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# Job satisfaction of Spanish knowledge-based workers: Characterization and determinants

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**Abstract**

The aim of the working paper is to address the characterization and determinants of job satisfaction for knowledge-based workers in Spain. To do this, micro data of 8,061 workers from the 2010 Survey of Quality of Life at Work was used for empirical analysis. Regarding job satisfaction, the variable was approximated by declared worker satisfaction, measured on a scale of 0 to 10, from total dissatisfaction to complete satisfaction. It is observed that only a small fraction of Spanish workers are explicitly dissatisfied. 61.3% of knowledge-based workers report very satisfied job satisfaction (levels 8 to 10). 41.4% of the less knowledge-based report satisfied job satisfaction (levels 5 to 7). An ordered probit model, which is designed to model the choice between discrete alternatives, was preferred for the determinants analysis. Evidence suggests that financial and non-financial (work organisation and work intensity) job dimensions are the most important determinants of knowledge-based workers satisfaction in Spain. In particular, job satisfaction in knowledge-based workers is basically explained by satisfaction with salary, level of motivation, career advancement, manager's evaluation, relationships between managers and employees, satisfaction with working hours, and satisfaction with job security. Additionally, stress and risk levels have negative effects.

**Keywords**

Knowledge-based work, Job satisfaction, Work Organisation, Work intensity, Ordered-probit model, Micro-data, Spain.

# Introduction

Currently, economic activity is undergoing a process of profound transformation, which we can summarise as having started with the migration from an industrial economy towards a new structure characterised by the decisive importance of knowledge streams. This process of disruptive change is, in fact, characterised by: 1) interconnection over a network; 2) investment, falling prices and the persistent and innovative use of information and communication technologies (ICT); and 3) the increasing presence of knowledge streams in the economic flows, within a context dominated by the globalisation of economic relations. There has been a consensus to identify this process of transition from an industrial economy towards a knowledge-based economy (Pérez 2002; Castells 2004; Foray 2004; Rooney et al. 2005; Dolfsma and Soete 2006; Torrent-Sellens 2012).

The increase in the use of ICT and knowledge in employment flows is likely to have changed the labour market in many dimensions. It has been found that ICT users hold jobs of higher quality and earn substantially higher wages than non-users. In addition, ICT is particularly used by more highly educated workers, suggesting that skill advantages play a crucial role in explaining employment structure and wages. Thus, it is still unclear whether these observed best jobs or higher wages are a result of ICT skills, or whether there is other sources underlying these occupational and wages differentials (Borghans and Ter Weel 2005). What is clear is that the adoption of ICT has been accompanied by an increase in cognitive demands, autonomy improvements, hierarchical control reductions, job quality increases and better wages (Autor et al. 2003). However, can we affirm that with the adoption of ICT and knowledge streams, do we feel happier at work? Which are the determinants or explanatory factors of job satisfaction for knowledge-based workers? These are the questions that we explore in this paper.

In Spain, the proportion of knowledge-intensive private work rose from 15.7% in 2000 to 16.2% in 2008 (OECD 2011). Despite upward this trend, the levels continue to lag well behind European countries such as Luxemburg (31.5%), Belgium (27.5%) and Germany (27.3%). On the other hand, job satisfaction has become a topic of interest in the social sciences. It is recognized that around a quarter of our lives is spent at work. Therefore, economists and other social scientists attempt to understand people's satisfaction in the changing workplace.

Therefore, the aim of the paper is to address the determinants of job satisfaction for knowledge-based work in Spain. Job satisfaction was approximated by declared worker satisfaction, measured on a scale of 0 to 10, from total dissatisfaction to

complete satisfaction. Job satisfaction depends on worker attributes, financial and non-financial job characteristics. The considered non-financial dimensions are work organisation, working conditions, work intensity, labour relations, reconciling work-family life, health and safety, and skills and training. Regarding the empirical definition of knowledge-based employment, two criteria were taken into account: 1) university education; and 2) high-skilled occupations.

To do the empirical analysis, micro data from 8,061 workers and the 2010 Survey of Quality of Life at Work, prepared annually by the Spanish Ministry of Labour and Immigration, were used. An ordered probit model, which is designed to model the choice between discrete alternatives, was used for the econometric analysis.

The paper is divided into six sections. The next section presents an overview of studies on job satisfaction and knowledge-based work. The third section describes the data and descriptive analysis, while the fourth one deal with the empirical model and the fifth discusses the main findings. The paper ends with our conclusions and bibliography.

# 1.Literature review

In the past few decades there has been a great deal of consolidated and growing economic research studying the determinants of job satisfaction, as an important part of overall life satisfaction and wellbeing (Lawler 1973; Van Praag et al. 1980; Van Praag 1993; Veenhoven 1993, 1999, 2000).

In the 1970s, economists started to analyse the factors that shape wellbeing at work by introducing a variable of job satisfaction, enriching the explanatory models of labour market behaviour. Although wages were important to explain overall job satisfaction, this academic literature reports that other factors exist with equally or more important effects, especially workers individual characteristics, working conditions, work organisation, health and safety, among others (Hamermesh 1977). Also, Freeman (1978) confirmed that job satisfaction was a major determinant of labour market mobility, in part, as a result of capturing aspects of the workplace not captured by the current standard objective variables.

More recently, empirical studies have shown that there is a U-shaped relationship between age and job satisfaction, declining on average until workers reach their thirties (Clark and Oswald 1996; Clark et al. 1996). Different reasons can explain this U-shaped relationship. First of all, older workers are better rewarded. Secondly, the importance of changes in expectations with increasing age. Older workers are more satisfied not only because they are better rewarded but also because they expect less

or because they care less about such comparisons. In a cohort analysis, Jürges (2003) finds a strong U-shaped cohort effect with the 1955-60s born generation being the least satisfied, where the age effects are mostly positive, but hump-shaped rather than U-shaped.

This trend is also observed for both men and women separately, having the same shape and the minimum ages across sexes (Clark 1997). Although the evidence shows that women enjoy their jobs more than men (Clark 1996; Oswald 2002), no differences are found between genders in explaining job satisfaction (Gamero 2004). This implies that identical men and women with the same jobs and expectations would indeed report identical job satisfaction. Unlike what would be expected, the literature points out that difference exist in the labour values and in the individual or job characteristics between genders, concluding that women's expectations are argued to be lower than men's. Ahn and García (2004) suggest that women declare higher job satisfaction levels than men even when important job characteristics are controlled for. However, the sign of the effect reverses when job characteristics are included. Another reason can be deduced from the importance of social capital in the workplace, suggesting that several different sorts of trust have direct effects on wellbeing. Although female workers earn less than males, Helliwell and Huang (2011) found differences between genders. Female workers have equal or greater satisfaction with their jobs and their lives, attaching a lower value to income and a higher value to trust in management.

The empirical literature also confirms a negative relationship between level of education and job satisfaction, holding income constant (Ahn and García 2004; Grund and Sliwka 2004). This negative relationship can be explained by the levels of aspirations and the utility of work. When analysing job satisfaction among highly educated workers, Belfield and Harris (2002) conclude that job satisfaction is neutral across graduates of different education qualities. Other individual characteristics such as the type of households seem to be significant. In addition to this, married and widowed workers reported to be more satisfied with their work. The presence of three or more children at home also has positive effects on job satisfaction. On the other hand, the reported job satisfaction with respect to good health-perceived status or health satisfaction are highly and positively associated (Lévy–Garboua et al. 2007).

It is worth noting that wage is important for overall job satisfaction. Assuming that the perceived utility of a job does not only depend on the absolute wage, but also on wage increases, there is interesting literature that explores the impact of both wages and wage increases on job satisfaction. In a pioneering study comparing income, Clark and Oswald (1996) state that job satisfaction levels are inversely related to their comparison wage rates. Clark (1999) finds also positive effects of both wages and wage increases, but no significant effect of the absolute amount of the wage alone. Grund and Sliwka (2004) confirms, what it is empirically established, that current job

satisfaction rises with absolute wage level as well as with wage increases, having a significant positive impact on job satisfaction. In a life satisfaction study, Ahn (2005) found that household income affects positively individuals' life satisfaction while individual labour income loses its effect when other job characteristics, especially subjective job evaluation variables, are included.

Further research confirms that wage plays a relatively small role, but other variables like health and safety, job match quality, contract type, and job status (working hours, flexibility and security) are also important determinants of overall job satisfaction (Clark 2009; Salvatori 2010). Various studies show that workers who rate themselves as unhappy with their work are more likely to become absentees or quit their jobs than satisfied workers (Akerlof et al. 1988; Shields and Ward 2001; Jürges 2003). Green (2010) found asymmetric effects of both job satisfaction and job-related wellbeing on quitting: low wellbeing or job satisfaction was associated with greater quitting and high wellbeing or job satisfaction was not significantly associated with reduced quitting.

Based on the Spanish case, Muñoz de Bustillo et al. (2004) report that the most related variable to job satisfaction is income level. Gamero (2004, 2009) provides evidence that wages have higher influence on females' and immigrants' wellbeing and their employment choice is basically wage based. Gamero (2007), when studying the type of contract on perceived job satisfaction, concludes that temporary contracts have negative effects on overall workers' satisfaction. From a general point of view, Dueñas et al. (2010) point out that job satisfaction is the highest component for explaining labour relations at work, the type of work carried out, autonomy and job security. On the other hand, components with the lowest values of job satisfaction are non-wage earnings, the options of training in a firm and labour promotion.

Regarding knowledge-based work, the relationship between technology, knowledge and work is an old and controversial area of discussion in economic and social analysis (Sanders 2005; Atkinson 2008; Saint-Paul 2008). In the literature, basically, two analytical approaches have been consolidated. The first, collected under the name of optimistic theory of compensation, stress the positive long-term impact of technological change and knowledge on work. The pessimistic view of the theory of compensation emphasises the negative impact of technology and knowledge on large groups of people, who see their unqualified work in a precarious situation, or simply eliminated. So, in this scenario, it is possible to envision the end of work (Braverman et al. 1974; Rifkin 1995).

The impact of technological change on work is the combined result of innovations in different branches of production, labour market specific conditions (internal and external) and the institutional framework (OECD 1996, 1998). When a firm introduces an innovation leading to an occupation increase, the effects on the overall labour market are indirect and spread to other sectors. The occupation lost to technological change tends to materialise in the manufacturing labour force and in less-educated

workers, while the new jobs require more skill and focus on services. The final impact will be positive if the conditions necessary for an efficient transition are fulfilled, especially macroeconomic stability and microeconomic efficiency. Additionally, some constraints relative to the adaptation to a changing labour market and to the institutions affecting this market must also be met (Van Reenen 1997; Borghans and Ter Weel 2005). So, the relationship between technology, knowledge and work is complex enough to stay with the first pessimistic view emphasising labour savings, but also to affirm that the optimistic view is confirmed. A full analysis of the linkages between technology, knowledge and work must be approached from a broad conceptual framework that takes into account the different effects, direct and indirect, of this relationship (Vivarelli and Pianta 2000).

The empirical literature on the linkages between ICT change and job creation/destruction, confirms clearly the approximation, already existing in the literature, on skill-biased technical change (SBTC). Under this approach, the process of introducing technology that generates more trained workers and better skills, or that can only be used by these workers, is behind the observed increase of the employment of the most skilled workers, both in the firm as in the national and international domain (Krueger 1993; DiNardo and Pischke 1997; Autor et al. 1998; Machin and Van Reenen 1998; Berman and Machin 2000; Machin 2003). In the international empirical environment, several investigations have confirmed that, in recent years, the employment generated has focused on the sectors of the population with more education and training, especially in the knowledge intensive services, while employment losses tend to concentrate on the workforce in the manufacturing sector and less skilled workers (Beaudry and Green 2002; Farber 2003; Hall 2005; Heckman 2005; Kallerberg 2008; Baccini and Cioni 2010). Following this line, empirical evidence confirms that the link between ICT and knowledge uses at work has reinforced the role of other non-digital technological components in explaining work changes (Torrent-Sellens 2008).

Within these circumstances, it is not surprising that the skills and abilities of economic agents to process information and to generate, apply and disseminate knowledge acquired a significant relevance. The starting points of this literature are the strong correlation found between the adoption and the growing ICT use, the increase in trained labour and the change in the labour force skill requirements (López-Bassols 2002; Brynjolfsson and Hitt 2003; Heckman 2005; Heckman et al. 2005). Following this line, it has been confirmed empirically that ICT uses are linked with a relative reduction in work based on routine manual and routine cognitive tasks, and a relative increase in work based on non-routine cognitive tasks (Autor et al. 2003). In this context, although the initial literature pointed to digital technological change at the core of work structure, giving the organisational and training changes a subsidiary role (Aghion et al. 1999), the subsequent investigation has been accumulating evidence that the establishment of complementary relationships between ICT, new forms of work organisation and job

training are the basis of work change (Bresnahan et al. 2002; Black and Lynch 2004; Foss 2005; Osterman 2006; Diaz and Torrent-Sellens 2008; Albertini and Leoni 2009).

Although the literature has shown that is a the link between ICT use, job creation in knowledge-intensive services, and job destruction in non-knowledge-intensive manufacturing; and also a link between ICT use, organisational change and job training in explaining work change, there is little evidence that integrates both results in a single model (Oort et al. 2009). In this sense, OECD (2001, 2003) defines the knowledge-intensive industries as all industries that generate and/or exploit new technology and knowledge to some extent, but some are more technology- and/or knowledge-intensive than others. To gauge the importance of technology and knowledge, it is useful to focus on the leading producers of high-technology goods and on the activities (including services) that are intensive users of high technology and/or have the relatively highly skilled workforce necessary to benefit fully from technological innovations. Following Cortada (1998), Brinkley (2006) and Torrent-Sellens and Ficapal (2009) we define knowledge-based work using information related to individual training and professional status. Thus a knowledge-based worker is characterised as having a university education and occupies a high professional level. We assume that the levels of knowledge use are associated with the intensity of ICT use.

A growing body of research suggests that ICT and knowledge streams are configured as a basic component in the transition process to an economy and knowledge-based society (Castells 2004; Torrent-Sellens 2004). However, although the relationship between ICT, knowledge and wellbeing seems significant, more specifically on job satisfaction, currently there is virtually no research linking these two areas.

Tampoe (1993) explored the motivational needs and organisational environments best suited to knowledge workers. Four motivators were identified: personal growth, operational autonomy, task achievement and money. Brian et al. (1997) focused on the knowledge workers teams. High levels of job motivation were associated with success of knowledge-based work teams. Most recent papers analyse the sources of perceived job quality (Handel 2005, Olsen et al. 2010) and obtain a wide range of factors (financial and non-financial determinants), including some indicators of knowledge-based work, such us training or ICT uses.

Finally, Green (2006) considers that among all forms of recent economic change, the development of the knowledge economy is the transformation, which has, apparently, the rosiest implications on the job quality of work life. Apart from any impact, the knowledge economy is directly beneficial for the quality of work life. Under the assumption that the quality of work employees influences their wellbeing, Brinkley (2006) find that a good job skills match was positively associated with: 1) high levels of job and life satisfaction; 2) good perceptions of the current job, and negatively associated with health interference with work. Workers who were not satisfied with

their jobs were more likely to perceive their posts as a way to pay the bills rather than feeling trapped in their jobs. Also the paper found that knowledge work is a divisive force in today's labour markets. Knowledge workers did report better overall health, more job role challenge, autonomy, social capital, job satisfaction and less absence than non-knowledge workers.

# 2. Data and descriptive statistics

The data used in this paper is drawn from the 2010 Quality of Working Life Survey (Encuesta de Calidad de Vida en el Trabajo, ECVT). The ECVT is a statistical survey conducted by the Ministry of Employment and Social Security of the Spanish Government. The survey allows us to link objective information, derived from the research of the situations and activities taking place in the working environment, with subjective information, based on the levels of satisfaction in relation to the performed job, the relationships that working people have at work, and the physical and emotional conditions resulting from the job itself. The ECVT provides information on the employment status and the family environment of the worker; the occupation or job place characteristics; job mobility; job satisfaction; the work organisation; collective bargaining; labour relations; working hours; compensation, training and job security; and work-life balance.

The population under study is the population aged 16 and over, residing in main family dwellings. The geographical scope is the entire Spanish territory. The sample size is 8,061 employed population in 2010, with a fraction of sampling [(n / N) * 1000] of 0.320, respectively. The survey collection was conducted during the last quarter of 2010 through computer-assisted telephone interviews. When it was not possible to locate a worker by phone, a personal interview was carried out. The validated questionnaire (Requena 2000) is divided into three main sections: socio-demographic data, employment status and quality of life at work (Ministry of Employment and Social Security 2010).

One key challenge is related to the empirical definition of knowledge-based work. It is recognised that there is a lack of agreement in the literature about what a knowledge worker is. In order to overcome this problem, Brinkley (2006) suggests that there are at least three ways of defining knowledge workers: 1) all those who work in the top three standard occupational classifications (managers, professionals, associate professionals); 2) all those with high level skills, indicated by degree or equivalent qualifications; and 3) all those who perform tasks that require expert thinking and complex communication skills with the assistance of computers. Given the available data from the Survey on Quality of Life at Work, the following two criteria were taken

simultaneously into account: university education and high-skilled occupation. For the former, it consisted of workers whose educational achievement was mid-level college or higher. The latter criterion, using the National Occupational Classification, considers business management and general government; technical, professional, scientific and intellectual; skilled agricultural and fishery workers, and artisans and skilled workers in manufacturing, construction and mining. It is a cross-sectorial approach and takes into account the first two above components mentioned. Table 1 compares some features of knowledge-based workers (17.0% of the total workforce) with less knowledge-based workers in Spain. Regarding age, both groups have an average of 40 years. A different pattern of job allocation is found according to gender. 52.8% of knowledge-based workers are woman. This participation accounts for 42.5% in the less knowledge-based workers. With respect to educational achievement, as expected, knowledge-based workers have a higher educational level and the other workers show a wider range of education levels.

**Table 1.** Comparison of workers characteristics in Spain. 2010

| | | Sub-samples | |
|---|---|---|---|
| | Full sample | Knowledge-based workers | Less knowledge-based workers |
| ***Total Employment***[1] | 18,409.625 | 3,136.412 | 15,273.213 |
| % | 100.0 | 17.0 | 83.0 |
| ***Sex (%)*** | | | |
| Man | 55.7 | 47.2 | 57.5 |
| Woman | 44.3 | 52.8 | 42.5 |
| ***Age (average in years)*** | 40.8 | 40.9 | 40.8 |
| ***Education (%)*** | | | |
| Primary | 13.9 | 0.0 | 16.8 |
| Compulsory secondary | 20.5 | 0.0 | 24.7 |
| Lower vocational and technical training | 12.9 | 0.0 | 15.6 |
| Upper vocational and technical training | 11.8 | 0.0 | 14.2 |
| Upper secondary general | 13.8 | 0.0 | 16.6 |
| Higher education: medium degree | 12.2 | 40.0 | 6.5 |
| Higher education: superior degree | 14.9 | 60.0 | 5.6 |
| ***Size of the firm (%)*** | | | |
| 1 worker | 10.7 | 5.9 | 11.7 |
| 2 to 9 workers | 25.0 | 14.7 | 27.2 |
| 10 to 49 workers | 18.2 | 14.9 | 18.8 |
| 50 to 249 workers | 13.5 | 14.3 | 13.3 |
| Over 250 workers | 32.6 | 50.2 | 29.0 |
| ***Economic Activity (%)*** | | | |
| Agriculture | 5.0 | 0.6 | 5.8 |
| Industry | 14.5 | 7.7 | 15.9 |
| Construction | 8.7 | 3.9 | 9.7 |
| Services | 71.9 | 87.9 | 68.6 |
| ***Professional situation (%)*** | | | |
| Public sector worker | 19.5 | 40.2 | 15.3 |
| Private sector worker | 61.8 | 41.3 | 66.0 |
| Entrepreneur, professional or self-employed | 17.2 | 18.0 | 17.0 |
| Other | 1.4 | 0.4 | 1.7 |

1. All figures refer to weighted data. Source: Authors' calculations.



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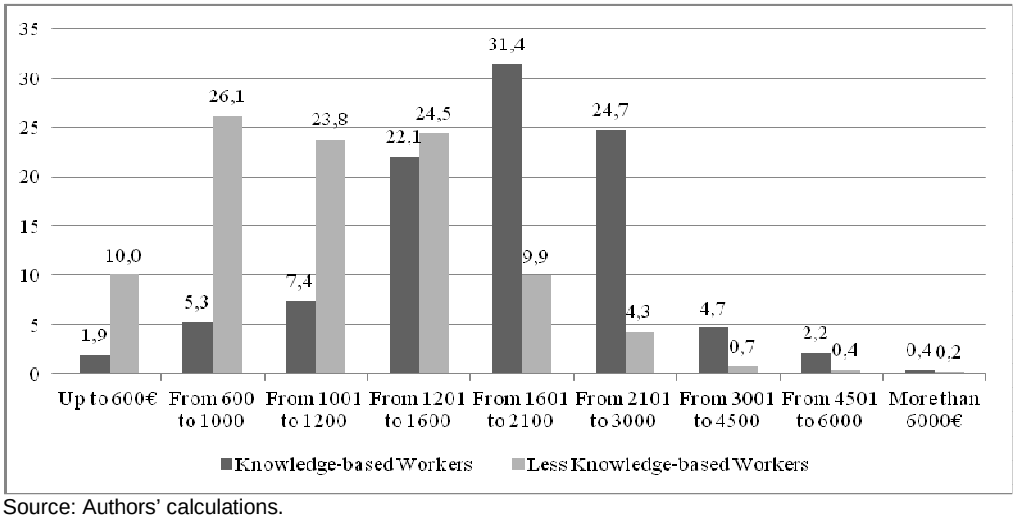
Focusing on size of the firm, a striking difference is identified. 64.5% of knowledge-based work is concentrated on firms with more than 50 workers, while in the less knowledge-based work is 42.3%. The allocation of workforce according to economic activity shows a similar pattern across groups. Knowledge-based employment is massively concentrated on the service sector, followed by industry, construction and a marginal presence in agriculture. Turning to the professional situation, a different distribution between public and private sector workers is observed. For knowledge-based work, private and public workers are distributed in a similar way (40.2% and 41.3%, respectively). On the other hand, for the less knowledge-based work, private workers account for 66.0% of total employment and public workers are 15.3%.

**Figure 1.** Spain's monthly income in Euros by knowledge-based and less knowledge-based workers (%). 2010




Source: Authors' calculations.

Figure 1 shows the distribution of knowledge-based workers and less knowledge-based workers according to diverse net monthly income intervals in Euros. There is a remarkable difference in the income distribution pattern across the groups. In general, knowledge-based workers earn the highest incomes and 56.1% of them are in the interval of 1,600 to 3,000 Euros. On the other hand, a majority of less knowledge-based workers (59.9%) earn less than 1,200 Euros. The estimation of Kendall's tau-c coefficient between the two variables was 0.339. This fact confirms a strong relationship between income and highly skilled and knowledgeable work (Iglesias et al. 2011).

Regarding job satisfaction, the variable was approximated by declared worker satisfaction, measured on a scale of 0 to 10, from total dissatisfaction to complete satisfaction. The specific question is: "Speaking of job satisfaction in general, could you situate on this scale? Where 0 is very dissatisfied and 10 is very satisfied". Table 2 shows the distribution of job satisfaction according to the full and sub-samples. It is

observed that only a small fraction of workers are explicitly dissatisfied. 61.3% of knowledge-based workers report very satisfied job satisfaction (levels 8 to 10). 41.4% of the less knowledge-based report satisfied job satisfaction (levels 5 to 7). Analyzing the job satisfaction score, the median value is around 8.

**Table 2.** Distribution of overall job satisfaction in Spain. 2010

| | | | Sub-samples | | | |
|---|---|---|---|---|---|---|
| | Full sample | | KBW[1] | | LKBW[2] | |
| | Number | % | Number | % | Number | % |
| ***Original Scale*** | | | | | | |
| 0 (fully unsatisfied) | 40 | 0.5 | 2 | 0.2 | 38 | 0.6 |
| 1 | 39 | 0.5 | 0 | 0.0 | 39 | 0.6 |
| 2 | 94 | 1.2 | 6 | 0.5 | 88 | 1.3 |
| 3 | 116 | 1.4 | 11 | 0.8 | 105 | 1.6 |
| 4 | 178 | 2.2 | 23 | 1.8 | 155 | 2.3 |
| 5 | 685 | 8.5 | 60 | 4.6 | 625 | 9.3 |
| 6 | 899 | 11.2 | 119 | 9.1 | 780 | 11.6 |
| 7 | 1,677 | 20.8 | 286 | 21.8 | 1,391 | 20.6 |
| 8 | 2,360 | 29.3 | 456 | 34.8 | 1,904 | 28.2 |
| 9 | 1,040 | 12.9 | 223 | 17.0 | 817 | 12.1 |
| 10 (fully satisfied) | 933 | 11.6 | 125 | 9.5 | 808 | 12.0 |
| Total | 8,061 | 100.0 | 1,311 | 100.0 | 6,750 | 100.0 |
| ***Grouped levels*** | | | | | | |
| Unsatisfied (0-4) | 467 | 5.8 | 42 | 3.2 | 425 | 6.3 |
| Satisfied (5-7) | 3,261 | 40.5 | 465 | 35.5 | 2,796 | 41.4 |
| Very satisfied (8-10) | 4,333 | 53.8 | 804 | 61.3 | 3,529 | 52.3 |
| ***Job satisfaction (median)*** | 8 | | 8 | | 8 | |

1. KBW: Knowledge-based workers. 2. LKBW: Less knowledge-based workers.
Source: Authors' calculations.

# 3. Empirical model

Following the tradition of happiness economics (Frey and Stutzer 2002), the section relies on a microeconomic model which assumes the maximization of a standard utility function of a worker. It is important to point out some methodological caveats associated to the empirical analysis of subjective wellbeing. One is related to the relative small percentage in changes in wellbeing explained by socio economic and demographic variables and the second one relates to the concern of causation (Ferrer-i-Carbonell and Frijters 2004). Therefore, job satisfaction, a proxy for subjective wellbeing, depends on worker attributes, financial and non-financial job characteristics: work organisation, working conditions, work intensity, labour relations, reconciling work/personal life, health and safety and skills and training.

This section empirically investigates the determinants of job satisfaction in Spain with special focus on knowledge-based workers. An ordered probit model, which is designed to model the choice between discrete alternatives, was preferred for the econometric analysis. In general, it is assumed that there are N workers ($i$ = 1….N), with a vector $x_{ki}$ containing observations on K independent variables that explain worker's job satisfaction. The empirical specification is formulated in terms of a latent response variable, $y_i^*$, which represents job satisfaction scales and is defined by the following structural equation:

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

Where:

$i$: The surveyed worker
$x_{ki}$: Independent variables that explain job satisfaction
$\beta_k$: Parameter that indicates the effect of $x_k$ on $y_i^*$
$\varepsilon_i$: A normally distributed independent error term for worker $i$

Let $y_i$ be a discrete random variable whose value ranges from 1 to 3. So, the job satisfaction variable was grouped in three categories for the model estimation (table 2): unsatisfied (1), satisfied (2) and very satisfied (3). Therefore, the ordered probit model with 3 alternatives is defined as follows:

$$y_i = \begin{cases} 1 & if \quad y_i^* < d_1 \\ 2 & if \quad d_1 \le y_i^* < d_2 \\ 3 & if \quad d_2 \le y_i^* < d_3 \end{cases}$$

Where $d_1<d_2<d_3$. The parameter d is called "threshold parameter", and the model is estimated using maximum likelihood estimation.

The set of independent variables posited to explain the level of job satisfaction comprises:

1) Worker characteristics such as age, age squared education and gender. The age variables denote the stage of the worker in his life cycle, as well as his experience. The effect of age may be non-linear, and hence the age squared variable was included. Education variables are captured by dummies (primary, secondary, upper secondary general, vocational and technical training and higher education).

2) A dummy variable for the knowledge-based worker.

3) Dummy variables for regions (Centre, South, Northeast, Northwest and East), being Madrid the reference variable.

4) Dummy variables for economic activities as agriculture, services, construction and industry (reference category).

5) Dummy variables referring to household types as couples with children, couples without children, single with children and single without children (reference category).

6) Financial job characteristics consist of the logarithm of monthly net income. Income was collected in nine categories and was transformed by taking logarithms of the midpoints. Other variables are satisfaction with salary and satisfaction with social benefits provided by firm.

7) Non-financial job characteristics, consisting of 25 indicators, include the following dimensions: work organisation, working conditions, work intensity, labour relations, reconciling work/family life, health and safety and skills and training (Diaz et al. 2013). Most of these job dimensions are subjective valuation of job characteristics. Respondents rated (from 0 to 10 scale) their satisfaction and these scales were introduced as regressors in the econometric models. The only dummy variable is participation in teamwork which takes the value of 1 if a worker takes part in teamwork. Two indexes were computed: working condition index and labour discrimination index. The first index is based on worker's assessment of air conditioning, heating, ventilation, noise and lighting. The second index consisted of the following dimensions of discrimination: sex, age, nationality, mobbing and sexual harassment. Both indexes were computed as an average of the respondent scores for the relevant variables.

8) Additional variables include a dummy that captures macroeconomic conditions such as the comparison of the 2010 national GDP per capita with the regional GDP per capita. Regressions were also carried out considering another region-specific variable as unemployment rate. At the regional level, GDP per capita and unemployment rate present a correlation coefficient of -0.753 ($p<.001$). This strong and negative correlation suggests that labour market conditions are captured by the level of economic activity (Clark et al. 2010). So, a dummy takes a value of 1 if a worker resides in a region with a GDP per capita above the national average. Another variable captures the city size. It takes a value of 1 if a worker is in a city with less than 100,000 inhabitants. With respect to the potential effect of unemployment rate on worker's job satisfaction, both regional unemployment variable and its interaction with the knowledge-based workers variable were considered as exogenous variables in all models. Coefficients of these variables were not significant. Furthermore, unemployment regional rate was disaggregated according to age-groups, namely from 16 to 19, from 20 to 24, from 25 to 54 and

for workers over 55. This implies that every worker in each region has a value for this variable that corresponds to the average value for his age group. Results using this approach were not either significant and the preferred models do not consider the unemployment rate.

For the empirical analysis, three main groups are considered. As a result, the sample is divided according to the worker being a knowledge-based worker or not. The first group, model 1 and model 2, consists of the full sample and a dummy variable capturing a knowledge-based worker was included. The second and third groups consist of the sub-sample of workers. So, model 3 is related to the knowledge-based work and model 4 corresponds to the less knowledge-based workers sample. In conclusion, four regression equations allow us to identify the determinants of job satisfaction.

# 4. Results and discussion

Table 3 reports the results for the model 1 and model 2. For all regressions, 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). Regarding the goodness of fit, pseudo-$R^2$ ranges from 0.01 to 0.39. Model 1 focuses on socio-demographic worker's features, location variables and the knowledge-based variable. The latter is highly significant, denoting that knowledge-based workers have a higher job satisfaction than other workers.

A worker's characteristic, such as age, exhibits a negative association with job satisfaction. Age squared is also significant and the U-shaped relationship between age and job satisfaction is confirmed, being 40 years the minimum age of the convex relationship. This is in line with the findings reported in empirical studies carried out in Spain (Gamero 2004, 2007, 2009). Worker residence in the Centre, South, North West and East region display a higher job satisfaction when compared to the Madrid region. A similar finding was reported by Iglesias et al. (2011). Turning to the economic activity variables, workers in the agricultural sector show lower job satisfaction than workers in industry, a result also confirmed by Dueñas et al. (2010). Regarding the size of city variable, a worker living in a city with less than 100,000 inhabitants, reports significantly higher levels of job satisfaction. With respect to the type of household, a worker having a household classified as a couple with children has a higher level of job satisfaction when compared to a single person without children household. Model 2 is an extension of model 1 and considers financial and non-financial job characteristic variables. However, only location variables remain significant from model 1, and the knowledge-based work variable became insignificant.

**Table 3.** Ordered probit determinants of job satisfaction in Spain. 2010

| | Model (1) | | Model (2) | |
|---|---|---|---|---|
| | Coefficient | Marginal effect[1] | Coefficient | Marginal effect[1] |
| Male | -0.033 | -0.013 | -0.049 | -0.020 |
| Age | -0.021* | -0.008 | 0.020 | 0.008 |
| Age$^2$/100 | 0.026* | 0.010 | -0.027 | -0.011 |
| Knowledge-based worker (dummy) | 0.240*** | 0.094 | -0.086 | -0.034 |
| City with less than 100,000 inhabitants (dummy) | 0.098*** | 0.039 | -0.056 | -0.022 |
| Region with GDP above national average (dummy) | 0.074 | 0.029 | 0.105 | 0.042 |
| ***Type of Household (ref.: single without children)*** | | | | |
| Couples with children | 0.182** | 0.072 | - | - |
| Couples without children | 0.094 | 0.037 | - | - |
| Single with children | 0.115 | 0.046 | - | - |
| ***Economic sector (ref.: manufacturing)*** | | | | |
| Agriculture | -0.393*** | -0.155 | - | - |
| Construction | -0.097 | -0.038 | - | - |
| Services | 0.014 | 0.006 | - | - |
| ***Region (ref.: Madrid)*** | | | | |
| South region | 0.231** | 0.090 | 0.291** | 0.114 |
| North West region | 0.186** | 0.073 | 0.336*** | 0.131 |
| North East region | 0.088 | 0.035 | 0.140* | 0.055 |
| East region | 0.187*** | 0.074 | 0.146* | 0.058 |
| Center region | 0.200** | 0.035 | 0.271* | 0.106 |
| ***Financial job characteristics*** | | | | |
| Monthly net income in Euros (log) | - | - | 0.439** | 0.175 |
| Satisfaction with social benefits provided by firm | - | - | 0.036*** | 0.014 |
| ***Work organisation (non-financial job characteristics)*** | | | | |
| Satisfaction with level of motivation | - | - | 0.163*** | 0.065 |
| Satisfaction with career advancement | - | - | 0.169*** | 0.067 |
| Satisfaction with level of autonomy | - | - | 0.033* | 0.013 |
| Satisfaction with manager's valuation of performed work | - | - | 0.104*** | 0.041 |
| Satisfaction with decision making | - | - | -0.003 | -0.001 |
| Participation in teamwork (dummy) | - | - | 0.013 | 0.005 |
| Satisfaction with promotion prospects | - | - | 0.018* | 0.007 |
| Stress level | - | - | -0.041*** | -0.016 |
| Level of monotony and routine | - | - | -0.016* | -0.006 |
| Level of physical effort | - | - | 0.005 | 0.002 |
| ***Working conditions (non- financial job characteristics)*** | | | | |
| Commuting time in hours | - | - | 0.026 | 0.010 |
| ***Labour relations (non-financial job characteristics)*** | | | | |
| Relationships between managers and workers | - | - | 0.036** | 0.014 |
| Relationships with co-workers | - | - | 0.011 | 0.004 |
| Labour discrimination index (sex, age, nationality, mobbing and sexual harassment) | - | - | -0.048** | -0.019 |
| ***Skills and training (non-financial job characteristics)*** | | | | |
| Degree to which academia training is useful for work | - | - | -0.002 | -0.001 |
| Satisfaction with training provided by firm | - | - | 0.034*** | 0.013 |
| ***Work intensity (non-financial job characteristics)*** | | | | |
| Satisfaction with working hours | - | - | 0.067*** | 0.027 |
| Satisfaction with holidays and leaves | - | - | 0.040*** | 0.016 |
| Satisfaction with flexibility of timetable | - | - | 0.004 | 0.002 |
| Satisfaction with job security | - | - | 0.044*** | 0.017 |
| ***Health and safety at work (non-financial job char.)*** | | | | |
| Level of risk | - | - | -0.031*** | -0.012 |
| Satisfaction with health and safety | - | - | 0.034** | 0.013 |
| ***Reconciling work/family life (non-financial job char.)*** | | | | |
| Satisfaction with work-family life balance | - | - | 0.026* | 0.011 |
| ***Statistics*** | | | | |
| Cut1 | -1.566*** | - | 4.331*** | - |
| Cut2 | -0.070 | - | 7.076*** | - |
| Observations | 8,061 | - | 5,148 | - |
| Wald Chi2 | 140.0 | - | 1,953.5 | - |
| Prob > Chi2 | 0.000 | - | 0.000 | - |
| Log likelihood function/Restricted log-likelihood | -6,900.8/-6,971.3 | - | -2,767.4/-4,368.2 | - |
| Pseudo-$R^2$ | 0.01 | - | 0.37 | - |
| Obs. correctly predicted (%) | 54.4 | - | 75.3 | - |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors were computed. 1. Marginal effects on Pr (job satisfaction =2). Source: Author's calculations.

Regarding education, note that education variable was not included in table 3 due to partial collinearity given that the definition of knowledge-based worker is based on level of education and occupation. Given the available data the following two criteria were taken simultaneously into account to construct knowledge-based worker: university education (workers whose educational achievement was mid-level college or higher) and high-skilled occupation (business management and general government; technical, professional, scientific and intellectual; skilled agricultural and fishery workers, and artisans and skilled workers in manufacturing, construction and mining). In this respect, and although education level is part of the knowledge-based work, it also incorporates the high-skilled occupations. Therefore, it is possible to find educated workers in low-skilled occupations or non-educated workers in high-skilled occupations

In order to untangle the lack of significance of the knowledge-based worker variable in model 2, different model specifications are displayed in table 4, which shows the coefficients obtained for the knowledge-based worker variable. The first specification indicates that the variable is significant and positively correlated when included as single regressor. This implies that the unconditional distributions of job satisfaction are different by type of worker. Therefore, the knowledge-based worker exhibits a higher level of job satisfaction than the other workers.

The basic model specification (BM) corresponds to model 1 of table 3 and confirms the significance of the knowledge-based worker variable. In order to check which job characteristics are responsible for the variable loses of significance, we have proceeded to add, alternately, each of the job dimensions as shown in table 4. It is observed that the knowledge-based worker variable maintains the level of significance and the positive sign when adding the individual job dimensions. The exception is when working organisation variables were considered. The loss of significance when considering simultaneously all job dimensions may be due to the fact that many of them could be highly correlated.

**Table 4.** Ordered probit estimation of the coefficients related to knowledge-based work in Spain according to alternative models. 2010

| Alternative models | Coefficient of KBW variable | Pseudo $R^2$ (%) | Observations correctly predicted (%) |
|---|---|---|---|
| Only knowledge-based employment as control variable | 0.245*** | 0.003 | 53.8 |
| Basic model (BM)[1] | 0.240*** | 0.01 | 54.4 |
| BM and working organisation variables | 0.019 | 0.32 | 73.9 |
| BM and working condition variables | 0.244*** | 0.04 | 57.9 |
| BM and labour relation variables | 0.232*** | 0.12 | 64.3 |
| BM and work intensity variables | 0.141*** | 0.15 | 65.0 |
| BM and health and safety at work variables | 0.237*** | 0.07 | 59.9 |
| BM and skills and training variables | 0.100* | 0.07 | 60.2 |
| BM and reconciling work/family life variable | 0.284*** | 0.05 | 58.2 |
| BM and financial variables | 0.110* | 0.11 | 62.2 |
| BM and all job dimension variables[2] | -0.086 | 0.37 | 75.3 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. 1. This corresponds to model (1) from Table 3. 2. This corresponds to model (2) from Table 3. Source: Author's calculations.



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In order to check the robustness of the grouped levels of the job satisfaction scale suggested in Table 2, a new grouping was carried out. Therefore, scales from 0 to 3 were classified as unsatisfied, 4 to 7 as satisfied and 8 to 10 as very satisfied. Findings, in relation to the original ones, show similar trends regarding the sign and significance of the variables. Table A.1 in the Annex shows the ordered probit coefficients related to knowledge-based workers according to alternative models

Focusing on model 2, it is important to assess the magnitude of the significant variables using marginal effects. With regard to the non-financial job characteristics variables, it is found that work organisation (satisfaction with level of motivation, satisfaction with career development, satisfaction with manager's valuation of performed work and stress level) and work intensity (satisfaction with working hours, satisfaction with job security and satisfaction with holidays and leave) are the job characteristics associated to the greatest marginal effect. This finding has to some extent been confirmed by Díaz et al. (2013). Another equally important dimension corresponds to labour relations. Relationships between manager and workers variable has a positive effect on job satisfaction, while labour discrimination index is associated with a lower level of job satisfaction. Moreover, health and safety at work and reconciling work and family life dimensions are significant determinants of job satisfaction. With respect to the variables related to financial job characteristics, net monthly income is a positive and highly significant variable in explaining job satisfaction, in line with findings reported in empirical studies about Spain and other countries (Grund and Sliwka 2004; Kristensen and Johansson 2008; Clark 2009; Salvatori 2010; Helliwell and Huang 2011). Even more, this variable exhibits the largest marginal effect for model 2.

Model 3 and model 4 of table 5 aim to identify any difference in the way in which knowledge-based workers and less knowledge-based workers determine their job satisfaction. The analysis across all samples suggests that no major differences are found regarding the same set of variables which are relevant in explaining job satisfaction. It is important to mention that worker's attributes variables have no impact on job satisfaction in both samples and that the greatest influence on job satisfaction are derived from financial and non-financial job dimension variables.

By comparing the magnitude of marginal effects from models 3 and 4, some interesting conclusions emerge. Regarding the satisfaction with salary, a financial job characteristic variable, less knowledge-based workers exhibit the largest marginal effect. This finding could denote that salary issue is an area of greater concern for this group. This should not come as a surprise given its lower net monthly income when compared with knowledge-based workers.

Focusing on non-financial characteristics, particularly among the work organisation dimensions, it is observed that knowledge-based workers display a higher impact on job satisfaction associated with the level of motivation, career advancement and manager's valuation, when compared to the less knowledge-based workers. Even

more, the stress level variable has a larger effect for the knowledge-based workers, affecting negatively their job satisfaction.

With respect to another job dimension such as labour relations, it is noted that relationships between managers and employees display a higher impact on job satisfaction for the knowledge-based workers. On the other hand, the labour discrimination index only has a negative impact on less knowledge-based workers' job satisfaction.

In relation to skills and training dimension, satisfaction with training provided by firms is only significant for less knowledge-based workers. Turning to the work intensity dimension, satisfaction with working hours has a larger impact on knowledge-based workers as well as satisfaction with job security. By contrast, satisfaction with holidays and leave is only significant for the less knowledge-based workers. Finally, concerning health and safety at work dimension, level of risk is negatively associated to job satisfaction to a greater extent for the knowledge-based workers.

**Table 5.** Ordered probit determinants of knowledge based worker's job satisfaction in Spain. 2010

| | Model (3) KBW | | Model (4) LKBW | |
|---|---|---|---|---|
| | Coefficient | Marginal effect[1] | Coefficient | Marginal effect[1] |
| Male | 0.097 | 0.035 | -0.092 | -0.037 |
| Age | 0.028 | 0.010 | 0.025 | 0.010 |
| Age$^2$/100 | -0.025 | -0.009 | -0.030 | -0.012 |
| City with less than 100,000 inhabitants (dummy) | -0.086 | -0.031 | -0.121$^{*}$ | -0.048 |
| Region with GDP above national average (dummy) | -0.069 | -0.025 | 0.148 | 0.059 |
| ***Education (ref: Primary)*** | | | | |
| Secondary | - | - | -0.081 | -0.032 |
| Upper secondary general | - | - | -0.103 | -0.041 |
| Vocational and technical training | - | - | -0.019 | -0.008 |
| Higher education | - | - | -0.111 | -0.044 |
| ***Type of Household (ref.: single without children)*** | | | | |
| Couples with children | 0.146 | 0.053 | 0.059 | 0.024 |
| Couples without children | 0.253 | 0.089 | -0.065 | -0.026 |
| Single with children | 0.231 | 0.082 | -0.060 | -0.024 |
| ***Economic Activity (ref.: Manufacturing)*** | | | | |
| Agriculture | 0.681 | 0.202 | 0.022 | 0.009 |
| Construction | 0.057 | 0.020 | -0.018 | -0.007 |
| Services | 0.007 | 0.003 | -0.017 | -0.007 |
| ***Region (ref.: Madrid)*** | | | | |
| South region | -0.075 | -0.028 | 0.305$^{*}$ | 0.120 |
| North West region | 0.111 | 0.040 | 0.348$^{**}$ | 0.137 |
| North East region | -0.030 | -0.011 | 0.135 | 0.054 |
| East region | -0.054 | -0.020 | 0.144 | 0.057 |
| Center region | 0.116 | 0.041 | 0.271$^{*}$ | 0.107 |
| ***Financial Job Characteristics*** | | | | |
| Monthly net income in Euros (log) | -0.211 | -0.077 | 0.109 | 0.043 |
| Satisfaction with salary | 0.066$^{*}$ | 0.024 | 0.106$^{***}$ | 0.042 |
| Satisfaction with social benefits provided by firm | 0.049$^{*}$ | 0.018 | 0.018$^{*}$ | 0.007 |
| ***Work Organisation (non-financial job characteristics)*** | | | | |
| Satisfaction with level of motivation | 0.238$^{***}$ | 0.087 | 0.144$^{***}$ | 0.058 |
| Satisfaction with career advancement | 0.252$^{***}$ | 0.092 | 0.151$^{***}$ | 0.060 |
| Satisfaction with level of autonomy | 0.009 | 0.003 | 0.045$^{**}$ | 0.018 |
| Satisfaction with manager's valuation | 0.149$^{***}$ | 0.054 | 0.099$^{***}$ | 0.040 |
| Satisfaction with decision making | -0.009 | -0.003 | -0.005 | -0.002 |
| Participation in teamwork (dummy) | -0.136 | -0.048 | 0.050 | 0.020 |
| Satisfaction with promotion prospects | -0.024 | -0.009 | 0.015 | 0.006 |
| Stress level | -0.091$^{***}$ | -0.033 | -0.031$^{***}$ | -0.013 |
| Level of monotony and routine | -0.041$^{*}$ | -0.015 | -0.009 | -0.004 |
| Level of physical effort | 0.001 | 0.0004 | -0.001 | -0.001 |
| ***Working conditions (non-financial job char.)*** | | | | |
| Working condition index (air, noise and lighting) | -0.042 | -0.015 | 0.021 | 0.008 |
| Commuting time in hours | -0.105 | -0.038 | 0.053 | 0.021 |
| ***Labour relations (non-financial job char.)*** | | | | |
| Relationships between managers and workers | 0.077$^{*}$ | 0.028 | 0.029$^{*}$ | 0.011 |
| Relationships with co-workers | -0.028 | -0.010 | 0.006 | 0.002 |
| Labour discrimination index (sex, age, nationality) | -0.023 | -0.009 | -0.068$^{***}$ | -0.027 |
| ***Skills and training (non-financial job char.)*** | | | | |
| Degree to which academia training is useful for work | 0.008 | 0.003 | -0.002 | -0.001 |
| Satisfaction with training provided by firm | 0.038 | 0.014 | 0.027$^{**}$ | 0.011 |
| ***Work intensity (non-financial job char.)*** | | | | |
| Monthly hours worked in main job | 0.003 | 0.001 | 0.0004 | 0.0001 |
| Satisfaction with working hours | 0.086$^{**}$ | 0.031 | 0.058$^{***}$ | 0.023 |
| Satisfaction with holidays and leave | 0.074 | 0.027 | 0.041$^{**}$ | 0.016 |
| Satisfaction with flexibility of timetable | -0.037 | -0.013 | 0.015 | 0.006 |
| Satisfaction with job security | 0.056$^{*}$ | 0.020 | 0.034$^{**}$ | 0.013 |
| ***Health and safety at work (non financial job char.)*** | | | | |
| Level of risk | -0.043$^{*}$ | -0.016 | -0.019$^{*}$ | -0.008 |
| Satisfaction with health and safety | -0.004 | -0.002 | 0.027$^{*}$ | 0.011 |
| ***Reconciling work/family life (non financial job char.)*** | | | | |
| Satisfaction with work-family life balance | 0.032 | 0.012 | 0.026 | 0.010 |
| Cut1/Cut2 | 3.334/6.376 | - | 3.636$^{***}$/6.457 | - |
| Observations | 884 | - | 3766 | - |
| Wald chi2/Prob > Chi2 | 305.1/0.000 | - | 1,586.7/0,000 | - |
| Log likelihood function/Restricted log-likelihood | -410.5/-674.9 | - | -2,006/-3,227 | - |
| Pseudo-R$^2$ | 0.39 | - | 0.38 | - |
| Obs. correctly predicted (%) | 79.1 | - | 76.0 | - |

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Robust standard errors were computed. 1. Marginal effects on Pr (job satisfaction =3). Source: Author's calculations.

# 5. Concluding remarks

In this paper we approached the question of the determinants of job satisfaction for knowledge-based workers in Spain. In spite of the growing number of studies on job satisfaction, the proposed subject has received limited attention in the empirical literature. So, this paper aims to fill this gap in knowledge. Over the past 40 years the labour markets of the advanced industrialised world have been significantly modified. The increase in the adoption and use of information and communication technologies (ICT) and knowledge in employment flows is likely to have changed the labour market in many dimensions. On the other hand, job satisfaction has become a topic of interest in the social sciences. It is recognised that around a quarter of our lives is spent at work. Therefore, economists and other social scientists attempt to understand people's wellbeing in the workplace. Given this scenario, the aim of the paper was to explore the determinants of job satisfaction for knowledge-based workers in Spain. To do this, micro-data from the 2010 Survey of Quality of Life at Work, consisting of 8,061 employees, was used for the empirical analysis.

After considering the full sample of workers and sub-samples according to the worker being a knowledge-based worker or not, the econometric analysis reveals important insights. Regarding the whole sample of workers, two models were taken into account. The first one focused on socio-demographic worker's features, location variables and the knowledge-based variable. The latter is highly significant, denoting that, knowledge-based workers have a higher job satisfaction than other workers. A worker's characteristic, such as age, exhibits a negative association with job satisfaction. Age squared is also significant and the U-shaped relationship between age and job satisfaction is confirmed, being 40 years the minimum age of the convex relationship.

The second model was an extension of the first model and considered financial and non-financial job characteristic variables. A high number of these variables were statistically significant. Focusing on the magnitude of the significant variables using marginal effects, it is found that work organisation (satisfaction with level of motivation, satisfaction with career development, satisfaction with manager's valuation of performed work and stress level) and work intensity (satisfaction with working hours, satisfaction with job security and satisfaction with holidays and leave) are the job characteristics associated to the greatest marginal effect.

Other equally important dimensions correspond to labour relations. The relationships between manager and employees variable has a positive effect on job satisfaction, while the labour discrimination index is associated with a lower level of job satisfaction. Moreover, health and safety at work and reconciling work and family life dimensions are significant determinants of job satisfaction. With respect to the variables related to financial job characteristics, net monthly income is a positive and

highly significant variable in explaining job satisfaction. Even more, this variable exhibits the largest marginal effect.

The analysis across the two sub-samples, knowledge and less knowledge-based workers, suggests that no major differences are found regarding the same set of variables which are relevant in explaining job satisfaction. However, the magnitude of the marginal effects denotes that there are subtle differences between the two groups. Job satisfaction in knowledge-based workers is marginally explained by the level of motivation, career advancement, manager's valuation, relationships between managers and employees, satisfaction with working hours, and satisfaction with job security. Even more, the stress and risk levels have large negative effects on knowledge-based workers. In contrast, job satisfaction among less knowledge-based workers is also marginally explained by the satisfaction with salary, with the training provided by firms, and with holidays and leave.

It is important to mention that workers' attribute variables have no impact on job satisfaction in both samples and that the greatest influence on job satisfaction are derived from financial and non-financial job dimension variables. Finally, by identifying a set of significant variables determining job satisfaction, our results could be valuable for policy makers and company managers looking for measures to enhance or improve job satisfaction in knowledge-based work.

# Annex

**Table A.1.** Ordered probit estimation of the coefficients related to knowledge-based work in Spain according to alternative models. 2010

| Alternative models | Coefficient of KBW variable | Pseudo $R^2$ (%) | Observations correctly predicted (%) |
|---|---|---|---|
| Only knowledge-based employment as control variable | 0.252*** | 0.004 | 53.8 |
| Basic model (BM)[1] | 0.250*** | 0.01 | 54.7 |
| BM and working organisation variables | 0.03 | 0.32 | 75.2 |
| BM and working condition variables | 0.256*** | 0.05 | 59.3 |
| BM and labour relation variables | 0.244*** | 0.13 | 65.7 |
| BM and work intensity variables | 0.158*** | 0.16 | 66.7 |
| BM and health and safety at work variables | 0.249*** | 0.07 | 61.4 |
| BM and skills and training variables | 0.106** | 0.08 | 62.1 |
| BM and reconciling work/family life variable | 0.264*** | 0.05 | 58.7 |
| BM and financial variables | 0.113** | 0.12 | 64.0 |
| BM and all job dimension variables[2] | -0.080 | 0.37 | 76.5 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: Author's calculations.

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***Resumen***

*El objetivo del documento de trabajo es analizar la caracterización y los determinantes de la satisfacción de los trabajadores del conocimiento en España. Para realizar este análisis empírico se han utilizado los microdatos de una encuesta representativa (Encuesta de Calidad de Vida en el Trabajo, ECVT) para 8.061 empleados en 2010. La satisfacción en el trabajo se ha aproximado a través de las percepciones declaradas por los trabajadores, medida en una escala de 0 a 10, desde una total insatisfacción hasta una completa satisfacción. Se ha observado que sólo una pequeña parte de los trabajadores españoles están explícitamente insatisfechos. Un 61,3% de los trabajadores del conocimiento reportan niveles de satisfacción muy elevados (valores de 8 a 10). Un 41,1% de los trabajadores menos intensivos en conocimiento reportan satisfacción con su empleo (valores de 5 a 7) Para el análisis de los determinantes de la satisfacción del empleo se ha utilizado un modelo probit ordenado, que supone una elección entre alternativas discretas. La evidencia obtenida sugiere que las dimensiones financieras y no financieras (organización e intensidad del trabajo) son las más importantes en la determinación de la satisfacción de los trabajadores españoles del conocimiento. En concreto, esta vendría explicada por la satisfacción con el salario, el nivel de motivación, el desarrollo de la carrera profesional, la evaluación de los directivos, las relaciones entre directivos y trabajadores, y la satisfacción con las horas trabajadas y la seguridad del empleo. Finalmente, el estrés y el riesgo laboral tendrían efectos negativos sobre la satisfacción de los trabajadores del conocimiento.*

***Palabras clave***

*Trabajo basado en el conocimiento, Satisfacción del trabajo, Organización del trabajo, Intensidad del trabajo, Modelo probit ordenado, Microdatos, España*

***Resum***

*L'objectiu del document de treball és l'anàlisi de la caracterització i els determinants de la satisfacció dels treballadors del coneixement a Espanya. Per a realitzar aquesta anàlisi s'han utilitzat les microdades d'una enquesta representativa (Encuesta de Calidad de Vida en el Trabajo, ECVT) per a 8.061 ocupats el 2010. La satisfacció en el treball s'ha aproximat a través de les percepcions declarades pels treballadors, mesurades en una escala de 0 a 10, des d'una total insatisfacció fins a una completa satisfacció. S'ha observat que només una petita part dels treballadors espanyols estan explícitament insatisfets. Un 61,3% dels treballadors del coneixement reporten nivells de satisfacció molt elevats (valors de 8 a 10). Un 41,4% dels treballadors menys intensius en coneixement reporten satisfacció amb la seva feina (valors de 5 a 7). Per a l'anàlisi dels determinants de la satisfacció en el treball s'ha utilitzat un model probit ordenat, que suposa una elecció entre alternatives discretes. L'evidència obtinguda suggereix que les dimensions financeres i no financeres (organització i intensitat del treball) són les més importants en la determinació de la satisfacció dels treballadors espanyols del coneixement. En concret, aquesta vindria explicada per la satisfacció amb el salari, el nivell de motivació, el desenvolupament de la carrera professional, l'avaluació dels directius, les relacions entre directius i treballadors, i la satisfacció amb les hores treballades i amb la seguretat de la feina. Finalment, l'estrés i els riscos laborals tindrien efectes negatius sobre la satisfacció dels treballadors del coneixement.*

***Paraules clau***

*Treball basat en el coneixement, Satisfacció del treball, Organització del treball, Intensitat del treball, Model probit ordenat, microdades, Espanya*

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