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DIFFERENCES OF CULTURAL CAPITAL AMONG STUDENTS IN TRANSITION TO UNIVERSITY SOME FIRST SURVEY EVIDENCES

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Differences of Cultural Capital among students in transition to university Some first survey evidences

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Abstract

The role played by '*Cultural Capital*' is crucial in shaping students' decisions with respect to the school university transition. This work is based on an *ad hoc* survey carried out on a sample of students enrolled in 2006 in the University of Cagliari. The '*cultural capital*' is a latent variable which students are supposed to possess at a greater or lesser degree. It has been here operationalized in four sub-components: (i) built-up by activities made by students themselves; (ii) built up by activities made by students' parents; (iii) transmitted by students' parents; (iv) built-up by formal education experiences. Each sub-component has been evaluated via students' responses to a battery of items in a questionnaire. Latent Class Analysis has been adopted in order to provide non arbitrary scaling of some of the sub-components and to sort out mutually exclusive classes of students, characterized by a different intensity of the latent variable. Moreover, Item Response Models have been used to assess the calibration of the questionnaire as an instrument to measure the cultural capital of the targeted population.

Keywords: cultural capital, students' transition, university, school, item response models, latent class analysis.
JEL Classification: C25, C49

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1 Introduction

This paper deals with the role played by cultural capital (*CC*) in shaping students' choices with respect to the transition from high school to university. Its main aim is to propose a way of quantifying the intangible construct *CC* via a survey questionnaire and to spot out differences in the amount of *CC* owned by clusters of students. This issue has been investigated with an *ad hoc* survey carried on in 2006 at the University of Cagliari.

According to Pierre Bourdieu's standpoint (Bourdieu and Passeron, 1970), we assume the *CC* as a strategic resource that involves the construction of individual habits linked to a defined position in a relational space. In Bourdieu's theory, family plays a strategic role in the conflict for social reproduction: it transmits from one generation to another cultural habits and cultural dispositions, skills and resources. Bourdieu focuses on cultural inheritance and the strategic accumulation of cultural capital as a resource which can be accumulated and translated into other types of capitals (firstly, social and symbolic) (Bourdieu, 1994). In Pierre Bourdieu's theory, the *CC* has three different forms: *embodied*, *objectified*, *institutionalized* (Bourdieu, 1986). We focus on the embodied form of *CC* which is the product of family socialization and cultural activities.

The transition school-university is crucial in determining students' social life and subsequent professional achievement and it remains one of the main topic investigated in the study of social and educational inequalities. The *CC* – linked to social origins – is considered the variable that mainly influences the process of transition from high school to university; it is used as a predictor of educational achievement in different theoretical frames. Hugh Mehan's phenomenological approach (Mehan, 1992) focuses on institutional construction of students destinies (careers), this process is defined as *constitutive action*; it explains how the day by day schooling process creates differences among scholars. On the other hand, the *rational choice* approach (Boudon, 1974; Boudon *et al.*, 2001) asserts that actors adopt an utilitarian perspective and shows how social origins and family resources affect school and university careers. A key role in school-university placement is played by the family strategies, the student's motivation and the social ambitions (Barone, 2006). In Pierre Bourdieu's approach (Bourdieu and Passeron, 1970; Bourdieu, 1989, 1994) – known as the *structuralist and constructivist* approach – *CC* plays a strategic role by interacting with economic and social variables. In spite of the *anti-bourdieu* criticism (Barone, 2006; Goldthorpe, 2007), the role of *CC* is not deterministic and the social agent has strategic perspectives embodied into his social world and cul-

ture. Adopting the *CC* concept as established by Pierre Bourdieu does not exclude to consider the importance of internal variables (like institutional mechanisms in Mehan's perspective) and others factors linked to students' aptitudes, motivations and ambitions. Every perspective spots only one side of this research object and serves to complete a complex tableau. We emphasize the role of *CC* but we assume that it is the product of a dynamic construction where individuals are engaged into a process of re-socialization.

In this paper we consider the *CC* as a product of social construction of families and individuals. Families adopt educational strategies linked to their social position (Laureau, 1987, 2002) and have cultural resources which can be transmitted from one generation to another. The issue that arises from this theoretical perspective is that the *CC* transmitted by the family can be improved by adopting several strategies, so that individuals play an active role in such a process. The student transition from high school to university is a critical moment in student trajectory. The academic place is the locus where the reproduction social strategies took place.

Hereafter, we will suppose that each individual possesses a basic amount of *CC*, namely the '*inherited cultural capital*' (CC_{IH}); it is measured via a proxy variable that is the highest level of formal education reached by students' parents. This basic amount of *CC* can be improved by each person during her daily life (acting as an adolescent and as a young adult). Thus, in our approach, the *CC* has been operationalized in four latent sub-components: (i) the above mentioned '*inherited cultural capital*' (CC_{IH} – inherited from students' parents: i.e., parents' educational level); (ii) the '*family made cultural capital*' (CC_{FM} – built up by positive actions made by students' families); (iii) the '*pro-active cultural capital*' (CC_{PA} – built up by the students: self-constructed); (iv) the '*institutional cultural capital*' (CC_{FE} – built up by the formal education institutions).

2 The Survey

The population surveyed is formed by students that completed their secondary school schemes in 2006 and enrolled at the University of Cagliari for the 2006-07 academic year. A CATI survey was carried out in April-May 2007. The sample size is $n = 494$, that is about 10% of the $N = 4880$ population. Some descriptive statistics concerning the population and the sample are depicted in Table 1; the sample seems to adequately reproduce the main characteristics of the surveyed population. A special section in the survey questionnaire was devoted to the measurement of the latent variable *CC* which has been operationalized in the already mentioned

Table 1: Some descriptive statistics

Variables	Sample	Population
Sesso (%)		
F	58.10	62.05
M	41.90	37.95
School* (%)		
Liceo	45.95	46.84
Not-Liceo	54.05	53.16
Faculty (%)		
Economics	10.88	11.87
Pharmacy	4.31	4.29
Law	12.73	11.79
Engineering	16.22	17.90
Literature	10.88	9.92
Foreign Languages	4.52	5.78
Medicine	3.29	4.80
Educational Science	6.16	7.77
Sciences†	13.76	14.84
Political Science	9.65	11.09
None‡	7.60	—
Age		
Mean	19.88	19.93
Median	19.28	19.37
SD	2.74	2.75
Final mark§		
Mean	79.07	79.23
Median	78.00	78.00
SD	12.51	14.18

∗The Liceo provides a classical education such as the one offered by the old British Grammar Schools.

†Math, Physics, Biology, Chemistry, Natural Science, Computer Science.

‡The sample column contains 37 people who did not enrol after failing the admission tests.

§At school graduation (in hundreds of pts.).

Table 2: Items and percentage of positive responses

Items	% Yes
CC_{FM}	
I_1 Student's parents belong to a cultural association	22.9
I_2 Student has attended non-school music classes	40.9
I_3 Student has attended non-school foreign language classes	36.7
I_4 Student's family has travelled for holidays	72.4
I_5 Student has visited cultural expositions with parents	10.9
I_6 Student's parents have used to buy non-school books as a gift	24.5
CC_{PA}	
I_7 The student has bought books as a gift	12.9
I_8 The student has bought non-school books for herself	38.9
I_9 The student has attended classical music live performances	2.4
I_{10} The student has attended pop music live performances	11.3
I_{11} The student has attended jazz music live performances	1.2
I_{12} The student belongs to a cultural association	22.1
CC_{FE}	
I_{13} The student evaluates as adequate her/his competencies in foreign language	61.5
I_{14} The student evaluates as adequate her/his competencies in computer	50.1
I_{15} The student evaluates as adequate her/his competencies in maths	42.5
I_{16} The student evaluates as adequate her/his competencies in literature	88.8
I_{17} The student evaluates as adequate the overall competencies	57.9
I_{18} The student never failed final year examinations at school	56.7

four sub-components: CC_{IH}, CC_{FM} CC_{PA} and CC_{FE}. The CC_{IH} was measured by considering the number of compulsory years necessary to reach the level of formal education possessed by one of student' parents (the one who reached the highest level in the couple). This measure has been relativized setting equal to 21 the number of years of formal education that are necessary, on average, to reach the highest level of formal education (the PhD). Thus, the variable CC_{IH} signals the CC inherited by each student as a quote of the maximum. Six binary items were used to scale each of the three sub-components: the CC_{FM}, the CC_{PA} and the CC_{FE} sub-components. Table 2 shows for each of the 18 items the percentage of positive answers. For the first two sub-components, we consider the answer to each of the 12 items to be positive only if the student asserts to make the activity frequently.

3 Scaling the Cultural Capital via LCA

The intangible construct *CC*, in this paper operationalized into the before mentioned four sub-components ($CC_{IH}, CC_{FM}, CC_{FE}, CC_{PA}$), is a latent variable whose amount is differently cumulated by each student during her lifetime. The CC_{FE} is measured by asking the students to self assess their competencies on several topics ($I_{13} - I_{17}$) plus a variable that informs on students' performances at school (I_{18}). As above described, the CC_{IH} sub-component is measured by a proxy variable (the years of formal education of students' parents) that is quantified in a direct way. On the contrary, the CC_{FE} and the CC_{PA} sub-components share a common feature: they are measured by *actions* made by the students or by their families. For that reason we focus our attention only on these sub-components to propose a way to scale them.

A Latent Class Analysis (LCA) is applied in order to sort out mutually exclusive classes of students (latent classes) who are supposed to take different values of the latent variable (Linzer Drew and Jeffrey Lewis, 2007; Barholomew *et al.*, 2002; Agresti, 2002) in the two sub-components CC_{PA} and CC_{FM}. Cases (students) are classified into clusters based upon membership probabilities (posterior probabilities) estimated directly from the response pattern given to the items of the questionnaire. Each latent class (LC) groups students who share the same level of *CC* (with respect to the specific dimension defined by the set of items). The assumption of a basic latent class model is that responses of individual j to a set of indicator variables $\boldsymbol{Y_j} = (Y_{j1}, \ldots, Y_{jI})$ are independent conditionally upon the latent classes $q = 1, \ldots, Q$ of the categorical latent variable θ. Thus, by indicating with γ the overall latent class membership probabilities, with ρ the item-response probabilities conditional on the latent class membership, the contribution of individual j to to the likelihood is:

$$P(\boldsymbol{Y}_j = \boldsymbol{y}) = \sum_{\theta=1}^{Q} \gamma_\theta \Pi_{i=1}^{I} \rho_{i|\theta}. \tag{1}$$

The LCA has been estimated using the poLCA package implemented in R by Linzer Drew and Jeffrey Lewis (2007). Table 3 shows the LCA fit measures for the 2, 3, and 4 LCA models. The analysis was carried out separately for each sub-component – CC_{FA} and CC_{PA} –. The 3 class model was retained for both sub-components. Moving from the item response probability conditional upon the LC memberships the profile of each LC was drawn and LCs was next ordered according to the degree of *CC* owned by their members (moving from the 'lowest' to the 'highest' amount owned of *CC*). The criteria adopted for sorting classes is based on the probability of positive answers returned by the model: values of $\rho_{i|\theta}$ was used to sort the LCs and

to differentiate units in the three classes. Moreover, for ranking, we have taken into account the rate of positive answers reported in Table 2. According to the criteria used to sort categories, the relation $C_1 < C_2 < C_3$ holds on both sub-components.

Focusing on CC_{FM} sub-component, we note that students belonging to C_1 have the lowest probabilities to answer positively to all the items: thus, students in C_1 are classified at the bottom of the LC ranking. The same criteria has been used to order $C_2 < C_3$. Looking at the rate of positive answers (Table 2) item I_5 seems to be the activity that requires students the highest level of CC_{FM} in order to be fulfilled. It is followed by I_1, I_6, I_3, I_2 and I_4, which have percentages equal to 22.9%, 24.5%, 36.7%, 40.9% and 72.4%, respectively. It is interesting to highlight that the three items with the lowest rates of positive responses are those that require a direct involvement of students' parents in the actions in order to be fulfilled. Students clustered in C_2 show a higher probability than students clustered in C_3 to answer positively only to items I_1 and I_2. In the remaining four items, students classified in C_3 show higher probability of returning positive answers; consequently we decided to rank $C_2 < C_3$. Furthermore, in our model framework, students clustered in C_3 seems to be the only who possess an amount of CC_{FM} that is sufficient to answer positively to item I_5 (10.9% of positive answers).

Looking at the second component (CC_{PA}), the ranking of the items according to the rate of positive answers is: I_{11}, I_9, I_{10}, I_7, I_{12}, I_8. Students who are classified in C_1 have the lowest probability to score positively on items I_7, I_8, I_9, I_{12}. In the remaining two items (I_{10}, I_{11}) differences in the probabilities to get a positive answer are not relevant ($I_9 = 0.09$ *vs* $I_9 = 0.08$; $I_{10} = 0.03$ *vs* $I_{10} = 0.00$). Furthermore, students in C_1 exhibit a probability to score positively close to 0 in four items out of six. Students in C_3 show the highest probabilities to score positively in four items out of six (I_7, I_9, I_{10}, I_{11}). Thus it seems straightforward to order $C_1 < C_2 < C_3$.

Predicted class membership (CM) vectors are $(0.47, 0.42, 0.11)$ for the first sub-component and $(0.60, 0.38, 0.02)$ for the second one. With respect to CC_{FM}, the 47% of the sample units is classified in the lowest class (C_1); whereas with respect to CC_{PA} the percentage of units in C_1 is almost 60%. On the basis of the CC_{FM}, the first class (C_1) identifies 'low intensity actions' of *CC*, the second (C_2) 'moderate intensity actions' and the third 'high intensity actions' (C_3). On the second component, students can be classified as 'no active' (C_1), 'slightly active' (C_2) and ' moderately active'(C_3). From this classification arises that the second component is strongly biased towards negative categories.

Table 4 shows the cross classification of students according to the levels of the two sub-components. Nine profiles of students arise from the table: among the 233

Table 3: LCA model results: CC_{FM}, CC_{PA}

Comp.	CC_{FM}							CC_{PA}						
Fit Measures: 2,3,4 class model														
$4CLA$:	AIC(4): 3241, BIC(4): 3354 ,$G^2(4)$: 18							AIC(4): 1991, BIC(4): 2104, $G^2(4)$: 20						
$3CLA$:	AIC(3): 3234, BIC(3): 3318 ,$G^2(3)$: 24							AIC(3): 1980, BIC(3): 2065, $G^2(3)$: 24						
$2CLA$:	AIC(2): 3243, BIC(2): 3298 ,$G^2(2)$: 48							AIC(2): 1992, BIC(2): 2047, $G^2(2)$: 49						
3 class model														
ρ: Item response probability conditional on latent class membership														
Latent	$Pr(Y_i = Yes)$							$Pr(Y_i = Yes)$						
classes	$\hat{\gamma}^*_\theta$	I_1	I_2	I_3	I_4	I_5	I_6	$\hat{\gamma}^*_\theta$	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}
C_1	47%	0.06	0.12	0.21	0.50	0.00	0.14	60%	0.00	0.00	0.01	0.09	0.03	0.17
C_2	42%	0.35	0.65	0.45	0.81	0.00	0.21	38%	0.30	0.95	0.03	0.08	0.00	0.29
C_3	11%	0.32	0.49	0.51	1.00	0.62	0.56	2%	0.44	0.83	0.27	1.00	0.30	0.27

* predicted class memberships (by modal posterior prob.)

students (47.2% of the sample) who received 'low intensity action', just 35.2% is 'slightly active' whereas 64.4% is in the category of 'no active'. 30.4% of students is cross classified 'low intensity action' and 'no active'. Among the 207 students who received 'moderate intensity actions', 59.4% is 'no active' and less than 1.5% is 'moderately active'. It is interesting to stress the negative trend of those who received 'high intensity actions': 44.4% is classified 'no active'; 46.3% is 'slightly active', and just 9.3% is 'moderate active'.

Table 4: Students according to the level of CC_{PA} and CC_{FM}

CC_{FM}	CC_{PA}			
	C_1	C_2	C_3	Total
	Counts			
C_1	150	82	1	**233**
C_2	123	81	3	**207**
C_3	24	25	5	**54**
Total	**297**	**188**	**9**	**494**
	%			
C_1	30.36	16.60	0.20	**47.16**
C_2	24.90	16.40	0.61	**41.91**
C_3	4.86	5.06	1.01	**10.93**
Total	**60.12**	**38.06**	**1.82**	**100.00**
	% for columns			
C_1	50.51	43.62	11.11	–
C_2	41.41	43.09	33.33	–
C_3	8.08	13.30	55.56	–
Total	**100.00**	**100.00**	**100.00**	
	% for rows			
C_1	64.38	35.19	0.43	**100.00**
C_2	59.42	39.13	1.45	**100.00**
C_3	44.44	46.30	9.26	**100.00**
Total	–	–	–	

Further evidence on the process of transmission and cumulation of the *CC* arise from the amount of CC_{IH} possessed by individuals belonging to the different LCs:

Table 5: Mean value of CC_{IH} conditional upon class membership

classes	CC_{FM}		CC_{PA}	
	mean	sd	mean	sd
C_1	0.52	(0.16)	0.58	(0.17)
C_2	0.60	(0.18)	0.57	(0.18)
C_3	0.72	(0.18)	0.69	(0.21)

as Table 5 shows units belonging to C_3 have in average value of CC_{IH} higher than units in C_1 and C_2, whereas with respect to the CC_{PA} sub-component, no significant differences in mean values arise between C_1 and C_2.

The first result that arises from this first analysis is that the level of cultural capital is measured on the basis of actions made by students or by their families which are not calibrated with respect to the intensity of *CC* owned by the population of students surveyed. Furthermore, results could suggest that the rule chosen in order to classify a student response in the 'positive' category (i.e., the actions described in the item had to be made *frequently*) seems to be too restrictive with respect to the overall level of *CC* observed in the sample. This consideration holds for both sub-components: only one item out of twelve has a rate of positive answers greater than 50%. Furthermore, on the second sub-component, the 'difficulty' of the action described in the items is even more strong: none of the items reaches the threshold of 50%; the highest percentage of positive answers observed is 38.9% and two items show extremely low rates of positive scores (under 3%).

4 Assessing the difficulty level of the survey questionnaire

In this section we use some tools provided by the Item Response Theory (IRT) in order to get a relative measure of the difficulty level of the survey questionnaire. An item in the questionnaire is considered relatively difficult in respect to another if it requires a higher level of *CC* in order to be positively answered. The IRT approach assumes the two sub-components of the *CC* (CC_{FM} and CC_{PA}) to be latent continuum variables. The aim is to use the tool to better understand the results obtained in the LCA.

IRT is a probabilistic framework for the development of scales stemming from

the psychometrics field. It deals with the whole response pattern of a set of items constituting a questionnaire (test). The characteristics of the items composing the questionnaire (item parameters) plays in this approach a central role in the phase of estimation of the subject's intensity of an *attribute* (subject parameter)(Baker and Kim, 2004; De Boeck and Wilson, 2004). Basically, this family of models assumes that the chance to score positively to an item depends on two parameters related to that item (in psychometric literature such parameters are called 'difficulty' and 'discrimination') and on a subject parameter ('ability parameter'). Higher levels of the *attribute* (the latent variable) imply an increase in the probability that the subject will response positively to each item (Rasch, 1960; Birnbaum, 1968; Fisher and Molenaar, 1995).

By adopting this approach it has been made possible to sort out a ranking of the items according to the intensity of the attribute *CC*, namely CC_{xy}. Moreover, the item parameters help us to shed some light on further choices in order to 'calibrate' the questionnaire for future surveys on the topic. In order to jointly measure both the sub-components CC_{PA} and CC_{FM} two person parameters have been considered $\boldsymbol{\theta}_j(\theta_{1j}, \theta_{2j})$; one for each latent sub-component measured by the items (Rasch, 1960; Adams *et al.*, 1997; Rijmen and Briggs, 2004). Thus, a *between-item two-dimensional model* (Adams *et al.*, 1997; Rijmen and Briggs, 2004) has been specified where each item taps just on a sub-component (Table 2). The model specifies the probability that unit j answers positively to an item i as function of an item parameter (β_i) and two person parameters ($\boldsymbol{\theta}_j$)

$$logit(\pi_{ij}) = \beta_i + \sum_{r=1}^{2} \lambda_{ir}\theta_{jr}. \tag{2}$$

The β_i is the *difficulty* of the item, whereas λ_i is called the *discrimination parameter*. In the framework of the quantification of the *CC* the lower is β_i, the higher is the intensity of the *CC* measured by the aspect i and the higher is the minimum level of *CC* required to students in order to answer positively. The distribution of the two latent sub-components is assumed to be *bivariate normal* $[\mathcal{N}(\mu, \Sigma)]$. The indicator vector $\boldsymbol{\Lambda}_i$ $(\lambda_{i1}, \lambda_{i2})$ specifies on which dimension item i loads. In this framework, we made the assumption that items have the same power to discriminate between subjects with different levels of ability by fixing loadings equal to one on each sub-component. This assumption was made considering the strong unreliability of the results obtained leaving the factor loadings free to vary and by considering that the aim of this IRT analysis is just to further investigate the relationships already highlighted by LCA. Each θ_{jr} measures the intensity of the latent construct (CC_{PA}

or CC_{FM}) in subject j. According to the model the higher is β_i the easier is the question (i.e. the lower is the intensity of *CC* measured by a question). The higher is θ_{jr} in student j, the higher is the probability that student j answers positively to items which tap on dimension r. The model was estimated using the package gllamm from STATA (Rabe-Hesketh *et al.*, 2004).

Looking at the sub-component C_{FM} (Table 6) the item parameters of I_2 ($\beta_2 = -0.43$) and I_3 ($\beta_3 = -0.64$) highlight that both are relatively easier than the remaining four items. The item parameter of the most difficult item is equal to -2.34 (I_5). Looking at the second component, the two easiest items (I_8 and I_{12}) have item parameters equal to -0.57 and -1.57; the most difficult items are I_9 and I_{11} which have item parameters equal to -4.29 and -5.02. The difficulty of the selected items to measure the sub-component CC_{PA} in respect of the items used to measure the CC_{FM} is well summarized by the values of the item parameters.

Results depicted in Table 6 show a high degree of positive correlation among the two latent traits (0.73). The main results single out by the model is that the structure of the test appears to be 'too difficult' with respect to the average level of the cultural capital owned by students surveyed. Specifically, excluding item I_3, all item parameters have a negative sign and the highest odd to get a positive answer is 0.65. On the second sub-component the test appears to be even more difficult to cope with: four items upon six have odds equal or lower than 0.10 (i.e. item I_7, I_9, I_{11}). The posterior means of person parameters and the 95% confidence intervals are depicted in Figure 1.

The *posterior means – empirical Bayes predictions* (Skrondal and Rabe-Hesketh, 2004) – of the person parameters for the CC_{FM} have for the 90% of the sample (discarding the first and the last 5%) a range of variation between -1.13 and 1.14 and their standard deviations show a high level of uncertainty [$\min 0.59, \max 0.71$]. For the CC_{PA} the range of variation for the 90% of the sample is even broader [$-1.25; 1.50$] with higher standard deviations [$\min 0.72, \max 0.92$].

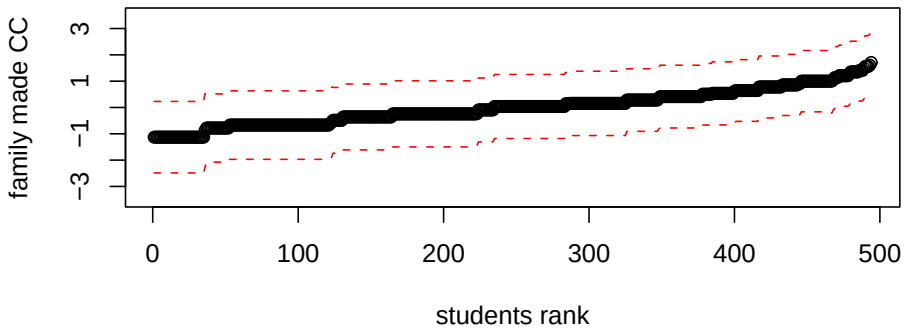
The overlap of the confidence intervals around both person parameters (Figure 1) suggests that differences among students would be better highlighted by clustering students in classes as it has been done by the LCA above described; moreover, the large values of the standard deviations indicate the uncertain location of the students on the latent variable (Bartholomew, 1998). The distribution of the posterior means of students person parameters on the two sub-components conditional upon the class-membership is depicted in Figure 2. The bunching of the sample in three clusters obtained with LCA seems to be adequate.

The IRT model leads also to a satisfactory description of the *difficulty* of the

Table 6: Between-item two-dimensional item response model

item parameters	Coef. dim1 (odds)	Coef. dim2 (odds)	Std. Err.	z	p-value
I_1	-1.41 (0.24)		.12	-11.33	0.00
I_2	-.43 (0.65)		.10	-4.01	0.00
I_3	-.64 (0.53)		.10	-5.84	0.00
I_4	1.12 (3.06)		.11	9.54	0.00
I_5	-2.39 (0.09)		.16	-14.78	0.00
I_6	-1.30 (0.27)		.12	-10.72	0.00
I_7		-2.33 (0.10)	.16	-13.78	0.00
I_8		-0.57 (0.56)	.11	-4.87	0.00
I_9		-4.29 (0.01)	.32	-13.36	0.00
I_{10}		-2.51 (0.08)	.17	-14.11	0.00
I_{11}		-5.02 (0.01)	.43	-11.58	0.00
I_{12}		-1.57 (0.21)	.14	-11.22	0.00
	random effects				
var(θ_1): 0.82 (SE:.14)	var(θ_2): 1.33 (SE: .27)	cov(θ_1, θ_2): 0.75 (SE:.12)	$cor(\theta_1, \theta_2)$ 0.72		

Figure 1: Posterior means of students' CC_{FM} and CC_{PA} sorted according to the rank (95% CI)



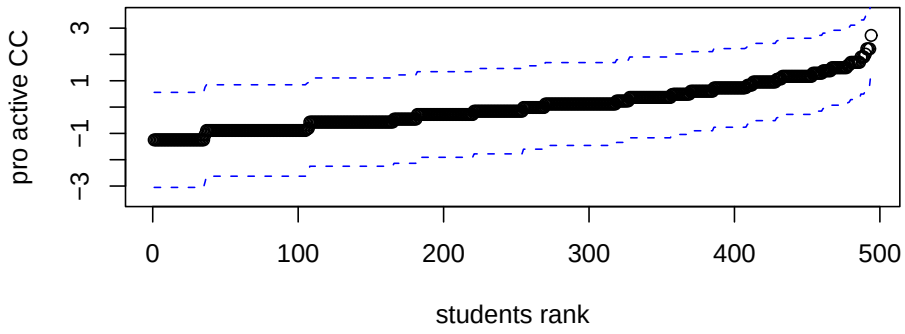
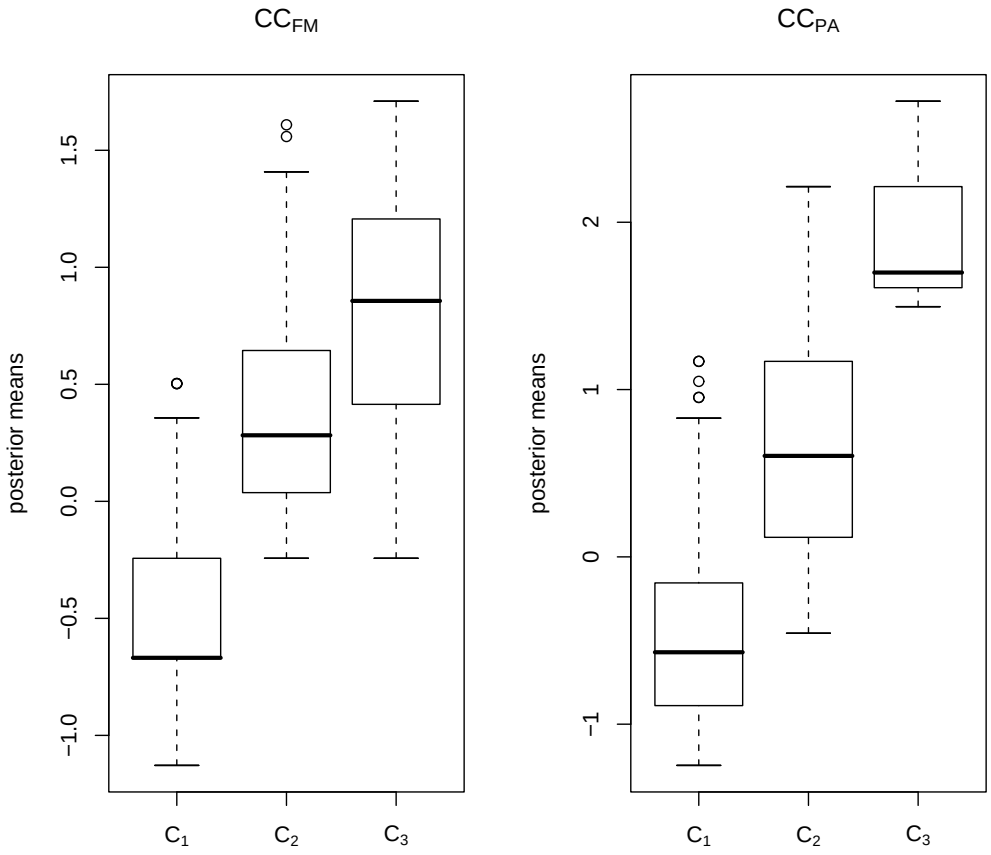


Figure 2: Box plot of posterior means of students CC_{FM} and CC_{PA} according to CC_{FM} and CC_{PA} class membership



items of the questionnaire to measure the *CC*. It shows also a classification of students and items which are consistent with the results obtained using LCA: the most *difficult* items are those which are scored positively just by students belonging to LC C_3, whereas the probability to answer positively to items (relatively) *easy* does not show significant differences among the three categories.

5 Some final remarks

The attention of this research has been focused on the analysis of the dimensionality of the items composing the sections of questionnaire addressed to measure the two sub-components of the latent variable *CC*, namely CC_{FM} and CC_{PA} and on their relative effectiveness in highlighting differences in the amount of *CC* owned by students. For each sub-component the LCA was used in order to classify students in three mutually exclusive classes characterized by different intensity of the amount possessed of the latent variables. The *between-item two dimensional model* (IRT) adopted in order to validate the results of the LCA provides a relative evaluation of the difficulty of the questions relaying on responses provides on both the sub-components. The values of the item parameters obtained represents a helpful system of weights to calibrate the questionnaire in subsequent researches.

Further analysis are still in progress in order to assess the relationships among the three sub-components of students' *CC* and some other relevant aspects. Namely,

a. Students' characteristics: demographic details, school careers, socioeconomic background.

b. The influence of several factors on students' educational decisions.

c. Students' strategies in selection of the degree programs.

Furthermore, the next step aims to quantify the sub-component CC_{FE} via LCA, and to validate the results using a *between-item three dimensional model* to keep simultaneously into account the overall structure of the three sets of indicators items.

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