A Latent Class Conjoint Analysis for analysing graduates' profiles

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Research Objectives

The aim of this study is to investigate companies' preferences about the possibility to hire new graduates by implementing a segmentation with conjoint analysis following a Latent Class Metric Conjoint Analysis: a mixture regression approach is used in which segments and conjoint model parameters are estimated simultaneously.

Some problems typically arise following one of the two usual approaches (DeSarbo et al., 1992):

- a priori segmentation: demographic or psychographic background information rarely adequately describe heterogeneous utility functions

- a posteriori segmentation: different clustering methods often produce different results and potential instability of part-worth estimates derived at the individual level, especially in highly fractionated designs

Latent Class Metric Conjoint Analysis

- Latent Class Metric Conjoint Analysis (LCMCA; DeSarbo et al., 1992) is one of a broader class of models called Finite Mixture Models

- Finite Mixture Models assume that the observed data are really comprised of several homogeneous groups or segments which have been mixed together in unknown proportions

- Assume the vector of response ratings y_{ij} with a probability density function f modeled as a finite mixture of G conditional distribution:

$$f(y_{ij}|\pi, x, z, \Sigma) = \sum_{g=1}^{G} \pi_{g|z} f_g(y_{ij}|x, z, \beta_g \Sigma_g) \qquad (1)$$

- Cluster membership: consumer i is assigned to latent class g via the estimated posterior probability

$$\hat{p}_{ig} = \frac{\hat{\pi}_{g|z} \hat{f}_{ig}(y_{ij}|x, z, \beta_g \Sigma_g)}{\sum_{g=1}^{G} \hat{\pi}_{g|z} \hat{f}_{ig}(y_{ij}|x, z, \beta_g \Sigma_g)} \qquad (2)$$

Electus survey

Objectives of the ELECTUS project:

- to identify an ideal graduate profile for several job positions
- to detect some across the-board skills, universally recognized as "best practices" for a graduate

Attributes	Levels
Major	Education Sciences
	Political Sciences/Sociology
	Economics
	Law
	Statistics
	Industrial engineering
	Mathematics/Computer Sciences
	Psychology
	Foreign Languages
Degree level	Bachelor
	Master

Attributes	Levels
Final grade	Low
	Average
	High
English knowledge	Suitable to communicate with foreigners
	Inadequate to communicate with foreigners
Work experience	None
	Internship during or after university
	Discontinuous work during university
	One year or more of work experience
Willingness to travel	Willing to travel for long periods of time
	Willing to travel for short periods of time
	Not willing to travel

Possible profiles obtained from combining every level in a full factorial scenario were so numerous, so it was necessary to apply an ad-hoc fractional factorial design. This experimental final design results both orthogonal and balanced.

Electus Survey

Sawtooth software was used for the conjoint experiment. The fixed setting for the experiment was provided by considering the figure of Administrative Clerk. Four profiles are generated, drawing levels from the whole list for each attribute. Then, interviewees were shown them and were asked to mark them. Attributes levels were drawn anew, for every interviewee.
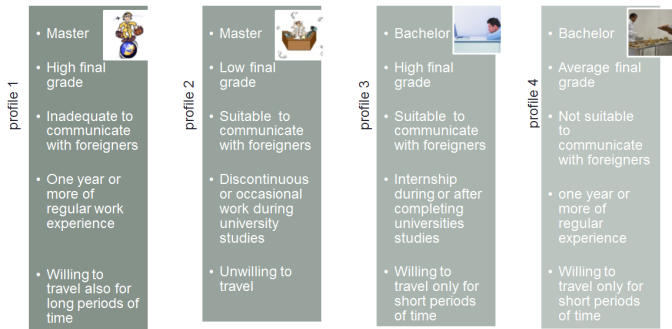
ML estimates of part-worth coefficients for latent class

	Latent	class	
	1	2	3	Aggregate
	$n_1 = 79$	$n_2 = 51$	$n_3 = 169$	n=299
Intercept	2.56**	8.25**	4.46**	4.79**
Philosophy and Literature	2.60**	-1.65**	-2.20	-0.88
Education sciences	1.54*	-0.02	-0.48	0.15
Political sciences	1.21	-1.23**	1.45**	0.97
Economics	6.52**	-5.21**	2.18**	1.92**
Law	4.29**	-3.75**	-0.47	-0.25
Statistics	3.99**	-2.77**	-0.63	0.42
Engineering	3.81**	-4.74**	-2.25**	-1.16*
Mathematics and computer sciences	2.68**	-5.41**	2.92**	0.45
Psychology	2.80**	-3.66**	-2.42**	-1.61*
Bachelor's degree	-0.23	0.59**	0.47	0.49
Low final grades	-1.62**	-1.13**	-1.01**	-1.25**
Medium final grades	-0.92*	1.70**	-0.94**	-0.50
No knowledge of English language	0.49	-0.75**	-1.57**	-0.87**
Internship experience	-0.56	0.84**	1.37**	0.46
Occasional working experience	2.10**	-0.25**	0.82	0.66
Stable working experience	1.04*	-2.28**	2.36**	1.07**
Willing to short-term business travels	-0.44	-1.46**	0.85**	-0.15
Willing to long-term business travels	-1.33*	-0.88**	0.53	-0.10

Reference profile: foreign language, master degree, high final grades, English knowledge, no working experience, not willing to travel

Characteristics of the groups

Group 1

- Lowest average rating corresponding to the reference profile (2.56)
- Identifies especially Economics as the most preferred degree, whereas Law, Statistics and Engineering are also appreciated
- Low final grades and willing to long-term business trips produce a lower preference

Group 2

- Higher average rating (8.25): the reference profile is already highly appreciated
- Employers within such class evaluate Economics, Engineering, Mathematics and computer sciences as less important degrees
- Bachelor's degree and a medium final grades increase employers' preference

Group 3

- Intermediate average rating, similar to that of the aggregate model (4.46)
- Mathematics and computer sciences and Economics are the most preferred degrees. Political science is also evaluated positively
- A previous work experience both as a stable experience and internship experience is relevant

ML estimates of latent class membership probability

	Estimate	SE	p-value
Class 1 (base outcome)			
Class 2			
Intercept	-2.42	0.77	0.002
Hired personnel over the past 3 years	-1.14	0.63	0.070
Education of the last administrative hired: graduated	1.00	0.56	0.076
Company run by a manager	0.89	0.61	0.147
Company with 20 or more employees	0.96	0.68	0.161
Company in the services sector	-0.72	0.54	0.182
Company committed also in the foreign market	0.52	0.53	0.319
Recruitment of staff within one year	1.74	0.65	0.007
Class 3			
Intercept	-1.42	0.77	0.066
Hired personnel over the past 3 years	-1.08	0.60	0.072
Education of the last administrative hired: graduated	0.21	0.53	0.685
Company run by a manager	1.30	0.62	0.036
Company with 20 or more employees	-0.30	0.60	0.617
Company in the services sector	-0.52	0.53	0.321
Company committed also in the foreign market	1.05	0.49	0.033
Recruitment of staff within one year	3.19	0.76	0.000

Characteristics of the groups

Domestic companies (26.4%)

- run by not a managerial view
- working in a service sector in prevalence in domestic market
- they neither will do recruitment new staff in the next year neither hired personnel over the past three years.

Static companies (17.1%)

- big sized companies
- they will recruit staff in the next year
- they did not hire personnel over the past three years.

Dynamic firms (56.5%)

- small or medium enterprises
- run by a manager
- committed also in the foreign market with a willingness to recruit new staff in the next year.

Conclusions

- Using the survey ELECTUS, a segmentation of employers' preferences for graduates' profiles for administrative clerk is carried out by using a Latent Class Metric Conjoint Analysis.

- Specifically, the analysis detects the existence of three unobserved subgroups of employers having homogeneous preferences about graduates' characteristics.

- The benefit to use this methodology is given by the substantial difference between the aggregate part-worth coefficients in conjoint analysis and those in each sub-model of the three-class solution