

Advances in Latent Variables - Methods, Models and Applications

Brescia - Department of Economics and Management

June 19, 2013 – June 21, 2013

 January 29, 2014A selection of extended papers will be eligible for publication in Advances in Data Analysis and Classification. Submission of manuscripts: May 30, 2014

 October 1, 2013 - CALL FOR PAPERSA selection of extended papers of the SIS 2013 Statistical Conference will be published by Springer in the new International Series Book Studies in Theoretical and Applied Statistics (call for papers)

 JULY 23, 2013 - CALL FOR PAPERSA selection of extended papers will be eligible for publication in the following Springer journals:- Quality & Quantity (call for papers)- Stochastic Environmental Research and Risk Assessment (call for papers)- Advances in Data Analysis and Classification (web site; the special issue on "Latent Class Models" will be published in September)

 supports the International Year of Statistics and this conference has been added to the Statistics2013 Activities Calendar The conference Time Table can be found here

 Scientific Program Committee and the Local Organizing Committee want to thank all participants and speakers at the SIS conference: you made this meeting an opportunity for ideas' and experiences' exchange. Thank you

Announcements

Electronic Book "Advances in Latent Variables"

The full version of the Conference Proceedings, collected in the **Electronic Book "Advances in Latent Variables"**, Eds. Brentari E., Carpita M., Vita e Pensiero, Milan, Italy, ISBN 978 88 343 2556 8, are available [here](#).

Posted: 2013-06-17

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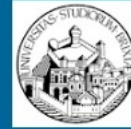
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Modelling Job Satisfaction of Italian Graduates

Stefania Capecchi and Silvia Ghiselli

Abstract Different models have been implemented to observe worker conditions, abilities, leadership, decision-making attitudes and others. A statistical approach to investigate Italian graduates' job satisfaction is here implemented and its main results are discussed. Respondents have been interviewed in 2010 AlmaLaurea Survey on *Graduates' employment conditions*, 5 years after their degree. Using CUB models approach, we highlight several issues which are effective for assessing the performance of the academic system and for detecting labour market responses towards graduates.

Key words: Job satisfaction, Graduates' employment conditions, CUB models

1 Introduction

The relationship between job satisfaction and worker characteristics have been heavily researched over the years in various domains such as Sociology, Economics and Management Sciences (Spector, 1997), mostly in the field of industrial-organizational Psychology and in the goal-setting theory (Spector, 1985). A frequently quoted definition explicates job satisfaction through a behavioural variable: "(...) a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976). In labour market dynamics, job satisfaction has become a leading determinant of productivity, mobility, unionism, etc., and can be examined as both an explicative variable of job performance and a dependent one on individual as well objective conditions (Freeman, 1978). Though job satisfaction may seem an element of job performance, it cannot be considered only

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related to incentives, especially to economic ones, which sometimes act as counterproductive (Pugno and Depedri, 2009) and it is also investigated as relevant for individuals overall life well-being (Judge and Watanabe, 1993; Blanchflower and Oswald, 2004).

To investigate this kind of phenomenon, a collection of adequate data is needed to analyze individual attitudes and satisfaction through a rating scale according to the level of agreement of the respondent.

The paper is organized as follows: in the next section, the CUB model notation is introduced. Section 3, after a brief mention about data collection, examines global job satisfaction and its components. Then, in section 4, we consider the effect of some subjects' covariates on satisfaction. Some concluding remarks end the work.

2 CUB models

In recent years, remarkable progressions have been made for the analysis of categorical ordinal data (Agresti, 2012; Tutz, 2012) and a new approach is represented by CUB models, introduced by Piccolo (2003): a comparison between such approaches with reference to job satisfaction has been conducted by Gambacorta and Iannario (2012). Here, we apply CUB models to explain respondents' behaviour about their job satisfaction when faced with multiple ordinal choices.

CUB models are generated by a class of discrete probability distributions which take into account two intrinsically continuous quantities, pertaining to the response, denoted as feeling and uncertainty; more specifically, these latent variables are modelled as *shifted Binomial* and a *Uniform* random variables, respectively.

Assume n people are rating a definite item; hence, we observe the sample $\mathbf{y} = (y_1, y_2, \dots, y_n)'$. Let the response variable Y take values in $\{1, \dots, m\}$, where $m > 3$ for identifiability constraints (Iannario, 2010). Moreover, let \mathbf{x}_i and \mathbf{w}_i , with $i = 1, \dots, n$ be subjects' covariates for explaining feeling and uncertainty, respectively.

The general formulation of a CUB (p, q) model (with p covariates to explain uncertainty and q covariates to explain feeling) is:

$$Pr(Y = y | \mathbf{x}_i, \mathbf{w}_i) = \pi_i \binom{m-1}{y_i-1} (1 - \xi_i)^{y_i-1} \xi_i^{m-y_i} + (1 - \pi_i) \left(\frac{1}{m} \right) \quad (1)$$

with $y = 1, 2, \dots, m$, and two logistic links for the *systematic components*:

$$\pi_i = \left[1 + e^{-\mathbf{x}_i \boldsymbol{\beta}} \right]^{-1}; \quad \xi_i = \left[1 + e^{-\mathbf{w}_i \boldsymbol{\gamma}} \right]^{-1}, \quad (2)$$

where $\boldsymbol{\psi} = (\boldsymbol{\beta}', \boldsymbol{\gamma}')'$ is the vector of parameters associated to the covariates.

Inference on CUB models has been mainly developed in a parametric framework, via maximum likelihood and asymptotic theory (Piccolo, 2006).

3 Global satisfaction and its components

A selection of AlmaLaurea survey on Italian graduates' employment condition is studied concerning job satisfaction (Almalaurea, 2011). The survey conducted in 2010 refers to the students who obtained their degree according to the old Italian university education system and who were working after 5 years from their graduation. Job satisfaction has been investigated through a global question and 14 specific items related to their components on 17,387 validated responses.

In details, respondents were asked to answer questions referring to their level of satisfaction on different items about overall work, intrinsic aspects of work and issues related to job environment. A modified 9-point response on a Likert scale was used (1=very dissatisfied, 9=very satisfied) and the selected components of job satisfaction were: 1. Security of the job 2. Coherence with studies 3. Acquisition of professionalism 4. Prestige 5. Correspondence with cultural interests 6. Social utility 7. Independence or autonomy in the job 8. Involvement in the decisional processes 9. Flexibility of time 10. Availability of free time 11. Workplace 12. Relationships with co-workers 13. Expectation of future gains 14. Perspectives of career.

The analysis performed for global satisfaction and for all 14 components confirms well separated models and highly significant parameters, as shown by the parametric representation of Figure 1. As we can see, all components present a high level of satisfaction since $(1 - \xi) > 0.744$. In addition, *Availability of free time*, *Expectation of future gains* and *Perspectives of career* get lower ratings. Comparatively, *Security of the job*, *Relationships with co-workers* and *Coherence with studies* are considered very satisfying. With regard to the indecision in the answers, we observe that respondents are more uncertain about *Security of the job*, *Coherence with studies* and *Availability of free time*.

We check if *Gender* exerts a significant effect on the responses. It turns out that women are more uncertain but there are not relevant differences about feeling component.

In Table 1 we list the sign of the relationship among uncertainty and feeling and the 14 components of job satisfaction with specific reference to gender effect.

Table 1 Significance of the Gender covariate in the components of job satisfaction

| | security | coherence | careerprospect | workplace | culture | utility | free time | acquisition | co-workers | autonomy | involvement | prestige | flexible | gainexpect |
|--------------------|----------|-----------|----------------|-----------|---------|---------|-----------|-------------|------------|----------|-------------|----------|----------|------------|
| <i>Uncertainty</i> | - | • | - | - | • | + | + | - | - | - | - | - | - | - |
| <i>Feeling</i> | - | - | + | - | - | - | - | • | • | + | + | + | + | + |

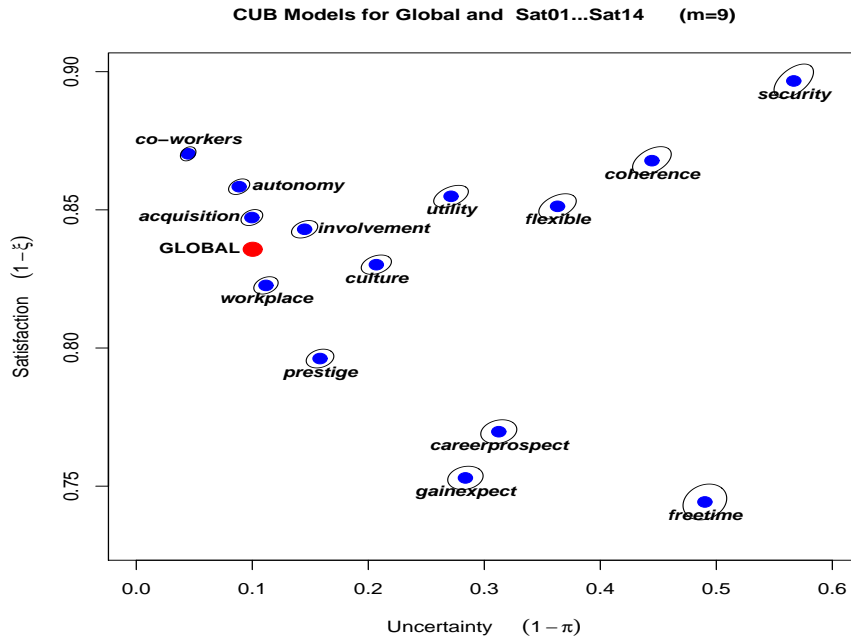


Fig. 1 Estimated CUB models of global job satisfaction and its components

4 Covariates effects on job satisfaction

In this section, we limit ourselves to a simplified discussion for presenting just few results on the effect of two groups of covariates on job satisfaction: the first ones are related to kind and nature of work, the second ones to the value of final grades.

Figure 2, left panel, summarizes the estimated CUB models of job satisfaction where covariates are Full-time/Part-time, Public/Private, and Gender. It is evident that the main discrimination is by Full-time versus Part-time options with the second one related to a greater uncertainty. Then, for Full-time jobs, the satisfaction of women is greater and in Private sector the effect of Gender is on the feeling: women are a bit more satisfied. Finally, in all cases, a work in Public sector generates more satisfaction than in the Private one.

If we consider how the final grade of the University degree is related the expressed job satisfaction we found a significant relationship only if we introduce in the logistic link both $\log(\text{Score})$ and $[\log(\text{Score})]^2$ variable. In this way, we improve some statistical properties of the estimation procedure (in terms of parameters correlation and speed of convergence) and obtain a more realistic interpretation.

Indeed, as shown by Figure 2, right panel, students receiving low scores are generally older and conclude their University training with some difficulties due to personal, family and environmental problems. Thus, when they get a degree, are often

in the labour market and such a result may improve their career: as a consequence, they manifest a greater satisfaction in the job despite the low scores. On the contrary, students receiving very high scores are generally quite clever in their professional ability, look for jobs adequate to their competence and thus they express a larger job satisfaction. Finally, the plot shows that scores around 97/110 produce *ceteris paribus* the minimum job satisfaction.

We notice that the estimated relationship is asymmetric and thus very high grades do not generate a corresponding increase in the job satisfaction.

It is remarkable to observe that this empirical evidence is an instance of the ability of CUB models to detect and measure unusual relationships in a case where standard methods failed to ascertain a sensible link among variables.

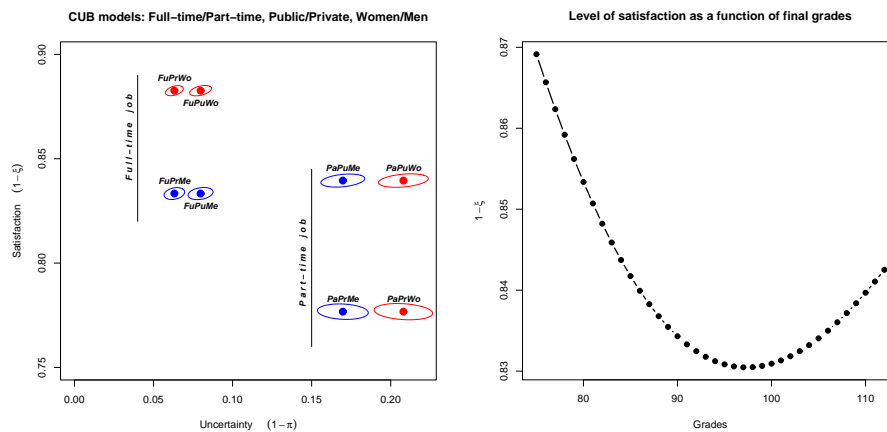


Fig. 2 Covariates effects of estimated CUB for job satisfaction.

5 Concluding remarks

The results so far discussed should convince about the flexibility and versatility of CUB models as an alternative paradigm for the analysis of job satisfaction data. More specifically, a remarkable added value of the approach is the possibility to represent these models in a parametric space and to see how they are modified with respect to subgroups and/or covariates by using several different graphical displays (for instance, the study of feeling as a function of selected covariates, the location of estimated CUB models with respects to different characteristics of respondents, and so on).

In any case, the consideration that all models contain an uncertainty component is a relevant one since this presence may alter the interpretation of the observed

data if we summarize all information by some average or other index only related to location.

Finally, if we adhere to the logic of CUB models, we are implicitly accepting the idea that all data related to job satisfaction may be summarized by just few parameters within a specific class of discrete mixture distributions and this aspect may help in interpretation and prediction.

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