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Gross Annual Salary of a new graduate: is it a question of profile?

Retribuzione Annuale Lorda di un neo-laureato: dipende tutto dal profilo?

Paolo Mariani, Andrea Marletta and Mariangela Zenga

Abstract The paper aims to identify an ideal profile for the new graduates in the recruitment process. Moreover, the distribution of their gross annual salary is analyzed in relation to a selected profile. The analysis is based on the Education-for-Labour Elicitation from Companies' Attitudes towards University Studies Project using the methodology of a Conjoint Analysis. The data refers to 471 enterprises operating in Lombardy in different economic sectors with particular focus on the tertiary sector.

Abstract *Il lavoro si propone di individuare un profilo ideale dei neo laureati nel processo di selezione. Viene inoltre presa in considerazione la distribuzione della retribuzione annua lorda del neo assunto in relazione ad uno specifico profilo selezionato. L'analisi si basa sulla ricerca Education-for-Labour Elicitation from Companies' Attitudes towards University Studies utilizzando la metodologia della Conjoint Analysis. I risultati sono relativi a 471 imprese operanti in Lombardia, secondo diversi settori economici, con particolare attenzione al settore del terziario.*

Key words: New graduates, Conjoint Analysis, Utility Score, Gross Annual Salary.

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1 Introduction

This work concerns the comprehension policies about relationships between the enterprises and universities, with reference to the labour market for the new graduates. In particular, the study is based on the multi-centre research, Education-for-Labour Elicitation from Companies' Attitudes towards University Studies (Electus) [3], a research project involving 6 Italian universities. The aims of Electus are various. Firstly, it focus on the identification of an ideal graduate profile for several job positions. Secondly, it works toward some across-the-board skills, universally recognized as 'best practices' for a graduate. Finally, the analysis allows to achieve differences and valuations between wage and competencies for new graduates.

The paper is organized as follows. The first section contains the presentation of the statistical method (Conjoint Analysis). The Mariani-Mussini coefficient of economic valuation is introduced in the second section. The results of Electus survey is showed in the third section. Finally, conclusions and main remarks are discussed in the last part of the paper.

2 Methodology: the Conjoint Analysis and the coefficient of Economic Variation

Conjoint analysis (CA) is a technique widely used to investigate consumer choice behaviour [4]. In particular, in this study CA refers to the stated preference model used to obtain part-worth utilities. The aim of this model consists in estimating a utility function (UF) for the characteristics describing several profiles. The UF is defined as follow:

$$U_k = \sum_{s=0}^n \beta_s x_{sk} \quad (1)$$

where x_{0k} is equal to 1 and n is the number of all level of attributes which define the combination of a given profile, x_{sk} is the dummy variable that refers to the specific attribute level. As a result, the utility associated with k alternatives (U_k) is obtained by summing the terms $\beta_s x_{sk}$ over all attribute levels, where β_s is the partial change in U_k for the presence of the attribute level s , holding all other variable constants. Usually when CA is performed, all respondents answer to every possible profile. In this experiment the possible profiles obtained from combining every level in a full factorial fashion were so numerous, so it was necessary to apply an ad-hoc fractional factorial design. According to several criteria [3], an individual random sample of four profiles was administered to each respondent which had to mark them on a scale of 1 to 10. This experimental final design results both orthogonal and balanced.

Part-worth utilities of levels obtained from non-standard CA represents the starting point to re-evaluate the proposed Gross Annual Salary of the job vacancies. Secondly, economic re-evaluation will be carried out through relative importance of

attributes in non-standard CA using Mariani-Mussini coefficient of economic valuation [5]. The general formulation of the coefficient is:

$$MI_{ij} = \frac{U_i - U_b}{U_b} * I_j \quad (2)$$

where U_i is the sum of part-worth utility scores associated with the profile i , U_b the sum of utility scores associated with a baseline profile and I_j is the relative importance for the attribute j .

The coefficient MI_{ij} could be also used for estimating the variation in terms of the salary associated to profile i compared to the baseline one. Given the salary associated with the baseline profile π , the coefficient of economic re-evaluation can be expressed as:

$$V_{ij} = MI_{ij} * \pi \quad (3)$$

Variations V_{ij} change in proportion of the I_j , this entails two basic considerations. Firstly, when an attribute has a very high value of importance, V_{ij} assumes higher variations. Secondly, V_{ij} concern attribute variations one at a time, that is to say profile comparisons are possible only varying an attribute, holding fixed all others. Moreover, if the baseline profile is the best/worst one, all coefficients MI_{ij} and all variations V_{ij} will be negative/positive.

3 Application

The survey was conducted in 2015 using CAWI technique. Data were collected using a software program called Sawtooth [6]. Data manipulation and Conjoint Analysis were obtained using R software and *Conjoint* package [1].

The questionnaire contained two sections: conjoint experiment for the five job positions and general information about the company (demographic questions). Regarding the five job positions for the new graduates, Administration clerk, HR assistant, Marketing assistant, ICT professional and CRM assistant were considered. To specify the candidates' profile, six attributes were used:

- *Field of Study* with 10 levels (Philosophy and literature, Educational sciences, Political science/ Sociology, Economics, Law, Statistics, Industrial engineering, Mathematics/ Computer sciences, Psychology, Foreign languages),
- *Degree Mark* with 3 levels (Low, Medium, High),
- *Degree Level* with 2 levels (Bachelor, Master),
- *English Knowledge* with 2 levels (Suitable for communication with foreigners, Inadequate for communication with foreigners),
- *Relevant work experience* with 4 levels (No experience at all, Internship during or after completion of university studies, Discontinuous or occasional work during university studies, One year or more of regular work)

- *Willingness to Travel on Business* with 3 levels (Unwilling to travel on business, Willing to travel on business only for short periods, Willing to travel on business even for long periods).

After having rated the selected profile and chosen the best one, the entrepreneurs had to propose a Gross Annual Salary for the chosen profile in order to measure the so-called 'willingness to pay' [2].

As far as the Milano-Bicocca research unit is concerned, interviewees were representatives of companies registered on the Portal of Almalaurea for recruitment and linkage, limited to the university site. Final respondents were 471. Companies profile shows that they were in prevalence (52%) small sized (15-49 employees), followed (25.6%) by medium sized, ranging from 50 to 249 employees and (22.4%) by the large companies with 250 employees or more. The most represented activity sectors were services to the industry (62.1%), services to the person or the family (16.2%) and manufacturing (14.9%). The majority of companies (89.4%) operated-fully or partially within the domestic market. Moreover, they were mainly under the management of the entrepreneur (63%).

Five CAs are achieved corresponding to the different job positions in order to measure entrepreneurs' preferences. Results for path-worth utilities are similar for all the attributes, except for the attribute *Field of Study*. This means that all other competencies have some levels that are universally identified as 'best practice' for a graduate.

The attributes named *Relevant work experience* and *English Knowledge* show always the same level as best for each vacancy. After all, it is easy to imagine that companies prefer to employ a candidate with one year or more of regular work and suitable for communication with foreigners. Variables *Degree Mark* and *Willingness to travel on business* are competencies where best two levels are always preferred, so a medium-high marked degree and the willing to travel on business for short or long periods are preferable among candidates.

Utility scores for variable *Degree level* are very close to 0 for each position, this means that there is no substantial difference for a bachelor or a master degree for a graduate.

The attribute *Field of Study* is more complex to analyse since it is less cross and a degree in a field could result the best for a position and the worst for an other one. For this reason, in this paper only variations about Field of Study are taking into account. This allows to make a comparison of the coefficient of economic re-evaluation MI_{ij} and its associated variation V_{ij} through different job positions.

In Fig. 1 part-worth utilities for *Field of Study* attribute from 5 non-standard CA are shown for each job position. Economics studies represents the best profile considering 3 job positions, while a degree in Psychology and Mathematics/ Computer sciences optimizes utility respectively for HR Assistant and ICT Professional.

The contribution of these part-worth utilities is very relevant for total utility U_i , since variable *Field of Study* has the higher relative importance of attributes I_j for each job vacancies. The quota of explained I_j ranges from a minimum of 42.98% for a position in customer relationship management (CRM) to a maximum of 80.54%

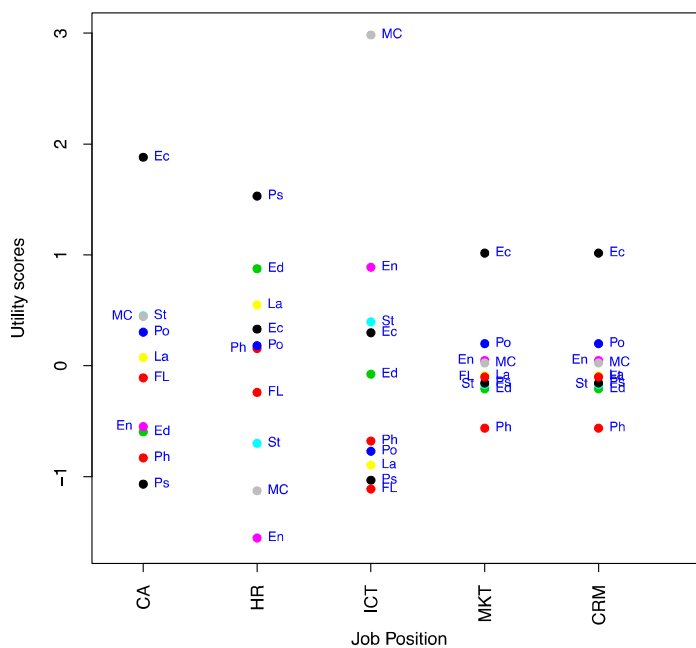


Fig. 1 Part-worth utilities for job position and field of study

for a vacancy in ICT technical positions. Importance for other attributes is always under 20% for each position.

In this application, baseline profile is the best profile which optimizes the total utility, so U_b is the sum of the highest part-worth utilities (plus an intercept) for each attribute j . This means that all M_{ij} coefficients and all variations V_{ij} are negative.

Table 1 shows M_{ij} coefficients of economic re-evaluation for Field of Study, as expected each $M_{ij} \leq 0$ and $M_{ij} = 0$ only in correspondence of the best Field of Study for vacancy. Comparing the job positions, ICT professionals displays higher coefficients. This is due to the fact the I_j is very high and a degree in Mathematics/Computer sciences is fully specialized for this position. The biggest coefficient is for a degree in Foreign languages for ICT professionals, in comparison with a graduate in Mathematics/Computer sciences they earn an halved Gross Annual Salary.

Table 1 M_{ij} coefficients for Field of Study

Field of Study \ Job position	AC	HR	ICT	MKT	CRM
Philosophy and literature	-18.27%	-10.97%	-45.96%	-12.35%	-10.84%
Educational sciences	-16.68%	-5.23%	-38.39%	-13.24%	-8.41%
Political science/ Sociology	-10.63%	-10.76%	-47.12%	-11.03%	-5.61%
Economics	---	-9.57%	-33.70%	---	---
Law	-12.17%	-7.83%	-48.68%	-15.71%	-7.60%
Statistics	-9.63%	-17.79%	-32.48%	-11.41%	-8.13%
Industrial engineering	-16.37%	-24.60%	-26.29%	-14.70%	-6.65%
Mathematics/ Computer sciences	-9.68%	-21.21%	---	-14.82%	-6.80%
Psychology	-19.86%	---	-50.40%	-10.47%	-8.04%
Foreign languages	-13.40%	-14.13%	-51.39%	-9.24%	-7.67%

4 Conclusion and future research

The article proposes the use of a non-standard Conjoint Analysis in detecting best profiles for graduates using data from the Electus project. Moreover, a new evaluation of the Gross Annual Salary is proposed using the Mariani-Mussini index derived from utility scores. Analysis deriving from 5 different job positions show how all graduates' competencies are across-the-board, except for *Field of Study*. English knowledge, medium or high level for degree mark, relevant work experience and willingness to travel are the most important required attributes for a graduate. About *Field of Study*, a degree in Economics seems to be the most attractive for entrepreneurs, except for very specialized vacancies as ICT professionals, where other degree courses exhibit an halved salary respect to Computer Sciences graduates.

Future research will focus the attention on results coming from stratified CA based on socio-demographic features of companies responding in the Electus project.

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