Working Paper no. **73**

Job satisfaction, working conditions and job-expectations

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February 6, 2008

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Abstract

According to Sen's capability approach, objective working conditions can be seen as functionings (i.e. things experienced by the individuals). The corresponding capability set includes all sets of alternatives working conditions existing in the society for a given kind of job. Observing the existing capability set of working conditions, individuals formulate expectations about their own working conditions. These expectations might create biases in the realistic perceptions of job satisfaction. Our aim is to study the determinants of worker perceptions of quality of work in EU Countries. In particular, we shed light on the complex relationship that exists between job satisfaction, objective working conditions and workers expectations. First, we determine which objective working conditions impact on the level of job satisfaction. Second, we test the existence, and the signs, of biases in the realistic perception of job satisfaction due to the existence of expectations. Third, we test if expectations are affected by the working conditions actually experienced in the job place. From a technically point of view, we estimate a two-tiered stochastic frontier model. We find that expectations biases exist. High expectations have stronger effects in reducing job satisfaction than low expectation in increasing job expectations. Finally, expectations are affected by the working conditions actually experienced by the workers.

Keywords: J81, J28, I31

JEL-codes: Job satisfaction, working conditions, expectations, two-tiered stochastic frontier model

1. Introduction

In recent years economists have taken an increasing interest in the analysis of the subjective well-being of individuals (Easterlin, 2001; Frey and Stutser, 2002 for a review; Clark and Oswald, 1994 and 1996). Next to the economic literature, there are more than 3000 studies done in the last 30 years by psychologist and sociologists (Veenhoven, 1994 and 1997; Warr, 1999). Many economic studies use micro-data to understand the determinants of answers to questions about satisfaction with life (or aspects of it like work): identifying the factors that raise or depress satisfaction is central to the understanding of well-being. But, the science in this area is relatively young and much needs to be done to establish the key empirical regularities, understand when are found, and why, in some cases, they do not hold (Anand and Clark, 2006).

Interest in individual well-being and in understanding the determinants of job satisfaction may emerge from the following observations. Firstly, satisfaction may be thought as an indicator of utility and the study of its determinant may contribute to the development of substantive theories of utility. Secondly, job satisfaction may be seen as an indicator of quality of work and the latter is often pointed out as the key condition for boosting employment and productivity in Europe.[1] Thirdly, according to Sen (1977, 1979, 1999), it is the opportunity to live a good life, rather than the accumulation of resources, that matters most for well-being, and the opportunities result from the capabilities (i.e. a set of alternatives) that people have. Thus, studying satisfaction may help in understanding what makes a good life for a human being and to build up from this to a theory of social good. Fourthly, the above arguments are policy relevant. Following the second argument, policies should focus on the determinants of job satisfaction in order to improve satisfaction and, therefore, employment and productivity. Following the third arguments, as stressed by Nassbaum (2001, 2000), policies should ensure that the goal of the political process is to set the stage and allow people to present whatever argument they have in favour of a given choice, but choice is up to each individual. Opportunities and the possibility to choice must be ensured.

Our paper contributes to the literature adding fresh empirical evidence that help to identify the determinants of job satisfaction. In first instance, it is natural to think that job satisfaction (worker perceptions of quality of work) may be explained by the objective working conditions. But, unfortunately the relation existing between worker job satisfaction and

[1] In Europe, one of the key issues raised by the conclusion of the European Council in Lisbon in March 2000 is the following: the European Union needs to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion (European Commission, 2003 and 2007). Globalization, economic integration and technological innovation are changing the way Europe lives and works. Thus, unless employment levels above the 70% level can be achieved and productivity can be significantly improved, the average GDP growth per capita in the EU will slow down significantly between 2010 and 2030 (Kok, 2003). Kok (2003) reports that "while it is clear that higher levels of real wages and better working conditions are dependent on higher rates of productivity growth, it is also true that raising the quality of jobs and skills levels helps to boost the efficiency and productivity of the economy and to integrate people more firmly into labour markets".

objective working conditions is not so simple. Individuals differ in personality, as well as emotions and cognitive process (Diener et al., 1999; Schwarz and Strack, 1999). They can be optimist or pessimist (Groot et al., 2007). All these factors (among others) affect workers expectations about life and working conditions. For example, two workers with jobs of identical objective characteristics may show radically different levels of job satisfaction. For one, the job may entail a decrease in status or a source of frustration if he/she expected to have a better valued job, whereas for the other, who perhaps had very low expectations owing to a lower level of education or other reasons, the same job may be related with perceptions of good quality. In general, the better the fit between expectations and objective working conditions, the better the subjective judgement of the job quality and, therefore, the higher the level of job satisfaction (Fernandez-Macia et al. 2005). Our aim is, therefore, to shed light on the complex relationship that exists between job satisfaction, objective working conditions and workers expectations.

Worker expectations can be also analysed in terms of the Sen's capabilities approach. Sen (1985) and many writing subsequently, defines capabilities as what people are able to do or able to be (i.e. the opportunity they have to achieve various lifestyles and as results, the ability to live a good life). He differentiates this from what he calls functionings: the things a person actually does and experiences. Thus, objective working conditions are indeed functionings (i.e. they are experienced by the individuals). The corresponding capability set includes all sets of alternatives working conditions existing in the society for a given kind of job and some individual characteristics (i.e. education).[2] In our view, individuals observe the capability set of working conditions and, thus, they have expectations about working conditions. These expectations might create biases in a realistic perception of job satisfaction. If individuals expect better conditions than the real ones (high expectations), perceptions of quality of work will be revised downward. The opposite will occur if individuals expect worst conditions than the real ones (low expectations). Sen (1999) also stress than individuals experiencing bad situations (i.e. bad working conditions) may get used to such contexts and therefore they could adjust their perceptions about the reality they live in. In other word, expectations could be different depending from the working conditions effectively experienced by the individuals.

In our paper, we try to shed light on the following points. First, we determine which objective working conditions impact on the level of job satisfaction. Second, we test the existence, and the signs, of biases in the realistic perception of

[2] Note that this definition implies that the individuals already decided the preferred type of job and, for example, the preferred level of education from sets of alternatives. Given these decisions, Nussbaum (2001) in her list of Capabilities specifies: "in work, (the individual has to be) able to work as human being, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers". This implies that quality of work is an important capability and working conditions are the corresponding functionings.

job satisfaction due to the existence of expectations. Third, we test if expectations are affected by the working conditions actually experienced in the job place.

We consider expectations about working conditions as unobservable, and we assume explicit distributions for these unobservable. We estimate a two-tiered stochastic frontier model (Polachek and Yoon, 1987; Groot and Oosterbeek, 1994; Groot et al., 2007). In this model, differences between observed job satisfaction and realistic perception of quality of work can be due to two sources of variation. Firstly, self-reported worker levels of satisfaction might be subject to measurement error or other random factors which may cause unusually high or lower than expected levels of satisfactions. In other words, the satisfaction frontier is stochastic across individuals. Secondly, a given individual might be subject to idiosyncratic, albeit unobservable expectations about working conditions that do not match with the reality which may lead to lower or higher satisfaction levels than the realistic ones. Alternatively, we could use an individual specifics effects model (i.e. Ferrer-i-Carbonell and Frijters, 2004). But, our approach has two main advantages compared with the individual effects models. First, we are able to test the existence of biases on the realistic perception of quality of work due to both high expectation and low expectation. Second, the stochastic frontier model can be estimated on cross-section data and does not require panel data.[3] The latter observation is especially important because we use the 2005 European Working Condition Survey (EWCS), a cross-sectional dataset providing unique and very detailed information on quality of work in Europe (i.e. working time, work organization, pay, work-related health risks and health outcomes, and access to training). As far as we know, no studies accounting for expectation biases in self-reported job satisfaction levels used so rich dataset.

The rest of the paper is structured as follows. In section two, we outline the empirical methodology we use. In section 3, we illustrate the data and the constructions of the relevant indicators of job satisfactions and working conditions. Section 3 presents the empirical findings. Section 4 concludes.

2. Methodology

Some studies measure psychological factors by survey questions on expectations about positive and negative outcomes in general and they study the correlation between the latter and satisfaction levels (i.e. Cummins and Nistico, 2002; Chang and Sanna, 2001). Other studies have considered psychological elements in the evaluation of satisfaction as individual specifics effects and have estimated fixed effects models on panel data to account for these (i.e. Ferrer-i-Carbonell and Frijters, 2004). Groot and at al (2007) also suggest to considers psychological factors as unobservables, but

[3] The model can be extended considering also time constant unobserved individual heterogeneity (Polachek and Yoon, 1996). In this case, panel data are required.

they do not treat them as fixed effects but rather assume explicit distributions for these unobservable. In particular, they use a two-tiered stochastic frontier model of satisfaction: their idea is to being able to ascertain by how much actual satisfaction deviates from potential levels. We follow the latter approach.

The starting point of the empirical model is the realistic level of indirect job satisfaction, y_i^*, that a worker may feel from a given set of objective working conditions. We assume that the log of job satisfaction is a linear function of the objective working conditions, x_i, plus a independently, identically normally distributed random term (with zero mean and variance σ_u^2) capturing measurement error and other random factors, u_i,

$$\ln(y_i^*) = x_i\beta + u_i$$

where β is a vector of coefficients that measure the impact of working conditions on job satisfactions.

The observed level of job satisfaction, y_i, may differ from the realisitc level of job satisfaction that the individual may feel y_i^* (given the vector of working conditions). In fact, if there is a bad match between individual expectations and reality, the individual will revise her perception of quality of work. Let ε_i be a measure of the extent to which observed satisfaction differs from the realistic level of satisfaction. The observed level of job satisfaction is then related to the realistic level of satisfaction by:

(1) $$\ln(y_i) = x_i\beta + u_i + \varepsilon_i$$

If $\varepsilon_i = v_i \in (-\infty, 0)$ measures the extent to which observed satisfaction falls short of the realistic level of satisfaction (due to bad matching between expectations and reality), the above equation constitutes a classic stochastic frontier methodology (Aigner, Lovell and Schmidt, 1977; Meusen and van den Broeck, 1977). But, we want to account for the effects of both high expectation and low expectations. The former can imply the downward revision of one's perception of quality of work compared with the realistic perception, whereas low expectations can imply the upward revision of quality of work relative to the realistic perception. Thus, the classic stochastic frontier model needs to be extended.

Following Polachek and Yoon (1987), we introduce in the above model a composite error term:

(2) $$\varepsilon_i = v_i + w_i$$

where $v_i \in (-\infty, 0)$ and $w_i \in (0, \infty)$. Equation (1) and (2) constitute a two-tiered model of satisfaction. In particular, equation (2) represent a two-error component model which allow for the possibility of both systematically positive and negative component within the error structure. We assume $E(-v_i) = \mu_v$ and $E(w_i) = \mu_w$. The term μ_v is the negative

bias of the observed satisfaction from the realistic perception of quality of work, and can be interpreted as the effect of too high expectations. Likewise, μ_v is the positive deviation of the observed satisfaction from the realistic perception, and can be interpreted as the effect of too low expectations. The u_i, v_i and w_i, are independent. The v_i and w_i are assumed to be independently and identically exponential distributed.[4]

The vector of parameters $(\beta, \sigma_u, \mu_v, \mu_w)$ can be estimated by maximum likelihood (Polachek and Yoon, 1987). The log likelihood function can be written as:

$$\log L = n \log\left(\frac{\vartheta_u \vartheta_v \vartheta_w}{\vartheta_v + \vartheta_w}\right) + \left[\vartheta_v \vartheta_u \sum_i \lambda_i + (n/2)\vartheta_v^2\right] +$$
$$+ \sum_i \log\{1 - \phi(\vartheta_u \lambda_i + \vartheta_v) + \left[1 - \phi(-\vartheta_u \lambda_i + \vartheta_w)\right] \exp\left[-1/2\left(\vartheta_u \lambda_i + \vartheta_v - \vartheta_w\right)\left(\vartheta_v + \vartheta_w\right)\right]\}$$

where

$$\vartheta_u = 1/\sigma_u$$
$$\vartheta_v = \sigma_u / \mu_v$$
$$\vartheta_w = \sigma_u / \mu_w$$
$$\lambda_i = \ln(y_i) - x_i\beta$$

The parameter ϑ_u is the inverse of the dispersion: it represents the precision of the error components u. The parameters ϑ_v and ϑ_w can be interpreted respectively as relative indicators of high expectation and low expectations.

Finally, we allow the positive and the negative deviation of the observed satisfaction from the realistic perception of quality of work to vary with observable characteristics. Thus, we allow the parameters μ_v and μ_w to vary with the observable characteristics. Following Groot et al. (2007), we specify:

$$\vartheta_v = x_i \alpha_v$$
$$\vartheta_w = x_i \alpha_w$$

where α_v and α_w are parameters to be estimated.

[4] The effects of the hypothesis of exponential distribution on the results have been tested running the classic stochastic frontier model under the hypothesis of half-normal distribution. The results are robust.

3. Data and relevant variables

We use data from the 2005 European Working Condition Survey (EWCS). The aim of the survey is to provide an overview of the state of quality of work and employment in Europe. Topics covered in the survey include working time, work organization, pay, work-related health risks and health outcomes, and access to training. The survey is questionnaire-based. It includes active population of the respective nationalities of the EU Member States, aged 15 years and over, resident in each of the 27 Member States. The basic sample design is a multi-stage, random sampling: in each country, a number of sampling points are drawn with probability proportional to population size (for a total coverage of the country) and to population density. The target number of interviews was 1,000 in all countries except Cyprus, Estonia, Luxembourg, Malta and Slovenia, in which it was 600. Weights are provided (and used in our analisis as appropriate): they are constructed in order to ensure that the distribution by region, locality size, gender, age, economic activity and occupation is identical to that of the Labor Force Survey distribution. Note that only employees are included in our sample.

The main dependent variable used in our analysis is an indicator of self-reported job satisfaction. In addition to asking individuals whether they are satisfied (on scale 1 to 4) with their working conditions, the EWCS asks individuals whether they agree (on scale 1 to 5) with statememnts about the risk of loosing the job, the feeling of being well-paid, the perception of having good prospective of career advancement, the feeling about the organisation, the opportunities to learn and grow, and the feeling of having good friends. All these questions give information about the subjective perception of quality of work and, therefore, are used to construct an aggregate indicator of job satisfaction.[5]

About objective working conditions, we select 45 questions that give information about the most important working conditions. These questions give information on working times, pace of work, work intensity, flexibility of work schedules, autonomy, work content, training, discrimination, health and safety and remuneration. See Appendix 1 for a full list. But, to be used in the analysis, the information contained in these questions need to be aggregated in a small number of indicators of working conditions.

We use factor analysis as a dimension reducing strategy. Factor analysis is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved random variables called factors. In general, with the factor analysis, we model the observed variables as linear combinations of the factors, plus "error" terms. Thus, we are able to reduce data on different attributes down to a few important dimensions. This reduction is possible because the attributes are related. The algorithm produces a factor structure matrix representing the correlations between the variables and the factors and is called the factor loading matrix. The interpretation of each factor is marked by high loadings

[5] The analysis was also performed using as indicator of job satisfaction the variable about satisfaction with working conditions only, the results confirm the ones presented in the paper.

on a certain sub-sample of attributes that give information on a specific kind of unobservable. As we extract consecutive factors, they account for less and less variability. The decision of when to stop extracting factors depends on when there is only very little "random" variability left. We retain only factors accounting for enough variance: this means that unless a factor extracts at least as much as the equivalent of one original variable, we do not consider it (Kaiser criterion). Since factor analysis is based on a correlation matrix, it assumes that the observed variables are measured continuously, are distributed normally, and that the associations among indicators is linear. Since many of our observed variables are discrete or dichotomous, we assume that they are indicators of underlying continuous unobserved variables and we use the appropriate correlations in the factor analysis.[6] Finally, we perform an oblique rotation allowing factors to be correlated.[7] This enhances the interpretability of the factors.

Table 1 reports the results of the factor analysis run to construct the indicator of job satisfaction. We identify only one factor (labeled job satisfaction) that explains the 41% of the total variance. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) reports a value of 0.8 confirming that the variables have enough in common to run a factor analysis. We rescale the factor scores and we take the logarithm: a score (in log) equal to zero indicates maximum dissatisfaction. Positive values (in log) indicate positive levels of satisfaction. We assume job satisfaction to be a cardinal variable. We feel justified in doing so by the findings of Ferrer-i-Carbonell and Frijters (2004) showing that assuming ordinality or cardinality of happiness makes little difference.

Table 2 reports the results of the factor analysis run to identify the indicators of working conditions. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) reports a value of 0.8 indicating that the variables have enough in common to run a factor analysis. We identify 13 factors representing (in order of proportion of explained variance): (1) absence of bad health conditions (i.e. vibrations, high/low temperatures, noises, smokes); (2) absence of autonomy; (3) no exposure to chemical elements; (4) atypical schedules; (5) work content; (6) absence of work intensity; (7) physical violence in the workplace; (8) discrimination linked to nationality, ethnic group, and religions; (9) training provided by employer; (10) discriminations linked to gender, age and sexual orientation; (11) Flexible working times; (12) pace of work not depending from others; and, (13) low wage and uncertainty. The 13 factors explain jointly the 56% of the total variance. Each factor has zero mean and unit variance by construction. Therefore, the explanatory variables include the above 13 factors and a set of dummies about gender, age groups, education classes, sectors and countries.

[6] The analysis was also performed either using normal correlation (Pearson moment correlation) or using polychoric correlation (for ordinal variables) / tetrachoric correlation (for dichotomous variables). Results are robust.

[7] The analysis was also performed using orthogonal varimax rotation: results are robust.

4. Empirical results

Table 3 presents four sets of estimates: OLS, stochastic frontier estimates, two-tiered stochastic frontier estimates with constant terms for the one-sided error terms only, and estimates in which the one-sided error terms are allowed to vary by working conditions, individual characteristics and job attributes. The likelihood ratio test indicates that the preferred specification in the latter.

A comparison of the four sets of estimates shows that the statistically significance parameter estimates are broadly similar. Atypical schedule has a statistically significant negative effect on job satisfaction underlining the dissatisfaction in being unable to achieve a good work-life balance. Physical violence and discrimination at the workplace as well as bad health conditions and exposure to chemical elements have significant negative impacts on job satisfaction. Work intensity also impact negatively on job satisfaction. Low wages and uncertainty about the length of the contract also have statistically significant negative effects on job satisfaction. Instead, autonomy, job content, training, flexible working times and pace of work independently from others positively impact on job satisfaction. Finally, self-reported levels of job satisfaction vary with age, education, nationality and job sectors. Surprising, levels of job satisfactions do not vary by gender: this result may be a consequence of the high number of controls we use.

We find that the estimates for both the indicators of high expectations (θ_v) and low expectations (θ_v) are statistically significant. This is true for both specifications of the two-tiered frontier model. We can also observe that some working conditions and individual characteristics impact on these indicators (see Table 4). High expectations imply downward biases in job satisfactions. But, high expectations are statistically significant positively associated with "good working conditions" (absence of bad heath conditions, absence of violence, autonomy, job content, absence of intensity, training, flexible working times and absence of atypical schedules). In other words, our results indicate that individuals experiencing bad working conditions get use to them and, therefore, exhibit lower expectations than individuals experiencing good working conditions. Moreover, adults aged 40 or above show higher expectations and expectations vary by sectors.

Low expectations imply upward revision in perceptions of job satisfaction. This upward revision is positively associated with good working conditions (absence of bad health conditions, no exposure to chemical elements, job content, absence of intensity, and absence of discrimination). Females and high educated workers are associated with smaller upward revision in perceptions. Thus, we can conclude that good working conditions enhance the effects of both high expectations and low expectations on the deviation of the observed satisfaction from the realistic perception.

To facilitate the interpretation of the impact of the individual characteristics on the indicators of high and low expectations, Table 5 shows the expected values of the one-sided error terms: $E(e^v) = 1/(1+\mu_v)$ and $E(e^w) = 1/(1-\mu_w)$. [8] The results indicate that observed levels of job satisfaction are 9% (=1-0.91) lower than the realistic perceptions of satisfaction due to too high expectations that do not match the reality. Similarly, self-reported level of satisfaction are 6% (=1.06-1) higher than the realistic level of satisfaction as effect of low expectations. Thus, mean observed self-reported levels of job satisfactions deviate downward from the realistic perceptions of quality of work.

Let's now look to the average level effects of high and low expectations by worker sub-groups. The downward bias due to higher expectation than the reality is particularly large in the groups of medium educated workers (13%) and workers working in agriculture (12%). Instead, it is particularly low in the group of individuals working in the public administration and defense (5%). The upward deviation due to lower expectation than the reality is especially small in the services sector (4%). However, we can conclude that there are no huge differences among socio-demographics groups.

5. Conclusion

Analysis of the subjective well-being of individuals are increasing in economic literature. Interest about the determinants of job satisfaction is also increasing. It is widely recognized that individuals perceptions about quality of work do not depend only from objective working conditions. Personality, emotions, cognitive process and knowledge about alternatives sets of working conditions for a given type of job, create expectations about "fair" working conditions. And, these expectations might create biases in the realistic perceptions of job satisfaction. In this paper, we determine which objective working conditions impact on the level of job satisfaction. We test the existence, and the signs, of biases in the realistic perceptions of job satisfaction due to the existence of expectations. We also test if expectations are affected by the working conditions actually experienced in the job places.

Our main finding are the following. *First*, objective working conditions clearly impact on the individual perceptions of quality of work as expected. *Second*, if individuals expect better conditions than the real ones (high expectations), self-reported levels of job satisfaction are downward biased (about 9%). If individuals expect worst conditions than the real ones (low expectations), observed levels of job satisfaction are upward biased (about 6%). So, mean self-reported levels of satisfactions deviate downward from the realistic perceptions of quality of work. *Third*, "good" working conditions enhance the effects of both high expectations and low expectations on the deviation of the observed

[8] See Polachek and Yoon (1987) for details.

satisfaction from the realistic perception. Thus, our findings point in the direction that workers adapt to the circumstances they experience and they revise their expectations consequently.

References

Anand, P., and Clark, A. (2006) "Symposium introduction: life satisfaction and welfare economics", *The Journal of Socio-Economics*, 35, 177-179

Clark, A.E. and Oswald, A.J. (1994) "Unhappiness and unemployment", *Economic Journal*, 104, pp.648-59

Clark, A.E. and Oswald, A.J. (1996) "Satisfaction and comparison income", *Journal of Public Economics*, 61, 359-381

Diener, E., Suh, E.M., Lucas, R.E., Smith, H.L. (1999) "Subjective well-being: three decades of progress", *Psychological Bulletin*, 125, 276-302

Easterlin, R.A. (2001) "Income and happiness: toward a unified theory", *The Economic Journal*, 111, 465-484

European Commission (2003) "Improving quality in work: a review of recent progress", COM(2003) 728 final, Brussels

European Commission (2007) "Improving quality and productivity at work: Community strategy 2007-2012 on health and safety at work", COM(2007) 62 final, Brussels

Fernandez-Macia, E. and Munoz de Bustillo Llorente, R. (2005) "Job satisfaction as an indicator of the quality of work", *The Journal of Socio-Economics*, 34, 5, 656-673

Ferrer-i-Carbonell, A., and Frijters, P. (2004) "How important is methodology for the estimates of the determinants of happiness?", *The Economic Journal*, 114, 641-659

Frey, B.S. and Stutser,A. (2002) "*Happiness and Economics: how the economy and institutions affect human wellbeing*", Princeton, Princeton University Press

Groot, W. and Maassen van den Brink, H. (2007) "Optimism, pessimism and the compensating income variation of cardiovascular disease: a two-tiered quality of life stochastic frontier model", *Social Science & Medicine*, 65, 1479-1489

Groot, W. and Oosterbeek, H. (1994) "Stochastic reservation and offer wages", *Labour Economics*, 1,(3-4), 383-390

Kok, W. (2003) "Jobs, Jobs, Jobs: creating more employment in Europe", report of the Employment Taskforce

Nassbaum, M.C. (2000) "*Woman and Human Development – The capability approach*", Cambridge: Cambridge University Press

Nassbaum, M.C. (2001) "Symposium on Amartya Sen's Philosophy: 5 adaptive preferences and woman's options", *Economics and Philosophy*, 17, 67-88

Polachek, S.W. and Yoon, B. J. (1987) "A two-tiered earnings frontier estimation of employer and employee information in the labor market", *The Review of Economics and Statistics*, vol 69, No. 2, pp. 296-302

Polachek, S.W. and Yoon, B.J. (1996) "Panel estimates of a two-tiered earnings frontier", *Journal of Applied Econometrics*, vol.11, pp. 169-178

Schwarz, N. and Strack, F. (1999) "Reports of subjective well-being: judgmental process and their methodological implications", in Kahneman, D., Diener, e., Schwarz, N. (eds.) "*Well-being: the foundations of hedonic psychology*", (1999), New York: Russell Sage Foundation

Sen, A. K. (1977) "Social choice theory: a re-examination", Econometrica, 45, 53-89

Sen, A. K. (1979) "Personal Utilities and Public Judgements, or what's wrong with welfare economics?", *Economic Journal*, 89, 537-58

Sen, A. K. (1985) "*Commodities and capabilities*", Amsterdam: North-Holland

Sen, A. K. (1999) "*Development as freedom*", Oxford: Oxford University Press

Veenhoven, R. (1994) "*Correlates of Happiness*", Rotterdam, The Netherlands, RISBO, Centre for Socio-Cultural Transformations.

Veenhoven, R. (1997) "Advances in understanding happiness", *Revue Quebecoise de Psychologie*, pp. 29-74

Warr, P. (1999) "Well-being and the workplace", in Kahneman, D., Diener, e., Schwarz, N. (eds.) "*Well-being: the foundations of hedonic psychology*", (1999), New York: Russell Sage Foundation, 492-412

Cummins, R., and Nistico, H. (2002) "Maintaining life satisfaction: the role of positive cognitive bias", *Journal of Happiness Studies*, 3, 37-69

Chang, E., and Sanna, L. (2001) "Optimism, pessimism, and positive and negative affectivity in middle-aged adults: a test of a cognitive-affective model of psychological adjustment", *Psychology and Aging*, 16, 524-531

Aigner, D., Lovell, K., and Schmidt, P. (1977) "Formulation and estimation of stochastic frontier production function model", *Journal of Econometrics*, 5, 21-38

Meusen, W., and van den Broeck, J. (1977) "Efficiency from Cobb-Douglas production functions with composed error", *International Economic Review*, 18, 435-444

Table 1. Job satisfaction indicator (factor loading)

Variables	Job satisfaction
Working conditions satisfaction (1=not satisf - 4=very satisf)	0.7217
Perception of the possibility of loosing the job in the next 6 months (1-5)	-0.3348
Perception of being weel paid (1-5)	0.6212
Perception that the job offers good prospects for career advancement (1-5)	0.7054
Feeling "at home" in the organization (1-5)	0.7445
Perception of having opportunities to lear and growth (1-5)	0.7362
Perception of having very good friends at work (1-5)	0.5227
Proportion explained	0.4123
Kaiser-Meyer-Olkin measure of sampling adequacy	0.7898
mean (ln)	1.44
min (ln)	0.00
max (ln)	1.97

Table 2. Objective working condition indicators (factor loading)

Variables describing working conditions:	Factors:												
	Bad health cond. 1	Absence of autonomy	Chemical Elements	Atypical schedule	Job contents	Absence of intensity	Violence	Discrim 1	Training	Discrim 2	Flexible working times	Pace of work	Low wage
threats of physical violence							0.85						
physical violence from people..							0.68						
physical violence from other...							0.78						
Bullying/harassment										0.53			
sexual discrimination										0.68			
age discrimination										0.65			
discrimination linked to disability													
Discrim. linked to sexual orientation										0.49			
discrimination linked to nationality								0.79					
Discrim. linked to ethnic backgrounds								0.86					
discrimination linked to religion								0.69					
able to choose/change order of tasks		0.78											
able to choose/change methods of work		0.82											
able to choose/change speed of work		0.82											
pace depending on colleagues													
pace depending on performance												0.59	
Pace depending on machine's speed												0.63	
Exposed to vibrations	0.69												
Exposed to loud noise	0.74												
Exposed to high temperatures	0.66												
Exposed to low temperatures	0.72												
Breathing in smoke, fumes, dust, ect	0.65												
Radiation such as x rays, radioactive	0.46												
Tobacco smoke from other people			0.60										
Breathing in vapors (solvents, ect)			0.75										
Handling/in contact with chemical prod			0.53										
Hand./ contact with infectious material			0.73										
assessing the quality of your own work					0.70								
solving unforeseen problems					0.67								
Complex tasks					0.56								
job involves learning new things					0.65								
work at night (No./month)				0.68									
work in the evening (No./month)				0.71									
work on Sunday (No./month)				0.76									
work on Saturday (No./month)				0.65									
work > 10 hours days (No./month)				0.53									
Working to tight deadlines						0.85							
Working at very high speed						0.84							
Working time arrangements is set											0.78		
fixed starting and finishing times											0.82		
training provided by the employer									0.64				
On-the-job training									0.81				
other forms of on-site training/learning									0.75				
wage decile													-0.65
uncertain in the contract length													0.78
Proportion explained	0.1065	0.076	0.0627	0.0512	0.0408	0.0375	0.032	0.028	0.0268	0.0254	0.025	0.023	0.0224
Kaiser-Meyer-Olkin measure of sampling adequacy													0.8105

Table 3. Estimated parameters

Dependent variable: Log (job satisfaction)	OLS			Frontier Model			Two-tiered Frontier Model (I)			Two-tiered Frontier Model (II)		
	Coef.		S.E.	Coef.		S.E.	Coef.		S.E.	Coef.		S.E.
absense of bad health conditions 1	0.038	**	0.002	0.027	**	0.002	0.027	**	0.004	0.032	**	0.002
absense of autonomy	-0.026	**	0.002	-0.021	**	0.002	-0.021	**	0.004	-0.022	**	0.002
No exposure to chemical elements	0.007	**	0.002	0.006	**	0.002	0.006		0.004	0.008	**	0.002
atypical schedule	-0.011	**	0.002	-0.007	**	0.002	-0.007		0.004	-0.008	**	0.002
Job content	0.048	**	0.002	0.037	**	0.002	0.037	**	0.004	0.041	**	0.002
absence of intensity	0.029	**	0.002	0.018	**	0.002	0.018	**	0.004	0.019	**	0.002
violence	-0.017	**	0.002	-0.011	**	0.002	-0.011	**	0.004	-0.008	**	0.002
Discrimination 1	-0.009	**	0.002	-0.003		0.002	-0.003		0.004	-0.009	**	0.002
Training	0.036	**	0.002	0.025	**	0.002	0.025	**	0.004	0.006	**	0.002
Discrimination 2	-0.031	**	0.002	-0.019	**	0.002	-0.020	**	0.003	-0.042	**	0.002
Flexible working times	0.014	**	0.002	0.014	**	0.002	0.014	**	0.004	0.004	*	0.002
Pace of work	0.005	*	0.002	0.004	*	0.002	0.004		0.004	0.004	*	0.002
Low wages	-0.039	**	0.002	-0.027	**	0.002	-0.027	**	0.004	-0.038	**	0.002
Female	-0.005		0.004	-0.002		0.003	-0.002		0.008	-0.002		0.003
Aged 25-39	-0.040	**	0.007	-0.039	**	0.006	-0.039	**	0.014	-0.066	**	0.006
Aged 40-54	-0.059	**	0.007	-0.060	**	0.006	-0.060	**	0.014	-0.079	**	0.006
Aged 55 or older	-0.049	**	0.008	-0.049		0.007	-0.049	**	0.016	-0.067	**	0.007
Medium education	0.011	*	0.006	0.005		0.004	0.005		0.010	-0.003		0.005
High education	-0.001		0.007	0.000		0.005	0.000		0.012	-0.018	**	0.005
Sector is industry	0.014		0.013	0.018		0.011	0.018		0.021	-0.012		0.011
Sector is services (exl pub adm)	0.003		0.013	0.013		0.011	0.013		0.021	-0.027	**	0.011
Sector is public adm and defence	0.016		0.015	0.023		0.012	0.023		0.023	0.003		0.011
Sector is “other services”	0.008		0.014	0.011		0.011	0.011		0.021	-0.067	**	0.011
Country dummies	yes	**	yes	yes	**	yes	yes	**	yes	yes	**	yes
Constant	1.480	**	0.019	1.670	**	0.015	1.636	**	0.022	1.605	**	0.003
σ_u				0.114	**	0.002	0.107	**	0.010	0.176	**	0.001
μ_v				0.195	**	0.003	0.196	**	0.018			
μ_w							0.036	**	0.001			
$\vartheta_u = 1/\sigma_u$				8.741	**		9.311	**		5.693	**	
$\vartheta_v = \sigma_u / \mu_v$												
Constant				0.587	**		0.549	**		1.470	**	0.126
Covariates (see table 4)										yes	**	yes
$\vartheta_w = \sigma_u / \mu_w$												
Constant							3.010			3.627	**	0.116
Covariates (see table 4)										yes	**	yes
R-squared	0.2772			---			---			---		
Log-pseudolikelihood	---			2453.9			2455			1899.6		
Obs.	14573			14573			14573			14573		

Table 4. Two-tiered Frontier Model (II): estimates of ϑ_v and ϑ_w

	$\vartheta_v = \sigma_u / \mu_v$			$\vartheta_w = \sigma_u / \mu_w$		
	Coef.		Std. Err.	Coef.		Std. Err.
constant	1.470	**	0.126	3.627	**	0.116
absense of bad health conditions 1	0.043	*	0.019	0.129	**	0.051
absense of autonomy	-0.037	*	0.019	0.038		0.054
No exposure to chemical elements	-0.014		0.016	0.077	*	0.041
atypical schedule	-0.037	*	0.017	-0.056		0.046
Job content	0.155	**	0.018	0.117	*	0.052
absence of intensity	0.128	**	0.018	0.162	**	0.049
violence	-0.071	**	0.017	-0.037		0.037
Discrimination 1	-0.008		0.014	-0.048	*	0.025
Training	0.769	**	0.029	0.069		0.048
Discrimination 2	0.032		0.017	-0.112	**	0.020
Flexible working times	0.097	**	0.022	-0.028		0.053
Pace of work	0.028		0.018	0.019		0.047
Low wages	-0.031		0.020	-0.063		0.049
Female	0.002		0.040	-0.250	*	0.113
Aged 25-39	0.112	*	0.056	0.161		0.183
Aged 40-54	0.189	**	0.056	0.112		0.187
Aged 55 or older	0.180	*	0.073	0.428		0.227
Medium education	-0.006		0.047	-0.314		0.163
High education	-0.031		0.064	-0.509	*	0.185
Sector is industry	0.228	*	0.097	-0.167		0.327
Sector is services (exl pub adm)	0.236	*	0.096	-0.368		0.322
Sector is public adm and defence	0.458	**	0.115	1.973	**	0.447
Sector is "other services"	1.645	**	0.107	-0.247		0.330
Country dummies	yes	**	yes	yes	**	yes

Table 5. Estimates of E(e^v) and E(e^w) for various groups

	E(e^v)	E(e^w)
Frontier	0.8370	---
Two-tiered Frontier (spec. 1)	0.8363	1.0370
Two-tiered Frontier (spec. 2)	0.9086	1.0606
Two-tiered Frontier (spec. II)		
Females:	0.9133	1.0584
males:	0.9047	1.0613
Aged <25:	0.9022	1.0589
Aged 25-39:	0.9155	1.0565
Aged 40-54:	0.9150	1.0509
Aged >54:	0.9013	1.0661
Low education:	0.8985	1.0568
Medium education:	0.8721	1.0688
High education:	0.9173	1.0601
agricultury	0.8753	1.0585
industry:	0.8999	1.0668
services: (exc pum adm)	0.9148	1.0348
pub adm and defence:	0.9483	1.0657
other services:	0.9362	1.0449

Appendix 1 . Objective working conditions

Variable	Description
threats of physical violence	1=yes; 0=no
physical violence from people..	1=yes; 0=no
physical violence from other...	1=yes; 0=no
Bullying/harassment	1=yes; 0=no
sexual discrimination	1=yes; 0=no
age discrimination	1=yes; 0=no
discrimination linked to disability	1=yes; 0=no
Discrim. linked to sexual orientation	1=yes; 0=no
discrimination linked to nationality	1=yes; 0=no
Discrim. linked to ethnic backgrounds	1=yes; 0=no
discrimination linked to religion	1=yes; 0=no
able to choose/change order of tasks	0=yes; 1=no
able to choose/change methods of work	0=yes; 1=no
able to choose/change speed of work	0=yes; 1=no
pace depending on colleagues	0=yes; 1=no
pace depending on performance	0=yes; 1=no
Pace depending on machine's speed	0=yes; 1=no
Exposed to vibrations	on scale 1-7 (1=all of the time; 7=never)
Exposed to loud noise	on scale 1-7 (1=all of the time; 7=never)
Exposed to high temperatures	on scale 1-7 (1=all of the time; 7=never)
Exposed to low temperatures	on scale 1-7 (1=all of the time; 7=never)
Breathing in smoke, fumes, dust, ect	on scale 1-7 (1=all of the time; 7=never)
Radiation such as x rays, radioactive	on scale 1-7 (1=all of the time; 7=never)
Tobacco smoke from other people	on scale 1-7 (1=all of the time; 7=never)
Breathing in vapors (solvents, ect)	on scale 1-7 (1=all of the time; 7=never)
Handling/in contact with chemical prod	on scale 1-7 (1=all of the time; 7=never)
Hand./ contact with infectious material	on scale 1-7 (1=all of the time; 7=never)
assessing the quality of your own work	1=yes; 0=no
solving unforeseen problems	1=yes; 0=no
Complex tasks	1=yes; 0=no
job involves learning new things	1=yes; 0=no
work at night (No./month)	0-31 (i.e. 0=never)
work in the evening (No./month)	0-31 (i.e. 0=never)
work on Sunday (No./month)	0-5 (i.e. 0=never)
work on Saturday (No./month)	0-5 (i.e. 0=never)
work > 10 hours days (No./month)	0-31 (i.e. 0=never)
Working to tight deadlines	on scale 1-7 (1=all of the time; 7=never)
Working at very high speed	on scale 1-7 (1=all of the time; 7=never)
Working time arrangements is set	on scale 1-4 (1=set by the company; 4=set by yourself)
fixed starting and finishing times	0=yes; 1=no
training provided by the employer	1=yes; 0=no
On-the-job training	1=yes; 0=no
other forms of on-site training/learning	1=yes; 0=no
wage decile	on scale 1-10
uncertain in the contract length	on scale 1 to 5 (1=indefinite contract; 5=no contract)