A Multilevel Analysis of Graduates' Job Satisfaction

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Summary. In this paper, we analyse some aspects of job satisfaction by means of a multilevel factor model, decomposing the factor structure into the graduate and degree programme components, using data from a survey on the 1998 graduates of the University of Florence. Due to the ordinal scale of the response variables, we adopt a multilevel factor model for ordinal variables. The results show that the factor structures at the graduate and study programme levels are not the same, although they are similar; the study programmes with extreme factor scores should be selected for a deeper investigation.
Keywords: Factor model; Job satisfaction; Multilevel model; Ordinal variable.

1. External effectiveness at Florence University

Nowadays it is relevant for the Universities to improve their efficiency and effectiveness, in order to ensure a good allocation of public funds, guarantee the rights of the students and their families to have good services and educational programmes, and, nonetheless, state the relevance of the University as a cultural, social and economic institution.

With this aim, the University of Florence has developed an evaluation system in the last years (Chiandotto *et al.*, 2004). External effectiveness is evaluated with respect to the employment results, such as the employment rate, the time span to the first job, the probability to find a job consistent with the acquired skills. The analysis of job satisfaction is a relevant part of the University evaluation. In the Italian context this issue is treated, among the others, by Santoro & Pisati (1996), Bini (1999), Mazzolli (2000), Bartolozzi (2001).

The main goal of the paper is to analyse and summarise the aspects of job satisfaction by means of a multilevel factor model (Goldstein & McDonald,

1988; Longford & Muthén, 1992), decomposing the factor structure into the graduate and study programme components. To this end, the data are taken from a survey conducted on the 1998 graduates of the University of Florence, interviewed about two years after the degree. Due to the ordinal scale of the response variables, a multilevel factor model for ordinal variables (Skrondal & Rabe-Hesketh, 2004; Grilli & Rampichini, 2006) is specified.

The structure of the paper is as follows. In Section 2 the model is defined, while in Section 3 the results of the analysis of job satisfaction of the 1998 graduates of the University of Florence, taken from a telephone survey conducted, about two years after the degree, are presented. Section 4 concludes our paper.

2. The statistical model

Let $Y_{ij}^{(h)}$ be the *h*-th ordinal variable (*h*=1, …, *H*) observed for the *i*-th subject (*i*=1, …, n_j) belonging to the *j*-th cluster (*j*=1, …, *J*). In the following, the subject level will be referred to also with the term 'within' and the cluster level with the term 'between'. In the application presented in Section 3 the clusters are the study programmes, the subjects are the graduates and the ordinal variables are the ratings on 5 items of the questionnaire (*H*=5).

A two-level factor model for ordinal variables can be set up by defining two components, namely:

- a threshold model which relates a set of continuous latent variables $\tilde{Y}_{ij}^{(h)}$ to the observed ordinal counterparts $Y_{ij}^{(h)}$;
- a two-level factor model for the set of continuous latent variables $\tilde{Y}_{ij}^{(h)}$.

As for the threshold model, let assume that each of the observed responses $Y_{ij}^{(h)}$, which take values in {1, 2, …, C_h}, is generated by a latent continuous variable $\tilde{Y}_{ij}^{(h)}$ through the following relationship:

$$\left\{Y_{ij}^{(h)} = c^{(h)}\right\} \quad \Leftrightarrow \quad \left\{\gamma_{c^{(h)}-1}^{(h)} < \tilde{Y}_{ij}^{(h)} \le \gamma_{c^{(h)}}^{(h)}\right\}, \tag{1}$$

where the thresholds satisfy the inequality

$$-\infty = \gamma_0^{(h)} \le \gamma_1^{(h)} \le \ldots \le \gamma_{C_h-1}^{(h)} \le \gamma_{C_h}^{(h)} = +\infty .$$

The factor model can now be defined on the set of latent variables. A general formulation is (Goldstein & McDonald 1988; Longford & Muthén 1992):

$$\tilde{Y}_{ij}^{(h)} = \mu^{(h)} + \left[\sum_{m=1}^{M_u} \lambda_{u,m}^{(h)} u_{mj} + \delta_j^{(h)}\right] + \left[\sum_{m=1}^{M_v} \lambda_{v,m}^{(h)} v_{mij} + \varepsilon_{ij}^{(h)}\right]. \tag{2}$$