

# The Interaction of Job Satisfaction, Job Search, and Job Changes. An Empirical Investigation with German Panel Data

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**Abstract** Using the rich data set of the German Socio-Economic Panel (GSOEP) this article analyzes the effects of job characteristics on job satisfaction as well as the conditions under which low job satisfaction leads to job search, and under which job search leads to job changes. Individual fixed effects are included into the analysis in order to hold unobserved heterogeneity constant. According to the empirical results, the strongest determinants of job satisfaction are relations with colleagues and supervisors, task diversity and job security. Furthermore, job satisfaction is an important determinant of the self-reported probability of job search, which in turn effectively predicts actual job changes. The effect of job search on the probability of changing jobs varies with job satisfaction and is strongest at low levels of job satisfaction. The effects of job dissatisfaction on job search and of job search on quits are stronger for workers with lower tenure, better educated workers, workers in the private sector and when the economy and labor market are in a good condition.

**Keywords** Job satisfaction · Job mobility · Job changes · Job search · Fixed effects

## 1 Introduction

This study analyzes the interdependence of job characteristics, job satisfaction and job changes. It draws on a German household panel data set providing detailed information on job characteristics. Most previous work has analyzed these aspects separately. A number of studies have looked at the determinants of job satisfaction (Warr 1999; Clark 2005; van Praag and Ferrer-i-Carbonel 2004; D’Addio et al. 2007; Böckerman and Ilmakunnas 2006). A key result of these studies is that non-pecuniary job aspects are very important determinants of job satisfaction. Other studies have analyzed the effect of job satisfaction

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on job mobility (Freeman 1978a; Clark et al. 1998, Akerlof et al. 1988; Clark 2001; Kristensen and Westergard-Nielsen 2004; Lévy-Garboua et al. 2007; Shields and Wheatley Price 2002; Böckerman and Ilmakunnas 2004; Griffeth et al. 2000). These studies have confirmed for different countries that job satisfaction reduces quitting, quit intentions, and job search.<sup>1</sup>

Currently, there is a lack of studies that combine these strands of the literature by jointly analyzing job characteristics, job satisfaction, job search and job mobility. An exception is a study by Böckerman and Ilmakunnas (2007). Using a Finnish data set, they find that job disamenities reduce job satisfaction, which in turn increases quit intentions and job changes. The existing literature in this context has furthermore neglected to analyze heterogeneous effects. In other words, it has not been analyzed how the effects of job satisfaction on job search, and of job search on job mobility differ according to socio-economic characteristics, the labor market situation, and the overall economic situation. Previous research has allowed for heterogeneous effects in this context only between men and women (Clark et al. 1998; Clark 2001; Kristensen and Westergard-Nielsen 2004). Moreover, while individual fixed effects have been included in the research on the determinants of job satisfaction (Ferrer-i-Carbonel and Frijters 2004) as well as in studies that analyze job mobility (for example as early as Freeman 1978b), most of the research that has looked at job satisfaction as a determinant of job search and job mobility has employed either pooled regressions or random-effects regressions (Clark et al. 1998; Clark 2001; Kristensen and Westergaard-Nielsen 2004; Lévy-Garboua et al. 2007; Freeman 1978a).<sup>2</sup> However, including fixed effects is especially important when subjective data, such as job satisfaction, are analyzed, because it can to some extent alleviate the problem of inter-personal non-comparability of subjective data.

To sum up, the contribution of the present analysis is threefold. First, it checks whether the results by Böckerman and Ilmakunnas (2007) with a Finnish data set can be confirmed for Germany. Second, the analysis adds to the literature by estimating heterogeneous effects of job satisfaction on job search, and of job search on job changes. Third, this article pays attention to individual fixed effects in order to investigate how taking into account unobserved heterogeneity affects the answers to the above-mentioned questions.

The article is organized as follows. Section 2 presents the theoretical considerations and the empirical model. Section 3 presents the data. Section 4 presents results, and Sect. 5 contains conclusions. An appendix contains details of the estimation method.

## 2 Theoretical Considerations and the Empirical Model

### 2.1 Job Satisfaction

As job satisfaction is related to objective job characteristics, it can be viewed as a proxy of on-the-job utility. This utility is likely to depend on pecuniary and non-pecuniary job

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<sup>1</sup> Job satisfaction has also been analyzed as a determinant of job changes within the same organization. Delfgaauw (2007) analyzed a Dutch data set and found that dissatisfaction of public sector employees with certain organization-specific job domains increased the probability of leaving the current employer, while dissatisfaction with job aspects that vary sufficiently within an organization can lead to job changes within the organization. However, the present analysis remains confined to job changes to a new employer.

<sup>2</sup> An exception is D'Addio et al. (2007), who find that including fixed-effects into the estimation affects the results importantly, and that the random-effects specification is rejected in favor of the fixed effects specification.

characteristics. From a theoretical viewpoint, Warr (1999) classified the job-related determinants of job satisfaction into 10 job features, these being personal control, opportunity for skill-use, job demands, variety, environmental clarity (including job security), income, physical security, supportive supervision, interpersonal contact, and a valued social position. The present analysis uses detailed data on job characteristics, which are similar to the dimensions proposed by Warr (1999). Table 1 gives an overview of the job characteristics included in the analysis. As a measure of job security, the type of contract is included among the regressors (dummy for a fixed-term contract), because Deloffre and Rioux (2004) have shown that the type of contract is a major determinant of the satisfaction with job security. Furthermore, a subjective measure of job security is also introduced into the analysis (worries about job security). This is useful, because this subjective measure may carry private information about the security of the job not yet captured by the type of contract. Such private information may be the economic situation of the firm or the individual risk of being laid off (Deloffre and Rioux 2004).

Self-reported job satisfaction as a proxy for utility is influenced not only by job outcomes, but also by subjective factors. Satisfaction with job outcomes is determined in an individual reference framework relative to the outcomes of relevant peer groups as well as relative to expectations, aspirations, and values (Warr 1999). Personality traits and other individual unobserved aspects therefore influence self-reported job satisfaction and hence need to be included in the analysis. Some of these subjective factors can be proxied by socio-demographic aspects, such as gender, schooling, age, etc. For example, highly educated workers may have higher aspirations and therefore may on average report lower satisfaction. Socio-demographic characteristics will therefore be included as regressors in the job satisfaction equation. However, not all the individual character traits are observed or can be proxied by observable variables. Furthermore, according to the set point model of happiness, individuals have their own long-run level of well-being, determined by genetic predispositions and personality, around which their well-being fluctuates according to more short-term life circumstances (Diener et al. 1999; Lykken and Tellegen 1996; Myers and Diener 1995). If the unobserved personality traits and genetic predispositions that influence job satisfaction are related to the observed characteristics, estimates of the effect of these characteristics on job satisfaction will be biased. This problem is especially relevant when both the dependent and the independent variable are subjective measures (Hamermesh 2004), because both then include a person-specific effect and the estimates are affected by this effect and do not reveal the true relationship of the underlying objective measures. It is therefore important to account for unobserved individual heterogeneity when estimating job satisfaction equations. Including individual fixed effects in the regression will hold time-invariant unobserved heterogeneity constant. These considerations related to the determinants of job satisfaction lead to the estimation of the following equation:

$$SATIS_{it} = x'_{it}\beta + e_{1i} + u_{1it}, \quad (1)$$

where  $SATIS_{it}$  denotes job satisfaction of individual  $i$  at time  $t$ ,  $x_{it}$  is the vector of explanatory variables,  $\beta$  is the corresponding vector of regression coefficients,  $e_{1i}$  is the individual fixed effect, and  $u_{1it}$  is the error term. Besides the job characteristics summarized in Table 1, the explanatory variables of the job satisfaction equation include the regional unemployment rate, a dummy variable for a public sector job, socioeconomic regressors such as gender, age, years of job tenure, years of education, job position, and a dummy for being new in the job. As further control variables, dummies for year, firm size and sector are included.

**Table 1** Overview of job characteristics

Variable	Surveyed	Wording
Activity corresponds to job	(A)	Is [your] position the same as the profession for which you were educated or trained?
Fringe benefits	(A)	Did you receive any of the following additional payments from your employer last year? (13th month salary, 14th month salary, Additional Christmas bonus, Vacation pay, Profit-sharing, premiums, bonuses, Other or 'No, I received none of these'.) What is your attitude towards your job security - are you concerned about it?
Some worries about job security	(A)	Somewhat concerned
Strong worries about job security	(A)	Very concerned
Fixed-term contract	(A)	Is your contract of employment for an unlimited or limited period? I would like to know more about work and the conditions at your place of employment. Please answer the following questions by stating whether it applies to your work completely, partly or not at all.
Conflicts, difficulties with supervisor	(B)	Do you often have conflicts and difficulties with your boss?
Exposed to adverse environment	(B)	Are you exposed to undesirable working conditions (cold, heat, wetness, chemicals, gases)?
Get along well with colleagues	(B)	Do you get along well with your colleagues?
Hard manual labor	(B)	Do you have to do hard manual labor at your job?
Stress	(B)	Does your work involve a high level of stress?
Independence	(C)	Do you decide yourself how to complete the tasks involved in your work?
Influence on pay and promotion of others	(C)	Do you have an influence in determining whether employees receive more pay or promotion?
Learning opportunities	(C)	Do you often learn something new on the job, something which is relevant for your career?
Shift work	(C)	Do you work the night shift or another type of special shift?
Strict control of performance	(C)	Is your work strictly monitored?
Task diversity	(C)	Is your job varied?
Subjective probability of promotion	(B)	How likely is it that the following career change will take place in your life within the next two years: receive a promotion at your current place of employment? Please estimate the probability of such a change according to a scale from 0 to 100.
Deviation of actual from desired work time	(D)	Difference of desired actual work time. Desired work time is taken from the question "If you could choose your own number of working hours, taking into account that your income would change according to the number of hours: How many hours would you want to work?"
Actual work time	(A)	How many hours do your actual working-hours consist of including possible over-time?

**Table 1** continued

Variable	Surveyed	Wording
Logarithm of net wage	(A)	How high was your income from employment last month? If you received extra income such as vacation pay or back pay, please do not include this. Please do include overtime pay. Fill in your net income, which means the sum after deduction of taxes, social security, and unemployment and health insurance.
Wage growth rate	(A)	=Logarithm of net wage [t] – Logarithm of net wage [t – 1]

(A) Yearly; (B) 1985, 1987, 1989, 1991 to 1994, 1996, 1998, 1999, 2001, 2003, 2005; (C) 1985, 1987, 1989, 1995, 2001; (D) yearly, except 1996

## 2.2 Job Search

In models of on-the-job search (Mortensen 1986; Mortensen and Pissarides 1999), employed workers engage in job search if the marginal return from searching exceeds its marginal cost. Search effort is adjusted so as to equate the marginal return and the marginal cost of searching. The marginal return increases if the difference between the utility derived from the current job and the expected utility from alternative jobs is high. The lower the utility from the current job (proxied by job satisfaction), the higher is the probability of finding alternative jobs of higher quality, and the higher is the probability of engaging in job search and of choosing a high level of search effort. Search costs, costs of job mobility, the time preference, and the payoff period of a new job (the remaining time up to retirement) also influence job search. From this theoretical framework, the following hypotheses on the effects of job satisfaction and socioeconomic characteristics can be derived. Older people are closer to retirement and have a shorter payoff period in the new job. They are therefore less likely to engage in on-the-job search. Labor market flows are known to respond to cyclical fluctuations. For example, Frederiksen and Westergaard-Nielsen (2007) estimate that an increase in growth in the economy increases flows into new jobs, and Erlinghagen and Knuth (2002) find for Germany that job entry and exit rates are procyclical, i.e. labor mobility is greater during upswings. A good labor market situation (high growth rates and low regional unemployment rates) increases the likelihood of finding good job offers and therefore can be expected to increase the probability of on-the-job search. In downswings, when job vacancies are generally lower, on-the-job search is less likely. However, a poor individual job situation, as opposed to poor labor market conditions in general, is likely to increase job search. The threat of losing one's job is likely to increase on-the-job search. A high individual level of education is likely to affect the chances of receiving outside job offers and makes job search more likely. In the public sector, outside job offers are likely to be less frequent than in the private sector, so that on-the-job search by public sector employees is likely to be lower. Finally, male and female workers may differ in their propensity to engage in on-the-job search. A dummy for gender is therefore also included among the determinants.

Human capital theory (Becker 1962) also provides an important argument for the determinants of job search. The longer an employee has worked for a given employer, the more firm-specific capital he/she has accumulated. Firm-specific capital designates those abilities of the worker that are of value to the current employer but which are of no value to different employers. Firm-specific capital therefore creates a wedge between the wage earned with the current employer and the wage that can be expected with a different

employer. From the view of human capital theory, long job tenure makes it less likely that a better-paying job with a different employer can be found and therefore lowers search effort and makes job search less likely.

One of the main aims of this article is to investigate how job satisfaction affects the probability of job search differently according to different circumstances. The job search equation accordingly not only includes job tenure, the growth rate of gross domestic product (GDP), the regional unemployment rate, subjective job insecurity, age, education, public sector affiliation, and gender as simple determinants of the probability of job search, but the interaction terms of these variables with job satisfaction are also included. The coefficients of the interaction terms indicate whether the effect of one regressor on the dependent variable depends on the values of another regressor (Wooldridge 2006, p. 204). For example, a negative coefficient for the interaction term of job satisfaction and education would imply that the effect of job satisfaction on job search is more negative (and hence stronger) for highly educated individuals than for less educated individuals.

It is important to control for unobserved heterogeneity in the job mobility regressions. If unobserved heterogeneity is correlated with the observed determinants of job search and job changes, the coefficients of the observed determinants are biased in a pooled regression. For example, there is an ongoing debate on whether the negative effect of tenure on job mobility is due to unobserved heterogeneity in mobility rates (Farber 1999). Self-selection of workers with different intrinsic mobility rates into jobs with different characteristics would lead to biased estimates in the framework of the present analysis. Holding fixed individual effects constant can alleviate these problems.

The job search equation therefore becomes:

$$SEARCH_{it} = \alpha_0 + \alpha_1 SATIS_{i,t-1} + \sum_{j=1}^l \gamma_j SATIS_{i,t-1} z_{jit} + c'_{it} \lambda + e_{2i} + u_{2it}, \quad (2)$$

where  $SEARCH_{it}$  denotes the self-reported probability of job search of individual  $i$  at time  $t$ . It is likely that job search influences contemporaneous job satisfaction. Including job satisfaction at time  $t$  as a regressor would therefore cause a simultaneity problem.<sup>3</sup> To avoid simultaneity, I include job satisfaction lagged by one period ( $SATIS_{i,t-1}$ ). The vector  $z_{jit}$  contains explanatory variables, which are interacted with lagged job satisfaction. These include gender, job tenure, the German national GDP growth rate, the regional unemployment rate, subjective job insecurity (some or strong worries about job security), age, education, and a dummy for a public sector job. All the regressors  $z_j$ , that were interacted with job satisfaction are also included in simple form (not interacted) in the regressor vector  $c_{it}$ . Besides these variables,  $c_{it}$  also includes age and dummies for year, sector, and firm size as control variables. The regression coefficients are  $\alpha_0$ ,  $\alpha_1$ ,  $\gamma_j$  ( $j = 1 \dots l$ ) and the vector  $\lambda$ , while  $e_{2i}$  is the individual fixed effect, and  $u_{2it}$  is the error term of the equation.

### 2.3 Job Changes

Kristensen and Westergaard-Nielsen (2004) have validated empirically that job search is a strong predictor of quits. However, whether job search leads to an actual job change depends on the circumstances. Of two individuals with the same probability of job search,

<sup>3</sup> Simultaneity arises when an explanatory variable is jointly determined with the dependent variable. Simultaneity biases the estimates of the structural coefficients (Wooldridge 2006, pp. 552–555).

the one who searches more intensively and who receives better job offers is more likely to change his/her job. Determinants of search effort and of the probability to receive a good job offer should therefore be included. Search effort is likely to be related to job satisfaction and job tenure, whereas the probability of receiving a good job offer is likely to depend on GDP growth, regional unemployment, work experience, education, and public sector affiliation. Hence, these are included as the determinants of job changes. As before, these determinants are included in simple form and as interaction terms, in this case interacted with the probability of job search. Gender is again included as a determinant to capture the different behavior of men and women. Individual fixed effects are also added to the analysis. The job change equation is

$$JOB\ CHANGE_{it} = \delta_0 + \delta_1 SEARCH_{it} + \sum_{j=1}^m \chi_j SEARCH_{it} z_{jit} + t'_{it} \kappa + e_{3i} + u_{3it}, \quad (3)$$

where the dependent variable  $JOB\ CHANGE_{it}$  is a dummy variable indicating whether an individual  $i$  changes his/her job between period  $t$  and  $t + 1$ . Throughout the analysis, only job changes initiated by the employee are considered.<sup>4</sup> The key explanatory variables are  $SEARCH_{it}$ , the self-reported probability of job search, as well as the interaction terms of  $SEARCH_{it}$  with other explanatory variables summarized in  $z_{jit}$ . These include job satisfaction, gender, job tenure, GDP growth, the regional unemployment rate, years of work experience, years of education, and a dummy for a public sector job. The remaining explanatory variables  $t_{it}$  also include these variables in their simple form as well as dummies for year, sector, and firm size as control variables. The regression coefficients are  $\delta_0$ ,  $\delta_1$ ,  $\chi_j$  ( $j = 1 \dots m$ ) and the vector  $\kappa$ , while  $e_{3i}$  is the individual fixed effect, and  $u_{3it}$  is the error term of the equation.

The detailed job characteristics that are determinants of job satisfaction in Eq. 1 are not included as determinants in the Eqs. 2 and 3, because I argue that job characteristics influence job search and job changes via utility, and utility is proxied by job satisfaction. Job satisfaction therefore embodies the job aspects that matter according to the preferences and the reference framework of the individual. Equations (1)–(3) form a system of three regression equations. Appendix A1 contains details of how this system is estimated.

The present analysis is limited, as not all factors that influence the decision to search for a job or to change a job can be included in the analysis. Omitted factors are satisfaction with the place or location of work, with local community services or with social contacts, and personal events, such as child birth, job changes of spouse, etc. These factors are not included in the model because of data restrictions, and because they are not central to the present analysis of the role of job satisfaction in explaining job search and of how job satisfaction and job search interact in explaining job changes.

### 3 Data

I used data from the German Socio-Economic panel (GSOEP) household survey, which contains a rich set of socioeconomic variables. The data cover the period from 1984 to

<sup>4</sup> Consequently, quits that lead to unemployment or withdrawals from the labor force are not considered. The reason is that they are not natural outcomes of job search, and job search is central to the analysis. Considering job changes initiated by the employee does not imply that these are voluntary separations. In particular, job changes occurring in anticipation of future job loss can be viewed as involuntary (Manski and Straub 2000).

2003. An overview of the structure of the GSOEP is provided by Wagner et al. (2007). I restrict the sample to employed West German workers between 16 and 60 years of age.

Job satisfaction of employed respondents is surveyed each year by the question “How satisfied are you today with your job? Please answer using the following scale [ranging from 0 to 10]: 0 means totally unhappy, 10 means totally happy.” The survey also contained different job characteristics. Some of them, such as wages, work time, and worries about job security are surveyed each year. The more detailed job characteristics, such as task diversity, hard manual labor, relations with colleagues, etc. have been surveyed only in recent years. Table 1 gives an overview of the job characteristics included in the analysis and presents the lists of questions associated with each characteristic.

The GSOEP survey also includes several questions about job mobility. In most years, there is a question on the subjective probability of job search. The wording is “How probable is it in the next two years that you will look for a new job?” The answer to the job search question is coded in 4 integers from ‘unlikely’ to ‘certain’.<sup>5</sup> Furthermore, there are retrospective questions on objective job mobility events. Respondents are asked whether there were any employment changes since 1 January of the preceding year and, if so, what types of change. I use the response option “I have started a new position with a different employer” to identify job changes. Respondents are also asked how the previous employment relationship was terminated. I use the response “My resignation” to restrict the job changes to those that are initiated by the employee.

Besides a set of socioeconomic control variables available in the GSOEP, the unemployment rates of the different Federal States and the national GDP growth rate as published by the German Federal Statistical Office are used in the analysis. Matching the unemployment rate at regional level to the micro data can magnify any bias in the estimates of the standard errors if there is within-region correlation of the error term (Moulton 1990). When estimating the job search and the job change equation, standard errors are therefore adjusted for clustering on regions.

For each of the three equations, job satisfaction, job search, and job changes, data are missing in some years, because the information has not been surveyed in each year. The sample sizes and the years on which the estimation of the respective equations are based are indicated in the results tables.

## 4 Results

### 4.1 Descriptive Statistics

Table 2 presents the descriptive statistics by gender for 21 job characteristics and overall job satisfaction. According to this report, West German workers seem on average to be satisfied with their jobs. Mean job satisfaction is about 7.3 on the ordinal scale, which ranges from 0 to 10. Judging from the mean of the ordinal job satisfaction variable, men report slightly higher job satisfaction than women, although the difference is small. With respect to the detailed job characteristics, men enjoy higher fringe benefits, more influence,

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<sup>5</sup> Since 1999, respondents are asked to indicate the probability in percent, choosing between 11 options ranging from 0%, 10%, 20% etc. up to 100%. I harmonize the reply options by recoding 0% as unlikely, 10%–50% as probably not, 60%–90% as probable, and 100% as certain. The recoding is chosen in such a way that in the years before and after the change of the reply options similar fractions of respondents are found in the four categories.



**Table 2** Descriptive statistics of job characteristics

Variable	Unit of measurement	Female	Male	Total			
		Mean	Mean	Mean	Std. Dev.	Min	Max
Job satisfaction	(d)	7.29	7.33	7.31	1.94	0	10
Activity corresponds to job	(a)	0.65	0.63	0.63	0.48	0	1
Fringe benefits	(a)	0.92	0.95	0.94	0.24	0	1
Some worries about job security	(a)	0.05	0.04	0.04	0.20	0	1
Strong worries about job security	(a)	0.29	0.33	0.31	0.46	0	1
Fixed-term contract	(a)	0.06	0.08	0.07	0.26	0	1
Conflicts, difficulties with supervisor	(a)	0.02	0.03	0.03	0.16	0	1
Exposed to adverse environment	(a)	0.07	0.22	0.17	0.37	0	1
Get along well with colleagues	(a)	0.80	0.79	0.80	0.40	0	1
Hard manual labor	(a)	0.09	0.14	0.12	0.32	0	1
Stress	(a)	0.27	0.31	0.30	0.46	0	1
Independence	(a)	0.39	0.40	0.40	0.49	0	1
Influence on pay and promotion of others	(c)	0.13	0.26	0.21	0.41	0	1
Learning opportunities	(a)	0.32	0.38	0.36	0.48	0	1
Shift work	(c)	0.14	0.20	0.18	0.38	0	1
Strict control of performance	(c)	0.45	0.52	0.50	0.50	0	1
Task diversity	(a)	0.58	0.67	0.64	0.48	0	1
Subjective probability of promotion	(b)	0.12	0.21	0.18	0.38	0	1
Deviation of actual from desired work time	Weekly hours	6.35	6.24	6.28	7.63	0	70
Actual work time	Weekly hours	34.66	43.36	40.14	9.90	1.00	80.00
Logarithm of net wage	Log monthly wage	6.75	7.31	7.11	0.52	5.00	9.07
Wage growth rate	Diff. log wage	0.07	0.05	0.06	0.21	-2.15	2.40

$N = 11,294$

(a) Fraction saying the job characteristic applies to their job

(b) Coded from 1 = unlikely to 4 = certain

(c) Fraction saying the job characteristic applies or partly applies to their job

(d) Coded in integers from 0 = totally unhappy to 10 = totally happy

learning and promotion opportunities, a higher task diversity and higher wages. But they also report more worries about job security, being more exposed to environmental risks, hard manual labor, stress, shift work, being more strictly controlled, and longer working hours. For the remaining job characteristics there are only small differences between men and women.

In the following sections, the estimation results of the Eqs. 1–3 are presented. The estimations will first be made without the individual fixed effects, and then fixed effects will be included. When fixed effects are included, the time-invariant characteristics (gender and education) are dropped. Age is also dropped in the fixed-effects estimations, because in a fixed-effects model age is perfectly collinear with the time dummies.

#### 4.2 The Effects of Job Characteristics on Job Satisfaction

Table 3 presents the effects of detailed job characteristics on job satisfaction. The first two columns refer to the pooled regressions, and the last column refers to the fixed-effects regression. Comparing the pooled ordered probit regression with the pooled linear regression, all effects are similar in sign and significance. In the present analysis, using a linear model instead of an ordered probit model does not affect the results significantly.

In the pooled regressions most effects of job characteristics on job satisfaction have the expected sign. Fringe benefits, good relations with colleagues, independence, influence, learning opportunities, task diversity, promotion opportunities, wage level, and wage growth increase job satisfaction. Perceived job insecurity, conflict with supervisors, adverse environmental effects, hard manual labor, stress, strict control at work, and a deviation of desired from actual work time reduce job satisfaction. The effects are statistically highly significant and continue to hold in the fixed-effects specification with the exception that hard manual labor is not statistically significant any more. These results are very similar to the results found using Finnish data by Böckerman and Ilmakunnas (2006). They also confirm that physical harm, physically demanding work, the social atmosphere in the workplace, having a voice and the existence of promotion prospect are important determinants of job satisfaction. By comparison with wages, wage growth and fringe benefits, some of the non-pecuniary job characteristics affect job satisfaction extremely strongly. Trade-offs can be computed by comparing the coefficients of different job characteristics. For example, the estimated fixed-effects model (last column of Table 3) predicts that if the relations with colleagues are not good, a wage rise of 110% is required to maintain the same level of job satisfaction as if relations with colleagues were good.<sup>6</sup> A lack of task diversity, strong worries about job security and conflicts with the supervisor are valued even more highly in terms of wages. The results match Clark's (2005) findings that good relations, job content and other nonpecuniary job aspects have a stronger effect on job satisfaction than income. Similarly, van Praag and Ferrer-i-Carbonel (2004) found that satisfaction with the work itself is more important than pay in determining overall job satisfaction.

In the pooled regression, somewhat counter-intuitively, the effect of shift work on job satisfaction is positive. This effect becomes insignificant once controlled for individual fixed effects. One possible interpretation of the fixed effect in the satisfaction equation is intrinsic satisfaction. For example, the fact that hard manual labor has a negative and statistically significant influence on job satisfaction in a pooled regression but no statistically significant effect in a fixed-effects regression suggests that intrinsically less satisfied workers seem to work in jobs with hard manual labor. In this context, "intrinsically less satisfied" means that a worker is less satisfied because of a time-invariant characteristic. This may be a subjective characteristic, such as a personality trait, or it may be an objective characteristic, such as the profession a worker works in, insofar as it is unobserved and time-constant.

Some characteristics have no statistically significant effect after holding the large number of job characteristics constant. These insignificant effects include the information whether the activity corresponds to the job that the worker was trained for, whether the job is a fixed-term job, and how long the actual working time is.

<sup>6</sup> In the fixed-effects specification, the coefficient of good relations with colleagues is 0.203, while that on the log wage is 0.275. This implies that the log wage would need to rise by  $0.203/0.275 = 0.74$  log points in order to compensate (hold job satisfaction constant) when relations with colleagues are bad instead of good. A rise of the log wage by 0.74 point is equal to a wage raise of about 110%, as  $\exp(0.74) - 1 = 1.1$

**Table 3** Job satisfaction regressions

Model	Pooled ordered probit	Pooled linear (a)	Fixed-effects linear (a)
Activity corresponds to job	0.008 (0.023)	0.008 (0.021)	-0.002 (0.040)
Fringe benefits	0.192*** (0.042)	0.179*** (0.039)	0.161** (0.065)
Some worries about job security	-0.275*** (0.023)	-0.256*** (0.021)	-0.183*** (0.031)
Strong worries about job security	-0.536*** (0.040)	-0.507*** (0.038)	-0.301*** (0.055)
Fixed-term contract	0.020 (0.050)	0.019 (0.046)	0.027 (0.075)
Conflicts with supervisor	-0.820*** (0.061)	-0.785*** (0.056)	-0.484*** (0.076)
Exposed to adverse environment	-0.103*** (0.030)	-0.096*** (0.028)	-0.119*** (0.042)
Good relation with colleagues	0.357*** (0.024)	0.337*** (0.023)	0.203*** (0.032)
Hard manual labor	-0.151*** (0.034)	-0.143*** (0.031)	-0.040 (0.048)
Stress	-0.252*** (0.023)	-0.236*** (0.021)	-0.167*** (0.032)
Independence	0.149*** (0.022)	0.136*** (0.020)	0.124*** (0.028)
Influence	0.095*** (0.027)	0.088*** (0.025)	0.135*** (0.038)
Learning opportunities	0.208*** (0.023)	0.193*** (0.021)	0.126*** (0.029)
Shift work	0.069** (0.028)	0.061** (0.026)	-0.050 (0.049)
Strict control of performance	-0.123*** (0.021)	-0.113*** (0.019)	-0.162*** (0.027)
Task diversity	0.360*** (0.022)	0.336*** (0.021)	0.231*** (0.030)
Subj. probability of promotion	0.115*** (0.027)	0.106*** (0.025)	0.105*** (0.033)
Deviation of actual from desired work time	-0.011*** (0.001)	-0.010*** (0.001)	-0.006*** (0.002)
Actual work time	-0.002 (0.001)	-0.001 (0.001)	-0.002 (0.002)
Logarithm of net wage	0.139*** (0.035)	0.128*** (0.033)	0.275*** (0.066)
Wage growth rate	0.143*** (0.047)	0.131*** (0.044)	0.181*** (0.061)
Regional unemployment rate	0.009** (0.004)	0.008** (0.004)	0.006 (0.014)
Public sector	0.045 (0.034)	0.042 (0.032)	-0.071 (0.066)
Gender: male	-0.056** (0.027)	-0.050** (0.025)	
Age	-0.007 (0.008)	-0.007 (0.008)	
Age squared/100	0.009 (0.010)	0.009 (0.010)	-0.011 (0.016)
Years of job tenure	-0.003 (0.004)	-0.002 (0.004)	-0.016*** (0.006)
Job tenure squared/100	0.001 (0.011)	-0.0001 (0.010)	0.015 (0.018)
Years of education	-0.035*** (0.005)	-0.032*** (0.005)	
Intermediate job position	-0.035 (0.029)	-0.033 (0.027)	0.071 (0.045)
High job position	-0.003 (0.044)	-0.001 (0.041)	0.036 (0.065)
Job move last year	0.058 (0.038)	0.052 (0.035)	0.063 (0.045)
Constant	-	0.018 (0.338)	-1.632** (0.712)
R <sup>2</sup>	-	0.179	-
N	11,294	11,294	11,294

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , standard errors clustered on regions in parentheses

Year, sector, and firm size dummies included

Data: GSOEP 1985, 1987, 1989, 1995, 2001

(a) Dependent variable “cardinalized” as described in Appendix A1

According to the effects of the control variables, highly educated workers are less satisfied, which may be explained by their higher aspirations. Male workers are less satisfied, a result which has been previously discussed by Clark (1997). Furthermore,

workers seem to be happier with their jobs when unemployment is high, at least in the pooled regression. As their own perceived job security is held constant in the regression, higher regional unemployment means that the relative position of a given worker improves, which can explain higher job satisfaction.<sup>7</sup> In the fixed-effects regression, there emerges a negative and significant effect of job tenure on job satisfaction. In a fixed-effect regression, the coefficient is only identified by the variation of tenure for a given individual, not by the variation of tenure between individuals. The negative effect therefore implies that job satisfaction tends to decrease in a given job. This may reflect a return to the baseline satisfaction as predicted by the set point model of happiness. The result obtained by Böckerman and Ilmakunnas (2006) that job satisfaction rises again after 8 years of job tenure is not confirmed in the dataset used here. Another interesting result is that after holding constant the broad set of job characteristics, there remains no statistical significant effect of being a public sector worker, age, job position, and whether a worker has just moved into a new job.

#### 4.3 The Effects of Job Satisfaction on Job Search

The subjective probability of job search is an ordinal variable coded in four categories (from “unlikely” to “certain”). The results of the job search Eq. 2 are presented in Table 4. As before, columns 1 and 2 present the pooled ordered probit and pooled linear regression, whereas column 3 presents the fixed-effects regression. The ordered probit regression shows that, as expected, job satisfaction is a strong predictor of job search. High job satisfaction reduces the probability of being in search of a new job. The influence of job satisfaction on job search is stronger for more educated workers, as the respective interaction term has a negative sign and is statistically significant. The influence of job satisfaction on the probability of job search is weaker when job tenure is high, when job insecurity is high, at a higher age, and in the public sector. These influences match the expectations that were discussed in Sect. 2. While subjective job security and its interaction with job satisfaction are highly significant, the interaction terms of job satisfaction with the regional unemployment rate and the national GDP growth rate are not statistically significant. One reason may be that the insecurity of a job is much more precisely captured by subjective job security than by aggregate measures such as unemployment and GDP growth rates. A further result is that the effect of satisfaction on job search is not significantly different between men and women.

Comparing the columns 1 and 2 of Table 4 reveals that the signs and statistical significance of the effects are not much altered when a linear model instead of an ordered probit model is used, with the sole exception of the interaction term of job satisfaction with perceived job insecurity. Including fixed effects into the analysis (column 3 of Table 4) leaves most of the results unchanged. However, the interaction effect of job satisfaction and education becomes insignificant.

#### 4.4 The Effects of Job Search on Job Changes

Table 5 reports the estimation of Eq. 3. In all three specifications presented in the table, a higher subjective probability of job search is associated with a higher probability of

<sup>7</sup> This result is in contrast to Clark’s (2003) finding, with British panel data, that higher unemployment reduces the well-being of employed (and increases the well-being of unemployed) individuals.

**Table 4** Job search regressions

Model	Pooled ordered probit	Pooled linear (a)	Fixed-effects linear (a)
Lagged job satisfaction	-0.157*** (0.017)	-0.139*** (0.011)	-0.095*** (0.020)
Lagged satisfaction × male	-0.008 (0.007)	-0.005 (0.004)	-0.004 (0.005)
Lagged satisfaction × tenure	0.001*** (0.001)	0.002*** (0.000)	0.002*** (0.000)
Lagged satisfaction × GDP growth	0.002 (0.002)	0.002 (0.001)	-0.001 (0.002)
Lagged satisfaction × regional unemployment	0.0001 (0.001)	0.0001 (0.001)	-0.001 (0.001)
Lagged satisfaction × job insecurity	0.019*** (0.007)	0.0001 (0.004)	0.004 (0.006)
Lagged satisfaction × age	0.001** (0.000)	0.002*** (0.000)	0.001*** (0.000)
Lagged satisfaction × education	-0.005*** (0.001)	-0.006*** (0.001)	-0.002 (0.001)
Lagged satisfaction × public sector	0.021** (0.009)	0.024*** (0.005)	0.018* (0.010)
Gender: male	0.143*** (0.046)	0.098*** (0.030)	
Age	0.026*** (0.004)	-0.019*** (0.003)	
Age squared/100	-0.086*** (0.006)	-0.022*** (0.004)	-0.029*** (0.008)
Years of job tenure	-0.060*** (0.004)	-0.047*** (0.003)	-0.005 (0.003)
Job tenure squared/100	0.090*** (0.011)	0.070*** (0.006)	0.021** (0.008)
Real GDP growth rate	-0.062 (0.048)	-0.037 (0.029)	0.021 (0.044)
Regional unemployment rate	-0.010 (0.008)	-0.007 (0.005)	-0.009 (0.006)
Subjective job insecurity	0.184*** (0.041)	0.193*** (0.025)	0.140*** (0.043)
Fixed-term contract	0.516*** (0.031)	0.391*** (0.025)	0.266*** (0.045)
Years of education	0.096*** (0.010)	0.085*** (0.007)	
Public sector	-0.397*** (0.079)	-0.319*** (0.050)	-0.162* (0.077)
Constant		0.690*** (0.116)	0.574*** (0.175)
$R^2$		0.249	0.053
$N$	36,952	36,952	36,952

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , standard errors clustered on regions in parentheses

Year, sector, and firm size dummies included

Data: GSOEP 1985, 1987, 1989, 1991, 1993, 1994, 1996, 1998, 1999, 2001, 2003, 2005

(a) Dependent variable “cardinalized” as described in Appendix A1

changing jobs, as was hypothesized in Sect. 2. However, the remaining effects differ quite substantially in some cases between the nonlinear probit model and the pooled linear model (columns 1 and 2 of the table). The most frequent difference is that effects are not significant in the probit model but become significant in the linear model. This is true of the interaction terms of job search with GDP growth, the regional unemployment rate, and the public sector, as well as for the regional unemployment rate and job satisfaction as regressors on their own. In the following, I interpret the results of the linear probability model, but it should be kept in mind that some of these results are not robust against employing the nonlinear probit model and should therefore be interpreted with caution.

With these reservations, the results of the pooled linear probability model suggest that the effect of job search on actual job changes is stronger when workers are more dissatisfied. Higher dissatisfaction hence increases search effort and raises the chances of finding a new job. However, job satisfaction as a regressor in simple form (not interacted with job

**Table 5** Job change regressions

Model	Pooled probit	Pooled OLS	Fixed-effects linear
Subj. probability of job search	0.215*** (0.066)	0.069*** (0.014)	0.065*** (0.021)
Search × satisfaction	-0.010* (0.006)	-0.004*** (0.001)	-0.005*** (0.001)
Search × male	-0.024 (0.023)	-0.000 (0.002)	-0.001 (0.005)
Search × tenure	0.012*** (0.003)	-0.002*** (0.000)	-0.001*** (0.000)
Search × GDP growth	-0.009 (0.007)	0.004*** (0.001)	0.003*** (0.001)
Search × regional unemployment	-0.002 (0.003)	-0.002*** (0.000)	-0.001 (0.001)
Search × experience	0.003*** (0.001)	0.000 (0.000)	-0.000 (0.000)
Search × education	0.015*** (0.004)	0.002** (0.001)	0.002** (0.001)
Search × public sector	-0.018 (0.022)	-0.020*** (0.003)	-0.018*** (0.004)
Job satisfaction	0.002 (0.017)	0.006*** (0.001)	0.004** (0.002)
Gender: male	0.115* (0.067)	0.004 (0.003)	
Years of job tenure	-0.141*** (0.010)	-0.003*** (0.000)	0.004*** (0.001)
Job tenure squared/100	0.288*** (0.024)	0.013*** (0.001)	0.006* (0.003)
Real GDP growth rate	-0.018 (0.139)	-0.011 (0.009)	-0.033*** (0.011)
Regional unemployment rate	-0.011 (0.007)	0.002** (0.001)	0.003* (0.001)
Years of work experience	0.029*** (0.006)	0.002*** (0.000)	-0.015*** (0.002)
Work experience squared/100	-0.133*** (0.016)	-0.005*** (0.001)	0.004 (0.003)
Years of education	-0.035*** (0.012)	-0.003*** (0.001)	
Public sector	-0.240*** (0.080)	0.018*** (0.003)	0.015* (0.009)
Constant	-1.376*** (0.226)	-0.024 (0.018)	0.065** (0.029)
$R^2$		0.073	0.052
$N$	47,175	47,175	47,175

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , standard errors clustered on regions in parentheses

Year, sector, and firm size dummies included

Data: GSOEP 1985, 1987, 1989, 1991, 1993, 1994, 1996, 1998, 1999, 2001, 2003, 2005

search) increases job changes.<sup>8</sup> Job satisfaction may increase job changes, because more satisfied people (holding search effort constant) give a better impression in job interviews and are therefore more likely to get a job. This interpretation is supported by empirical results from personnel psychology that show a link between success at job interviews and personality traits such as extraversion, self-esteem, etc. (Liden et al. 1993; Caldwell and Burger 1998; Cook et al. 2000), and a correlation of these personality traits with subjective well-being (Hayes and Joseph 2002; Emmons and Diener 1985). The findings of the present analysis suggest that the strong negative effects of job satisfaction on quitting identified by Clark et al. (1998) in data of the same source as used here is actually no direct effect but an indirect effect running via job search activities.

The results of the pooled linear probability model also suggest that the effect of job search on actual job changes is stronger when tenure is short, when GDP growth is high,

<sup>8</sup> As the previous analysis has shown, there is a strong association between job search and job satisfaction. Including both variables in the job change regression might potentially cause multicollinearity. I therefore also repeated the estimation excluding job satisfaction as a regressor from the job change equation (results available upon request). The magnitudes of coefficients, significance levels and the variance inflation factors computed after the linear regression were very similar. Multicollinearity due to the job satisfaction variable therefore does not seem to be harmful to the present regression.

when regional unemployment is low, when workers are better educated, and when workers are employed in the private sector. These results carry over to the fixed-effects regression. Some of the remaining regressors at first sight have counter-intuitive signs in the linear pooled and fixed-effects regressions. For example, GDP growth as a regressor on its own (not interacted with job search) decreases job changes, education as a regressor on its own decreases job changes, and public sector affiliation as a regressor on its own increases job changes. These regressors therefore seem to exert their expected effects on job changes through their interaction with search, but taken on their own, they show opposite effects. For some of these opposite effects, there are plausible explanations.

Better economic conditions (GDP growth) may not only improve the job-finding rate, but also improve the future expectations with the present employer, for example, regarding future promotions or wage rises and may therefore affect job changes negatively. If they search more, better educated people have higher probabilities of changing their jobs, because they may be more efficient in searching and are faced with more job opportunities. However, when job search and job satisfaction are held constant, they are apparently more attached to their present employer, probably because they have better opportunities of making a career with their present employer, and because employers put more effort into attaching highly educated workers to the firm than lower educated workers.

## 5 Conclusion

Using German panel data, this article has analyzed the effects of detailed job characteristics on job satisfaction as well as the conditions under which low job satisfaction leads to job search, and under which job search leads to job changes. In sum, the results of Böckerman and Ilmakunnas (2007) for Finland can be confirmed also for Germany: adverse job characteristics decrease job satisfaction, which in turn increases job search, which is an important predictor of actual job changes.

From a practical standpoint the results imply that firms that do not provide satisfactory working conditions run the risk of experiencing high rates of fluctuation. Non-pecuniary job aspects are found to be very important determinants of job satisfaction. For example, bad relations with colleagues depress job satisfaction so heavily that pay would need to be more than doubled to compensate for this effect. As a wage rise of this extent appears improbable, this implies that a bad atmosphere in the workplace can hardly in practice be compensated by higher wages. Task diversity, conflicts with supervisors, and worries about job security have equally strong effects. The remaining job characteristics analyzed also have considerable effects on job satisfaction.

The analysis has also shown that job satisfaction is a strong determinant of the probability of engaging in on-the-job search. The more an employee is dissatisfied, the more likely he/she is to search for a new job. This effect is stronger for workers with lower tenure, young workers and workers in the private sector. According to the results of pooled probit regressions, job security (a proxy for a good economic situation) leads to a stronger effect of dissatisfaction on search, but this result is not robust when a linear model is used and fixed effects are included in the analysis.

Finally, job search is found to be an important determinant of the probability of actually changing jobs. Job satisfaction modifies this relationship: at low levels of job satisfaction, the effect of job search on the probability of changing jobs is stronger. This can be interpreted in the way that dissatisfaction increases not only the probability of searching for a job but also the search effort. However, after holding the probability of search and the

search effort constant, job satisfaction was found to increase the probability of changing jobs. This seems to show that more satisfied people fare better in job interviews. The results also show that job search is more likely to lead to job changes when workers are employed in the private sector, when job tenure is low, economic conditions are good, and education is high. Especially those firms that rely on a highly educated workforce should therefore worry about the risk of high turnover due to unsatisfactory working conditions.

There remains scope for further research. As this study is based on household survey data, it was possible to include firm characteristics only by introducing firm size and sector as control variables. Furthermore, job security was not available as an objective piece of information at firm level but was only available as a subjective variable at individual level and as a highly aggregated variable at regional or national level. Further research into this topic should therefore aim at using linked employer–employee data providing much more detailed firm-level information. However, in Germany the widely used linked employer–employee LIAB data are currently based on linking firm survey data to individual registry data, which includes neither job satisfaction nor detailed characteristics of individual jobs.

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## Appendix A1: Details of the Estimation

Equations (1)–(3) form a recursive system of equations that can be estimated by treating each of the equations separately. The inclusion of fixed effects is not so straightforward in models for binary or more general ordinal dependent variables such as the (ordered) probit and the (ordered) logit model. The fixed-effects probit model leads to inconsistent parameter estimates (see for example Baltagi 2001, p. 206; Hsiao 2003, p. 194), and the fixed-effects logit model can only be estimated on the subsample of individuals that have longitudinal variation in the dependent variable, which leads to small sample sizes and selective samples.<sup>9</sup> To circumvent these problems, I applied linear fixed-effects models to the binary and to the ordinal dependent variables. In the case of multinomial ordered variables with more than two classes (job satisfaction and job search), I rescaled the dependent variable before applying the linear regression model as proposed by van Praag and Ferrer-i-Carbonel (2004). The rescaling makes the coefficients of the linear model comparable with the coefficients of the ordered probit model. Van Praag and Ferrer-i-Carbonel (2004) call this probit-adapted OLS (POLS). The rescaling consists of deriving those  $Z$ -values of a standard normal distribution that correspond to the cumulative frequencies of the different categories of the ordinal dependent variable. Suppose an ordinal variable  $x$  coded from 1 to 4 has the following distribution:  $P(x = 1) = 0.1$ ,  $P(x = 2) = 0.3$ ,  $P(x = 3) = 0.5$ , and  $P(x = 4) = 0.1$ . The cumulated frequencies are then  $P(x \leq 1) = 0.1$ ,  $P(x \leq 2) = 0.4$ ,  $P(x \leq 3) = 0.9$ , and  $P(x \leq 4) = 1$ , and the corresponding  $Z$ -values of the standard normal distribution are:  $Z_{0.1} = -1.28$ ,  $Z_{0.4} = -0.25$ ,

<sup>9</sup> If the job change equation is estimated by a fixed-effects logit model instead of the linear fixed-effects model, the sample size shrinks from 47,175 to 7,050 and individuals in the restricted sample differ systematically from those in the complete sample. For example, the sample quit rate rises from 0.035 to 0.21 and mean work experience in the sample falls from 21 to 17 years.



$Z_{0.9} = 1.28$ , and  $Z_1 = \infty$ . For a given value of the original ordinal variable, the value of the “cardinalized” dependent variable is constructed by considering the expectation of a standard normally distributed variable under the condition that it is in the interval between those two  $Z$ -values that correspond to the class of the value of the original variable. In the above example, this means that cardinalized variable  $x_c$  takes on the values:

$$x_c = \begin{cases} E(Z|Z < -1.28) = -\phi(-1.28)/\Phi(-1.28) & \text{if } x = 1 \\ E(Z|-1.28 < Z < -0.25) = [\phi(-1.28) - \phi(-0.25)]/[\Phi(-0.25) - \Phi(-1.28)] & \text{if } x = 2 \\ E(Z|-0.25 < Z < 1.28) = [\phi(-0.25) - \phi(1.28)]/[\Phi(1.28) - \Phi(-0.25)] & \text{if } x = 3 \\ E(Z|1.28 < Z) = \phi(1.28)/[1 - \Phi(1.28)] & \text{if } x = 4 \end{cases}$$

where  $Z$  is a standard normal random variable,  $\phi$  being the standard normal probability density function, and  $\Phi$  being the standard normal cumulative density function, which leads to:

$$x_c = \begin{cases} -1.75 & \text{if } x = 1 \\ -0.70 & \text{if } x = 2 \\ .42 & \text{if } x = 3 \\ 1.75 & \text{if } x = 4 \end{cases}$$

In principle, I follow this approach but I replace the  $Z$ -values from the standard normal distribution by the cutoff points from the ordered probit regression instead. I prefer this approach because it uses the information of the whole model and not only the frequency distribution of the dependent variable for the re-scaling.

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