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Job Satisfaction in the "Big Four" of Europe: Reasoning Between Feeling and Uncertainty Through CUB Models

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Abstract The paper offers a comparative investigation of *objective* and *subjective* driving forces behind the satisfaction that people feel in their job in four representative countries of Western Europe. The main element of this work's novelty is its linking the research of cross-country similarities and differences in the leading determinants of global job satisfaction to methodological issues that arise when responses to survey questions are detected on a rating scale through self-evaluation. In particular, this paper is one of the first attempts to test the potentialities of CUB models on EWCS data in a broader conceptual framework in which the response on overall job satisfaction depends on some psychological dynamics of the evaluation process. Although overall job satisfaction is significantly higher for British and German employees, the subjective factors—the amount of socio-economic security embodied in a job, the working conditions and the aspects of work–life balance—are the most relevant in shaping job satisfaction, disregarding the myth that considers earnings as the dominant factor.

Keywords Job satisfaction · CUB models · European countries

JEL Classification C25 · J28 · O52

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1 Background and Introduction

At least three of the five headline goals of the Europe 2020 growth strategy relate directly to employment, or more specifically to productive activity, with a focus on the target of "new skills for new jobs" taking the idea of "more and better jobs" from the earlier Lisbon agenda. This derives from the awareness that employment enables people to achieve their individual goals and expectations, and provides them with a sense of identity, social status, integration, and opportunities for personal development (Drobnič et al. 2010; Gallie 2002). In this regard, having a job is surely important for each person's quality of life, and knowing how satisfied workers are with their occupation is therefore essential in assessing the overall life satisfaction (Rain et al. 1991; Judge and Watanabe 1993). Although the work is a core activity in society (Kalleberg 2009), and persons with a positive attitude and behaviour at workplaces are usually more satisfied with their life (Wilczynska et al. 2014), it remains however one facet of overall life (Rice et al. 1980) and subjective wellbeing (Decancq et al. 2015).

The heterogeneous and multidisciplinary nature of job satisfaction makes it hard to conceptualise, and any integral approach to its measurement collides with the lack of understanding of what job satisfaction refers to. In fact, workers differ in valuing various work-related aspects and they can mean different things when assessing the extent of their job satisfaction (Muñoz de Bustillo-Llorente and Fernández-Macías 2005; Millán et al. 2013).

In line with the concept of job satisfaction as more than one possible outcome of job quality (Sirgy et al. 2001) rather than one of its dimensions (Hamermesh 2001; Ritter and Anker 2002; Green 2006), most of approaches focus on the factors affecting the degree of satisfaction that people feel in their job. Accordingly, job satisfaction may be a critical predictor of labour market dynamics, worker productivity and mobility, job performance, firm's competitiveness, and more generally potential growth of society (Faragher et al. 2005).

In this field, the paper aims at exploring the job satisfaction at a global level and its primary driving forces comparatively for France, Germany, Italy, and the United Kingdom, known as the Big Four of Europe (OECD 2014). One of the main elements of this work's novelty is its linking the research of cross-country similarities and differences in the leading determinants of job satisfaction to methodological issues that arise when responses to survey questions are detected on a rating/ranking scale through self-evaluation. For this purpose, CUB models (Piccolo 2003; D'Elia and Piccolo 2005; Iannario and Piccolo 2011) allow analysing the satisfaction in a broader conceptual framework of job-related aspects in which the response on overall satisfaction depends on two latent components, one related to the individual liking/disliking *feeling* and the other to *uncertainty* of the ranking process.

Apart from the few studies by Capecchi et al. (2012) and Gambacorta and Iannario (2013) in which CUB models were tested in order to measure job satisfaction in Italy, the potentialities of this methodology in investigating multiple aspects of job satisfaction from a cross-national perspective are still unexplored. Many works are country-specific, except for Sousa-Poza and Sousa-Poza (2000) who studied the levels and determinants of job satisfaction in 21 countries, and Borooah (2009) who compared job satisfaction between 18 and 15 countries of Western and Eastern Europe, respectively. Accordingly, in this paper, efforts will be devoted to investigating how dynamics in job satisfaction differ across representative market economies of Western Europe. Their knowledge helps organisations and policy-makers to focus on the crucial dimensions of job satisfaction and deliberate the

most appropriate strategies offering individuals better chances of getting decent and productive jobs.

Since the beginning of the twentieth century—a period that dates the first studies of attitudes and their influence on productivity—many models on job satisfaction have been developed. They start from the discrepancy theory proposed by Locke (1976), move on the demand-control (Karasek 1997) and experienced preference models (Lévy-Garboua and Montmarquette 2004), to recent approaches of the relevance that job satisfaction has on happiness/wellness (Blanchflower and Oswald 2004; Bakhshi et al. 2008) as a part of the overall life satisfaction (Van Praag 1993; Veenhoven 2000).

Moreover, during the last decades, research on job satisfaction has also integrated different fields of inquiry transversally, from organisational and industrial psychology to sociology, economics and management (Spector 1997). As discussed by Eurofound (2007), the basic rationale would be that when the actual state differs sufficiently from the desired state, this generates job dissatisfaction. For instance, some studies, which observed men and women separately, suggested that though women have frequently fewer opportunities in the labour market, they adapt to them and are not necessarily less satisfied (Millán et al. 2013). Clark and Oswald (1996) and Clark et al. (1996) showed a significant U-shape in the function of job satisfaction and age, declining on average until the age of thirties.

A large body of literature (Clark 1996; Gamero Burón 2004; Grund and Sliwka 2007) assessed the influence of education on specific aspects of job satisfaction, assuming that workers tend to get frustrated when they cannot fully utilise their knowledge and skills (Kalleberg and Sørensen 1973). The better-educated and high-skilled workers have usually higher aspirations and tend to undervalue job rewards (Clark and Oswald 1996; Gardner and Oswald 2002). Winkelmann and Winkelmann (1998) demonstrated that job satisfaction also depends on the employment status and on other job-related factors that are conceived as sources of social relationships and identity and not simply of income. While the unemployed necessarily show lower satisfaction levels, the self-employed are considerably more satisfied than employees because of their greater independence, responsibility, flexibility, and task variety (O'Brien 1986; Loscocco and Roschelle 1991; Millán et al. 2013). Several studies examined the role of union membership (Bryson et al. 2004; Renaud 2002) and other individual characteristics (e.g., household type, health and personal earnings) in affecting job satisfaction (Clark et al. 1996; Grund and Sliwka 2007, Lévy-Garboua and Montmarquette 2004).

The article is structured as follows. Section 2 addresses the methodological issues of CUB models and of the relative goodness-of-fit tools. Section 3 presents the conceptual framework and practical choices (selected countries, data sources, target population, and variables) made for the analysis. The role of feeling and uncertainty by clusters of employees and the leading determinants of global job satisfaction are covered in Sects. 4 and 5, respectively. Some remarks conclude the paper in Sect. 6.

2 Methodology: Combination of Uniform and Shifted Binomial Random Variable (CUB Models)

Generalised linear models (GLM) are the most common methodology for analysing ordinal data (Nelder and Wedderburn 1972; McCullagh 1980; McCullagh and Nelder 1989) in which the dependent variable is assumed to be generated from a particular distribution in the exponential family. CUB models (Piccolo 2003; D'Elia and Piccolo 2005) are an alternative

methodology to manage categorical data that also enables the investigation of respondents' psychology and of the driving forces behind an expressed preference towards an item. As for GLM models, CUBs are suitable to analyse ordered evaluations that may concern opinions, perceptions, the degree of satisfaction or preference, and in addition, they allow modelling the interviewee's response as the result of a very complex mental process that involves relevant factors influencing the final choice or judgment (Tourangeau et al. 2000).

The human process of choosing between ordered alternatives expressing the satisfaction on an object premises two successive cognitive steps. First, the *perception* through which the subject experiences the item based on his/her own personal life, attitudes and emotions, or external conditions, and second the *evaluation* that is realised in the rationalisation of the previous experience and definition of judgement about the item. If it may be conjectured that the *ith* respondent adopts a balanced decision between the attractiveness he/she experiences for the object or item (among m discrete ordered alternatives) and the indecision in the response, two main factors—*feeling* and *uncertainty*—are considered as the relevant ones that can be easily modelled by CUBs. As argued by Iannario and Piccolo (2016), feeling expresses the degree of perception of the subject towards the item based on his/her own personal attitude caused by several latent factors, while uncertainty pertains to the subjective respondents' indecision that depends on the external facts surrounding the final choice.

Moreover, CUB models overcome a series of restrictive conditions imposed by GLMs. CUBs actually allow modelling the stochastic component as a different random variable from the exponential family whose well-defined mass function $f(\cdot)$ may fit better the data:

$$R_i \sim f(r, \theta_i, \alpha) \quad i = 1, 2, \ldots, n \tag{1}$$

where R_i is the response variable and the α parameters may be also constant among subjects. The systematic component links the θ_i parameters to the covariates x_i of the *ith* subject through a parameter vector β:

$$\theta_i = g(x_i\beta) \quad i = 1, 2, \ldots, n \tag{2}$$

Parameters are directly interpretable as the value of the response variable (not only on the expected value) that can lead to parsimonious models with a better fitting. In this way, the exploration of the dynamics between variables and the construction of respondents' profiles can be drawn more easily.

In line with the latent variables' approach to analyse ordinal data, which assumes that ordinal responses are generated by an unobservable continuous variable, the rationale of CUB models stems from the interpretation of the respondent's final choice—expressed by a discrete random variable R_i defined over the ordered support $\{1, 2, \ldots, m\}$—as a weighted mixture of the personal feeling (parameterised by a *shifted Binomial random variable*)[1] and the uncertainty (modelled by a proportion of a *Uniform random variable* as the extreme solution for a totally indifferent choice). The mass function is:

$$P(R_i = r) = \pi_i \left[\binom{m-1}{r-1} \xi_i^{m-r} (1-\xi_i)^{r-1} \right] + (1-\pi_i)\frac{1}{m} \tag{3}$$

where the vector of parameter (ξ, π) is defined on the unit square left open $]0, 1] \times [0, 1]$. The shifted Binomial distribution involves the single parameter ξ_i that is linked to the

[1] The shifted Binomial is preferred because its support coincides to the choice set {1, 2,…, m}, which is more common than the Binomial support that starts with 0.

degree of feeling and presents a modal value located everywhere over the support $\{1, 2, \ldots, m\}$; however, its interpretation depends on the evaluation scale.[2] The uncertainty parameter (π_i), which adds dispersion to the shifted binomial distribution, stands for the propensity of each respondent, from a thoughtful to a completely random choice.[3] Concisely, $(1 - \pi)$ increases with the uncertainty of the choice, while $(1 - \xi)$ is a measure of adherence to the proposed choice. Iannario (2010) proved that CUB models are identifiable for $m > 3$.

Iannario and Piccolo (2012a) generalised CUB models with subjects' covariates on uncertainty and feeling by means of a formal link between parameters and covariates with the advantage of capturing the different reactions in the decision-making processes depending on the characteristics of the item that respondents are evaluating.[4] Let $\boldsymbol{y}_i$ and $\boldsymbol{w}_i$ be the covariates of uncertainty and feeling suitable to characterise (π_i, ξ_i), respectively, and $\boldsymbol{\beta} = (\beta_0, \beta_1, \ldots, \beta_p)$ and $\boldsymbol{\gamma} = (\gamma_0, \gamma_1, \ldots, \gamma_q)$ their coefficients' vectors. The logistic function is a convenient formulation for the deterministic link among the parameters (explaining uncertainty and feeling, respectively) and subjects' characteristics (Iannario 2009; Capecchi et al. 2012):

$$\begin{cases} \pi_i = logit(-y_i\beta) \\ \xi_i = logit(-w_i\gamma) \end{cases} \tag{4}$$

For $m > 3$, the general formulation of CUB models with a logistic link with p and q covariates to explain feeling and uncertainty $CUB\ (p, q)$ becomes

$$P(R_{i=r}r|\boldsymbol{y}_i, \boldsymbol{w}_i, \boldsymbol{\beta}, \boldsymbol{\gamma}) = \frac{1}{1 + e^{-\boldsymbol{y}_i\boldsymbol{\beta}}} \left[\binom{m-1}{r-1} \frac{(e^{-\boldsymbol{w}_i\gamma})^{r-1}}{(1 + e^{-\boldsymbol{w}_i\gamma})^{m-1}} - \frac{1}{m} \right] + \frac{1}{m} \tag{5}$$

As for all mixture distributions, CUB models are estimated using the Maximum Likelihood methods and exploiting the EM procedure for convergence (Dempster et al. 1977), specifically oriented to finite mixtures (McLachlan and Krishnan 2007; Peel and McLachlan 2000) and adapted for CUB models by Piccolo (2006). Although the estimation of the parameters is guaranteed, the convergence process is developed and made faster by starting off with a distribution function of observed data (Iannario 2009, 2010).

As widely discussed by Iannario and Piccolo (2016), beyond the more general approaches based on residuals to compare and choose among different models (i.e., the traditional *AIC*, *BIC*, and other likelihood-based indexes), Iannario (2009) and Di Iorio and

[2] In *rating* analysis that expresses a direct evaluation on the item, $(1 - \xi)$ increases with agreement towards the item. In *ranking* analyses that put at first place the best item, ξ increases with the expressed preference.

[3] The extreme values of π_i are associated to *complete uncertainty* $(\pi = 0)$, and the mixture resolves to a discrete Uniform random variable where any category has the same probability to be chosen, and to *no uncertainty* $(\pi = 1)$ when the choice is completely determined by feeling.

[4] Another extension of CUB models, not implemented in this analysis, considers the *shelter effect* that allows modelling the presence of a sort of "refuge" category (Corduas et al. 2009; Iannario 2012a). A more Generalised class of CUB models (GeCUB) is also defined if covariates are included into a CUB model with shelter effect (Iannario and Piccolo 2012b, 2016). Capecchi and Piccolo (2016) proposed a Combination of a discrete Uniform random variable with a SHelter effect (CUSH models). Iannario (2012b, 2014) designed CUBE models as a Combination of a Uniform and a BEta-binomial distribution, which allow capturing a possible over-dispersion; its specific case (IHG) is applied when the data generating process follows an Inverse Hyper-Geometric distribution, which is adequate if the mode is an extreme value of the support. Varying Uncertainty in CUB models (VCUB) is the most recent generalisation to consider the uncertainty component differently from the discrete Uniform distribution (Gottard et al. 2016).

Iannario (2012) investigated more specific diagnostics for CUB models and proposed alternative goodness-of-fit tools. These include the *Normed Dissimilarity index* (*Diss*):

$$Diss = \frac{1}{2}\sum_{r=1}^{m}\left|f_r - P\left(\hat{\pi}, \hat{\xi}\right)\right| \tag{6}$$

that measures the proportion of subjects to move among the cells of the frequency distribution to reach a perfect fit. In fact, f_r and $P\left(\hat{\pi}, \hat{\xi}\right)$ are the observed relative frequencies and the probabilities estimated by CUB models, respectively. The complement of *Diss* is $\mathcal{F}^2$:

$$\mathcal{F}^2 = 1 - \frac{1}{2}\sum_{r=1}^{m}\left|f_r - P\left(\hat{\pi}, \hat{\xi}\right)\right|, \quad 0 \leq \mathcal{F}^2 \leq 1 \tag{7}$$

and evaluates the proportion of subjects correctly predicted by the estimated models. Values of $\mathcal{F}^2$ lower than 0.90 denote an acceptable fitting.

Iannario (2009) and Piccolo (2008) introduced *ICON* (*I*nformation *CON*tent) as a pseudo R^2 that compares the log-likelihood of the estimated model with the log-likelihood of a completely uninformative distribution, which is the discrete Uniform distribution:

$$ICON = 1 + \frac{l\left(\hat{\theta}\right)}{l(0)} = 1 + \frac{\frac{\ell(\hat{\boldsymbol{\theta}})}{n}}{\log(m)} \tag{8}$$

3 The Conceptual Framework: Data Source and Variables

The choice of countries to be compared—France, Germany, Italy, and the United Kingdom—reflects the forth approach identified by Kohn (1989) to cross-national comparison that relates nations insofar as they are systematically interrelated due to some underlying process without losing sight of each national context or system (Livingstone 2003). As anticipated, these countries are known as the Big Four of Europe (OECD 2014) as they are the major European powers and the Western countries individually represented as full members of the main inter-governmental political forums of the world's main highly industrialised economies. They are also branded as G4 since their meeting in Paris to debate potential responses to the financial crisis during the Great Recession.

The data are from the fifth European Working Conditions Survey (EWCS 2010) that is a European reference source for comparable and reliable statistics on working conditions and quality of work and employment. The EWCS, which is carried out by Eurofound every five years since 1990, provides harmonised data on employment status and type, working hours and organisation, learning and training, physical environment, health and safety, worker participation, work–life balance, earnings and financial security in addition to a large set of personal socio-demographic information (European Foundation for the Improvement of Living and Working Conditions 2012).[5] Some issues related to the EWCS data quality and

[5] EWCS is a questionnaire-based survey with interviews conducted face-to-face to a random sample of persons in employment, both employees and self-employed, which is representative of the entire working population in each European country. The sampling strategy is based on a multi-stage design where each country is divided into sections based on region and degree of urbanisation, in each of which a number of PSUs is drawn randomly. A random sample of households is then drawn in each PSU, and in each household, the interviewee is the worker who has the birthday next. In general, in 2010, the total number of

the multiple imputation procedure adopted for the treatment of missing data are discussed in the "Appendix 3".

The analysis focuses on employees (i.e., anyone who works for a public or private employer and gets a basic wage not directly dependent on the revenue of the employer), aged 16–64, irrespective of their activity sector. Excluding the self-employed can be misleading because it may hide the duality of the labour market and the differences in their levels of job satisfaction. Nevertheless, the great diversity between employees and self-employed in personal characteristics and labour market settings, and not least, the high heterogeneity of self-employment (Parker 2004; Castellano and Punzo 2013) led us to the choice of restricting the analysis to the employees.

The EWCS question used to investigate global job satisfaction is presented as a 1–4 rating scale through the ordered set of four categories: *very satisfied*, *satisfied*, *not very satisfied*, and *not at all satisfied*. The use of an even-numbered scale allows compelling the respondent to take a clear stand, assuming that the "real" uncertain are equally and stochastically distributed (Perrone 1977). This strategy can attenuate the high concentration of preferences on the central value if an odd-numbered scale is used (Kulas and Stachowski 2009) or towards the extreme positive values when having a satisfactory job expresses personal fulfilment (Arnold et al. 1985).[6]

The literature on job satisfaction previously examined suggests alternative theories—and discusses the real consequences on its measurement—associated with explaining employees' general behaviour towards job. The major difference between those approaches concerns the ways through which specific aspects of job satisfaction are combined. In sketching job satisfaction profiles, it is worth noting that job-related factors may differently satisfy or dissatisfy employees, and within each dimension, they may also counterbalance each other.

Therefore, in order to evaluate how particular characteristics affect overall job satisfaction, a set of specific variables regarding individual work-related facets are categorised to form seven dimensions, each of them captures a specific side of global job satisfaction:

- *Socio-demographic characteristics* (gender, age).
- *Human capital* measured by variables concerning education and skill levels and work experience (formal educational attainment, skills in own work, and experience in the labour market). In truth, formal education at different levels, non-formal enterprise-based training and experience acquired through work are the most relevant and measurable settings for human capital development.
- *Job background* that captures certain objective characteristics of the work performed (type of contract, area of activity, number of co-workers, occupation type, and activity sector).
- *Monetary compensation* related to the living cost and salary (to make ends meet, total net earnings).
- *Socio-economic security* that captures, on the one side, the relationship of employees with their co-workers and/or their firm head or supervisor, and on the other, both their

Footnote 5 continued
completed interviews was 43,816 on 34 countries and around 1.000 in most countries. Precisely, in Germany it was 2.133, in Italy 1.500, in the UK 1.575, and in France 3.046. Further technical details can be found in the 2010 Technical Report (www.eurofound.europa.eu) where official documents that provide a complete and rigorous description of EWCS variables are available.

[6] A restriction has been made omitting the "do not know" and "refusals" on the question concerning the overall job satisfaction, whose incidence (0.7% on the entire dataset) is somewhat negligible. Precisely, on the restricted dataset to each country, the shares are: 0.93% for France, 0.23% for Germany, 0.47% for Italy, and 0.99% for the United Kingdom.

current position (feeling at 'home' in workplace and well paid for own work) and working future perspective (probability to lose the job and to find another similar to actual, perspective of job).
- *Working conditions* synthesized by a set of variables on the work environment (type of the main workplace) that involves physical and psychological conditions (exposition to hand activity or chemical products, managing complex situation, handling angry clients/patients, work with PC) with potential risks on health or safety (health and security).
- *Work–life and gender balance* that detects the ways in which personal life and business activities are coordinated (dominant gender of co-workers, weekly working hours and days, work–life balance, gender of supervisor).

The first three macro-areas belong to the objective dimensions of job satisfaction, while EU's Employment Committee Indicators Group identified the last four categories as subjective core dimensions (Eurofound 2012).

4 Modelling Job Satisfaction: Components and Selected Clusters

In the first step, the global job satisfaction is evaluated by country using the simplest *CUB(0,0)* models, which are CUBs without covariates (Table 1). *Diss* and $\mathcal{F}^2$ deviate only slightly from those values that Iannario (2009) considers as compatible with an acceptable global fitting ($Diss \leq 0.12$; $\mathcal{F}^2 \geq 0.88$). Figure 2 shows the empirical distributions of answers by country compared to those provided by *CUB(0,0)* models.

There is a one-to-one correspondence among CUB models and points in the $\Omega(\theta)$ space where the coordinates are expressed by the uncertainty $(1-\pi)$ and feeling $(1-\xi)$ parameters, respectively. Figure 1 shows the graphical representations of how the four countries rank according to both dimensions of feeling and uncertainty. The degree of feeling turns out to be significant and very high for the United Kingdom (0.7555) and Germany (0.6997), and slightly lower than 0.65 for Italy and France. On the other side, a degree of uncertainty close to zero highlights, in principle, no indecision in the selection process of the item that best describes one's level of global job satisfaction, which can be seen even from the squeezing of ellipse of confidence.

Table 1 Estimated *CUB(0,0)* models of global job satisfaction by country

CUB(0,0)	France	Germany	Italy	The UK
Uncertainty (π)	1.0000*** (.0248)	1.0000*** (.0212)	1.0000^{***} (.0383)	0.9998^{***} (.0145)
Feeling (ξ)	0.3633*** (.0064)	0.3003*** (.0071)	0.3513^{***} (.0094)	0.2445^{***} (.0080)
Log-likelihood	−2717.10	−1755.59	−1133.88	−1255.93
AIC	5438.19	3515.18	2271.75	2515.86
BIC	5449.80	3526.07	2281.68	2526.14
Diss	0.1523	0.1873	0.1781	0.1252
$\mathcal{F}^2$	0.8477	0.8127	0.8219	0.8748
ICON	5435.91	3512.41	2269.49	2512.46

*** Significant at 1%; ** significant at 5%; * significant at 10%

Standard errors in brackets

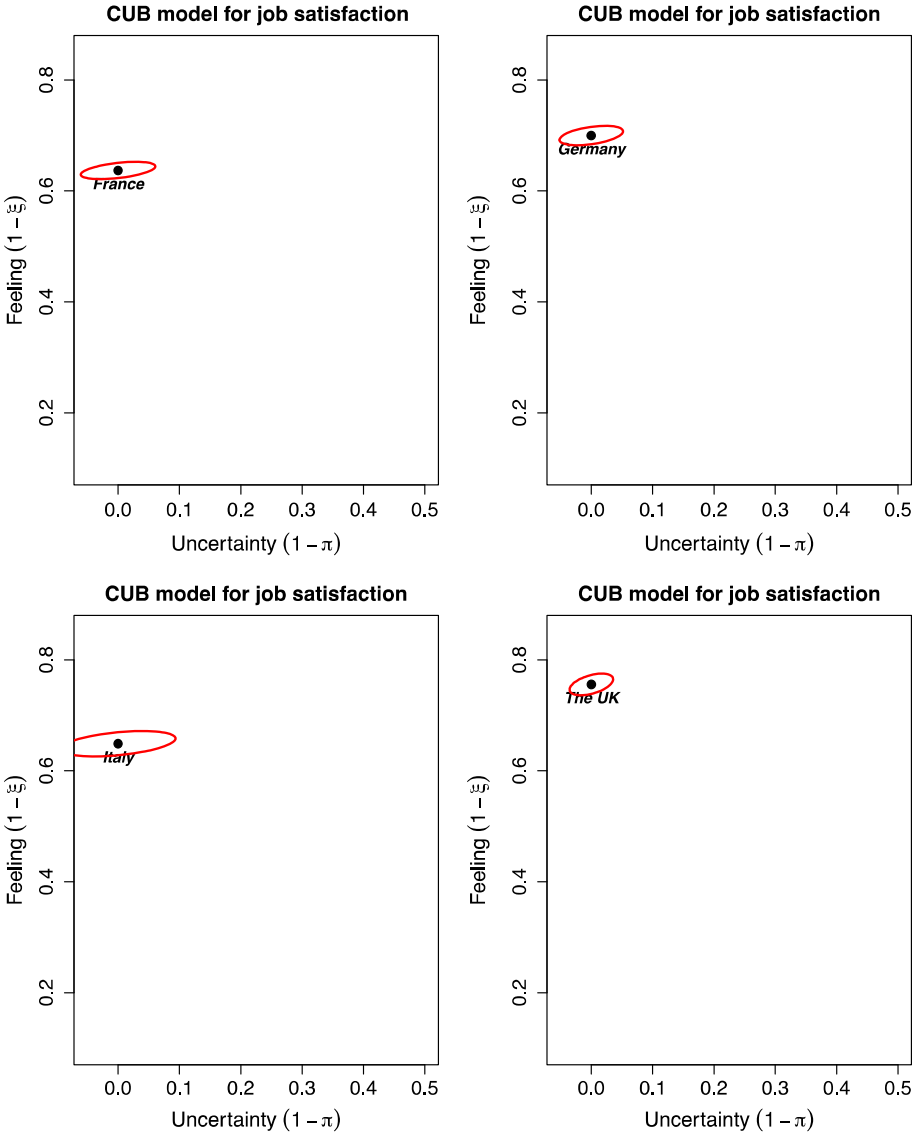

Fig. 1 Estimated *CUB(0, 0)* models of global job satisfaction by country

The previous analysis has enabled us to assess in general the role of uncertainty and feeling in overall job satisfaction. A set of CUB models are now performed separately by sub-groups of employees categorised by gender, age and earnings groups, and firm size, and plotted in the parametric space according to the estimated values of feeling and uncertainty of global job satisfaction in a comparative perspective (Fig. 3).

Some clusters of employees show low degrees of uncertainty, meaning that respondents' opinions on overall job satisfaction, in principle, are not faulty and cannot prejudice feeling of the same judgment. However, controlling for the effect of potential measurement errors due to the respondent uncertainty is still crucial for specific sub-categories of

employees. Similarly, most of clusters are relevant for detecting different patterns in response behaviours for as feeling on satisfaction is concerned. Except for Germany, feeling appears to be slightly higher for women, especially for the British ones, even though the gap in feeling is not large enough to conclude that global job satisfaction is statistically different between genders. Concerning the age groups, it is worth to note that younger British and German employees, aged 18–40, show higher degrees of feeling equal to 0.77 and 0.72, respectively, at constant lower levels of uncertainty. Although with a bit larger uncertainty (0.12), very young Italian employees, aged 18–24, have a higher degree of feeling than their older colleagues but lower than their British and German counterparts. Instead, younger French employees perceive the lowest feeling, and thus, the lowest levels of job satisfaction.

In each country, working in micro-sized firms increases feeling on satisfaction, except for Italy where it becomes slightly higher for employees who work in large companies. As for the other factors, feeling is higher for the United Kingdom, followed by Germany, and finally by Italy and France. However, as the following Section details, the size of company negatively affects global job satisfaction, particularly in Germany where employees of micro-sized enterprises are the most satisfied. Moreover, high-earnings employees seem to show a slightly better feeling on satisfaction, regardless of country.

Concerning the socio-economic security (Fig. 4), for each country, a set of components (good co-worker, feeling at 'home' in the workplace) shows a degree of feeling on global job satisfaction higher than 0.60, while the probability to lose own job shows the lowest feeling (around 0.20). A larger variability in both uncertainty and feeling is sketched for the remaining socio-economic aspects (feeling well paid for own work, good perspective of job, finding another similar job). The heterogeneous levels of uncertainty vary from values close to zero for the "good co-workers" for each country to values higher than 0.60 for "finding another similar job" in France and the United Kingdom.

All components of working conditions (Fig. 5) show a very low degree of feeling as they are negatively linked to global job satisfaction. In fact, while "handling angry clients/patients" and "managing complex situation" show a degree of feeling only slightly lower than 0.20, some others (exposition to hand activity, exposition to chemical products and work with PC) have feeling close to zero. However, these components are characterised by heterogeneous levels of uncertainty from the lowest (0.20) for "exposition to chemical products" across countries (for "handling angry clients/patients" in Germany and "exposition to hand activity" in the United Kingdom) to more than 0.80 for "working with PC" across countries (for managing complex situation in France).

5 Objective Versus Subjective Dimensions of Global Job Satisfaction

As discussed by Iannario and Piccolo (2012a), the mean value of CUB models is not always a useful measure of feeling and uncertainty since infinitely many parameters generate the same expectation while having different probability structures with respect to the decision-making processes. Therefore, covariates that are functions of respondents could help in explaining the complexity of global job satisfaction, and the goodness-of-fit measures are the benchmark for evaluating the performance of CUBs with subjects' covariates with respect to the more baseline models. In this regard, more sophisticated $CUB\ (p, q)$ models, with p and q covariates to explain feeling and uncertainty, respectively, allow for the interpretation of their effects on job satisfaction in a dual perspective: by

referring to the unobserved components of uncertainty and feeling and by studying the probabilities of ordered choices.

Some variables of the socio-economic security and working condition dimensions could be plethoric in explaining job satisfaction, beyond to generate estimation and multicollinearity problems. In order to estimate models that accomplish a desired level of explanation and prediction with an adequate number of variables, the degree of association among all possible covariates is evaluated by country through Pearson's Chi squared test. In the case of strongly associated covariates, conditions being equal, we select the variable with a higher degree of association with global job satisfaction. In particular, in the socio-economic security the "probability to lose own job" and the easiness "finding another job, similar to actual" are both connected to feeling of job insecurity felt by the employee; "feeling well-paid for own work" and to have "good perspective of job" are more often related to the same economic perspective. Similarly, "feeling at 'home' in workplace" and to have "good co-worker and/or supervisor" are both related to have friendships or good relationships at work. Based on the above criterion, for each couple of covariates, the choice is always relapsed on the first ones because they appear to be more associated with the target variable. Concerning the dimension of working conditions, the "exposition to hand activity" and the "exposition to chemical products" are related to the same large category of manual work; however, except for the United Kingdom, the second ones reflect a higher association with global job satisfaction. Finally, between the two variables that assess the levels of worker stress—"managing complex situation" and "handling angry clients/patients"—the first one is higher associated with the target variable for each country.

This stepwise procedure has led to the estimation of $CUB(p,q)$ models by country with $p = 1$ covariate on uncertainty and a set of $q = 23$ covariates on feeling. Table 3 offers an exhaustive description of all variables included in our analysis.

For the right interpretation of the results of $CUB(1,23)$ models (Table 2), it is important to remember that CUB coefficients allow inferring variations of uncertainty and feeling on overall job satisfaction and that the evaluation of parameters is strictly related to the opposite signs of covariates. The sensible reductions of log-likelihood functions denote better fitting of CUB models with covariates, particularly BICs for each country result to be lower than the corresponding values of the simplest $CUB\ (0,0)$ models.

In general, although the level of respondent cooperation is potentially related to the degree of uncertainty, the variable appears to be non-significant across countries. Concerning feeling, it is worth noting that, in principle, it does not seem to be much difference between countries in shaping the determinants of global job satisfaction.

The gender effect is one of the most controversial across countries. In Germany, women workers seem to be slightly less satisfied than their male counterpart is, coherently to most of the literature that shows the usual more disadvantaged positions of women in the labour market (Sloane and Williams 2000). In France, women appear to be more satisfied than men because of their lower expectations in the labour market under the same job conditions. However, the greater weakness of women do not necessarily entail a lower job satisfaction (Clark 1997; Oswald 2002). In fact, in Italy and the United Kingdom, our results highlight no significant differences between genders in explaining global job satisfaction in line with some other studies (Gamero Burón 2004; Millán et al. 2013). Looking at the substantial similarity between the relative distributions of answers of men and women along the four ratings of job satisfaction (Table 7), there is no evidence to justify differences on the perception of the satisfaction between genders.

Based on our results, no significant differences exist between the high-educated employees and those who reached a lower education level. In this regard, it is interesting to

Table 2 Estimated CUB (1,23) models of global job satisfaction by country

Variables	France	Germany	Italy	The UK
Socio demographic				
Gender (female)	−0.005* (0.003)	0.006* (0.036)	0.003 (0.005)	0.004 (0.004)
Human capital				
Education (high)	0.054 (0.063)	0.040 (0.087)	−0.094 (0.113)	0.047 (0.100)
Skill in own work (ref. right skilled)				
Under skilled	0.009 (0.095)	0.049 (0.088)	0.046 (0.131)	0.050 (0.155)
Over skilled	0.009 (0.058)	0.089 (0.077)	−0.044 (0.092)	0.057 (0.085)
Work experience (years)	0.015*** (0.004)	0.008* (0.005)	0.001 (0.006)	0.008 (0.006)
Job background				
Type of contract (indefinite)	0.009 (0.080)	−0.002 (0.106)	0.4e−04 (0.117)	0.179 (0.115)
Size of Enterprise (ref.: micro [1,9])				
Small [10, 49]	0.092 (0.068)	0.158** (0.081)	0.138 (0.103)	−0.039 (0.118)
Medium [50, 259]	0.157** (0.074)	0.167* (0.094)	0.193* (0.117)	−0.002 (0.128)
Large (≥260)	0.094 (0.086)	0.266** (0.119)	0.050 (0.139)	−0.013 (0.135)
Area of activity (ref.: social economy)				
Private	0.112 (0.130)	0.019 (0.116)	0.097 (0.199)	−0.024 (0.178)
Public	0.113 (0.138)	−0.057 (0.138)	−0.137 (0.207)	−0.013 (0.186)
Sector of activity (ref.: secondary)				
Primary	0.103 (0.259)	−0.064 (0.298)	0.556* (0.337)	−0.087 (0.316)
Tertiary	0.020 (0.078)	0.682 (0.086)	0.048 (0.105)	−0.080 (0.128)
Monetary compensation				
Make ends meet	−0.061** (0.026)	−0.048 (0.033)	−0.063* (0.038)	−0.074** (0.038)
Income groups (ref.: [0, Q_1])				
[Q_1, Q_2]	0.014 (0.073)	0.040 (0.096)	−0.051 (0.115)	0.098 (0.122)
]Q_2, Q_3]	−0.036 (0.079)	0.047 (0.110)	−0.086* (0.114)	0.217* (0.130)
]Q_3, Q_4]	−0.103 (0.094)	−0.107 (0.127)	−0.094 (0.141)	0.101 (0.150)

Table 2 continued

Variables	France	Germany	Italy	The UK
Socio-economic security				
Probability to lose own job	0.070*** (0.025)	0.123*** (0.032)	0.166*** (0.038)	0.105*** (0.036)
Feeling well paid for own work	−0.160*** (0.027)	−0.192*** (0.036)	−0.142*** (0.044)	−0.192*** (0.038)
Feeling at 'home' in the workplace	−0.430*** (0.030)	−0.298*** (0.034)	−0.291*** (0.043)	−0.418*** (0.045)
Working conditions				
Exposition to hand activity	–	–	–	0.041 (0.032)
Exposition to chemical products	−0.010 (0.018)	0.003 (0.027)	0.008 (0.034)	–
Managing complex situations	0.049*** (0.013)	0.048** (0.021)	0.023 (0.022)	0.049** (0.025)
Type of main workplace (ref. no ordinary place)				
Office	0.123 (0.122)	−0.107 (0.467)	0.442 (0.309)	0.185 (0.235)
Outside (vehicle, clients)	0.095 (0.133)	−0.080 (0.472)	0.408 (0.322)	0.051 (0.251)
Feeling health/safety at risk for own job (yes)	0.258*** (0.068)	0.324*** (0.084)	0.483*** (0.117)	0.092 (0.112)
Work–life/gender balance				
Weekly working hours	−0.002 (0.004)	0.003 (0.005)	−0.001 (0.005)	−0.003 (0.005)
Weekly working days	0.030 (0.040)	−0.046 (0.054)	0.002 (0.062)	0.002 (0.049)
Work–life balance	−0.184*** (0.034)	−0.211*** (0.048)	−0.114** (0.056)	−0.214*** (0.056)
Workers with same job title (ref.: equity situation)				
Mostly male	0.085 (0.071)	0.054 (0.093)	−0.025 (0.105)	0.108 (0.112)
Mostly female	−0.013 (0.068)	0.148* (0.090)	−0.050 (0.102)	0.090 (0.106)
Gender of supervisor (female)	0.019 (0.064)	−0.067 (0.086)	−0.046 (0.101)	−0.099 (0.101)
Administrative				
Respondent cooperation	−1.006 (374.155)	−0.936 (764.91)	3.628 (18,450.43)	−0.955 (75.103)
BIC	4861.29	3293.76	2256.70	2400.37

*** Significant at 1%; ** significant at 5%; * significant at 10%

Standard errors in brackets

resume some deductions by Belfield and Harris (2002) who concluded that the levels of job satisfaction among the highly qualified workers are rather neutral across graduates of alternative educational paths. However, a body of literature (Clark 1996; Clark and Oswald 1996; Gamero Burón 2004; Grund and Sliwka 2007) confirmed a negative relationship between education and job satisfaction justified by the different levels of aspiration and utility of work that characterise each educational attainment. Based on the theory that young people enter the labour market with greater ideals and aspirations for their career prospects (Oxenbridge and Evesson 2012), their starting satisfaction may be higher than that of the later years of life. In our study, French and German employees seem to confirm this hypothesis since their levels of job satisfaction depend negatively on the years of work experience, also due to the country's deteriorating employment situation and to the proliferation of "integration contracts" (or back-to-work) and subsidised contracts in the third sector that determined a large discontent among workers of different ages. Probably, younger employees may even enjoy job more than their older colleagues as it facilitates their transition into adulthood, while with growing maturity, new needs, requests and pressures arise because of more responsibilities. In problematic contexts, young people may consider their early jobs as stepping-stones (Kalleberg and Loscocco 1983) and feel positive about their working experience because they perceive outside alternatives as limited or even non-existent.

Coherently with several other studies (Oi and Idson 1999; Lallemand et al. 2007; Millán et al. 2013), in general, the firm size appears to be inversely related to job satisfaction. It means that employees see their needs met in micro-sized enterprises, while they are not as readily satisfied in larger firms where they may have less freedom and independence in shaping the type of work. In Germany, for instance, employees of all companies (with at least 10 workers) are less satisfied than their colleagues of micro-sized firms, supporting the hypothesis that lower levels of job satisfaction in larger firms come from the greater rigidity of working environment (García-Serrano 2008). In fact, in Germany, workers reach job satisfaction in the higher flexibility and incentives, which are peculiarity of micro organisations.

In France and Italy, just working in medium-sized firms (and not large) reduces global job satisfaction, probably because these employees have neither the perception of high job security of bigger companies nor the freedom and independence of micro-sized firms (Millán et al. 2013). Instead, no significant differentials in job satisfaction across size categories exist for the United Kingdom where the more homogeneous distribution of job satisfaction by firm size makes this effect smoothly (Table 7).

Some other characteristics—the type of contract, the area of activity, the wage groups, and the activity sector—are not strong predictors of global job satisfaction, except for the Italian agricultural employees who feel a lower economic security and thus are less satisfied with their type of work than their colleagues of other sectors are. These covariates are however modelled because they allow controlling for the structural position of employees within the country's labour market.

Concerning the more subjective dimensions, it is possible to separate the significant covariates on feeling that respectively have a positive and negative effect on global job satisfaction (Table 2). The following belongs to the first group:

- "Making ends meet", which captures the ease or difficulty of families of responding adequately to their needs, increases employees' job satisfaction regardless of wage they receive.

- "Feeling well paid" gratifies employees with their jobs and makes them happier in each country more than they actually get.

Indeed, except for Germany, coming from a household whose members earn enough significantly increases the satisfaction with the type of job and may improve feeling towards the work. As widely discussed by Kahneman and Deaton (2010), after a certain level of household income, money "does nothing for happiness, enjoyment, sadness or stress". This is why members usually pool their resources within the households and share their decisions (Castellano et al. 2016), regardless of personal capacity to earn income. Therefore, employees, who belong to households who make ends meet more easily, not necessarily require high wages to be satisfied with their job because they compensate with resources of other family members and this may strengthen their "feeling well paid".

- "Feeling at home in the workplace" is a much sought prerogative by workers and people who spend time socially with their colleagues are more likely to be more satisfied than those who have poorer opportunities for social interactions. Conflict with peers or superiors is one of the vital causes of job dissatisfaction that adversely affects the job quality, productivity, and ultimately leads to organizational instability (Molla 2015). Therefore, socialising with colleagues could be a reason of being satisfied in one's job and this aspect is potentially linked to the firm size. In particular, a lower sense of freedom and ownership may concern those employees of bigger sized enterprises where a more formal work environment usually exists.
- "Work–life balance" that means higher degree of feeling towards job satisfaction if employees are put in a position to succeed in reconcile their time between work and personal/family commitments as well as other non-work duties and activities. As widely discussed by Clarke et al. (2004) and Delecta (2011), a "balanced" worker is able to reduce at minimum the conflict among works, family responsibilities and personal demands with higher job performances.

Instead, the negative effect on job satisfaction derives from:

- "Probability to lose own job" that can be seen as a barometer of the widespread fear among employees of losing their job through downsizing as a result of the recent economic recession that has led to sharp increases in unemployment across countries.
- "Managing complex situations" is another common aspect among employees of all four countries, except for Italians.
- "Feeling health/safety at risk for own job", the workers' perceptions of safety climate, regarded as a crucial guide to safety performance, may provide a strong proactive work tool.

Jobs that require the management of complex conditions or constant changes in machines, systems, processes and work layout may lead to job dissatisfaction if organisations do not impart promptly the necessary training to their human capital (Weightman 1999). Coherently, expectations of possible job loss have one of the largest negative effects on job satisfaction (Blanchflower and Oswald 1999). Workers with a high workload or work pressure, and thus with a negative perception of safety climate, tend to engage in unsafe acts, which, in turn, increase their susceptibility to accidents (Salminen 1995; Hofmann and Stetzer 1996; Ayim Gyekye 2005).

In brief, the amount of socio-economic security embodied in a job and the working conditions are the most important driving subjective forces on feeling towards job satisfaction. These aspects may be well explained if contextualised in the period of survey, i.e.,

the first years of the economic crisis, during which it was an actual decline of job security or, at least, of the one perceived. Finally, the results shed light on the importance of balancing family and working life as another positive characteristic shared by all countries involved in driving job satisfaction. In reality, since 1980s European and national institutions have been perceived the importance of policies on work–life balance, flexibility and good conciliation in order to revitalise the labour market performance and to narrow the gap between genders.

6 Concluding Remarks

This paper has been designed to investigate the primary driving forces that are likely to explain the overall job satisfaction comparatively for the most representative countries of Western Europe. One of the main elements of this work's novelty is its linking the research of the factors that drive job satisfaction to the investigation of respondents' behaviour behind an expressed preference using the relatively recent CUB methodology. In the broader conceptual approach, which regards job satisfaction as more than one possible outcome of job quality, CUBs have allowed us to model the employees' satisfaction as a combination of their feeling towards the item and uncertainty in the decision-making process.

First, feeling plays a relevant role in designing profiles of job satisfaction for most clusters of workers. In principle, their high degree of feeling makes British employees more satisfied with respect to their colleagues from Continental Europe. Meanwhile, not all clusters show low uncertainty; conversely, the degrees of uncertainty are quite heterogeneous, and for some categories of employees, they even touch 0.80. It means that their judgments on overall job satisfaction, mainly because of the more subjective facets, could prejudice feeling of the same opinion if CUB models did not control for uncertainty. In that case, the traditional methodologies, which cannot manage measurement errors in the response process, could infer on a higher number of statistically significant factors of job satisfaction. Instead, controlling for the effect of measurement errors due to the respondent uncertainty, the estimated CUBs have allowed a more reliable and truthful interpretation of patterns of global job satisfaction.

Second, job-related subjective aspects capture the employees' desire of being recognised in their professionalisms better than any other objective characteristic, downsizing the role of earnings as the dominant factor that drives job satisfaction.

Third, the dynamics of subjective factors of job satisfaction are quite homogeneous across the "Big Four" of Europe. These results may be surprising if they link to the different welfare regimes and socio-economic scenarios that were foreshadowed in these countries before and during the global crisis whose effects continue to be felt.

In brief, this research has found the socio-economic security, working conditions and specific facets of work–life balance as the main dimensions for *positive feelings* towards job satisfaction across countries. In this field, systematic attempts to enhance the employees' well-being are important in their own right and even for the organisational performance because a real driver of job performance may also be an indicator of all subjective aspects of job quality.

Job is a core activity in society and people invest many hours of the day in their work. This draws on the importance of becoming aware of the "centrality" that each person must have in his/her workplace. A more pervasive involvement would allow workers to realise

more favourable job outcomes and could be a deterrent for the lack of interest or worse for absenteeism. Ensuring healthy and safe workplace, upgrading assets and equipment, driving workers to socialisation, developing a sense of teamwork, boosting family-supportive benefits are appropriate strategies that company leaders and human resource managers could implement to make the work environment as the place where employees do more than survive and where an adequate sense of ownership increases satisfaction and productivity.

Our results endorse the good explicative power of CUB models to job satisfaction analysis, managing the latent cognitive components of feeling and uncertainty that traditional methods cannot do. However, the investigation of global job satisfaction on a longer Likert scale ($m > 4$) would be able to better itemising the differences in a comparative approach. From a statistical point of view, the potential presence of response bias (quite frequent in the rating scale with many categories) could be managed through the extended GeCUB models. The latter allow the estimation of the impact of subjects' covariates for the component of shelter effect in addition to feeling and uncertainty. These aspects were deliberatively neglected in this work (as the shelter effect was not significant), and we intend to examine them closely afterwards on the other datasets in which job satisfaction is measured on longer rating scales.

Finally, the findings achieved are directly valid in the restricted context of employees although they form the basis for further developments in the attempt to extend the analysis to more countries and more complex situations where the main differences between employees and the self-employed could be accounted for.

Appendix 1

See Tables 3, 4, 5, 6 and 7.

Table 3 List of variables

Dimension	Variables	Code	Description
Socio demographic	Gender	hh2a	Dummy for female (ref.: male)
Human capital	Education	ef1_isce	Dummies for high level of education (ref.: lower levels): low- and medium-level (ISCED97: from pre-primary to, post-secondary non-tertiary education) high-level (first and second stage of tertiary education)
	Working experience	q12	Number of years spent in work in the own last organisation
	Skill in own work	q60	Dummies (ref.: right skilled): for skill that need training (under skilled) for skill more than sufficient (over skilled) for enough skill to work (right skilled)

Table 3 continued

Dimension	Variables	Code	Description
Job background	Type of contract	q7	Dummies for type of contract (ref.: not stable contract):
			indefinite contract
			fixed-term contract and occasional work
	Size of enterprise	q11	Dummies for level of dimension (ref.: level micro):
			micro from 1 to 9 workers
			small from 10 to 49 workers
			medium from 50 to 249 workers
			large from 250 and over workers
	Area of activity	q10	Dummies for area of activity (ref.: social economy):
			for private sector
			for public sector
			for social economy (joint private–public, not profit sector, not government organisation)
	Sector of activity	nace_r1	Dummies for branch of activity (ref.: secondary):
			primary (agriculture, fishing, forestry and mining)
			secondary (industry, manufacturing and construction)
			tertiary (retail, service, and so on)
Monetary compensation	Making ends meet	ef6	Rating about difficult/easiness from 1 (with great difficulty) to 6 (very easily)
	Income groups	ef11_rec	Dummies for level of yearly net earnings from main job (ref.: lowest level):
			very low income (under 1st quartile)
			low income (between 1st and 2nd quartile)
			medium income (between 2nd and 3rd quartile)
			high income (over 3rd quartile)
Socio-economic security	Probability to lose own job	q77a	Probability to lose the job in the next 6 months from 1 (low prob.) to 5 (high prob.)
	Feeling well paid for own work	q77b	How much agree/disagree from 1 (strongly disagree) to 5 (strongly agree)
	Good perspective of job	q77c	How much agree/disagree from 1 (strongly disagree) to 5 (strongly agree)
	Feeling at 'home' in the workplace	q77d	How much agree/disagree from 1 (strongly disagree) to 5 (strongly agree)
	Good co-worker and/or supervisor	q77e	How much agree/disagree from 1 (strongly disagree) to 5 (strongly agree)
	Finding another job, similar to actual	q77f	Difficulty/easiness for the respondent to find a similar job in terms of salary and overall quality from 1 (very difficult) to 5 (very easy)

Table 3 continued

Dimension	Variables	Code	Description
Working conditions	Exposition to hand activity	q23a	Rating from 1 (never) to 7 (all of time)
	Exposition to chemical products	q23g	Rating from 1 (never) to 7 (all of time)
	Managing complex situation	q24a	Rating from 1 (never) to 7 (all of time)
	Desk to clients/patients	q24g	Rating from 1 (never) to 7 (all of time)
	Work with PC	q24h	Rating from 1 (never) to 7 (all of time)
	Type of main workplace	q26	Dummies on main workplace (ref.: no ordinary workplace): office outside (to clients, in vehicle, …) no ordinary workplace (at home, …)
	Feeling health/ security at risk for own job	q66	Dummy on the perceived risk of health or safety because work (in reference with "no")
Work–life/gender balance	Weekly working hours	q18	Number of hours work for week
	Weekly working days	q20	Number of days work for week
	Work–life balance	q41	Rating on work–life balance from 1 (not at all well) to 4 (very well)
	Workers with same job title	q16	Dummies (ref.: equity situation): for mostly men for mostly women for equity situation (nobody else has the same job or the same number of men and women)
	Gender of supervisor	q59	Dummy for female (ref.: male)
Administrative	Respondent cooperation	p5	Ranking with four categories (in order excellent, fair, average and bad)

Table 4 Weighted descriptive statistics: France and Germany

Variables	France			Germany		
	Mean	Median	Entropy	Mean	Median	Entropy
Socio-economic security						
Probability to lose own job	2.01	2	0.864	1.98	2	0.858
Feeling well paid for own work	2.73	3	0.944	3.20	3	0.903
Good perspective of job	2.64	2	0.962	2.55	2	0.960
Feeling at 'home' in workplace	3.73	4	0.819	3.68	4	0.883
Good co-worker and/or supervisor	3.77	4	0.835	3.72	4	0.871
Finding another similar job	3.00	3	0.983	2.46	2	0.957
Working conditions						
Exposition to hand activity	1.86	1	0.530	2.01	1	0.666

Table 4 continued

Variables	France			Germany		
	Mean	Median	Entropy	Mean	Median	Entropy
Exposition to chemical products	1.70	1	0.511	1.76	1	0.647
Managing complex situation	3.63	3	0.982	2.88	3	0.947
Handling angry clients/patients	2.42	2	0.870	2.25	2	0.843
Work with PC	3.51	3	0.876	3.14	3	0.932
Type of main workplace	–	–	0.607	–	–	0.501
Office	0.744	–	–	0.79	–	–
Outside (vehicle, clients)	0.194	–	–	0.205	–	–
No ordinary workplace	0.062	–	–	0.005	–	–
Feeling health/safety at risk for own job	–	–	0.711	–	–	0.659
Yes	0.769	–	–	0.792	–	–
No	0.231	–	–	0.208	–	–
Work–life/gender balance						
Weekly working hours	35.04	35	8.415	36.37	40	9.498
Weekly working days	4.93	5	0.53	4.93	5	0.438
Work–life balance	3.02	3	0.864	3.06	3	0.777
Workers with same job title	–	–	0.999	–	–	0.996
Mostly male	0.318	–	–	0.375	–	–
Mostly female	0.332	–	–	0.323	–	–
Equity situation	0.35	–	–	0.302	–	–
Gender of supervisor	–	–	0.882	–	–	0.734
Male	0.672	–	–	0.758	–	–
Female	0.328	–	–	0.242	–	–

Table 5 Weighted descriptive statistics: Italy and the United Kingdom

Variables	Italy			The UK		
	Mean	Median	Entropy	Mean	Median	Entropy
Socio-economic security						
Probability to lose the job	2.18	2	0.915	2.01	2	0.872
Feeling well paid for own work	2.86	3	0.916	3.18	4	0.935
Good perspective of job	2.56	2	0.930	3.04	3	0.958
Feeling at 'home' in workplace	3.43	4	0.875	3.99	4	0.793
Good co-worker and/or supervisor	3.67	4	0.774	4.20	4	0.767
Finding another similar job	2.58	2	0.955	2.98	3	0.965
Working conditions						
Exposition to hand activity	1.76	1	0.516	1.54	1	0.426
Exposition to chemical products	1.50	1	0.423	1.64	1	0.496
Managing complex situation	3.02	2	0.944	2.22	1	0.779
Handling angry clients/patients	2.35	2	0.853	2.56	2	0.899
Work with PC	3.33	3	0.911	3.92	4	0.900
Type of main workplace	–	–	0.409	–	–	0.435

Table 5 continued

Variables	Italy			The UK		
	Mean	Median	Entropy	Mean	Median	Entropy
Office	0.841	–	–	0.831	–	–
Outside (vehicle, clients)	0.141	–	–	0.133	–	–
No ordinary workplace	0.018	–	–	0.036	–	–
Feeling health/safety at risk for own job	–	–	0.540	–	–	0.571
Yes	0.839	–	–	0.827	–	–
No	0.160	–	–	0.173	–	–
Work–life/gender balance						
Weekly working hours	35.27	40	9.853	33.73	37	0.959
Weekly working days	5.18	5	0.572	4.57	5	0.719
Work–life balance	2.89	3	0.795	3.33	3	0.805
Workers with same job title	–	–	0.999	–	–	0.991
Mostly male	0.340	–	–	0.284	–	–
Mostly female	0.326	–	–	0.325	–	–
Equity situation	0.334	–	–	0.391	–	–
Gender of supervisor	–	–	0.749	–	–	0.974
Male	0.749	–	–	0.58	–	–
Female	0.251	–	–	0.42	–	–

Table 6 Multivariate frequency distribution of job satisfaction by subgroups: France and Germany

Variables	France				Germany			
	1	2	3	4	1	2	3	4
Socio demographic								
Gender								
Male	0.0440	0.1762	0.6298	0.1500	0.0192	0.1052	0.6324	0.2432
Female	0.0398	0.1925	0.5666	0.2012	0.0243	0.1022	0.6241	0.2494
Human capital								
Education								
Low	0.0467	0.2445	0.5495	0.1593	0.0209	0.1080	0.6491	0.2219
Medium	0.0487	0.1780	0.6034	0.1700	0.0172	0.1293	0.6983	0.1552
High	0.0288	0.1707	0.5998	0.2007	0.0253	0.0833	0.5455	0.3460
Skill in own work								
Right skilled	0.0253	0.1680	0.6236	0.1831	0.0109	0.0967	0.6478	0.2446
Under skilled	0.0687	0.2073	0.5479	0.1762	0.0508	0.1126	0.6093	0.2274
Over skilled	0.0563	0.2254	0.5587	0.1596	0.0120	0.1111	0.6006	0.2763
Job background								
Type of contract								
Indefinite	0.0383	0.1829	0.6003	0.1785	0.0169	0.0838	0.6430	0.2563
Fixed term	0.0646	0.2041	0.5544	0.1769	0.0500	0.2375	0.5000	0.2125
Occasional work	0.0413	0.1818	0.5868	0.1901	0.0597	0.2239	0.6119	0.1045

Table 6 continued

Variables	France				Germany			
	1	2	3	4	1	2	3	4
Size of Enterprise								
Micro [1, 9]	0.0263	0.1538	0.5911	0.2287	0.0166	0.0714	0.6213	0.2907
Small [10, 49]	0.0446	0.1985	0.5908	0.1662	0.0167	0.1354	0.6438	0.2041
Medium [50, 259]	0.0665	0.2137	0.5887	0.1310	0.0302	0.1126	0.6236	0.2335
Large ($\geq$260)	0.0424	0.2062	0.6158	0.1356	0.0348	0.0995	0.6169	0.2488
Area of activity								
Private	0.0464	0.1901	0.5928	0.1707	0.0192	0.1092	0.6369	0.2346
Public	0.0302	0.1661	0.6074	0.1963	0.0246	0.0902	0.5779	0.3074
Social economy	0.0280	0.2150	0.5421	0.2150	0.0370	0.0802	0.6358	0.2469
Sector of activity								
Primary	0.0400	0.3200	0.4800	0.1600	0.0000	0.1364	0.5000	0.3636
Secondary	0.0521	0.1911	0.5980	0.1588	0.0183	0.1027	0.6553	0.2237
Tertiary	0.0396	0.1826	0.5948	0.1831	0.0233	0.1035	0.6212	0.2520
Monetary compensation								
Income classes	0.0553	0.2234	0.5532	0.1681	0.0414	0.1329	0.6122	0.2135
$[0, Q_1]$	0.0491	0.2000	0.5891	0.1618	0.0184	0.1195	0.6581	0.2040
$]Q_1, Q_2]$	0.0318	0.1423	0.6479	0.1779	0.0123	0.0790	0.6568	0.2519
$]Q_2, Q_3]$	0.0123	0.1327	0.6265	0.2285	0.0101	0.0638	0.5604	0.3658
$[Q_3, Q_4]$	0.0553	0.2234	0.5532	0.1681	0.0414	0.1329	0.6122	0.2135
Working condition								
Type of main workplace								
Office	0.0428	0.1843	0.5974	0.1755	0.0178	0.0980	0.6273	0.2569
Outside (vehicle, clients)	0.0464	0.2194	0.5886	0.1456	0.0370	0.1282	0.6268	0.2080
No ordinary workplace	0.0132	0.0921	0.5724	0.3224	0.0000	0.0000	0.8750	0.1250
Feeling health/safety at risk for own job								
Yes	0.0181	0.1333	0.6367	0.2119	0.0111	0.0666	0.6373	0.2850
No	0.1201	0.3587	0.4523	0.0689	0.0620	0.2451	0.5944	0.0986
Work–Life/Gender balance								
Workers with same job title								
Mostly male	0.0553	0.1928	0.6195	0.1324	0.0219	0.1002	0.6557	0.2222
Mostly female	0.0381	0.2162	0.5651	0.1806	0.0272	0.1270	0.6243	0.2214
Equity situation	0.0327	0.1494	0.5986	0.2194	0.0155	0.0833	0.5988	0.3023
Gender of supervisor								
Male	0.0456	0.1733	0.6085	0.1726	0.0193	0.1060	0.6334	0.2413
Female	0.0336	0.2102	0.5647	0.1915	0.0291	0.0969	0.6126	0.2615

Table 7 Multivariate frequency distribution of job satisfaction by subgroups: Italy and the UK

Variables	Italy				The United Kingdom			
	1	2	3	4	1	2	3	4
Socio demographic								
Gender								
Male	0.0259	0.1756	0.6367	0.1617	0.0282	0.0847	0.5591	0.3280
Female	0.0324	0.1691	0.6079	0.1906	0.0101	0.0565	0.5246	0.4087
Human capital								
Education								
Low	0.0216	0.2716	0.5819	0.1250	0.0189	0.0699	0.5531	0.3581
Medium	0.0309	0.1577	0.6472	0.1642	0.0141	0.061	0.5493	0.3756
High	0.0333	0.1048	0.5905	0.2714	0.0196	0.0728	0.5098	0.3978
Skill in own work								
Right skilled	0.0269	0.1644	0.6428	0.1659	0.0165	0.045	0.5442	0.3943
Under skilled	0.0290	0.1739	0.5942	0.2029	0.0182	0.0869	0.5515	0.3434
Over skilled	0.0446	0.2143	0.5625	0.1786	0.0316	0.1474	0.4526	0.3684
Job background								
Type of contract								
Indefinite	0.0227	0.1637	0.6404	0.1732	0.0212	0.0683	0.5404	0.3702
Fixed term	0.0469	0.1562	0.6250	0.1719	0.0119	0.0476	0.5714	0.3690
Occasional work	0.0652	0.2717	0.4457	0.2174	0.0000	0.0902	0.5188	0.3910
Size of Enterprise								
Micro [1, 9]	0.0260	0.1818	0.6000	0.1922	0.0147	0.0368	0.5551	0.3934
Small [10, 49]	0.0161	0.1613	0.6774	0.1452	0.0128	0.0744	0.5308	0.3821
Medium [50, 259]	0.0452	0.1946	0.5837	0.1765	0.0129	0.0806	0.5645	0.3419
Large ($\geq$260)	0.0426	0.1348	0.6170	0.2057	0.0351	0.0807	0.5123	0.3719
Area of activity								
Private	0.0343	0.2046	0.6180	0.1431	0.0194	0.0687	0.5492	0.3627
Public	0.0191	0.0955	0.6306	0.2548	0.0147	0.0786	0.5233	0.3833
Social economy	0.0227	0.2045	0.6136	0.1591	0.0256	0.0256	0.5385	0.4103
Sector of activity								
Primary	0.1429	0.1429	0.5714	0.1429	0.0000	0.0000	0.7727	0.2273
Secondary	0.0241	0.2048	0.6667	0.1044	0.0294	0.0588	0.6118	0.3000
Tertiary	0.0290	0.1625	0.6083	0.2003	0.0169	0.0723	0.5239	0.3869
Monetary compensation								
Income classes								
$[0, Q_1]$.	0.0409	0.2234	0.5695	0.1662	0.0081	0.0732	0.5420	0.3767
$]Q_1, Q_2]$	0.0280	0.1682	0.6495	0.1542	0.0338	0.0752	0.5526	0.3383
$]Q_2, Q_3]$	0.0242	0.1280	0.6851	0.1626	0.0224	0.0769	0.5609	0.3397
$[Q_3, Q_4]$	0.0160	0.1444	0.5936	0.2460	0.0129	0.0516	0.5065	0.4290
Working condition								
Type of main workplace								
Office	0.0259	0.1575	0.6344	0.1822	0.0172	0.0689	0.5388	0.3751
Outside (vehicle, clients)	0.0470	0.2617	0.5638	0.1275	0.0240	0.0599	0.5808	0.3353
No ordinary workplace	0.0526	0.1579	0.4737	0.3158	0.0222	0.1111	0.4222	0.4444

Table 7 continued

Variables	Italy				The United Kingdom			
	1	2	3	4	1	2	3	4
Feeling health/safety at risk for own job								
Yes	0.0147	0.1274	0.6595	0.1984	0.0125	0.0490	0.5375	0.4010
No	0.1059	0.4059	0.4235	0.0647	0.0461	0.1659	0.553	0.2350
Work–Life/Gender balance								
Workers with same job title								
Mostly male	0.0362	0.1838	0.6462	0.1337	0.0252	0.0868	0.5910	0.2969
Mostly female	0.0319	0.1768	0.5913	0.2000	0.0123	0.0711	0.5221	0.3946
Equity situation	0.0198	0.1558	0.6261	0.1983	0.0183	0.0549	0.5183	0.4085
Gender of supervisor								
Male	0.0316	0.178	0.6275	0.1629	0.0247	0.0796	0.5501	0.3457
Female	0.0226	0.1547	0.6038	0.2189	0.0095	0.0549	0.5265	0.4091

Appendix 2

See Figs. 2, 3, 4 and 5.

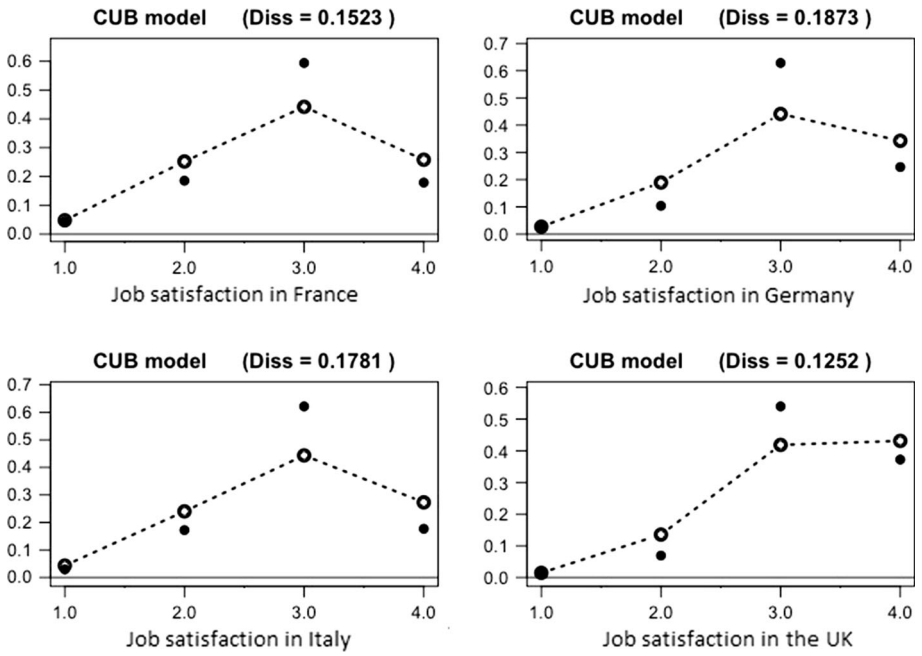

Fig. 2 *CUB(0, 0)* of global job satisfaction by country

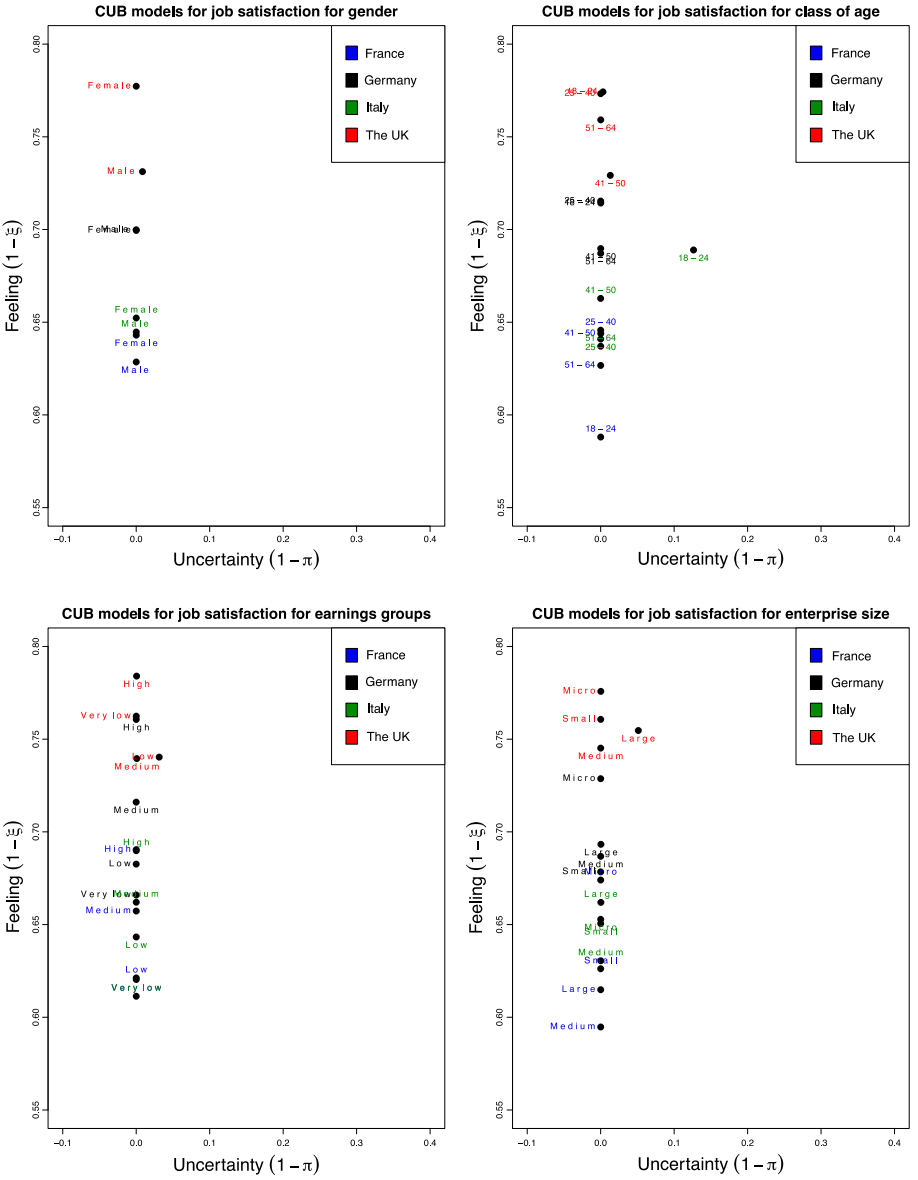

Fig. 3 Estimated *CUB(0, 0)* models of global job satisfaction by country for gender, age groups, earnings groups, and enterprise size

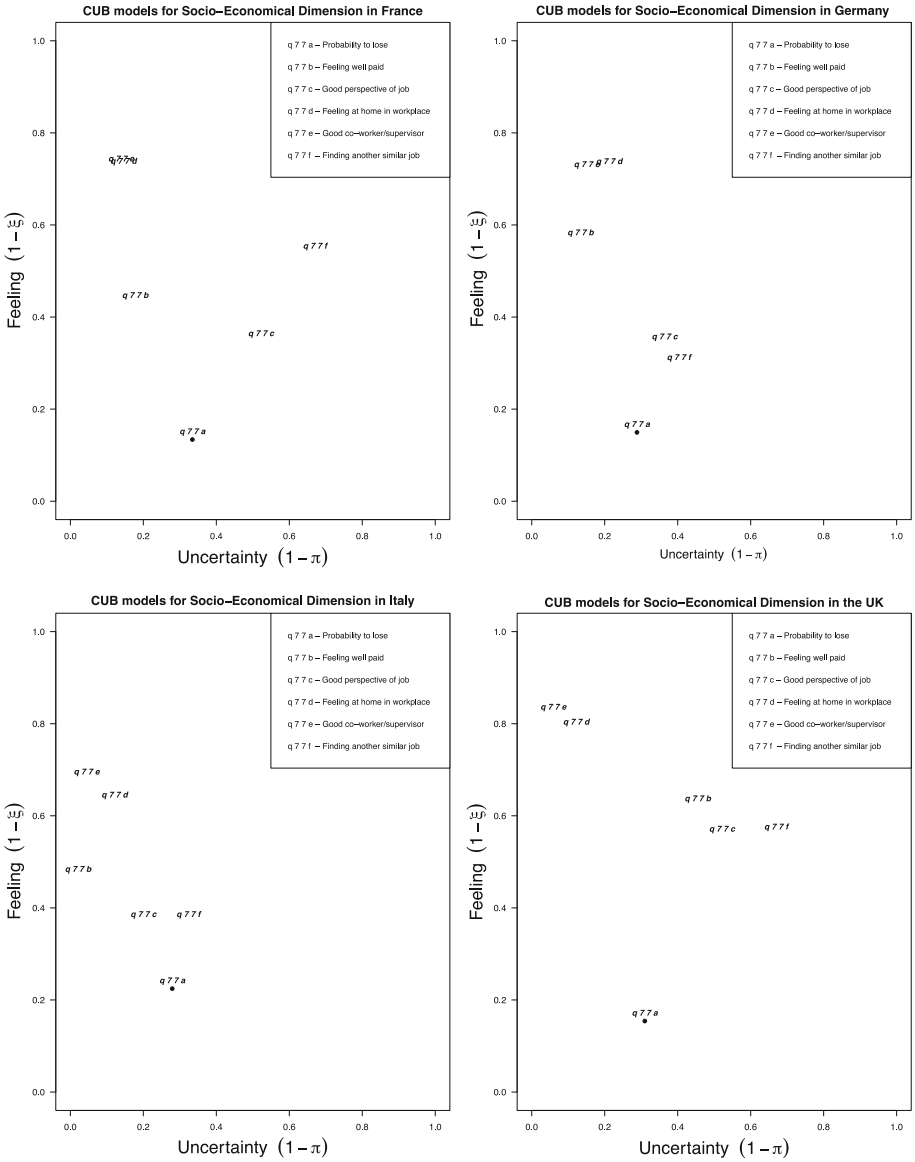

Fig. 4 Estimated *CUB(0, 0)* models of components of socio-economical dimension by country

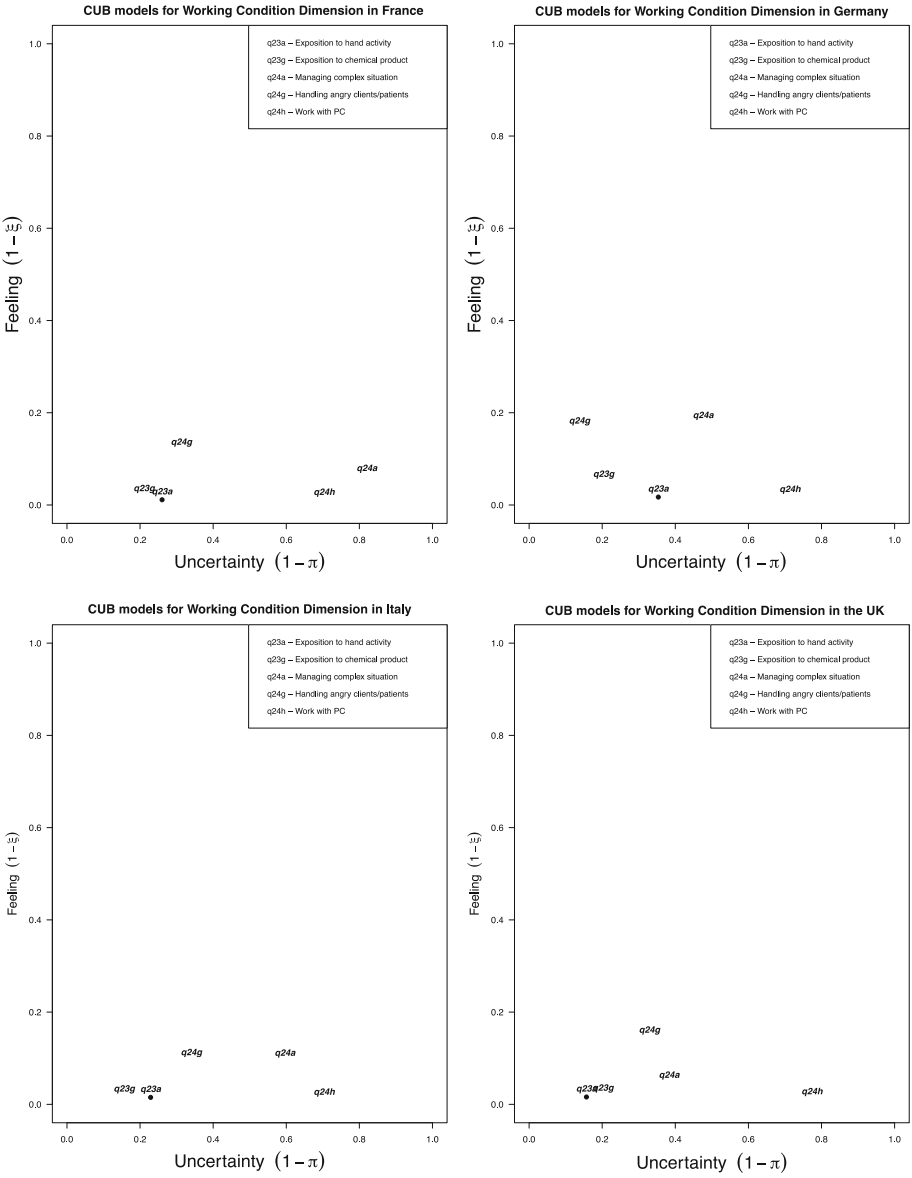

Fig. 5 Estimated *CUB(0, 0)* models of components of working condition dimension by country

Appendix 3

Data Quality: Multiple Imputation Through Amelia II

Item non-responses (*don't know* and *refusal*) are ubiquitous in most quantitative research studies, and the 2010 EWCS dataset is not immune to the problem. The percentages of item non-responses by country are quite negligible—1.4% for France, less than 1% for

Germany, 1.6% for Italy and the United Kingdom. However, if each unit with at least one missing value had been deleted, a large number of observations would have been lost—33.8% for France, 24.9% for Germany, 40.6% for Italy and 45.3% for the United Kingdom—with unavoidable effects on the conclusions that could be drawn from the data.

Therefore, after having removed the very few missing values (less than 1% for each country) on the question concerning the global job satisfaction (see footnote 2), we take up the strategy of multiple imputation (Honaker and King 2010) through the Amelia II's EMB (Expectation–Maximization with Bootstrapping) algorithm implemented by Honaker et al. (2015). Multiple imputation (Rubin 1987; Little and Rubin 2002)—known as the gold standard of treating missing data (Baraldi and Enders 2010; Cheema 2014)—assures data quality without losing too many observations and avoids biases, inefficiencies and incorrect uncertainty estimates that can result from the deletion instead.

The imputation model in Amelia II assumes that the complete dataset D (both observed D^{obs} and unobserved D^{mis}) has:

- A multivariate normal distribution:

$$D \sim N_k(\mu, \Sigma) \tag{9}$$

- The unobserved data are *missing at random* (MAR).

The first hypothesis is often an approximation to the true distribution of data, even though this method works as well as other more complicated models even in the face of categorical or mixed data (Schafer 1997; Schafer and Olsen 1998). The second one means that the pattern of missingness only depends on the observed part (D^{obs}), not the unobserved data (D^{mis}). Let M be the binary missingness matrix, which indicates the presence of missing values with 1 (and 0 otherwise), the MAR assumption is:

$$P(M|D) = P(M|D^{obs}) \tag{10}$$

The vector of parameters $\theta = (\mu, \Sigma)$ determines the data distribution that, under the MAR assumption, it can be factorised as follows:

$$P\left(D^{obs}, M|\theta\right) = P\left(M|D^{obs}\right)P(D^{obs}|\theta) \tag{11}$$

The parameters θ are estimable through the likelihood function:

$$L\left(\theta, D^{obs}\right) \propto P(D^{obs}|\theta) \tag{12}$$

Supposing a flat prior on θ, the posterior function is rewritten as:

$$P\left(\theta, D^{obs}\right) \propto P(D^{obs}|\theta) = \int P(D|\theta)dD^{mis} \tag{13}$$

This posterior function is solved through the EMB algorithm that combines the classic EM algorithm (Dempster et al. 1977) with a bootstrap approach to take draws from this posterior. From the posterior of the complete-data parameters, imputations are made by drawing values of D^{mis} from its distribution conditional on D^{obs} and the draws of θ, which is a linear regression with parameters that can be calculated directly from θ (Honaker et al. 2015).

In brief, what Amelia does is imputing m values for each missing data and creating m five new complete datasets. As suggested by Honaker et al. (2015), being a few missing data, we chose $m = 5$, and without affecting generality, one of the five datasets (the fourth)

was selected randomly to avoid the complexity of merging imputed values from the five datasets given that most are categorical variables.

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