

Knowledge Workers and Job Satisfaction: Evidence from Europe

Clara Viñas-Bardolet¹ · Joan Torrent-Sellens¹ · Mònica Guillen-Royo²

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Abstract This article analyzes the determinants of job satisfaction among knowledge workers (KWs). Data from a representative sample of 14,096 employed workers from the European Social Survey (2010) are used for an empirical analysis drawing on multiple binary logistic regression models. Job satisfaction among KWs in 21 EU countries is found to be explained better by non-financial characteristics than by monetary rewards. Career advancement opportunities, flexible work schedules, colleague support, and work–family relations, as well as job security, emerge as central in explaining job satisfaction among KWs in our sample. Unlike the case for other workers (OWs), opportunities for further training and career experience are not determinants of job satisfaction among KWs. Management divisions in companies employing KWs would be well-advised to take these points into account.

Keywords Job satisfaction · Knowledge work · Work organization · Work–life balance · Europe · ESS

Introduction

The increase in the use of knowledge in employment flows is transforming the labor market. This transformation also concerns the economic performance of knowledge workers (hereafter: KW)—persons who are defined by, inter alia, their capacity to perform non-routine tasks, their high levels of education, and their use of information and communications technologies (ICTs) at work (Brinkley 2006; Pyörriä 2007). Because of their impact on economic performance, KWs are increasingly included in

✉ Clara Viñas-Bardolet
cvinasb@uoc.edu

¹ Faculty of Economics and Business, Universitat Oberta de Catalunya, UOC, Avinguda Tibidabo, 39-43, 08035 Barcelona, Spain

² Centre for Technology, Innovation and Culture, University of Oslo, UiO, Postbox 1108, Blindern, 0317 Oslo, Norway

organizational strategic plans for improving productivity (Ramírez and Nembhard 2004, p. 602). In fact, authors like Drucker (2007) and Holtskog (2015) claim that KW productivity is a major management challenges of the twenty-first century.

The characteristics of job and work environments affect many activities people engage in, also in non-work-related domains. In general, job satisfaction is related to overall life satisfaction: indeed, the relationship seems to go both ways (Frey and Stutzer 2010). Moreover, job characteristics are closely related to health status. Thus, there will be less cost to employers and society, as well as greater productivity, if employers take into account the factors that contribute to worker satisfaction (Brinkley et al. 2010). This leads us to ask: Do KWs differ from OWs with regard to what determines their work satisfaction?

This article investigates the connections between *knowledge work* and *job satisfaction* in countries of the European Union. Despite the substantial body of research on job satisfaction, this sector has received limited attention in the empirical literature. Research has shown that KWs are allowed to exercise considerable autonomy and discretion in performing their tasks; moreover, they have better job security and higher wages than other kinds of workers (Huang 2011; Tampoe 1993). The latter are all factors consistently associated with greater job satisfaction (Torrent-Sellens et al. 2016; Wilczyńska et al. 2016). However, the literature has failed to inquire into other job characteristics related to work intensity, work organization and work–life balance, and their relevance for job satisfaction.

This study fills a gap in the literature by investigating whether KWs differ from OWs with regard to what determines their satisfaction at work. We focus on variables addressing five conceptual dimensions: *financial job characteristics*, *work organization*, *work intensity*, *working conditions*, and *work–life balance*. Using data from 21 EU countries in the European Social Survey (2010), we apply multiple binary logistic regression models to test our hypotheses. Results indicate clear differences between KWs and OWs with regard to predictors of job satisfaction. Among KWs, job satisfaction is better explained by non-financial aspects than by monetary reward. Further, factors linked to career advancement opportunities, flexible work schedules, and work-to-family conflict emerge as more relevant in explaining job satisfaction among KWs than OWs in this EU sample.

The article is structured as follows: [1] we describe the underlying literature background: studies on knowledge work and its relationships with job satisfaction; [2] we outline the characteristics of the European Social Survey (2010) and the data used in this article; [3] we develop the research hypotheses; [4] we present the empirical model and describe its main results; [5] we discuss our findings and offer some conclusions.

Literature Review

Knowledge Work

The relationship between technology, knowledge, and work is a much-discussed and controversial area in economic and social analysis (Saint-Paul 2008). Empirical studies confirm that employment generated in recent years has focused on people with more

education and training, especially in knowledge-intensive services, whereas employment losses tend to concentrate on the workforce in the manufacturing sector and on less-skilled workers (Baccini and Cioni 2010). Drawing on the skill-biased technological change (SBTC) approach, Handel (2007) holds that technology as such is not the sole cause of shifts in employment patterns. Workers' skills, capacities, and expertise; productive and organizational schemata; management decisions; labor relations systems; cultural and institutional settings and public policies—these are all interrelated factors that influence changes in the nature of employment. This means that the impacts of ICTs, for example, can only be understood in terms of their complex interaction with the social and economic system in which they are applied. However, as the nature of employment shifts towards more “knowledge work,” it is unclear if the *quality* of work is improving. As Brinkley et al. (2010, p. 6) ask: Does the knowledge economy mean more “good work”? Is knowledge work good for employees?

Definitions of “knowledge economy” and “knowledge work” remain highly contested. The Organisation for Economic Co-operation and Development (OECD) defines the knowledge economy in terms of knowledge-intensive industries based on ICT production or usage and/or high shares of highly educated labor (2003). Included in the OECD classification are high- and medium-tech manufacturing, high value-added “knowledge-intensive” market service industries and business services, education, and health. As Torrent-Sellens et al. (2016) note, this definition does not take into account the fact that the knowledge economy is present in *all* sectors, not only in knowledge-intensive industries.

Drucker (1959) was the first to use the term “knowledge workers,” defining them as those who work with intangible resources. He extended the term in 1994, defining knowledge workers as high-level workers who apply theoretical and analytical knowledge, acquired through formal education, to develop new products or services (Drucker 1994). In 1999, he again widened the term to include “knowledge technologists” (Drucker 1999). Sulek and Maruchek (1994, p. 5) use the term “knowledge worker” to refer to those who possess high levels of formal education, experience, and organizational status and are thus allowed to exercise considerable autonomy and discretion in performing their work. Others use “knowledge workers” as a term to describe a specific subgroup of highly skilled workers (Pernicka and Lücking 2012) or professionals (Alvesson 2001), whereas Olsen (2016) apply the term to the broader category of highly skilled workers, including professionals and highly technical occupations.

Most definitions and attempts at conceptualizing KWs are difficult to operationalize. We follow Brinkley's (2006) definition: (1) those who work in the three highest standard occupational classifications (managers, professionals, associate professionals); (2) those with high-level skills, indicated by university degrees or equivalent qualifications (bachelor's degree or higher); and (3) those who perform tasks that require expert thinking and complex communication skills involving the use of computers. We agree with Wilczyńska et al. (2016, p. 639) that, to minimize error, employees should be categorized as “knowledge workers” (hereafter: KWs) if and only if they fulfill all three conditions. The advantage of this definition is that it is standard, used in most studies on the topic and in macro-level accounts. It is also close to Huang's (2011) definition of KWs as a new type

of white-collar workers who generally possess higher educational degrees and greater skill levels or knowledge.

Job Satisfaction

Job satisfaction has been widely studied as an important part of overall life satisfaction and well-being (see, for instance, Veenhoven 1999). Economists like Hamermesh (1977) and Freeman (1978) began to analyze the factors that shape well-being at work by introducing *job satisfaction* as a subjective economic variable, enriching explanatory models of labor market behavior in economic research. Later, when studying the importance of the financial component of a work position, Clark and Oswald (1996) found that job satisfaction was inversely related to comparison wage rates, implying that workers' satisfaction decreased as the incomes of people they compared with increased. Salvatori (2010) and Clark (2005) confirmed the relatively insignificant role of wages, finding other variables—like health and safety, type of contract, or job status—to be important determinants of overall job satisfaction. The importance of financial remuneration for job satisfaction may vary according to the type of worker. Torrent et al. (2016), in their study of Spanish workers, found that net monthly income was a positive and highly significant variable in explaining job satisfaction only among other workers (OWs)—it was not significant for KWs. And, in their study of employment flexibility and job security in Poland, Wilczyńska et al. (2016) found that income was more important for job satisfaction among OWs than among KWs.

Non-financial job characteristics appear to influence job satisfaction considerably (Pichler and Wallace 2009). Hence, concerning work organization and working conditions, Salvatori (2010) and Sousa-Poza and Sousa-Poza (2000) agree that job-match quality, type of contract, and job status (working hours, flexibility, and security) are major determinants of overall job satisfaction. Other determinants, such as influence on company decision-making, colleague work support, or career advancement opportunities (Clark et al. 1996; Sousa-Poza and Sousa-Poza 2000), also appear important. In his study of the importance of the autonomy of professional workers (medical doctors, nurses, teachers, social workers), Mastekaasa (2011) found that, although autonomy was important for both samples (general population and professional workers), having interesting work, with varied work tasks and good social support, was more crucial to professional workers. Pichler and Wallace (2009), studying levels of job satisfaction at the individual level in 27 European countries, found that workers in higher occupational categories were more satisfied with their jobs. They concluded that job satisfaction can be explained by objective working conditions, the type of contract, job-related training, working hours, and by subjective evaluations of job characteristics (such as job security and supervisory responsibilities). Lastly, Tampoe (1993) holds that certain motivational needs—like organizational environments and personal growth that encourage operational autonomy and task achievement—contribute to well-being among KWs.

The above findings have been partially replicated in the few studies of job satisfaction specifically among KWs. For example, Huang (2011), comparing KWs and blue-collar workers in China and Japan, found that KWs share more motivational characteristics than do blue-collar workers, but report similar levels of job satisfaction. Additionally, KWs who experienced highly motivating workplace characteristics

(job complexity, problem solving, skill variety, and specialization) were likely to report higher levels of job satisfaction than OWs. Other studies employing Brinkley et al.'s (2010) definition have found that KWs report greater role challenges, autonomy, and social capital and less absenteeism and enjoy significantly better job quality and job satisfaction than other types of workers. Additionally, in their study of the relationship between job security, employment stability, and job satisfaction in Poland, Wilczyńska et al. (2016) found that KW job satisfaction was more influenced by job security. This emerged as the single most influential factor regarding job satisfaction; also, significant for KWs was work-time (schedule) flexibility. Similarly, Torrent-Sellens et al. (2016) found that the most relevant determinants of job satisfaction among KWs in Spain were non-financial factors—like workplace relations, career advancement opportunities, or influence on the company's decision-making.

Hypotheses

Drawing on the literature reviewed above, we develop several research hypotheses concerning the relationship between financial and non-financial characteristics of work and job satisfaction. In line with the widespread finding in the happiness literature on the diminishing marginal utility of income (Frey and Stutzer 2002) and the results on research on knowledge work (Torrent et al. 2016; Wilczyńska et al. 2016), we assume that once workers achieve high monetary compensation in their jobs, they will tend to give priority to non-financial aspects. KWs are known to have higher average wage levels than OWs. Our first hypothesis is that income matters less to KWs because they tend to earn more already.

H1: KW job satisfaction is less influenced by financial aspects—monthly salary in particular—than is the case with OWs.

Concerning non-financial job characteristics and drawing on the studies of Wilczyńska et al. (2016), Brinkley et al. (2010), Huang (2011), and Torrent-Sellens et al. (2016), it seems reasonable to expect KW job satisfaction to be more influenced by non-financial characteristics, like those linked to work organization, work intensity, and/or flexibility, than is the case for OWs. Thus, we test these additional hypotheses:

H2: KWs are more likely to be satisfied with jobs that offer career advancement opportunities, work colleague support, and influence in firm's decision-making than OW.

H3: KWs are more likely to be satisfied with jobs with flexible schedule arrangements than OW.

H4a: KWs are more likely to be satisfied with jobs that offer greater job security and opportunities for further training than OW.

H4b: OW job satisfaction is better explained by general career experience.

Further, in line with research indicating that work–family conflicts are more prevalent among highly skilled and professional workers (Gallie and Russell 2009; Ginnity and Calvert 2009), we hypothesize that:

H5: KW job satisfaction is better explained by work–life balance than is the case with OWs.

Data and Descriptive Statistics

Data Sources

Our data are drawn from the 2010 European Social Survey (ESS), specifically the ESS5 questionnaire. The *ESS* provides data from EU countries on attitudes, beliefs, and behaviors of EU citizens. In 2010, the rotating section of the survey included a module on “family, work, and well-being” that captures specific working conditions such as work intensity, job security, and work–life balance.

Out of the population included in the ESS survey, we focus on those aged 21 and over, in paid employment, living in private households (regardless of their nationality, citizenship, language, or legal status), in EU countries¹—Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom—at the time of data collection. Data collection was conducted between October 2010 and June 2011 through computer-assisted personal interviews. We excluded individuals for whom values were missing on the most relevant variables. The final sample contains 14,096 observations. Throughout the analysis, the data have weighted by national weights that correct for response biases within countries. This data set has been used several times for analyzing job satisfaction, for example, by Esser and Olsen (2012), Lange (2012), and Mysíková and Večerník (2013).

Following Brinkley (2006) and Wilczyńska et al. (2016), the definition of “knowledge worker” is articulated around three criteria: occupation classification, skills, and tasks. Regarding the data available from the 2010 European Social Survey, we consider KWs are seen as those who fulfill all three conditions: (1) whose educational achievement is a bachelor’s degree or higher (5 medium to 8 first digit of the ISCED code²); (2) whose occupational classification categorizes them as legislators, senior officials, and managers, (1 to 1319 ISCO-88 code³), professionals (2 to 2470 ISCO-88 code), technicians and associate professionals (3 to 3480 ISCO-88 code)—and who reported their main tasks as working with text and/or figures, reading, writing, counting, and computing.

Descriptive Statistics

Table 1 compares some features of KWs (7% of the total workforce) with OWs in EU countries. Job satisfaction was approximated by declared worker satisfaction, measured on a scale from 0 (extremely dissatisfied) to 10 (extremely satisfied), to the question: “How satisfied are you in your main job?”. As expected, the distribution of this

¹ We have excluded Finland due to a filter error in the interviewer phase (European Social Survey 2014, p. 76) of one of the relevant variables.

² A detailed list of ISCED codes can be found at the UNESCO website: <http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf> [accessed on 3/02/17]

³ A detailed list of ISCO-88 codes can be found at International Labour Organization website: <http://www.ilo.org/public/english/bureau/stat/isco/isco88/alpha.htm> [accessed on 3/02/17]

variable was significantly positively skewed. For that reason, for the regression analysis, we collapsed answers into two categories—satisfied and dissatisfied—using the sample mean (7.25) as a benchmark.

Table 2 shows the distribution of job satisfaction according to the full sample and the two subsamples. We see that 56.2% of KWs report being very satisfied (score above the sample mean, 8 to 10) compared to 52.2% of OWs. Job satisfaction mean score is 7.40 for KWs and 7.24 for OWs. Table 3 compares the means of the indicators for the two groups of workers; we see that the two groups differ substantially on most indicators.

Empirical Model

Drawing on the economics of happiness (Frey and Stutzer 2010), we present a microeconomic model based on the maximization of the standard utility function of a worker. In our model, job satisfaction depends on the individual's socio-demographic characteristics, as well as various factors like working conditions, work organization, work intensity, and work–life balance.

A binary logit regression model is employed in the econometric analysis. We assume that there are N workers ($i = 1 \dots N$), with a vector x_{ki} with observations on K independent variables related to workers' job satisfaction. Empirically, job satisfaction is treated as a latent response variable, y_i^* , and job satisfaction can be presented by the following equation:

$$y_i^* = \sum_{k=1}^K \beta_{ki} x_{ki} + \varepsilon_i \quad \varepsilon_i \sim \text{Logistic}(0, 1) \quad (1)$$

where ε_i is a normally distributed random error term with expected value 0, independently and identically distributed between surveyed workers i . Further, x_{ki} is a vector of independent variables that explain job satisfaction, and β_k are parameters that indicate the effect of x_k on y_i^* .

The discrete binary variable y_i takes the value 0 if the value of reported job satisfaction is lower than the sample median, and value 1 otherwise:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > d \\ 0 & \text{if } y_i^* \leq d \end{cases}$$

where d is the value of the sample mean, used as a benchmark.

For reasons explained above, the eleven scores of the original job satisfaction scale were regrouped into two (0, 1), using the sample mean (7.25) as a benchmark. Thus, for any worker who reported a score above the sample mean, a value of 1 was imputed; otherwise, it was 0. Moreover, using a binary job satisfaction variable removes some of the unexplained variation in the original scale. The analysis was conducted using SPSS 21.

Independent Variable

The set of independent variables used for explaining job satisfaction comprises individual and household characteristics, as well as financial and non-financial job characteristics. The age variable was not included in the model due to its high correlation with other

Table 1 Worker characteristics, EU countries, 2010

	Subsamples		
	Full sample	Knowledge workers (KWs)	Other workers (OWs)
Total employment ¹	14,096	957	13,139
%	100.0	6.8	93.2
Gender (%)			
Male	48.1	47.1	48.2
Female	51.9	52.9	51.8
Age (%)			
21 to 30	18.2	23.4	17.9
31 to 40	26.4	33.0	25.9
41 to 50	28.5	23.1	28.9
51 to 60	22.2	16.2	22.6
61 or older	4.7	4.3	4.7
Age of respondent (mean)	42	40	42
Education (%)			
Completed primary	4.9	0.0	5.3
Secondary	53.1	0.0	57.0
Post-secondary	13.2	0.0	14.2
University, higher education	28.8	100.0	23.6
Household (%)			
Couples with children	51.0	45.3	51.4
Couples without children	5.8	8.3	5.6
Separated, divorced, or widowed, with children	12.1	7.9	12.5
Separated, divorced, or widowed, no children	1.7	2.8	1.7
Single, with children	7.5	6.5	7.6
Single, no children	21.8	29.3	21.2
Labor relations system (%)			
Continental	23.9	24.1	23.9
Anglo-Saxon	11.4	9.5	11.5
Mediterranean	15.8	16.7	15.8
Scandinavian	9.3	12.7	9.0
Eastern Europe	39.6	36.9	39.9
Size of the firm (%)			
Under 10 workers	23.2	13.0	24.0
10 to 24 workers	19.3	17.5	19.5
25 to 99 workers	26.4	25.8	26.5
100 to 499 workers	17.9	22.6	17.6
500 or more workers	13.1	21.2	12.5
Economic sector (%)			
Agriculture and construction	7.8	3.2	8.1
Industry	20.0	12.8	20.5
Services	72.2	84.0	71.4

Table 1 (continued)

	Full sample	Subsamples	
		Knowledge workers (KWs)	Other workers (OWs)
Type of work contract (%)			
Unlimited	82.7	85.9	82.4
Limited	12.2	11.8	12.2
No contract	5.1	2.3	5.3
Monthly income: mean in euros (SE)	2233.23	3030.98	2174.23

Source: Authors' calculations from ESS5

¹ All figures refer to weighted data

variables, like type of household or career experience, which cover the life cycle stage of the worker, and experience. The non-financial job characteristics consist of 12 indicators that include the following dimensions: work organization, work intensity, working conditions, and work–life balance. Figure 1 presents the conceptual model, while Table 4 presents the descriptions of the independent variables.

Table 2 Overall job satisfaction, EU countries, 2010

	Full sample		Subsamples			
			KWs		OWs	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Original scale						
0 (Extremely dissatisfied)	71	0.5	3	0.3	68	0.5
1	94	0.7	6	0.6	88	0.7
2	194	1.4	9	0.9	185	1.4
3	364	2.6	25	2.6	339	2.6
4	417	3.0	19	2.0	398	3.0
5	1401	9.9	57	6.0	1344	10.2
6	1320	9.4	92	9.6	1228	9.3
7	2842	20.2	208	21.7	2634	20.0
8	3818	27.1	304	31.8	3514	26.7
9	2200	15.6	155	16.2	2045	15.6
10 (Extremely satisfied)	1375	9.8	79	8.3	1296	9.9
Total	14,096	100%	957	100.0%	13,139	100.0%
Grouped levels						
Satisfied (above the sample mean)	7393	52.4	538	56.2	6855	52.2
Dissatisfied (below the sample mean)	6703	47.6	419	43.8	6284	47.8
Total	14,096	100.0%	957	100.0%	13,139	100.0%
Job satisfaction (mean score)	7.25		7.40		7.24	
Job satisfaction (SD)	1.93		1.76		1.94	

Source: Authors' calculations from ESS5

SD standard deviation

Table 3 KWs versus OWs: results of the Wilcoxon Mann-Whitney test

	KWs	OWs	Difference (z score)
Job satisfaction	7.40	7.24	-2.228**
Gender (Male)	0.47	0.48	-0.623
Household			
Couples with children	0.45	0.51	-3.601***
Couples without children	0.08	0.06	-3.479***
Separated, divorced or widowed, with children	0.06	0.08	-1.276
Separated, divorced or widowed, no children	0.29	0.21	-5.851***
Single, with children	0.08	0.12	-4.168***
Single, no children	0.03	0.02	-2.471**
Labor relations system			
Continental	0.24	0.24	-0.195
Anglo-Saxon	0.10	0.12	-1.894
Mediterranean	0.17	0.16	-0.789
Scandinavian	0.13	0.09	-3.849***
Eastern Europe	0.37	0.40	-1.810
Economic sector			
Agriculture	0.00	0.02	-4.180***
Industry	0.13	0.20	-5.749***
Construction	0.03	0.06	-3.838***
Services	0.83	0.71	-8.028***
Company size	3.21	2.75	-10.230***
Monthly income	3.33	3.10	-15.114***
Influence on company decision-making	4.45	3.39	-11.131***
Career advancement opportunities (dummy)	0.40	0.30	-5.980***
Work effort (dummy)	0.70	0.70	-0.200
Health and safety risk at work (dummy)	0.06	0.22	-11.647***
Work-colleague support (dummy)	0.81	0.75	-3.884***
Working hours per month	149.13	149.07	-2.130**
Extra work hours (dummy)	0.09	0.12	-2.322**
Schedule flexibility (dummy)	0.41	0.19	-15.884***
Job security (dummy)	0.66	0.57	-5.412***
Participation in training activities (dummy)	0.59	0.37	-13.201***
General career experience	16.13	20.55	-11.318***
Work/family conflict	2.88	2.76	-4.632***

***1% significance level

**5% significance level

Results

Table 5 reports the results for the three models: first using the total sample (model 1), and then dividing the sample into two subsamples, one representing KW model 2 and

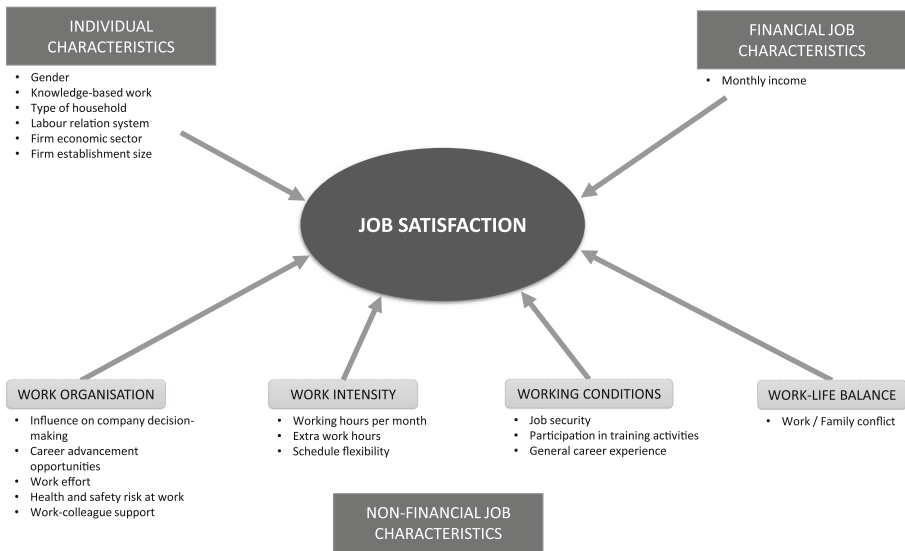


Fig. 1 Job satisfaction conceptual model. Source: Authors' own elaboration

the other representing OW model 3. For all regressions, we see that the hypothesis that the coefficients associated with each of the explanatory variables are jointly zero can be rejected (the p value for the chi-square test is smaller than 0.001 for each of the specifications). The goodness of fit (Cox and Snell and the Nagelkerke measures) is adequate in all three models, as the independent variables in the logistic model explain between 14 and 20% of the variation of job satisfaction, depending on the sample and goodness of fit indicator chosen. The Hosmer-Lemeshow test shows that all three models fit well and that the chosen model form is appropriate. The models correctly predict job satisfaction for 66% of the workers included in models 1, 2, and 3.

Model 1 considers socio-demographic features, location variables, the knowledge variable, and financial and non-financial job characteristic variables for the whole sample. Women declare higher job satisfaction than men—a common finding in such studies (Clark 1997; Wilczyńska et al. 2016). Job satisfaction is higher among couples with children than for other categories (single persons with/without children, or separated, divorced or widowed persons with/without children). These results resonate with those of previous studies: workers living together with partners report higher levels of job satisfaction than others (Clark and Oswald 1996; Green 2010; Lange 2012). Workers living in Anglo-Saxon⁴ countries display lower job satisfaction when compared to Continental countries. Further, workers in large companies show lower job satisfaction than those in small or micro-firms. When mean scores were calculated, KWs were found to be generally more satisfied than OWs (7.4 versus 7.2). However,

⁴ Assuming that national differences in institutional regimes may affect the level of job satisfaction, we define a new variable following Esser and Olsen (2012) and Holman's (2013) classification of five institutional regimes.

including job characteristics in the analysis led to the opposite result. That finding is not common in the literature, although most studies have focused on country-level data. For example, Torrent-Sellens et al. (2016) did not find the knowledge work variable to be significant when they controlled job satisfaction with non-financial job characteristics in Spain; Wilczyńska et al. (2016) reported higher KW job satisfaction only for those on temporary contracts, compared with OWs with the same type of contract. However, the consensus among previous studies may be due to the fact that the variables linked to job satisfaction were likely to differ between KWs and OWs. This is what we set out to explore in models 2 and 3.

Monthly income plays a positive role, in line with findings reported in other studies (Clark 2005; Wilczyńska et al. 2016), but the non-financial aspects of a job also emerge as important determinants of job satisfaction. Workers who have influence on company decision-making report higher job satisfaction than workers who do not, as also found by Mysíková and Večerník (2013). Career advancement opportunities, work effort, and work-colleague support are also positively linked to job satisfaction, whereas health and safety risks at work are associated with lower levels of job satisfaction. These findings partially echo those of Clark (1997) and by Sousa-Poza and Sousa-Poza (2000).

However, the number of working hours per month emerges as negatively associated with job satisfaction: those who say they work extra hours report higher levels of job satisfaction than others. The research of Pereira and Coelho (2013) provides contradictory evidence concerning the relationship between work hours and job satisfaction. This result might perhaps be related to the economic recession and the extra pay resulting from overtime work. Schedule flexibility, being able to decide when to start and finish at work, is found to be a positively significant determinant of job satisfaction. Further, with respect to working conditions, job security is positively linked to job satisfaction. This is in line with the views of Clark (1997), Wilczyńska et al. (2016), and Souza-Pouza's (2000) on the importance of perceiving a job as secure. Opportunities for attending further training programs have a positive effect on job satisfaction; also, Lange (2012) has found empirical support for this. General career experience is also positively linked to job satisfaction, in line with the results obtained by Mysíková and Večerník (2013). Moreover, the variable capturing work–life balance is shown to be a significant determinant of job satisfaction.

These findings are interesting when we compare the results of model 1 with the results of estimating the model for the subsamples of KWs and OWs. Most variables remain significant for OWs, but not for KWs, where labor relations, company size, and financial job characteristics emerge as non-significant determinants of job satisfaction. One reason for this difference lies in the sample size of the two groups, as only 7% of workers in our (total) sample can be defined as knowledge workers. However, certain differences are worth noting. Regarding the OW model (model 3), higher levels of education have a negative impact on job satisfaction, in line with findings by Lange (2012). Further, we find that career advancement is a more important determinant of job satisfaction for KWs than for OWs. By contrast, health and safety risks at work have a negative impact only on OW job satisfaction, perhaps because of the type of work and workplace involved: OWs are more likely to have jobs entailing such risks.

Table 4 Independent variables

Variable	Description	Obs	Mean	SD	Min	Max
Individual characteristics						
Male	1 if male	14,092	0.481	0.500	0	1
KW (dummy)	1 if knowledgeable worker	14,096	0.068	0.252	0	1
Type of household						
	Couples with children	14,096	0.505	0.500	0	1
	Couples without children	14,096	0.057	0.232	0	1
	Separated, divorced, or widowed, with children	14,096	0.075	0.263	0	1
	Separated, divorced, or widowed, no children	14,096	0.216	0.411	0	1
	Single, with children	14,096	0.120	0.325	0	1
	Single, no children	14,096	0.017	0.130	0	1
Labor relations system						
	Continental	14,096	0.239	0.426	0	1
	Anglo-Saxon	14,096	0.114	0.318	0	1
	Mediterranean	14,096	0.158	0.365	0	1
	Scandinavian	14,096	0.093	0.290	0	1
	Eastern Europe	14,096	0.396	0.489	0	1
Economic sector						
	Agriculture	14,096	0.019	0.136	0	1
	Industry	14,096	0.198	0.398	0	1
	Construction	14,096	0.058	0.234	0	1
	Services	14,096	0.716	0.451	0	1
Company size	Under 10 workers; 10 to 24 workers; 25 to 99 workers; 100 to 499 workers; 500 or more workers	13,964	2.645	0.620	1	5
Financial job characteristics						
Monthly income (log)	Based on questions “What is your usual gross pay before deductions for tax and insurance?” and “how long a period does the pay cover?” Logged income	9975	3.116	0.405	1.7	5.0

Table 4 (continued)

Variable	Description	Obs	Mean	SD	Min	Max
Work organization (non-financial job characteristics)						
Influence on company decision-making	Based on question “How much does the management allow you to influence policy decisions about the activities of the company?”	14,018	3.463	3.225	0	10
Career advancement opportunities (dummy)	1 if worker agrees/strongly agrees that his/her opportunities for advancement are good	13,789	0.311	0.463	0	1
Work effort (dummy)	1 if a worker agrees/strongly agrees that his/her job requires very hard work	14,054	0.701	0.458	0	1
Health and safety risk at work (dummy)	1 if a worker states that his/her health or safety is at risk because of his/her work	14,003	0.210	0.407	0	1
Work-colleague support (dummy)	1 if a worker states that s/he can get support and help from co-workers when needed	13,988	0.755	0.430	0	1
Work intensity (non-financial job characteristics)						
Working hours per month	We restricted the sample to persons working at least 40 h per month	13,928	148.824	29.456	40	210
Extra work hours (dummy)	Work involves working extra hours once a week or more	14,069	2.645	1.564	0	1
Schedule flexibility (dummy)	1 if a worker states that s/he can decide at what time to start and finish at work	14,034	0.210	0.407	0	1
Working conditions (non-financial job characteristics)						
Job security (dummy)	1 if a worker states that his/her job is secure	13,734	0.579	0.494	0	1
Participation in training activities (dummy)	1 if a worker states that s/he has taken a course or attended a lecture or conference to improve his/her knowledge or work skills during the last 12 months	14,073	0.385	0.487	0	1
General career experience	Total number of years (experience) in the labor market (in full or part-time work)	13,858	20.243	11.772	0	64
Work-life balance (non-financial job characteristics)						
Work/family conflict	Subjective indicator of work–life balance, based on the individual’s own assessment. Average of three measures: “How often do you keep worrying about work problems when you are not at work?”; “How often do you feel too tired after work to enjoy the things you would like to do at home?,” and “How often do you find that your job prevents you from spending the time you want with your partner or family?”	14,066	2.764	0.813	1	5

Source: Authors’ own elaboration

Turning to the work intensity dimension, we find that monthly working hours are negatively significant and working extra hours positively significant only for OWs. However, more research, with larger samples of KWs, is needed to confirm this. Schedule flexibility has a positive impact in both samples, but is more important for KW job satisfaction. Related to the working condition dimension, while job security significantly increases the chances of job satisfaction in both samples, opportunities for further training and general career experience, are significantly positive only for OWs. General career experience could be related to the age of KWs, who tend to be younger—and younger workers are often less satisfied, as Belfield and Harris (2002) report from their study of job satisfaction among young workers in the UK.

Concerning the work–life balance, the work/family conflict variable emerges as highly significant in both samples. These results are in line with the findings of Mysíková and Večerník (2013). Additionally, worrying about work when not on the job is one of the most powerful factors that lower job satisfaction. The odds of job dissatisfaction for KWs who report difficulties in enjoying family relations or life in general because they are worried about work are 39% higher than for KWs who do not, while for OWs, the odds are 37% higher. Moreover, as Gallie and Russell (2009) point out, long working hours, high work intensity, and low job security all have strongly negative effects on work–life conflict.

To analyze the robustness of the classification of knowledge work, Table 6 presents a set of three models of *soft KW* samples, deconstructing the knowledge work variable. Thus, model 4 categorizes KWs without accounting for the characteristic of belonging to the top three standard occupational classifications. Model 5 excludes from the categorization the condition concerning high-level skills, as indicated by academic degrees or equivalent qualifications; and model 6 does not include in the classification of knowledge work the characteristic describing the complexity of tasks performed in terms of expert thinking and complex communication skills.

As Table 6 shows, in model 4 (which excludes those working in the top three standard occupational classifications sample), KWs have the same non-financial job determinants of job satisfaction as do KWs classified by the three characteristics shown in Table 5. Working extra hours becomes positively significant and company size negatively significant for KWs when the classification of knowledge work does not account for all those with high-level skills (model 5). Model 6 (which excludes those who perform tasks requiring expert thinking and complex communication skills) is the model where KWs are more similar to OWs in Table 5 as to the predictors of job satisfaction. This indicates that the level of complexity of tasks performed with regard to the expertise and the communication skills required is what distinguishes KWs from OWs in our sample.

Conclusions

This article has investigated the determinants of job satisfaction for knowledge workers (KWs) and other workers (OWs) in European Union countries, using micro-data from the 2010 European Social Survey concerning 14,096 workers. Before elaborating on the conclusions of this study, we should note two types of limitations. The first

Table 5 Logit determinants of job satisfaction in EU countries, 2010

	Model (1) all sample		Model (2) KW ¹		Model (3) OW ²	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Individual characteristics						
Male	-0.248***	0.780	-0.609***	0.544	-0.228***	0.797
KW (dummy)	-0.292***	0.747				
Education (ref cat.: completed primary)						
Secondary					-0.403***	0.668
Post-secondary					-0.414***	0.661
University, higher education					-0.493***	0.611
Type of household (ref. category: couples with children)						
Couples without children	-0.215**	0.807	-0.619**	0.538	-0.179*	0.836
Separated, divorced, or widowed, with children	-0.423***	0.655	0.235	1.264	-0.468***	0.626
Separated, divorced, or widowed, no children	-0.186***	0.831	-0.500**	0.606	-0.163**	0.850
Single, with children	-0.207***	0.813	-0.108	0.898	-0.206***	0.814
Single, no children	-0.199	0.819	-0.807*	0.446	-0.138	0.871
Labor system (ref category: Continental)						
Anglo-Saxon	-0.456***	0.634	-0.106	0.900	-0.493***	0.611
Mediterranean	-0.096	0.909	0.621	1.861	-0.184**	0.832
Scandinavian	-0.016	0.984	-0.178	0.837	-0.001	0.999
Eastern Europe	0.097	1.102	0.259	1.296	0.148	1.160
Economic sector (ref category: agriculture)						
Industry	0.030	1.031	1.005	2.731	-0.005	0.995
Construction	0.082	1.086	0.044	1.045	0.050	1.052
Services	-0.121	0.886	0.682	1.977	-0.135	0.873

Table 5 (continued)

	Model (1) all sample		Model (2) KW ¹		Model (3) OW ²	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Company size	-0.063***	0.939	-0.008	0.992	-0.062***	0.940
Financial job characteristics						
Monthly income (log)	0.651***	1.917	0.227	1.255	0.753***	2.123
Work organization (non-financial job characteristics)						
Influence on company decision-making	0.071***	1.074	0.012	1.012	0.078***	1.081
Career advancement opportunities (dummy)	0.640***	1.896	0.971***	2.641	0.607***	1.834
Work effort (dummy)	0.107**	1.113	-0.266	0.767	0.133**	1.142
Health and safety risk at work (dummy)	-0.308***	0.735	-0.037	0.964	-0.326***	0.722
Work-colleague support (dummy)	0.633***	1.883	0.434*	1.543	0.651***	1.918
Work intensity (non-financial job characteristics)						
Working hours per month	-0.002***	0.998	0.003	1.003	-0.003***	0.997
Extra work hours (dummy)	0.272***	1.313	0.492	1.635	0.265***	1.303
Schedule flexibility (dummy)	0.321***	1.378	0.545***	1.724	0.316***	1.371
Working conditions (non-financial job characteristics)						
Job security (dummy)	0.520***	1.683	0.467**	1.594	0.532***	1.702
Participation in training activities (dummy)	0.114**	1.121	0.098	1.103	0.128***	1.137
General career experience	0.009***	1.009	0.003	1.003	0.007***	1.007
Work-life balance (non-financial job characteristics)						
Work/family conflict	-0.480***	0.619	-0.493***	0.611	-0.474***	0.626
Constant	-1.212***	0.298	-1.314	0.269	-1.100***	0.333
Statistics						
Observations	9135		646		8489	
Prob > chi2	0.000		0.000		0.000	

Table 5 (continued)

	Model (1) all sample		Model (2) KW ¹		Model (3) OW ²	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
-2 log likelihood	12,182.134		848.265		11,273.003	
Cox and Snell R square	0.140		0.143		0.145	
Nagelkerke R square	0.187		0.192		0.194	
Hosmer and Lemeshow test	0.200		0.113		0.233	
Observations correctly predicted (%)	66.2		66.2		66.4	

Source: Author's calculations based on ESS5 micro-data

All figures refer to weighted data

* $p < 0.1$

** $p < 0.05$

*** $p < 0.01$

¹ KWs

² OWs

Table 6 Logit determinants of job satisfaction, *soft* knowledge workers, EU countries, 2010

	Model 4 ¹	Odds ratio	Model 5 ²	Odds ratio	Model 6 ³	Odds ratio
	Coefficient		Coefficient		Coefficient	
Individual characteristics						
Male	-0.413**	0.662	-0.418***	0.658	-0.309***	0.735
Education (ref cat.: completed primary)						
Secondary			-0.161	0.851		
Post-secondary			-0.510	0.600		
University, higher education			-0.370	0.690		
Type of household (ref. category: couples with children)						
Couples without children	-0.327	0.721	-0.413*	0.662	-0.450***	0.637
Separated, divorced, or widowed, with children	0.372	1.451	-0.153	0.858	-0.524***	0.592
Separated, divorced, or widowed, no children	-0.455**	0.634	-0.271	0.762	-0.436***	0.646
Single, with children	-0.152	0.859	-0.137	0.872	-0.121	0.886
Single, no children	-0.674	0.510	-0.299	0.741	0.055	1.057
Labor system (ref category: Continental)						
Anglo-Saxon	-0.340	0.712	-0.314*	0.731	-0.154	0.857
Mediterranean	0.562**	1.754	0.487**	1.628	-0.077	0.926
Scandinavian	-0.163	0.849	-0.225	0.798	-0.070	0.932
East European	0.405	1.500	0.230	1.259	0.280	1.324
Economic sector (ref category: agriculture)						
Industry	0.984	2.675	0.348	1.416	-0.150	0.861
Construction	0.644	1.905	-0.140	0.869	-0.816	0.442
Services	0.687	1.987	-0.067	0.935	-0.046	0.955
Company size	0.014	1.014	-0.144***	0.866	-0.093**	0.911

Table 6 (continued)

	Model 4 ¹ Coefficient	Odds ratio	Model 5 ² Coefficient	Odds ratio	Model 6 ³ Coefficient	Odds ratio
Financial job characteristics						
Monthly income (log)	0.348	1.416	0.474	1.606	0.597***	1.816
Work organization (non-financial job characteristics)	0.044	1.045	0.024	1.025	0.0480***	1.049
Influence on company decision-making	1.050***	2.856	0.610***	1.841	0.837***	2.310
Career advancement opportunities (dummy)	-0.186	0.830	-0.108	0.898	0.174	1.190
Work effort (dummy)	-0.216	0.806	0.165	1.179	-0.430***	0.651
Health and safety risk at work (dummy)	0.411*	1.509	0.515***	1.674	0.656***	1.927
Work-colleague support (dummy)						
Work intensity (non-financial job char.)						
Working hours per month	-0.002	0.998	0.003	1.003	-0.002	0.998
Extra work hours (dummy)	0.508	1.662	0.788***	2.200	0.426***	1.531
Schedule flexibility (dummy)	0.579***	1.785	0.819***	2.267	0.300***	1.350
Working conditions (non-financial job char.)						
Job security (dummy)	0.383**	1.467	0.286**	1.332	0.385***	1.470
Participation in training activities (dummy)	0.116	1.123	0.022	1.023	-0.047	0.954
Career general experience	0.001	1.001	0.009	1.009	0.008	1.008
Reconciling work/family life (non-financial job char.)						
Work/family conflict	-0.315***	0.730	-0.438***	0.645	-0.637***	0.529
Constant	-1.732	0.177	-0.808	0.446	-0.405	0.667
Statistics						
Observations	751		1061		2252	
Prob > chi2	0.000		0.000		0.000	
-2 log likelihood	976.934		1481.607		2812.485	

Table 6 (continued)

	Model 4 ¹ Coefficient	Odds ratio	Model 5 ² Coefficient	Odds ratio	Model 6 ³ Coefficient	Odds ratio
Cox and Snell R square	0.141		0.124		0.141	
Nagelkerke R square	0.189		0.165		0.191	
Hosmer and Lemeshow test	0.885		0.039		0.007	
Observations correctly predicted (%)	66.5		66.2		67.2	

¹ KWs, excluding all those who work in the top three standard occupational classifications sample

² KWs, excluding all those with high-level skills, indicated by academic degrees or equivalent qualifications

³ KWs, excluding all those who perform tasks that require expert thinking and complex communication

Source: Author's calculations based on ESS5 micro-data

All figures refer to weighted data

* $p < 0.1$

** $p < 0.05$

*** $p < 0.01$

concerns the relatively small percentage in changes in well-being explained by socio-economic, demographic, and organizational variables, which gives only a partial picture of the factors that matter for the subjective well-being of workers. The second links to the problem of endogeneity: when well-being is studied with cross-sectional data, it is difficult to account for unobserved characteristics that may influence both dependent and independent variables, thus reducing the possibility of interpreting results in causal terms (Ferrer-i-Carbonell and Frijters 2004).

Our aim was to explore the variables that can explain job satisfaction for KWs and OWs. As predicted, we find that monthly income plays an important role only for job satisfaction among OWs and is not significantly related to KW job satisfaction: this shows support for *H1*. This finding is in line with Wilczyńska et al.' (2016) study in Poland as well as with findings in the happiness literature on the diminishing marginal utility of income (Frey and Stutzer 2002). As KWs tend to earn more than OWs, the importance they place on economic rewards when assessing job satisfaction is probably lower, and other non-financial characteristics of their job are likely to be central.

The importance of non-financial characteristics (work organization, work intensity, working conditions, and work–life balance) for the job satisfaction among KWs and OWs was explored through five hypotheses drawn from previous literature on the topic. Concerning work organization, although KW job satisfaction was influenced by career advancement opportunities and work-colleague support, having influence on company decision-making was not a significant predictor, indicating only partial support for *H2*. The opportunity for career advancement was the most important variable in explaining KW job satisfaction. This accords with Pyöriä's study (Pyöriä 2007) of trust and length of employee relations in Finland. That study found that meritocracy (the degree to which employees perceive that their rewards and career advancement are based on merit and not other forms such as nepotism or seniority) had a direct effect on organizational commitment among KWs. This is an interesting result that calls for further research: is the relative emphasis on this variable linked to factors like labor market characteristics, regulations, or gender issues? Another possible factor to consider following Carayannis and Campbell (2011) could be the national or regional innovation systems determining the capacity of workers to advance their position in firms or its corresponding clusters.

Regarding work intensity, our analysis confirmed that work-schedule flexibility is crucial for KW job satisfaction. For KWs who have flexible schedule arrangements, the odds of being satisfied with one's job are 72% higher than for KWs who do not have such arrangements, whereas for OWs, the odds are only 37% higher. This, together with the level of significance of this variable, supports our *H3*.

Related to working conditions, job security emerges as an important predictor of job satisfaction for KWs. Contrary to expectations, opportunities for further training were not found to be significantly related to KW job satisfaction. Following Huang (2011), a possible explanation could be that, in KW jobs, continued learning is usually deemed a prerequisite for growth and development and a requirement for successful performance. Thus, we do not find support for *H4a*. However, this does not mean that non-formal learning is not relevant for knowledge workers as knowledge acquisition can also come internally from interaction with customers (Santoro et al. 2016) and the local research communities (Del Giudice et al. 2013) and from the improved quality of firm and business levels information systems (Carayannis et al. 2017). Furthermore, we can

accept *H4b*, as OW job satisfaction is better explained by general career experience than is KW job satisfaction. As noted, this finding could be related to age: KWs tend to be younger than OWs—56% of our sample are under 40 years, against 44% for OWs.

According to *H5*, work–life balance will be more decisive for understanding job satisfaction among KWs than with OWs. Our results indicate that this is the case, as this balance emerges as the third most important determinant, among non-financial job characteristics. However, coefficient values are very similar between types of jobs, so we find only partial support for this hypothesis. The relatively higher importance of work–life balance for KWs resonates with the work of McGinnity and Calvert (2009), indicating that professionals work longer hours and experience more work pressure than other groups. The increase in women’s participation in the labor force, particularly in knowledge work, could also have influenced our findings.

KWs are a very diverse group, ranging from employees who attend frequent refresher courses and training (and enjoy high levels of autonomy, and are committed to their work) to those who experience considerable techno-stress, working long hours with precarious and temporary contracts. These divergent situations and experiences of KWs must be disentangled in order to fully understand and respect the complexity of employment relations in highly skilled work. This diversity calls for further examination in future studies of KWs. One approach could be through cluster analysis, accounting for the relevant organizational and contractual categories that define the different types of KWs. Future research should deepen the analysis of job satisfaction, replicating the model differentiating by labor relation systems and by gender. Further research could also extend the findings of our study by focusing on job satisfaction among KWs in specific organizations or sectors.

Finally, our results indicate that managers seeking to improve the well-being of their employees should incorporate the growing body of evidence on the determinants of job satisfaction among KWs. For instance, interventions could address the work–life balance of these employees by providing greater flexibility in work schedules and with discussion of clear pathways for further promotion within the company. By contrast, measures directed towards OWs could focus on traditional labour issues, like providing lifelong training opportunities, protecting against health and safety risks, and guaranteeing company compliance with legally binding agreements on working hours.

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