, this question has only been posed in the two most recent waves, namely in 2002 and 2004.[19] For this reason, analysing *levels* with a fixed effects model is econometrically problematic as the calculation of the variance-covariance matrix could be affected (as deviations from the average over time are analysed). On the other hand, a random effects estimation might yield biased coefficients due to unobserved individual heterogeneity, as discussed in the model section. However, as this health outcome is reported in two waves, the method of first differencing (see equation (3)) can be applied, which, in this specific case, results in estimating a cross section.[20]

Table 5 reports the results of this analysis. For simplicity, we have assumed that (the difference in) health state with respect to having problems climbing stairs is linear in (a change in) job satisfaction. Column 1 gives the outcomes for a logit random effects panel model in which health state (as level) is the dependent variable. The estimate suggests that persons who are more satisfied with their work are 26 percentage points less likely to experience the health problem of having difficulties with climbing the stairs (significant at the

[19] The alternatively suitable measures 'health limits kneeling' and 'health limits vigorous activities' have not been collected between 1992 and 2005.

[20] As the age difference is identical across individuals (+ 2 years) it drops automatically out of the regression.

0.1% level). However, as said before, without the inclusion of individual fixed effects this sizeable correlation may be spurious.

The result of the first difference model is reported in column (2). Given that the underlying measure of health is dichotomous with value '1' indicating that the respondent suffers from problems with climbing stairs, the difference can take on the values '-1', '0', and '1'. While '0' indicates that the health state has not changed between periods 2002 and 2004, '1' reflects a worsening (moving from 'no problems = 0' to 'having difficulties = 1', while '-1' denotes an improvement. In our sample of 7500 persons recorded in both waves, about 6000 experienced no change in their health state between *t-2* and *t*, about 640 an improvement and about 850 a worsening. Given the cross-sectional nature of our data, the model is estimated with a multinomial logit.

The results show that a change in job satisfaction between 2002 and 2004 does not induce an improvement of the respondent's health state (column 2), compared to the reference group of those who experienced no change in their health (difference = 0). In contrast, for the outcome (1) the negative sign of the significant coefficient on the difference in job satisfaction suggests that improving workers satisfaction over time decreases the probability of health state deterioration during the same period, by roughly 1 percentage point for an increase in job satisfaction by one category. In contrast, the analysis of the identical model for those workers aged 25 or younger (about 400 observations) suggests that an increase in job satisfaction over time does not affect the ability to climb stairs, a finding not unexpected for this particular age group.[21] In other words, job satisfaction appears to protect particularly middle-aged and older workers against developing health problems of having difficulties with climbing stairs, but seems less likely to support healing processes.

[21] Assuming non-linearity in job satisfaction does not alter our findings. Estimation results are available upon request. Lagging the job satisfaction variable by one period showed the identical impact for the random effects model (at the 1% level), but no effect on changes in problems with climbing stairs.

Insert Table 5 about here

Objective measures of health

With regards to objective health measures, the GSOEP contains information on an individual's disability status and body weight and height. In general, objective measures have the advantage that they are less subject to recall errors that could be caused by an individual's character. The measures relating to 'being disabled' are available for almost all waves in our panel and have the advantage that the degree of disability, measured in percentage points, is, at least in Germany, officially defined and assessed by external administrators. As there are financial and social advantages from being recognized as 'disabled', there is a strong economic incentive to report even minor disabilities, also for 'optimistic' persons. In Germany, disabilities may include not only physical impairment, but also mental diseases. Information on body weight and (mostly time-invariant) height constitute the main components for the BMI (Body Mass Index), which are available for the years 2002 and 2004 only. For this reason, only the first differencing estimation strategy can be applied as argued in the preceding section.

The results are reported in Table 6. Controlling for unobservable personal characteristics through inclusion of individual fixed effects, a lower level of job satisfaction appears significantly negatively related with the probability of being severely disabled (column 1). In other words, individuals who are more satisfied with their work are less likely to be an officially recognized disabled person – by 1.2 percentage points.[22] In addition, higher levels of job satisfaction are also negatively associated with the degree of disability, ranging from zero (not disabled) to 100% (fully disabled), albeit with a small marginal effect as indicated by the

[22] Marginal effect is calculated based on a logit fixed effects estimation without clustering by individuals.

size of the coefficient.[23] Thus, we observe a positive relationship between job satisfaction and physical or mental health that is not driven by personality traits such as negative or positive affectivity.[24]

Turning to the estimation with the difference in dichotomously measured disability status between period *t* and the preceding period *t-1* as the dependent variable, we observe no significant impact of a change in job satisfaction over time with a change in health (column 3).[25] In contrast, employing the change in the continuously coded degree in disability (column 4), we find that an improvement in job satisfaction exerts a contemporaneous, beneficial, health improving influence; an improvement by one category over time is associated with a lower degree of 0.12 percentage points of disability.[26]

However, estimating the same model for the subpopulations of workers younger than 25 and male workers younger than 55 renders the coefficients on the change in job satisfaction independently and jointly insignificant. In contrast, the disability-reducing effect of the level of job satisfaction is also observable in the male worker group below early retirement age of 55 (while no significance can be detected in the young workers' sample). Further analysis indicates that the effect of the change in the total population is driven by female workers and those male workers who are older than 55 years, who are both more likely to leave the labour force in case their health state does not improve or worsens. Thus, although *levels* of job satisfaction and degree of disability appear robustly related, no such statement can be made for *changes* therein.

Finally, we also analyzed changes in weight and BMI using the difference model (equation (3)). Table 7 column 1 reports the results for changes in body weight (measured in

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[23] An increase of job satisfaction by one category out of available ten would decrease the degree of disability by 0.2 percentage point.

[24] The health improving effect on the probability of being disabled remains when job satisfaction is lagged by one period (at the 5% level), while the degree of disability appears now only weakly affected (10% level).

[25] Assuming a non-linear functional form does not alter the main finding.

[26] The health improving effect for changes in being disabled or the degree of disability appears unrelated to changes in job satisfaction when lagged by one period.

kilograms) and column (2) those for changes in BMI (calculated as height divided by squared body weight). In both cases, the change in job satisfaction does not appear to exert any decisive impact on changes in any of these two objective measures of physical health. [27]

However, the results for the BMI are sensitive to using a different definition of deviations from the normal body mass. More specifically, constructing two categorical measures of 'having normal weight' and 'having abnormal weight' (BMI2 and BMI3) based on the cardinal BMI variable and calculating the differences, yields a different picture. In the first case (change in BMI2), reported in columns 3 and 4, the outcome (-1) indicates that body weight has been reduced, while outcome (1) reflects the case in which the respondent's weight has substantially increased. The coefficient estimates and their marginal effects (based on multinomial logit) in column (3) show that a positive change by one category in job satisfaction significantly lowers the probability of a weight loss by almost 0.3 percentage points (at the 1% level), while the probability of a weight gain is not affected. This result is difficult to interpret, as a decrease in weight occurs both in case when an overweight person looses weight (0 - 1 = -1) as well as in case when a person develops an underweight problem (-1 - 0 = -1). Thus, it is not clear whether job satisfaction prevents employees from developing dangerous underweight or prevents workers from undertaking a health-improving diet.[28]

We therefore also analyzed the impact of changes in job satisfaction on a change in BMI (measured by BMI3) where the outcome (0) indicates that the respondent always had normal weight in the two observational periods, (-1) that she returned from having a weight problem (in either direction) to normal weight again, and (1) that she developed an abnormal weight between periods 2004 and 2002. The regression results in columns (5) and (6) imply that positive changes in job satisfaction lower the probability of returning to normal weight

[27] These results are independent of the assumed functional form of job satisfaction or lagging it by one year.

[28] It has been argued that this result might reflect that changes in mood and weight losses are both triggered by the unobservable ‚cancer risk' or, more specifically, symptoms of early stages of cancer development. In response, the estimation strategy implicitly controls also for ‚genetic disposition' to develop any disease, and the ‚job satisfaction' question attempts to capture long-term effects that are not driven by mood or moodiness.

(outcome (-1)) again by 0.03 percentage points, as the marginal effects indicate. On the other hand, no significant impact on developing a weight problem is observable.[29] Combining the last two findings for BMI2 and BMI3, it appears that improvements in job satisfaction make adjustments to normal weight through weight losses less likely. In other words, happier but overweight workers do not appear to undertake a (from a health economists' perspective) necessary diet during the same time period, or are less likely to complete such with success.

5. Conclusions

This paper analyzes the impact of job satisfaction on the health of persons active in the labour market using a national German panel dataset (German Socio-Economic Panel, GSOEP). The initial analysis uses both subjective and objective health measures. In addition, the study also investigates both the effect of levels of and changes in job satisfaction on (changes in) health.

Using data from the 1992 – 2005 waves, we show that self-reported measures of health (such as health status and health satisfaction) are positively influenced by job satisfaction, both for levels as well as changes. Admittedly, even though knowing what effects job satisfaction has on self-reported health is important (Burke et al., 1993), this relationship may be partly driven by personal traits like negative affectivity. If so, this problem would probably be best tackled by using objective measures of health or taking mood factors directly into account. In the model estimated with GSOEP panel data, inclusion of individual fixed effects or differencing them out allows us to control for potentially omitted unobservable personal traits, such as psychic constitution or early childhood experiences. The results show an unambiguously increasing effect of job satisfaction on health. This result corresponds well to

[29] Lagging the job satisfaction variable by one period shows the likelihood of a weight gain to be significantly reduced (BMI2), while no effect is observable for the BMI3 measure. This differing outcome might well reflect the difference between contemporaneous and lagged effects of job satisfaction.

the numerous cross-sectional analyses on this topic. In consequence, qualitatively, omitted variable bias in these cross-sectional studies does not appear to be a major problem.

With respect to more specific health problems, job satisfaction decreases the self-reported impediment of the daily activity of climbing stairs and also lowers the likelihood of medical treatment as measured by the self-report number of doctor visits or hospital stays, or sick leaves from work. Most importantly, job satisfaction does not only prevent workers from becoming disabled or from developing more severe forms of disability, but there is also some evidence that improvements in job satisfaction over time exert a 'healing' effect with respect to this more objective health measure. Interestingly, however, increases in job satisfaction reduce the probability of a worker successfully combating a weight problem, potentially through generating disincentives to do so, assuming that the decision to adjust weight is rational and based on a cost-benefit analysis.

By controlling for individual heterogeneity, our results based on subjective health measures offer a more convincing causal relationship between self-reported measures of job satisfaction and employee health than previous cross-sectional studies. In addition, our analysis reveals that this effect of job satisfaction goes beyond the influence on subjective health assessments – the positive relationship also holds with more objective health measures such as contacts with the healthcare system and sick leave from work. Moreover, for self-reported impairment and officially recognized disability status, our results suggest that the health-preserving impact of job satisfaction pertains not only to levels of health but also to changes in health.

Although the approach taken in this paper provides a strong methodological improvement over previous analyses that relied on cross-sections only, it does not correct for endogeneity caused by time-varying factors that are related to health that can only be resolved using an instrumental variable approach. Until this issue of causality is fully resolved, policy recommendations can only be preliminary. However, our results strongly suggest that

anything that is conducive to job satisfaction, for example improvements in working conditions, would be beneficial to health perceptions and accrual health state. Thus, in turn, job satisfaction may impact not only on workers' productivity, but would also come along with large-scale cost savings in the healthcare sector, particularly, as our most sizeable effects suggest, through lesser sick leaves from work and fewer contacts with the healthcare system.

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Appendix

Table A1: Description of variables

Variable	Definition
Health variables	
Satisfaction with health status	Satisfaction of respondent with her health, on a categorical scale from 0 (low) to 10 (high), categorical variable.
Self-assessed health status	Subjective assessment of health status in 5 categories. Ranging from 'bad' (lowest category), 'poor', 'good', 'satisfactory', to 'very good' (highest category).
Number of annual doctor visits	Continuous variable from 0 to 360 measuring the number of doctor consultations in a year.
Number of inpatient nights in hospital	Continuous variable from 0 to 243 measuring the number of inpatient nights in hospital in a year.
Number of work accidents that required treatment	Dichotomous variable: '1' indicates 'one accident', and '0' 'no accident'.
Inpatient treatment	Dichotomous variable: '1' indicates 'yes', and '0' 'no'.
Number of days sick leave	Continuous variable from 0 to 366 measuring the number of days the respondent was on sick leave in a year.
Sick leave exceeding 6 weeks	Categorical variable measuring absence due to sick leave lasting more than six weeks, with '0' indicating 'no', '1' 'once', and '2' 'several times'.
Troubles climbing stairs	Dichotomous variable: '1' indicates 'yes', and '0' 'no'.
Being disabled	Dichotomous variable: '1' indicates 'yes', and '0' 'no'.
Degree of disability	Officially recognized degree of disability (physical and/or mental) ranging from 0 to 100 percent.
Weight	Weight of respondent measured in kilograms, ranging from 37 kg to 185 kg.
BMI	BMI is defined as height (in m) divided by weight squared (in kg).
BMI2	BMI2 takes on the value of '0' if the BMI indicates a normal weight, '1' overweight (BMI > 30) and '-1' underweight (BMI < 18.5).
BMI3	BMI3 takes on the value of '1' if the respondent deviates strongly from the normal weight in any direction (based on BMI2), and '0' otherwise.
Explanatory variables	
Job satisfaction	Satisfaction of respondent with her work, from a scale 0 (low) to 10 (high), categorical variable.
Age	Age of respondent, continuous variable between 16 and 60.
Married	Married person, dichotomous variable.
Widowed	Widowed person, dichotomous variable.
Divorced	Divorced person, dichotomous variable.
Separated	Separated person, dichotomous variable.
Household income (ln)	Monthly household net income, continuous variable.

Table A2: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Health variables					
Satisfaction with health status	75746	7.04	1.99	0	10
Self-assessed health status	95261	-2.39	0.83	-5	-1
Number of annual doctor visits	95269	7.89	13.34	0	360
Number of inpatient nights in hospital	95348	0.87	5.11	0	243
Number of work accidents that required treatment	7764	0.26	0.44	0	1
Inpatient treatment	3154	0.24	0.43	0	1
Number of days sick leave	70078	8.66	21.45	0	366
Number of sick leave periods exceeding the duration of 6 weeks	72046	0.04	0.22	0	2
Having troubles climbing stairs	17796	0.26	0.44	0	1
Being disabled	5349	0.42	0.49	0	1
Degree of disability	95284	2.22	10.79	0	100
Respondent's weight	6791	77.01	15.56	40	184
BMI	6788	25.50	4.26	15.82	64.74
BMI2	6788	0.12	0.37	-1	1
BMI3	6788	0.15	0.36	0	1
Explanatory variables					
Job satisfaction	75746	7.07	2.00	0	10
Job satisfaction squared	75746	53.92	25.40	0	100
ln(age)	75746	3.62	.30	2.77	4.09
Married	75746	0.63	0.48	0	1
Widowed	75746	0.01	0.12	0	1
Divorced	75746	0.07	0.25	0	1
Separated	75746	0.02	0.13	0	1
ln(household income)	75746	8.28	0.49	2.303	10.82

Summary statistics for the explanatory variables are based on observations from the regression sample of the first regression in Table 1. Summary statistics for the dependent variables are based on the regression samples relating to levels. As not all questions were posed in all waves, the number of observations can differ substantially.

Tables

Table 1: Satisfaction with own health status

	Levels			Changes		
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Men below 55	25 year olds	Full sample	Men below 55	25 year olds
Satisfaction with work / Δ	0.152**	0.154**	0.154*	0.201**	0.183**	0.121
	[7.20]	[5.18]	[2.56]	[8.56]	[5.45]	[1.83]
Job satisfaction squared / Δ	0.009**	0.010**	0.007	0.005**	0.008**	0.010*
	[5.85]	[4.58]	[1.63]	[3.00]	[3.05]	[2.07]
ln (age) / Δ	0.778*	0.365	-0.587	2.025**	1.558	-4.166
	[2.24]	[0.74]	[0.18]	[3.35]	[1.76]	[0.98]
ln (household income)/ Δ	-0.007	-0.001	0.073	0.015	0.046	0.086
	[0.29]	[0.02]	[1.11]	[0.48]	[1.11]	[1.11]
Married / Δ	-0.061	-0.006	0.104	-0.105	-0.011	0.045
	[1.41]	[0.10]	[0.72]	[1.70]	[0.13]	[0.26]
Widowed/ Δ	-0.178	-0.598	.	-0.430*	-0.971*	.
	[1.24]	[1.65]	.	[1.99]	[2.18]	.
Divorced/ Δ	-0.058	-0.054	0.029	-0.055	0.014	-0.839*
	[0.87]	[0.60]	[0.07]	[0.62]	[0.12]	[1.98]
Separated/ Δ	-0.014	-0.003	-0.056	-0.03	0.042	0.094
	[0.19]	[0.03]	[0.13]	[0.32]	[0.34]	[0.16]
Constant	2.41	4.184*	7.332	-0.065*	-0.123**	0.354
	[1.84]	[2.35]	[0.68]	[2.25]	[3.09]	[1.60]
Observations	75746	38849	9706	53740	27967	5194
Number of Persons	17423	8763	3882	13252	6779	2297
F-statistics / Wald-statistics	217.258	129.092	22.215	2182.548	1270.471	244.236
(p-value)	0.00	0.00	0.00	0.00	0.00	0.00
F-test / Wald-test on joint sign. of job satisfaction variables	1483.85	865.47	161.66	2182.548	1270.471	244.236
(p-value)	0.00	0.00	0.00	0.00	0.00	0.00
Satisfaction variable significant in parsimonious model	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable: satisfaction with own health ranked on a scale from 0 (low) to 10 (high).
FGLS estimation with fixed effects and clustering at the individual level. Robust t-statistics in brackets.
* significant at 5%; ** significant at 1%, Coefficients on year fixed effects are not reported.

Table 2: Self-assessed health status

	Levels			Changes		
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Men below 55	25 year olds	Full sample	Men below 55	25 year olds
Satisfaction with work / Δ	0.029**	0.028**	0.060**	0.022**	0.019	0.047
	[4.31]	[3.05]	[2.89]	[2.69]	[1.74]	[1.88]
Job satisfaction squared / Δ	0.003**	0.003**	0.000	0.003**	0.003**	0.001
	[5.06]	[4.21]	[0.11]	[4.17]	[3.66]	[0.50]
ln (age) / Δ	0.631**	0.214	-1.783	0.386	-0.187	-1.996
	[4.92]	[1.18]	[1.35]	[1.54]	[0.51]	[1.10]
ln (household income) / Δ	0.006	-0.008	0.012	-0.002	-0.002	-0.011
	[0.60]	[0.63]	[0.52]	[0.15]	[0.13]	[0.38]
Married / Δ	-0.027	-0.035	0.047	0.018	0.007	0.131
	[1.62]	[1.63]	[0.85]	[0.73]	[0.21]	[1.55]
Widowed / Δ	-0.058	-0.250*	.	-0.028	-0.294*	.
	[1.05]	[2.41]	.	[0.37]	[2.09]	.
Divorced / Δ	-0.023	-0.048	0.14	0.037	0.028	0.403
	[0.93]	[1.43]	[1.26]	[1.01]	[0.59]	[1.88]
Separated / Δ	0.023	0.000	-0.114	0.069	0.077	0.005
	[0.85]	[0.01]	[0.58]	[1.80]	[1.52]	[0.02]
Constant	-5.301**	-3.584**	3.223	-0.036**	-0.040*	0.061
	[10.91]	[5.24]	[0.73]	[2.90]	[2.26]	[0.64]
Observations	95261	48034	11797	65332	33178	5915
Number of Persons	18832	9419	4566	14124	7057	2527
F-statistics / Wald-statistics	168.35	99.52	16.57	844.121	483.459	143.759
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000
F-test/Wald-test on joint significance of job satisfaction variables	732.967	412.779	84.902	767.446	440.092	108.677
(p-value)	0.00	0.00	0.00	0.00	0.00	0.00
Satisfaction variable significant in parsimonious model	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable: Current Self-rated health status measured in 5 categories ('-5' "bad" to '-1' "very good") (original values recoded). FGLS estimation with individual fixed (levels) or random (changes) effects. Observations are clustered by person ID. Robust t-statistics in brackets.
* significant at 5%; ** significant at 1%, Coefficients on year fixed effects are not reported.

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Table 3: Contacts with the health services and illness at work place (levels)

	(1) number of annual doctor visits	(2) inpatient nights in hospital	(3) work accidents required treatment	(4) in patient treatment	(5) number of days sick leave	(6) sick leaves exceeding 6 weeks
Satisfaction with work	-0.609**	-0.05	-0.053	-0.054	-1.207**	-0.008**
	[4.05]	[0.90]	[0.77]	[0.50]	[3.06]	[2.70]
Job satisfaction squared	0.018	0.000	0.001	0.001	0.057*	0.000
	[1.59]	[0.02]	[0.10]	[0.10]	[2.02]	[1.67]
ln(age)	-12.629**	-4.242**	-2.452	-5.407	-30.082**	-0.172**
	[6.22]	[4.90]	[1.53]	[1.41]	[6.53]	[3.58]
ln (household income)	-0.420*	-0.161	0.093	-0.118	-0.580	-0.005
	[2.53]	[1.86]	[0.80]	[0.62]	[1.86]	[1.44]
Married	0.842**	0.03	0.162	0.339	0.497	-0.006
	[2.74]	[0.26]	[0.85]	[0.85]	[1.08]	[1.24]
Widowed	1.629	0.017	1.238*	-0.918	0.916	-0.043
	[1.57]	[0.05]	[2.20]	[0.89]	[0.30]	[1.56]
Divorced	0.951*	0.081	0.735**	-0.831	-0.164	-0.002
	[1.98]	[0.40]	[2.64]	[1.57]	[0.19]	[0.20]
Separated	1.00	-0.019	0.525	0.618	0.413	-0.006
	[1.92]	[0.07]	[1.62]	[1.07]	[0.42]	[0.54]
Constant	61.572**	18.382**			131.655**	0.784**
	[7.92]	[5.27]			[7.46]	[4.27]
Observations	95269	95348	7764	3154	70078	72046
Number of Persons	18838	18837	1472	659	14663	14800
F-statistics / Wald-statistics	15.34	3.20	35.35	21.40	5.82	7.19
(p-value)	0.00	0.000	0.001	0.065	0.00	0.00
F-test / Wald-test on joint sign. of job satisfaction variables	76.56	7.90	7.00	2.41	19.3	13.21
(p-value)	0.00	0.00	0.03	0.30	0.00	0.00
Satisfaction variable significant in parsimonious model	Yes	Yes	Yes	No	Yes	Yes

Notes: FGLS and/or conditional logit estimation with fixed effects and clustering at the individual level.
Significant at 5%; ** significant at 1%, Robust t(z)-statistics in brackets.
Coefficients on year fixed effects are not reported.

Table 4: Contacts with the health services and illness at work place (changes)

	(1) number of annual doctor visits	(2) inpatient nights in hospital	(3) work accidents required treatment	(4) in patient treatment	(5) number of days sick leave	(6) sick leaves exceeding 6 weeks
Δ Satisfaction with work	-0.551**	0.027	-0.009	-0.002	-1.175**	-0.007*
	[2.94]	[0.43]	[1.95]	[0.34]	[2.80]	[2.07]
Δ Job satisfaction squared	0.021	-0.004	0.001	0.000	0.075*	0.000
	[1.49]	[0.77]	[1.62]	[0.04]	[2.44]	[1.67]
Δ ln(age)	-16.083**	-1.216	0.245	-0.090	-29.969**	-0.173
	[3.63]	[0.48]	[1.37]	[0.81]	[3.08]	[1.84]
Δ ln (household income)	-0.559*	0.017	0.004	-0.004	-0.548	0.000
	[2.31]	[0.18]	[0.44]	[0.70]	[1.34]	[0.03]
Δ Married	0.705	-0.196	-0.014	0.008	0.552	0.002
	[1.72]	[1.58]	[0.82]	[1.03]	[0.78]	[0.26]
Δ Widowed	1.436	-0.687	0.058	-0.105*	-3.381	-0.089
	[0.99]	[1.20]	[1.09]	[1.97]	[0.92]	[1.93]
Δ Divorced	-0.135	-0.124	-0.018	-0.012	-0.087	0.001
	[0.20]	[0.63]	[0.79]	[0.78]	[0.06]	[0.05]
Δ Separated	0.847	-0.041	0.023	0.023	1.593	0.012
	[1.13]	[0.15]	[0.89]	[1.41]	[1.23]	[0.80]
Constant	0.850**	-0.077	-0.006	0.004	2.193**	0.015**
	[3.44]	[0.69]	[0.89]	[0.82]	[4.04]	[2.76]
Observations	65398	65446	22304	20443	51630	54203
Number of Persons	14133	14136	7101	6017	11821	12053
F-statistics / Wald-statistics	163.40	15.93	19.21	20.68	52.15	38.54
(p-value)	0.00	0.59	0.08	0.05	0.00	0.003
F-test / Wald-test on joint sign. of job satisfaction variables	52.92	2.40	5.16	2.82	10.72	6.67
(p-value)	0.00	0.30	0.08	0.24	0.00	0.04
Satisfaction variable significant in parsimonious model	Yes	No	Yes 5 % level	No	Yes	Yes

Notes: FGLS random effects estimation with clustering at the individual level.
Significant at 5%; ** significant at 1%, Robust t(z)-statistics in brackets.
Coefficients on year fixed effects are not reported.

Table 5: Problems with climbing stairs

	(1) level	(2) changes	(3)
		improvement	worsening
	outcome (0/1)	outcome (-1)	outcome (1)
Satisfaction with work / Δ	-0.261**	0.017	-0.058**
	[16.85]	[0.72]	[2.77]
ln (age) / Δ	2.955**	-18.335**	-20.065**
	[17.93]	[2.79]	[3.45]
ln (household income) / Δ	-0.560**	-0.112	0.011
	[7.72]	[0.70]	[0.08]
Married / Δ	0.335**	-0.278	0.001
	[3.26]	[0.59]	[0.00]
Widowed / Δ	0.658*	-0.146	-0.248
	[2.23]	[0.13]	[0.22]
Divorced / Δ	0.062	0.561	0.209
	[0.42]	[0.80]	[0.35]
Separated / Δ	0.038	-0.289	-0.017
	[0.17]	[0.47]	[0.03]
Constant	-6.740**	-1.766**	-1.451**
	[8.79]	[10.35]	[9.63]
Observations	17796	6437	
Number of Persons	10944	6437	
F-statistics / Wald-statistics	823.28	32.591	
(p-value)	0.00	0.003	
Satisfaction variable significant in parsimonious model	Yes	No	Yes

Notes: Logit random effects (column (1)) and multinomial logit estimation (columns (2) and (3).
* significant at 5%; ** significant at 1%, Robust t(z)-statistics in brackets. Coefficients on year fixed effects are not reported.

Table 6: Objective measures of health: disability

	(1)	(2)	(3)	(4)
	level		Change	
	being disabled	degree of disability	being disabled	degree of disability
Satisfaction with work / Δ	-0.203*	-0.214**	-0.003	-0.121*
	[2.47]	[3.02]	[1.58]	[2.05]
Job satisfaction squared / Δ	0.009	0.012*	0.00	0.007
	[1.24]	[2.16]	[1.30]	[1.58]
ln (age) / Δ	-9.285**	-17.303**	-0.399**	-16.523**
	[2.78]	[10.58]	[8.54]	[9.07]
ln (household income) / Δ	-0.27	-0.267**	-0.001	-0.017
	[1.36]	[3.05]	[0.30]	[0.21]
Married / Δ	0.162	0.151	0.004	0.145
	[0.36]	[1.07]	[0.88]	[0.94]
Widowed / Δ	0.226	-0.117	0.001	-0.477
	[0.18]	[0.14]	[0.04]	[0.36]
Divorced / Δ	0.537	0.192	0.020*	0.697*
	[0.93]	[0.75]	[2.33]	[2.30]
Separated / Δ	0.227	0.23	0.004	0.207
	[0.37]	[0.82]	[0.50]	[0.86]
Constant		71.369**	0.013**	0.614**
		[11.18]	[5.36]	[6.93]
Observations	5349	95284	65513	65377
Number of Persons	697	18837	14142	14133
F-statistics / Wald-statistics	250.578	15.816	100.781	94.558
(p-value)	0.00	0.00	0.00	0.00
F-test / Wald-test on joint sign. of job satisfaction variables	20.529	10.621	3.482	8.379
(p-value)	0.00	0.00	0.17	0.01
Satisfaction variable significant in parsimonious model	Yes	Yes	Yes	Yes
			5% level	

Notes: Conditional logit or FGLS estimation with individual fixed effects (levels). FGLS random effects (changes). Observations are clustered by person ID. * significant at 5%; ** significant at 1%, Robust t(z)-statistics in brackets. Coefficients on year fixed effects are not reported.

Table 7: Objective measures of health: BMI

	(1)	(2)	(3)	(4)	(5)	(6)
			Changes			
	weight	BMI	BMI2		BMI3	
			Outcome (-1)	Outcome (1)	Outcome (-1) returning to normal weight	Outcome (1) deviation from normal weight
			weight loss	weight gain		
Δ Satisfaction with work	0.043	0.018	-0.116**	-0.051	-0.107**	-0.047
	[1.13]	[1.36]	[2.79]	[1.66]	[2.86]	[1.44]
Δ ln(age)	44.069**	13.588**	-20.790	13.042	26.150**	-17.948
	[4.46]	[4.01]	[1.71]	[1.72]	[2.93]	[1.94]
Δ ln (household income)	-0.163	-0.085	0.083	0.261	0.275	0.143
	[0.64]	[0.97]	[0.29]	[1.28]	[1.11]	[0.64]
Δ Married	0.735	0.229	-0.319	-0.006	0.202	-0.501
	[1.13]	[1.03]	[0.38]	[0.01]	[0.36]	[0.74]
Δ Widowed	-2.19	-0.667	1.315	1.041	1.889	0.600
	[1.08]	[0.96]	[0.96]	[0.88]	[1.55]	[0.47]
Δ Divorced	-1.165	-0.430	2.417*	-0.231	1.827	0.275
	[1.09]	[1.17]	[2.18]	[0.28]	[1.82]	[0.28]
Δ Separated	-0.574	-0.195	1.214	-0.821	0.811	-0.167
	[0.62]	[0.62]	[1.31]	[1.04]	[0.97]	[0.20]
Constant	-0.182	-0.033	-3.150**	-3.326**	-4.180**	-2.630**
	[0.69]	[0.36]	[10.10]	[15.94]	[16.44]	[11.05]
Observations	6378	6375	6375		6375	
Number of Persons	6378	6375	6375		6375	
F-statistics / Wald-statistics	4.393	3.846	33.687		31.74	
(p-value)	0.00	0.00	0.002		0.004	
Satisfaction variable significant in parsimonious model	No	No	Yes	No	Yes	No

Notes: BMI is defined as height (in m) divided by weight squared. BMI2 takes on the value of '0' if the BMI indicates a normal weight, '1" overweight (BMI > 30) and '-1' underweight (BMI < 18.5).
BMI3 takes on the value of '1' if the respondent deviates strongly from the normal weight in any direction (based on BMI2), and '0' otherwise. The change variables based on BMI, BMI2, and BMI3 take then on the values (-1), (0) and (1) accordingly.
OLS and/or multinomial logit estimation.
* significant at 5%; ** significant at 1%, Robust t(z)-statistics in brackets.