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GRADUATES JOB MOBILITY: A LONGITUDINAL ANALYSIS

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1. INTRODUCTION

Evaluating the internal and external effectiveness and efficiency of university education is not just a requirement for Italian universities under the current legislation[1], but also a valuable instrument that governing bodies at various levels can use for making decisions based on adequate information. Of course, there are countless elements that go into the definition of the concepts of effectiveness and efficiency. In particular, with regard to external effectiveness, in addition to considering the employment rates of graduates, it is also essential to assess the quality of the working activity carried out. This assessment must be based on an analysis of several aspects and characteristics of the job including, by way of example, income level, type of employment contract, leisure time availability, career opportunities, geographic localization of the workplace. The latter aspect is the main focus of this article: in particular, this analysis is based on a comparison between Region of employment and Region of residence.

The goal of this analysis is to pinpoint and investigate any significant differences among degree courses with respect to the phenomenon of occupational mobility and to identify individual and context-related determinants trying to estimate their net impact. Of all the different variables that can explain the phenomenon under consideration, special attention was devoted to the effect of time in order to estimate mobility trends and identify possible interactions with the other covariates. This paper is a natural follow up to the analysis conducted by Bacci and Chiandotto (2007) on the same mobility-related aspects whose focus was restricted, however, to cross-sectional data. Being aware of the limitations inherent in a cross-sectional analysis, the authors of this work investigated the phenomenon of occupational mobility by adopting a longitudinal approach.

This analysis draws upon the data gathered by ALMALAUREA as part of its surveys on graduates from the years 2000, 2001 and 2002 interviewed at 1, 3 and 5 years after graduation. Thanks to the high number of interviewees involved, it was possible to differentiate the analysis by type of degree course; furthermore,

[1] See Ministerial Decree No. 544 of October 31st, 2007 and subsequent directorial decree no. 61 of June 10th, 2008.

the double hierarchical nature of the data (graduates from degree courses and repeated measurements for each graduate) suggested the use, as a suitable instrument of analysis, of a multilevel random-effects model.

Section 2 introduces the data set used for the analysis and discloses some preliminary results; Section 3 briefly reports some of the conclusions arising out of the cross-sectional analysis and, above all, points out the limitations inherent in this type of approach. Section 4 presents a first longitudinal analysis whose purpose is to allow a direct comparison with the findings of the cross-sectional analysis. A more in-depth longitudinal analysis is described in paragraph 5 using a three-level random-effects logistic model. The article ends with a few conclusive remarks.

2. DESCRIPTION OF DATA SETS AND PRELIMINARY ANALYSIS

The data used in the analysis were obtained from the last seven ALMALAUREA[2] reports (from the 2001 to the 2007 edition[3]) on graduates' employment conditions. This survey, which is conducted on a yearly basis, sheds light on the latest trends and developments on the labour market identifying the employment conditions of graduates from the universities participating in the Consortium during the first five years after graduation. For the purpose of this survey, all graduates were interviewed after one, three and five years from completion of their studies; the broad range of data and information which derives from this survey provides a suitable frame of reference for conducting a full-scale longitudinal analysis. As briefly pointed out in the introduction, the analysis described in this article is restricted to the pre-reform graduates from the years 2000, 2001 and 2002 from a total of 24 Italian universities who were interviewed on all three interviewing sessions (at one, three and five years from graduation) and who reported being in employment on at least one of the three interviews: they totalled a number of 31,621 graduates from 80 different degree courses[4]. Only Table 1 reports data concerning the whole graduate population (34,122) from the 80 de-

[2] ALMALAUREA, set up in Italy in 1994 as an Inter-University Consortium by the Observatory of Statistics of the University of Bologna, sees the participation of a total of 53 universities representing about 70% of Italian graduates and is open to collaboration with foreign universities as part of its strong international commitment. ALMALAUREA was created to be at the service of graduates, universities and businesses; to achieve this goal the Consortium collects and makes available an updated documentation on the human capital educated in Italian universities and provides an online database of graduates, including those with several years of experience, to facilitate the matching of demand and supply of work on the national market as well as to boost transnational mobility. Further details on the survey methodology are available on Almalaura's website: www.almalaurea.it.

[3] Participation in the survey interviews has always been broad-based with a rate of over 85% at one year from graduation, 80% at three years and 76% at five years. For further details on the last survey see Consorzio Interuniversitario ALMALAUREA (2008).

[4] The analysis considered only degree courses with at least 10 employed graduates in one of the 3 survey interviews.

TABLE 1

Employment conditions of graduates at one, three and five years from graduation, by type of degree course

N.	Degree course	Graduates at 1 years		Graduates at 3 years		Graduates at 5 years		Total graduates
		% employed	No. employed	% employed	No. employed	% employed	No. employed	
1	administration	66.7	14	85.7	18	76.2	16	21
2	aerospace engineering	78.9	75	95.8	91	94.7	90	95
3	agric. sciences and technologies	59.0	69	76.9	90	87.2	102	117
4	agriculture	64.0	89	77.7	108	85.6	119	139
5	animal husbandry sciences	72.2	13	72.2	13	72.2	13	18
6	architecture	75.3	1,389	92.0	1,697	93.9	1,733	1,845
7	astronomy	30.4	7	52.2	12	69.6	16	23
8	banking and insurance sciences	60.0	9	73.3	11	60.0	9	15
9	banking economics	70.0	63	88.9	80	87.8	79	90
10	banking fin. and insur. economics	50.0	27	74.1	40	83.3	45	54
11	biological sciences	43.9	362	59.4	490	71.0	586	825
12	biotechnologies	37.1	26	42.9	30	61.4	43	70
13	business economics	68.5	583	84.3	717	94.7	806	851
14	business engineering	86.6	304	95.2	334	97.2	341	351
15	chemical engineering	70.6	89	85.7	108	92.1	116	126
16	chemistry	50.5	158	63.3	198	80.2	251	313
17	chemistry and pharmac. tec.	65.7	301	79.9	366	88.4	405	458
18	civil engineering	82.5	514	92.3	575	96.5	601	623
19	communications	68.9	306	87.4	388	92.3	410	444
20	conservation of cultural heritage	68.2	165	80.2	194	86.8	210	242
21	construction engineering	87.0	168	94.3	182	97.4	188	193
22	dentistry and dental implants	70.9	134	92.6	175	94.2	178	189
23	economics and banking	64.0	135	86.3	182	91.5	193	211
24	economics and commerce	62.7	2,456	77.6	3,042	91.0	3,568	3,919
25	economics of tourism	77.6	59	85.5	65	89.5	68	76
26	education sciences	77.4	1,114	87.5	1,260	88.2	1,270	1,440
27	electrical engineering	83.1	138	97.6	162	97.0	161	166
28	electronic engineering	79.2	528	90.7	605	95.8	639	667
29	eng. for envir. and land-use planning	76.8	215	89.6	251	95.7	268	280
30	environmental sciences	50.6	40	83.5	66	86.1	68	79
31	Europ. foreign lang. and literature	65.2	15	82.6	19	87.0	20	23
32	European languages and cultures	76.2	16	71.4	15	85.7	18	21
33	food sciences and technologies	65.0	89	78.1	107	87.6	120	137
34	foreign languages and literature	65.6	1,027	80.5	1,261	84.4	1,322	1,566
35	forestry and environ. sciences	58.3	67	78.3	90	81.7	94	115
36	forestry sciences	58.3	7	91.7	11	91.7	11	12
37	geography	85.7	12	71.4	10	100.0	14	14
38	geology	59.1	156	77.7	205	84.8	224	264
39	history	59.0	108	76.5	140	81.4	149	183

N.	Degree course	Graduates at 1 years		Graduates at 3 years		Graduates at 5 years		Total graduates
		% employed	No. employed	% employed	No. employed	% employed	No. employed	
40	history of conserv of architectural and environ. heritage	52.8	19	83.3	30	83.3	30	36
41	industrial chemistry	53.3	72	76.3	103	83.0	112	135
42	information sciences	86.4	121	87.1	122	92.1	129	140
43	information technology	74.0	71	81.3	78	92.7	89	96
44	institutions and financial markets	50.0	5	80.0	8	90.0	9	10
45	intern. trade and curr. market economics	62.8	27	90.7	39	95.3	41	43
46	intern. and diplomatic relations	56.3	36	85.9	55	93.8	60	64
47	IT engineering	87.5	253	91.0	263	94.8	274	289
48	land-use urban and environ. planning	72.9	35	93.8	45	93.8	45	48
49	law	29.6	1,468	58.3	2,897	84.4	4,190	4,965
50	letters	53.7	946	73.6	1,297	82.3	1,450	1,762
51	letters and literature	75.4	92	78.7	96	80.3	98	122
52	marine engineering	80.8	21	100.0	26	100.0	26	26
53	maritime and transp. economics	82.1	23	85.7	24	92.9	26	28
54	materials engineering	68.6	70	87.3	89	95.1	97	102
55	mathematics	55.5	212	74.3	284	83.2	318	382
56	mechanical engineering	82.5	613	93.5	695	97.3	723	743
57	medicine and surgery	15.4	210	23.0	313	52.0	708	1,361
58	modern foreign lang. and literature	61.5	59	77.1	74	82.3	79	96
59	motor sciences	93.8	30	96.9	31	93.8	30	32
60	natural sciences	56.9	173	75.7	230	83.9	255	304
61	nuclear engineering	57.1	12	85.7	18	95.2	20	21
62	pedagogy	71.2	178	78.4	196	82.0	205	250
63	pharmacology	83.1	424	90.8	463	93.1	475	510
64	philosophy	51.8	290	72.5	406	78.9	442	560
65	physics	42.0	124	52.2	154	71.2	210	295
66	political economics	70.9	105	87.8	130	95.9	142	148
67	political sciences	68.8	1,399	85.4	1,737	90.2	1,834	2,034
68	psychology	55.0	880	85.8	1,372	87.9	1,405	1,599
69	public admin. and intern. institutions	71.4	10	78.6	11	85.7	12	14
70	social services	98.0	390	97.2	387	96.5	384	398
71	sociology	67.5	52	81.8	63	92.2	71	77
72	statistics and actuarial sciences	84.2	16	100.0	19	100.0	19	19
73	statistics and business IT	81.5	22	100.0	27	100.0	27	27
74	statistics and economics	69.1	103	87.9	131	94.6	141	149
75	statistics demogr. and social sciences	58.4	45	87.0	67	85.7	66	77
76	telecoms engineering	75.0	141	88.3	166	96.8	182	188
77	the arts, music and the performing arts	64.7	196	76.6	232	84.2	255	303
78	translation and interpreting	79.9	111	89.9	125	93.5	130	139
79	tropical and subtrop. agric. sciences	50.0	10	55.0	11	65.0	13	20
80	veterinary medicine	53.2	125	81.7	192	89.8	211	235
Total		**59.3**	**20,236**	**76.5**	**26,114**	**86.7**	**29,597**	**34,122**

Source: measurements based on ALMALAUREA data

gree courses under consideration and is inclusive, therefore, of those graduates who have never had a job after completion of their university studies; this choice was dictated by the need to make a more accurate assessment of differences in employment rates across the various degree courses.

Table 1 shows, for each of the 80 degree courses under investigation, the indicators relating to the employment rate at one, three and five years from graduation. At one year from completion of the degree course, almost 60% of interviewed graduates declared having a paid job (with the exception of those engaged in any type of training activity, including remunerated training schemes)[5]; this percentages reached 76.5% at three years and as much as 87% at five years from completion of university studies. The type of degree course was found to contribute in varying degrees to the above results: on the one hand there are degree courses whose graduates report high rates of employment as early as one year after completion of their education (in particular several degree courses from the engineering grouping, but also from the social services, motor sciences, pharmacology, groupings with employment rates of over 80 per cent at one year after graduation) and, on the other hand, there are degree courses whose graduates typically take longer to find an employment (medicine and surgery, law, but also some courses in the sciences grouping).

Figure 1 reports a schematic representation of the transitions, from employed to unemployed status and vice versa, identified during the three interviewing sessions: as clearly shown by the data, having entered the labour market increases the likelihood of staying in employment; as a matter of fact, over 90% of those who declared to be in employment one year after graduation were found to be still employed three and five years thereafter. This means, in general, that slightly more than half of graduates have found a job at one year after graduation and remains employed in the four years that follow.

At the other end of the spectrum, about 7% of graduates declared, on all three interviews, to have no employment; of course this cohort has been excluded from all further analyses on mobility for job reasons.

As a whole, for 15 of the 80 degree courses examined, the employment rate at one year from graduation exceeded 80%; when lowering the employment rate threshold to 70%, the number of degree courses increases to 34. By contrast, only 6 degree courses show employment rates lower than 50%.

As already discussed, at three years from graduation the percentage of graduates engaged in a work activity show a substantial increase as regard both the total number of interviewees and the majority of the degree courses under examination

[5] In line with the ISTAT official survey on the employment conditions of graduates, this analysis considered as "employed" only those graduates who declared being in some sort of paid job provided this did not entail some form of training (traineeships, apprenticeships, research doctorates, master courses); according to this definition, the fact that a graduates gets paid, though being a precondition, it not sufficient for him/her to be defined as employed. This definition differs from the one used by ISTAT in its survey on the Labour Force: according to this latter definition, all those who declared they were working for a wage, even as part of trainee programmes and without a regular employment contract, were considered as being employed.

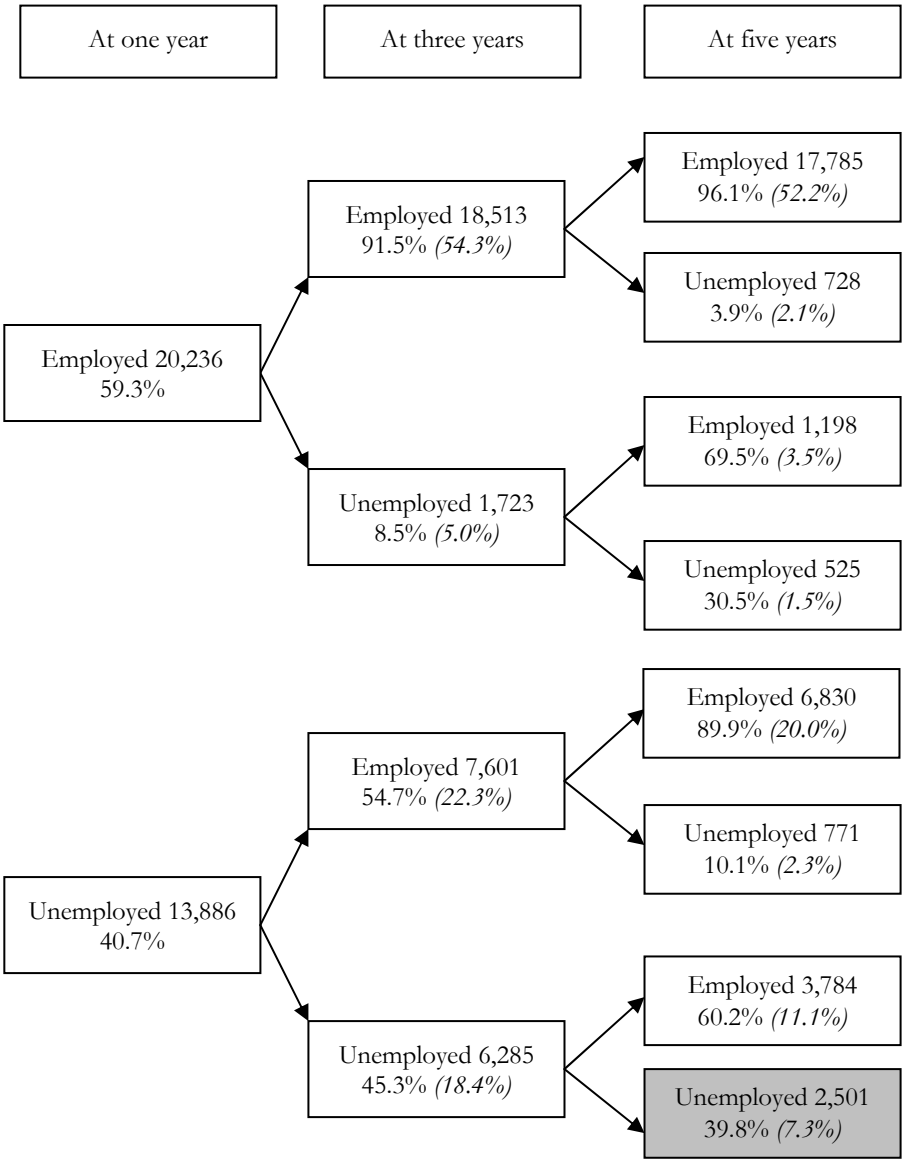

Figure 1 – Graduates from the years 2000, 2001 and 2002: employment conditions at one, three and five years from graduation.
Note: the figures in italics reported in brackets are the percentages calculated with respect to the total number of interviewees (34,122). Moreover, the box highlighted in grey, which shows the number of interviewees with no work experience whatsoever in the three-year period under investigation, refers to graduates excluded from the analysis on occupational mobility.

(with a few exceptions due to the low number of graduates surveyed): in 19 degree courses, the employment rate exceeded 90% whereas it remained below 70% for 8 degree courses (these are courses in which high numbers of graduates pursue post-graduate studies).

Finally, at five years from graduation, the percentage of graduates who have found a job, while reaching 87% in the aggregate, exceeds 90% in 39 of the degree courses under consideration (95% for 17 of them). At the bottom of the ranking there are 10 degree courses in which the percentage of employed graduates remains lower than 80%.

Of course, a through analysis of the employment conditions of graduates cannot be confined to employment rates only, but must necessarily consider also the main characteristics of the working activity carried out: type of employment agreement, level of remuneration, relevance to the course of study in the job activity as well as the location of the workplace with respect to the place of residence[6].

Figure 2 and Table 2 provide a summary indication of mobility flows for study and occupational reasons; what emerges is a strong association between the two components under examination: graduates who moved to a different town for study purposes are later more likely to stay away from home for occupational reasons. As a whole, 15% of graduates declare having taken up a work activity outside of their region of residence at one year from completion of their studies; this percentage shows a slight increase to 17.3% at 3 years from graduation and to 18.1% at five years. A twofold increase in these percentages is observed when narrowing down the analysis to those graduates who completed their studies in a region different from the one of residence: in this case the percentage raise to about 33% in all the years under consideration (secondary mobility). By contrast, occupational mobility is markedly lower in the case of graduates who studied in their region of residence (primary mobility): as it turned out, on all three interviewing occasions, about 90% of graduates reported working in the same region where they live and completed their university education.

With reference to degree courses, the picture appears decidedly more articulate compared to the one observed for the total number of graduates. As a matter of fact, with the passing of time from the year of graduation, the number of degree courses showing relatively high mobility flows tends to increase: while at one year from graduation, only 7 of the 80 degree courses under examination report over 30% of employed graduates working away from their region of residence, this number increases to 13 at three years and to 17 at five years from completion of studies. At the other end of the spectrum, in the period between one and five years from graduation, the number of degree courses involved in low mobility flows (i.e. lower than 10%) drops drastically: from 17 degree courses at one year from graduation to 9 after three years and further down to 6 after five years.

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[6] On the topic of graduates' occupational mobility see also G. Cainelli, G. Gorla (2008) and G. Viesti (2005).

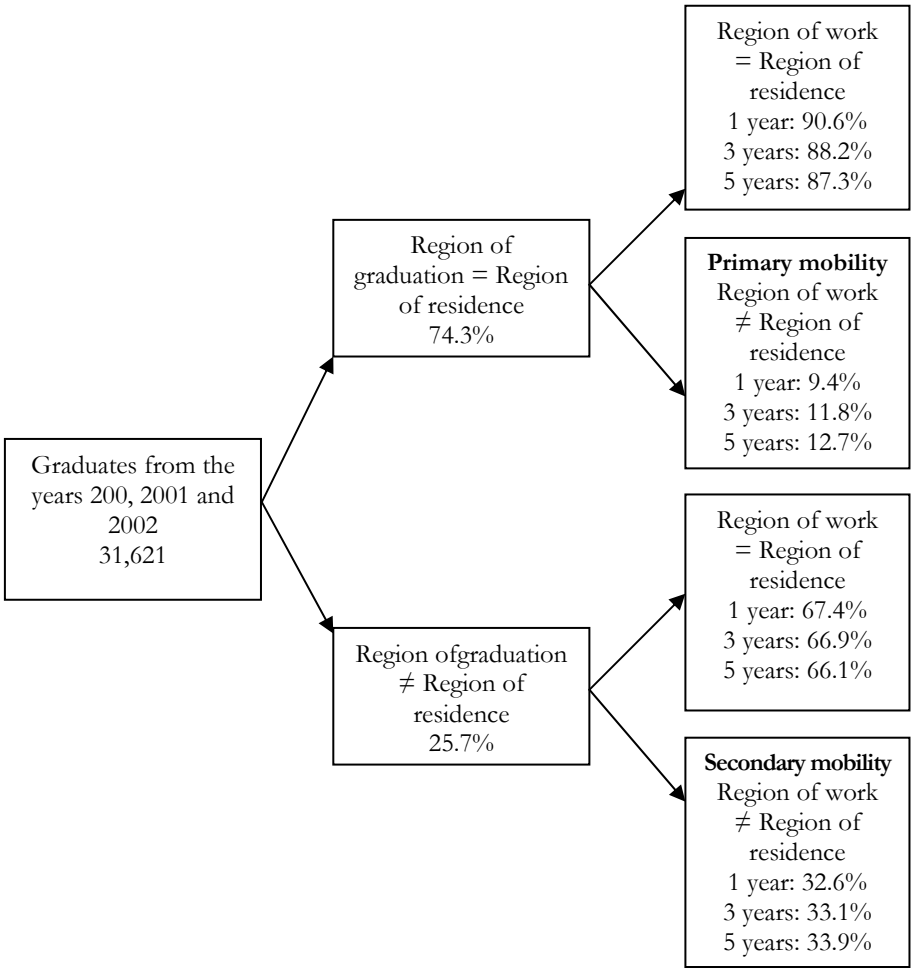

Figure 2 – Graduates from the years 2000, 2001 and 2002: mobility for study and occupational reasons at one, three and five years from graduation.
Note: the percentages relating to the comparison between region of work and region of residence are calculated on the employed graduates only and not on the total number of interviewees as is the case, instead, of the percentages relating to the comparison between region of graduation and region of residence.
Source: measurements based on ALMALAUREA data

In particular, the degree courses characterised by the highest rates of mobility for occupational reasons are those offered by a limited number of universities which, therefore, feature a high level of mobility for study reasons. But these are also degree courses which, by their very nature, require some predisposition to mobility, in particular, international and diplomatic relations, translation and interpreting, institution and financial markets (a low number of graduates), the arts, music and the performing arts, economics and banking, banking economics, all of them firmly positioned within the first 10 in terms of percentage share of gradu-

TABLE 2

Percentage of graduates employed in a region different from the one of residence, by type of degree course and by comparison between region of graduation and region of residence: same region, different region and total number of employed graduates (degree courses denominations as per Table 1 above)

Degree course number	1-year graduates			3-year graduates			5-year graduates		
	Region of graduation vs region of residence			Region of graduation vs region of residence			Region of graduation vs region of residence		
	same	different	total	same	different	total	same	different	total
1	7.7	-	7.1	12.5	50.0	16.7	28.6	50.0	31.3
2	14.5	76.9	25.3	17.8	83.3	30.8	18.7	73.3	27.8
3	1.6	62.5	8.7	4.9	44.4	8.9	10.1	46.2	14.7
4	5.6	11.8	6.7	7.9	26.3	11.1	11.2	23.8	13.4
5	-	33.3	7.7	-	50.0	23.1	12.5	60.0	30.8
6	5.6	31.9	13.6	6.4	25.8	12.4	5.9	25.1	11.8
7	-	40.0	28.6	-	50.0	33.3	25.0	66.7	56.3
8	28.6	-	22.2	37.5	-	27.3	28.6	-	22.2
9	27.5	34.8	30.2	30.2	44.4	35.0	31.5	40.0	34.2
10	29.4	20.0	25.9	34.8	35.3	35.0	44.0	30.0	37.8
11	10.1	40.0	16.3	17.0	43.6	22.4	15.5	51.2	23.2
12	20.0	100.0	23.1	18.5	66.7	23.3	25.0	85.7	34.9
13	8.0	47.2	16.3	10.9	48.2	19.5	12.5	42.6	19.4
14	17.1	52.5	24.0	17.9	56.1	25.4	18.8	57.8	26.1
15	20.8	66.7	27.0	27.6	61.9	34.3	25.5	59.1	31.9
16	11.6	48.3	18.4	19.9	33.3	22.7	18.8	48.1	25.1
17	16.3	41.8	20.9	20.3	34.2	23.2	19.8	43.2	24.4
18	8.4	42.1	15.4	10.4	41.0	16.9	11.9	38.5	17.3
19	12.9	57.1	29.1	18.3	56.2	31.7	18.1	58.7	32.9
20	8.6	18.3	12.1	12.2	28.2	18.0	13.0	27.8	18.1
21	3.9	37.5	7.1	8.5	38.9	11.5	8.3	50.0	12.8
22	6.3	18.4	9.7	6.3	29.8	12.6	3.8	27.1	10.1
23	23.8	61.1	43.7	16.9	60.6	40.7	11.4	54.3	34.7
24	9.6	31.8	13.5	12.3	31.4	15.7	12.7	31.9	16.3
25	6.3	48.8	37.3	-	42.2	29.2	10.0	58.3	44.1
26	4.9	28.9	8.2	6.4	25.6	8.9	7.4	28.1	10.2
27	12.5	50.0	21.7	9.1	58.5	21.6	11.5	56.4	22.4
28	14.6	62.9	22.7	13.9	60.3	22.8	18.4	60.7	26.4
29	10.1	46.8	18.1	11.3	45.6	19.1	14.5	45.9	21.6
30	-	30.0	7.5	22.2	38.1	27.3	16.7	50.0	26.5
31	7.7	-	6.7	23.5	-	21.1	16.7	-	15.0
32	13.3	100.0	18.8	21.4	100.0	26.7	17.6	100.0	22.2
33	16.4	40.9	22.5	14.6	44.0	21.5	16.1	55.6	25.0
34	9.4	40.9	14.1	12.9	38.6	17.2	13.4	45.2	18.7
35	6.0	11.8	7.5	7.4	9.1	7.8	8.5	21.7	11.7
36	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	10.0	25.0	14.3
38	16.3	33.3	19.2	18.0	36.8	21.5	17.8	35.9	21.0
39	9.5	33.3	14.8	8.3	32.3	13.6	8.0	30.6	13.4
40	7.7	16.7	10.5	15.0	20.0	16.7	20.0	20.0	20.0
41	13.0	33.3	18.1	11.4	37.5	17.5	15.3	48.1	23.2
42	11.8	73.7	21.5	13.9	66.7	23.0	9.3	47.6	15.5
43	13.1	50.0	18.3	17.6	50.0	21.8	19.5	50.0	23.6
44	100.0	-	40.0	33.3	60.0	50.0	33.3	50.0	44.4
45	5.9	40.0	18.5	13.6	41.2	25.6	8.3	35.3	19.5
46	30.0	43.8	36.1	32.0	46.7	40.0	41.4	51.6	46.7
47	13.7	62.5	22.9	15.3	59.6	23.2	19.6	60.0	27.0
48	10.0	33.3	20.0	13.8	25.0	17.8	7.1	35.3	17.8
49	9.0	20.7	13.1	11.1	22.6	15.2	11.6	23.0	15.6
50	7.5	27.4	10.4	12.2	36.0	15.8	12.6	38.1	16.8
51	8.9	23.1	10.9	6.1	57.1	13.5	7.4	52.9	15.3
52	6.7	50.0	19.0	30.0	33.3	30.8	30.0	33.3	30.8
53	22.7	100.0	26.1	13.0	-	12.5	15.4	-	15.4
54	17.7	37.5	20.0	12.8	36.4	15.7	12.8	36.4	15.5
55	11.0	33.3	16.0	20.8	39.7	25.0	21.7	37.2	25.5
56	11.7	53.1	18.3	14.4	49.5	20.0	15.0	47.4	20.2
57	6.6	38.6	13.3	7.6	45.3	16.6	14.2	55.0	23.4
58	5.8	28.6	8.5	15.0	35.7	18.9	20.9	50.0	25.3

Degree course number	1-year graduates			3-year graduates			5-year graduates		
	Region of graduation vs region of residence			Region of graduation vs region of residence			Region of graduation vs region of residence		
	same	different	total	same	different	total	same	different	total
59	4.2	16.7	6.7	12.0	-	9.7	8.0	-	6.7
60	8.3	31.0	12.1	15.1	36.8	18.7	14.4	39.1	18.8
61	-	100.0	16.7	14.3	50.0	22.2	13.3	80.0	30.0
62	5.8	12.8	7.3	8.7	17.4	10.7	7.6	16.7	9.8
63	7.0	21.1	11.1	7.1	24.8	12.5	7.2	24.5	12.4
64	8.4	34.0	13.1	13.8	41.1	20.2	13.8	39.6	19.7
65	10.3	52.9	16.1	12.5	42.3	17.5	17.1	57.1	23.8
66	12.8	37.0	19.0	14.0	45.9	23.1	17.5	43.6	24.6
67	8.6	33.0	12.3	10.5	34.4	14.3	11.6	39.0	15.9
68	5.8	21.1	12.0	7.3	24.7	14.8	8.4	23.5	14.9
69	-	33.3	10.0	-	33.3	9.1	-	33.3	8.3
70	7.9	2.3	2.8	7.9	2.9	3.4	5.4	3.2	3.4
71	-	24.1	13.5	-	25.7	14.3	-	26.3	14.1
72	7.1	-	6.3	5.9	-	5.3	5.9	-	5.3
73	22.2	50.0	27.3	14.3	50.0	22.2	14.3	50.0	22.2
74	12.0	45.0	18.4	15.8	43.3	22.1	15.5	35.5	19.9
75	16.1	35.7	22.2	29.2	63.2	38.8	21.3	57.9	31.8
76	21.8	70.6	27.7	16.8	69.6	24.1	12.8	65.4	20.3
77	8.6	45.2	32.1	17.9	43.2	34.1	28.7	45.8	40.0
78	19.5	58.6	44.1	19.6	62.0	46.4	20.8	59.8	45.4
79	-	50.0	20.0	-	50.0	18.2	10.0	33.3	15.4
80	12.2	32.6	19.2	6.8	37.3	16.1	8.3	36.4	17.1
Total	9.4	32.6	15.0	11.8	33.1	17.3	12.7	33.9	18.1

Source: measurements based on ALMALAUREA data

ates employed out of their original regions, regardless of the year of measurement. At the bottom of the ranking there are social services, pedagogy, forestry and environmental sciences.

When restricting our analysis to graduates who studied away from their region of residence, the number of graduates employed in a region different from the one of origin exceeds, for some degree courses, 60%; when considering just the graduates interviewed at five years from completion of their studies, these degree courses are: european languages and cultures, biotechnologies, nuclear engineering, aerospace engineering, astronomy (few graduates), telecoms engineering, electronic engineering, it engineering, animal husbandry sciences (few graduates).

3. SOME CONSIDERATIONS ON THE CROSS-SECTIONAL ANALYSIS

The findings outlined in the previous paragraph revealed considerable differences among the various degree courses in terms of occupational mobility, but did not provide any indication as to the individual and context factors that may have an impact on the extent and characteristics of the phenomenon under examination. Estimating the impact of such factors will enable us to measure the net effect of degree courses on mobility and a deeper understanding of this phenomenon.

As briefly mentioned in the introduction, previous attempts to identify the major determinants of occupational mobility were made by Bacci and Chiandotto (2007) who applied a two-level model (first level: graduates, second level: degree courses – see the works by Snijders and Bosker, 1999, Raudenbush and Bryk,

2002 and Goldstein, 2003 for a detailed analysis of multi-level models) to cross-sectional data taken from the ALMALAUREA 2005 and 2006 surveys on graduates' employment conditions. The variables that were chosen as possible determinants are reported on Table 3 and are the same as those considered in this article: the first-level explanatory variables refer both to the graduate's individual characteristics (gender, secondary school-leaving certificate mark, degree mark, etc.) and to the characteristics of the job (professional status, type of employment agreement, etc.) and of the employer of the graduate (size of company, economic sector, public or private sector); the second-level explanatory variables were obtained by aggregating individual characteristics and were determined on the basis of their ability to reflect and represent differences among degree courses.

As emerged from the analysis, both the graduates' individual characteristics and the characteristics relating to type of employer and work activity were found to have a sizable impact on mobility for work reasons. In particular, what appears to determine the variability of the phenomenon are, to a great extent, the geographical location of the university of graduation, the geographical location of the company where the graduate is employed as well as the mobility for study reasons. After subtracting the effect of the first-level variables selected, what remains is a statistically significant level of variance that is attributable to the non-observed characteristics of the degree courses; this confirms the existence of an effect due to the type of university education received.

The results so obtained provide a number of valuable insights concerning those degree courses which are associated with a very high level of mobility for occupational reasons. However, this type of analysis has a few inherent limitations due, in particular, to the use of cross-sectional data. The main limitation lies in the impossibility of tracking the evolution, which is longitudinal in nature, of the phenomenon under consideration, i.e. of assessing whether - and to what extent - the "time" variable could affect in a significant manner the decision to move away from one's region of residence for occupational reasons. In the same way, the use of cross-sectional data does not enable an assessment of the evolution in time of the effects exercised by the variables under examination because possible variations between the different cohorts could in the same way be attributed to an evolution of the phenomenon in time and to the structural differences between the cohorts. For the same reason, there is no comparability between the rankings obtained for each data set due to the different nature of the data sets under consideration.

To overcome these limitations, the analysis was carried out on longitudinal data. The first step consisted in estimating three two-level logistic models identical to the models applied in the previous study, using the same explanatory variables. At a later stage, in order to overcome additional limitations inherent in this type of analysis (see next session for additional details), a three-level logistic model was adopted, with the year of the interview being chosen as the third-level unit (Section 5). In this latter case, it was decided to consider additional first-level variables which may be useful to explain the phenomenon under consideration; these new variable are reported on Table 3 and are marked with a star.

TABLE 3

First, second and third-level variables employed in the three-level model

Variable considered	Relevant modalities
Variable under examination	
Region of employment vs. region of residence	same region/different region/abroad
Explanatory variable relative to the year of the interview	
*Year of the interview	quantitative
Explanatory variables relative to graduates	
Characteristics of the graduate	
Region of graduation vs. region of residence	same region, different region
Gender	female, male
Type of upper secondary school	lyceum, other school
Secondary school-leaving certificate	quantitative (sixtieths)
Degree mark	quantitative
Age at graduation	quantitative
Study abroad experiences	no, yes
*At least one post-graduate training course	no, yes
Area of study	South, Centre, North, abroad
Was employed at the time of graduation	no, yes
Is currently seeking employment	no, yes
*Has children	no, yes
*Married or not-married cohabiting	no, yes
*At least one graduate parent	no, yes
Characteristics of the employer	
Company size	small, medium, large
Economic sector of the company	agriculture, industry, services
Public/private sector	private, public
Characteristics of the job	
Professional status	employee, self-employed, other (collaborator, partner)
Type of employment agreement	stable, temporary
Location of the workplace	South, Centre, North, abroad
General satisfaction with the job	quantitative (from 1 to 10)
Use of skills	high, moderate, none
Usefulness of the degree certificate	useful, useless
Explanatory variables relative to degree courses	
% of males	quantitative
average age at graduation	quantitative
average graduation mark	quantitative
average school-leaving certificate mark	quantitative
% of students coming from lyceums	quantitative
% of students already working at the degree	quantitative

* New variables included in the three-level model used for the longitudinal analysis

4. A PRELIMINARY LONGITUDINAL ANALYSIS

In order to allow a direct comparison between cross-sectional and longitudinal data, a preliminary analysis was conducted on this latter category in order to closely replicate the cross-sectional analysis referred to in the preceding section. In particular, three two-level logistic models were estimated (using employed graduates as first-level unit and degree courses as second-level unit), one for each interview year. The degree courses chosen corresponded to the 54 courses already examined in the cross-sectional analysis with the exception of the degree course in public relations for which no longitudinal data were available; moreover, the explanatory variables were the same as those used in the previous analysis.

The estimated regression coefficients reported on Table 4 show remarkable differences between the models estimated around the two types of data both in terms of covariates' significance and of rank order of degree courses. As one can easily notice, while several variables are found to be significant in both types of

TABLE 4

Cross-sectional and longitudinal data: regression coefficients estimates

Covariate	Reference	1 year degree		3 years degree		5 years degree	
		Cross-section	Longitudinal	Cross-section	Longitudinal	Cross-section	Longitudinal
Intercept		NS	NS	NS	NS	-3.46	2.22
2-level variance		0.06	0.07	0.08	0.11	0.15	0.12
Characteristics of the graduate							
Region of graduation vs. region of residence	Same Region	2.29	1.99	1.99	1.84	1.43	1.77
Gender	Female	NS	0.29	NS	0.29	NS	0.27
Age at graduation		NS	-0.04	NS	-0.05	NS	-0.04
Degree mark		NS	0.01	NS	0.01	NS	0.02
Type of upper secondary school	Technical school	0.2	NS	0.25	0.16	0.18	0.15
Study abroad experiences	No	0.69	0.63	0.6	0.54	0.55	0.53
Geographical area of study: Centre	South	-3.92	-2.03	-3.53	-2.05	-1.97	-1.93
Geographical area of study: North	South		-2.69		-3.09		-2.90
Was employed at the time of graduation	No	-0.42	-0.19	-0.23	NS	-0.27	NS
Is currently seeking employment	No	NS	NS	0.23	0.18	0.25	0.22
Characteristics of the employer							
Public sector	Private sector	-0.22	-0.19	NS	-0.28	NS	-0.32
Company size: small	Large	-0.36	-0.63	-0.65	-0.85	-0.63	-0.88
Company size: medium	Large	NS	-0.42	-0.42	-0.50	-0.31	-0.35
Characteristics of the job							
Prof. status: self-employed	Employee or other	-0.42	-0.47	-0.27	-0.25	-0.43	-0.25
Type of employment agreement: temporary	stable	0.25	NS	0.24	NS	0.34	0.19
Geogr. location of the workplace: Centre	South	4.61	2.58	4.1	2.99	2.29	2.84
Geogr. location of the workpl.: North/abroad	South		2.71		3.35		3.16
Generalsatisfaction with the job		NS	0.06	NS	0.04	NS	0.06
Characteristics of the degree course							
Average age at graduation for the degree course		-0.14	-0.11	-0.09	-0.09	NS	-0.13
% of males in the degree course		0.71	0.99	NS	NS	NS	NS

models and show similar estimated coefficients, other variables, which in the cross-sectional analysis did not turn out as being significant on any of the three years under consideration, were selected for all three years in the longitudinal analysis: these variables are, in particular, gender, age at graduation, degree mark and satisfaction with the current job.

Further differences can be observed among degree courses rankings (not reported in their entirety in this article for lack of space) which were developed on the basis of second-level residuals. As was also the case for the cross-sectional analysis, here too it is possible to build three rankings (one for each year) enabling a one-to-one comparison with degree courses. By calculating the Spearman's Rho cograduation index for each of the three pairs of rankings (on cross-sectional and on longitudinal data), the following values were obtained: 0.40 at one year, 0.58 at three years and 0.68 at 5 years from graduation. Therefore, the correlation be-

tween a ranking of degree courses built on the basis of cross-sectional data and a ranking built on the basis of longitudinal data appears to be, in all cases, medium to low. In other terms, the use of rankings built on the basis of cross-sectional data can lead to wrong conclusions (and hence to wrong decisions) regarding the effect of a degree course on graduates' mobility. Finally, the tendency towards an increasingly positive correlation between the two types of rankings, as evidenced by the Spearman's Rho coefficient values, can be ascribed to the fact that the structural differences among the graduate populations from the various degree courses tend to diminish with the passing of time from the year of graduation.

However, apart from the similarities and differences observed between the two-level cross-sectional and longitudinal analyses, the latter type of analysis still poses a number of outstanding questions. First of all, having relied on three different two-level logistic models, it was not possible to take into account the correlation of the response variable across the three measurement occasions: in other words, it is reasonable to assume that the tendency to mobility at time t is a function of the tendency to mobility at time t-q, where $q = 1, 2, \ldots$. Secondly, an estimation of the effect exercised by time on both the rankings of degree courses and the covariates, which would provide an understanding of whether the courses' effect and the covariates' effect change over time or remain constant, was not possible. What can be provided, at the most, is a descriptive evaluation obtained by comparing the estimates resulting from the three models which, however, would not enable a judgement of the significance of the identified differences.

5. A THREE-LEVEL RANDOM INTERCEPT AND RANDOM SLOPE LOGISTIC MODEL

5.1. *The model*

In order to overcome the limits inherent in conducting a two-level analysis separately for each cohort of graduates as shown in the preceding section, a single three-level regression model can be used (Gibbson and Hedeker, 1997) in which the first-level units are represented by the measurement occasions ($i = 1, 2, 3$), the second-level units by employed graduates ($j = 1, \ldots, n$) and the third-level units by the degree courses ($k = 1, \ldots, 80$). The model can be constructed in terms of a three-level random intercept logistic model (both at level 2 and at level 3) using the following equations:

- First-level equation:

$$\text{logit}[P(Y_{ijk} = 1 \mid x_{ijk}, x_{jk}, x_k)] = \beta_{0jk} + \sum_{h=1}^{H} \beta_h x_{h,ijk},$$

where $x_{h,ijk}$ indicates the value taken by the $h-th$ characteristic at the level of the i measurement occasion for subject j belonging to group k, β_h is the corresponding (fixed) regression coefficient and β_{0jk} is the random intercept at individual and group levels.

- Second-level equation:

$$\beta_{0jk} = \beta_{00k} + \sum_{l=1}^{L} \beta_l x_{l,jk} + u_{0jk}$$

where $x_{l,jk}$ is the value taken by the *l*-th individual characteristic for subject *j* of group *k*, β_l is the corresponding (fixed) regression coefficient, β_{00k} is the fixed component at individual level and the variable component at group level of the intercept of the first-level model and u_{0jk} is the second-level residual component. The second-level residuals are assumed to be normally distributed with zero mean and constant variance (equal to σ_u^2). They indicate the variation experienced by the mean value of *Y* among the subjects: therefore, u_{0jk} indicates the extent to which the likelihood of mobility for student *j* from the *k* degree course varies with respect to the average likelihood observed for course *k*.

- Third-level equation:

$$\beta_{00k} = \beta_{000} + \sum_{m=1}^{M} \beta_m x_{m,k} + v_{00k} ,$$

where $x_{m,k}$ is the value taken by the *m*-th context-related characteristic for group *k*, β_m is the corresponding (fixed) regression coefficient, β_{000} is the fixed component of the intercept at group level and v_{00k} is the third-level residual component. The third-level residuals are assumed to be normally distributed with zero mean and constant variance (equal to σ_v^2). They indicate the variation experienced by the mean value of Y among the various groups: therefore, v_{00k} reveals the extent to which the likelihood of mobility for a student with average characteristics coming from course *k* varies with respect to the average likelihood observed for the entire graduate population. In other words, third-level residuals measure the degree courses' different "propensity" to mobility.

Of all first-level covariates, particular importance is attached to the measurement occasion indicator since it allows an estimation of the response variable's time trend. With regard to this, it might be useful to introduce a polynomial function of time – $f(time_{ijk})$ – which indicates the average growth trajectory of the response variable over time – as well as to assume interaction effects with the other 1-level covariates in order to check the assumption about there being a mean constant effect on mobility with the passing of time. Moreover, since it is reasonable to assume that the growth trajectory of the mobility likelihood will not be constant neither within the graduates' population nor across the various degree courses, the corresponding regression coefficient ($\gamma_{1,ijk}$) is assumed to be variable both a level 2 and at level 3. By taking into account all these elements, a three-level random intercept and coefficient logistic model is obtained:

$$\begin{cases} \text{logit}[\text{P}(\text{Y}_{\text{ijk}} = 1 \mid \text{x}_{\text{ijk}}, \text{x}_{\text{jk}}, \text{x}_{\text{k}})] = \beta_{0jk} + \sum_{h=1}^{H} \gamma_{1jk} \cdot f(time_{ijk}) + \eta \cdot [x_{h,ijk} \cdot f(time_{ijk})] \\ \beta_{0jk} = \beta_{000} + \sum_{m=1}^{M} \beta_m x_{m,k} + \sum_{l=1}^{L} \beta_l x_{l,jk} + u_{0jk} + v_{00k} \\ \gamma_{1jk} = \gamma_{11k} + u_{1jk} \\ \gamma_{11k} = \gamma_{111} + v_{11k} \end{cases}$$

Compared to the model with a single random intercept, the three-level model is more complex due to the presence of residual components u_{1jk} and v_{11k}. These are both assumed to be normally distributed with zero means and constant variance; moreover, they are generally assumed to be uncorrelated with one another; by contrast, a correlation different from 0 is deemed to exist between u_{0jk} and u_{1jk}, on the one hand, and between v_{00k} and v_{11k}, on the other hand. For interpretation purposes, the u_{1jk} residuals indicate the variation experienced by the growth trajectory of subject *j* with respect to the mean trajectory reported by the *k* group to which it belongs; the v_{11k} residuals indicate, on the contrary, the variation in the growth trajectory for group *k* with respect to the mean trajectory of the population.

5.2. *Results: the random effects*

The three-level logistic model was estimated with the MLwiN software (Rasbash *et al.*, 2005) using Taylor series expansion with second-order approximation and, hence, the Iterative Generalized Least Squares method.

The first series of significant results shows the random effects and, in particular, the significance of the hierarchical structure assumed in the analysis. A high percentage (41.8%) of the resulting total variance (equal to 5.64) is ascribable to the hierarchical structure of the data: in particular, 40.0% is attributed to differences among graduates whereas the remaining part (only 1.8%) is attributed to differences among degree courses (see Table 5 for an estimate of variance components). Based on these findings one can therefore conclude that, despite the degree courses' significant effect on the tendency towards mobility, this effect is nevertheless quite weak; in fact, a much greater role is played by individual differences.

As for the assumed random effect on the regression coefficient of the growth trajectory, it turned out to be non-significant (both at individual and at group level): in other words, the estimated time effect on the mobility likelihood was found to be linear, positive and fixed. This means that the time trajectory of mobility does not show any variation among the various graduates and degree courses. The conclusion, therefore, is that the differences observed among the degree courses' rankings in the two-level cross-sectional and longitudinal analyses are not

statistically significant. Therefore, the estimated model is a three-level random intercept logistic model.

5.3. *Results: the covariates effects*

Before commenting on the effects of the explanatory variables included in the final model, it might be useful to indicate that several other variables have turned out to be not statistically significant. Among them there are individual characteristics of the graduates, such as secondary school-leaving certificate mark and degree mark, specific characteristics of the employer such as the economic sector, characteristics of the work activity, such as type of employment agreement, income level and the use of skills and, finally, typical characteristics of the degree course such as average degree mark, average secondary school-leaving certificate mark, percentage of students coming from a lyceum and percentage of working students. Therefore, contrary to what one would reasonably expect, seeking and finding employment in a Region different from the one of residence is typically not leading to a better paid job or to an employment that better fits one's university qualifications nor is it correlated to school and educational success or to observable characteristics of the degree courses. With respect to the two-level cross-sectional and longitudinal analyses, some interesting differences emerge: the level of income, the type of employment agreement, the economic sector of the employer and the status as working student did, in fact, turn out to be statistically significant covariates for at least one of the three types of estimated models.

Table 5 reports the estimates of the regression coefficients and the relevant odds ratios of the covariates which were found to be significant. In this case, the results confirm, in substance, what had already emerged from the cross-sectional analysis: the variables which seem to decisively affect the probability of mobility are the study area (Centre, North, South), the location of the workplace (Centre, North or abroad, South) and primary mobility as results from the comparison between Region of study and Region of residence. In particular, graduates attending universities in the Centre or in the North of Italy report a remarkably lower tendency to mobility than students in the South (odds ratios equal to 0.18 and 0.09 for the Centre and the North respectively). By contrast, those who work in the Centre and North have an odds ratio of over 12 times as high as the one observed for those employed in the South. Finally, those students who moved away from their region of residence to undertake university studies are found to be highly likely to remain away from their family of origin also when starting to seek employment. It should be stressed in this respect that primary mobility is the only explanatory variable which showed a statistically significant time interaction effect: as a matter of fact, the tendency towards mobility for occupational reasons, though being invariably high among those who studied in a Region different from the one of residence, tends to decrease with the passing of time (with odds ratios dropping from 7.20 at one year from graduation to 5.74 at 5 years from graduation) which clearly testifies to the tendency, by some graduates, to go back eventually to their region of origin. Finally, it is worth noticing that the Region of resi-

dence was not included in the analysis since its effect is absorbed both by primary mobility and by the area of study.

TABLE 5

Three-level random intercept logistic model: regression coefficients estimates, standard errors, odds ratio

Covariate	Reference	Estimate	Std. Error	Odds ratio
Intercept		0.82	0.67	
2-level variance		2.26	0.05	
3-level variance		0.10	0.02	
Description of measurement occasion				
Year of the interview		0.12	0.02	1.12
Characteristics of graduates				
Region of graduation vs. region of residence*1 year from graduation	Same Region	1.97	0.05	7.20
Region of graduation vs. region of residence *3 years from graduation	Same Region	1.82	0.05	6.18
Region of graduation vs. region of residence *5 years from graduation	Same Region	1.75	0.06	5.74
Gender	Female	0.24	0.04	1.27
Age at graduation		-0.04	0.01	0.96
Type of upper secondary school	Technical school	0.13	0.04	1.14
Study abroad experiences	No	0.59	0.04	1.80
At least one post-graduate training course	No	0.19	0.03	1.20
Area of study: Centre	South	-1.71	0.07	0.18
Area of study: North	South	-2.43	0.07	0.09
Was employed at the time of grad.	No	-0.11	0.03	0.90
Is currently seeking employment	No	0.10	0.03	1.10
Has children	No	-0.47	0.06	0.63
Married or not-married cohabiting	No	0.11	0.03	1.12
At least one graduate parent	No	0.15	0.04	1.16
Characteristics of the employer				
Public sector	Private sector	-0.15	0.04	0.86
Company size: small	Large	-0.69	0.04	0.50
Company size: medium	Large	-0.35	0.03	0.71
Characteristics of the job				
Professional status: self-employed	Employee or other	-0.33	0.05	0.72
Localization of the workplace: North/Centre/Abroad	South	2.51	0.07	12.34
General satisfaction with the job		0.06	0.01	1.06
Characteristics of the degree course				
Average age at graduation for the degree course		-0.13	0.02	0.88
% of males in the degree course		0.40	0.19	1.50

Table 5 provides a list of the other covariates along with a thorough analysis of their net effects which are substantially in line with the findings of the cross-sectional analysis. It should be noted, in this respect, that all the variables which had not been considered in the previous analyses were found to be statistically significant; in particular, graduates who completed post-graduate studies, graduates who got married and graduates with at least one graduate parent displayed a stronger tendency to mobility (odds ratios of 1.20, 1.12 and 1.16 respectively); by contrast, graduates with children showed a lower tendency (odds ratio of 0.63).

Moreover, with the exception of primary mobility, no other variable was found to exert a time-dependent effect. This allows a clearer reading of the findings of the two-level cross-sectional and longitudinal analyses; in fact, for a number of variables, the resulting estimates showed either a time trend or a fluctuating trend that were apparently difficult to interpret; in other instances the variables were found to be significant for only one of the three cohorts. To conclude, the effect of the covariates under consideration on the mobility likelihood does not change significantly over time.

Finally, it is worthy to notice that the likelihood of mobility tends to increase in a linear manner throughout the years: with each additional year, the odds ratio of mobility increases, as a matter of fact, by 12% (Table 5). This finding can lead to various interpretations. One possible explanation is that graduates might start, at the beginning, to seek employment in the Region of residence and then, if their job seeking is unsuccessful, decide to move elsewhere. Another possibility is that the positive trend is exclusively attributable to the fact that the graduates who pursue post-graduate studies and who, as mentioned before, are more likely to move for occupational reasons, are not included among employed graduates in the years immediately following the year of graduation (because they are continuing their education).

5.4. *Results: the probability of mobility*

In order to provide some useful guidance to future university students, the estimated regression coefficient values can be used to calculate the probability of mobility for the various individual profiles. This will allow each individual student to assess, on the basis of his/her own characteristics and the characteristics of the job sought, the odds of having to move elsewhere to find employment after completing university studies. Table 6 reports the characteristics of 7 profiles. The base profile refers to an individual displaying the characteristics selected as the reference features for the estimation of the model: although it may not correspond to the profile of the "most common" individual, it is nevertheless useful for an easier interpretation of the estimated parameters. The two extreme profiles (lowest and highest) represent two individuals who, for each of the characteristics under consideration, display the modalities that are, respectively, the least and the most conducive to mobility: in this way it is possible to calculate the degree of variability of the phenomenon being considered.

Finally, profile A represents a typical individual (female, average age at graduation, attended a lyceum, married, no children, with at least one graduate parent, etc.) while profiles B, C and D differ from profile A for just one characteristic: profile B for primary mobility, profile C for the area of study and profile D for the location of the workplace. Thanks to this arrangement it is possible to get an immediate understanding of what would happen by changing just one of the explanatory variables with a high odds ratio.

Table 7 shows the estimated probability for each profile and for each of the three modalities that can characterise the variable indicating the time of the interview (1, 3, 5 years from graduation). As clearly shown by the base profile, the probability of mobility follows a growing trend. Moreover, compared with an average value ranging between 7.4% and 9.1% for the base profile, the variability range of mobility probability is extremely broad, as shown by the two extreme profiles. This fact is confirmed by the probabilities calculated for profiles A, B, C and D. With reference to employed graduates at one year from graduation – an observation which applies also to the other two time points – type A graduates show a probability of mobility equal to 12.3% whereas their peers who completed

TABLE 6

Individual profiles

	Base profile	The lowest extreme	The highest extreme	Profile A	Profile B	Profile C	Profile D
Year of the interview	1, 3, 5	1	5	1, 3, 5	1, 3, 5	1, 3, 5	1, 3, 5
Region of grad. vs. region of residence	Same region	Same region	Different region	Same region	Different region	Same region	Same region
Gender Female	Female	Female	Male	Female	Female	Female	Female
Age at graduation	Av. value (27.7)	Q3 (29.2)	Min value (24.5)	Av. value (27.7)	Av. value (27.7)	Av. value (27.7)	Av. value (27.7)
Type of upper secondary school	Technical	Technical	Class./scient.	Class./scient.	Class./scient.	Class./scient.	Class./scient.
Study abroad experiences	No	No	Yes	No	No	No	No
At least one post-graduate training course	No	No	Yes	Yes	Yes	Yes	Yes
Geographical area of study	South	North/C.	South	South	South	North/C.	South
Was employed at the time of graduation	No	Yes	No	No	No	No	No
Is currently seeking employment	No	No	Yes	No	No	No	No
Has children	No	Yes	No	No	No	No	No
Married or not-married cohabiting	No	No	Yes	Yes	Yes	Yes	Yes
At least one graduate parent	No	No	Yes	Yes	Yes	Yes	Yes
Sector	Private	Public	Private	Private	Private	Private	Private
Company size	Large	Small	Large	Large	Large	Large	Large
Professional status	Employee	Self-Empl.	Employee	Employee	Employee	Employee	Employee
Geographical location of the workplace	South	South	North/C./A.	South	South	South	North/C./A.
General satisfaction with the job	Average (7.4)	Min (1)	Max (10)	Average (7.4)	Average (7.4)	Average (7.4)	Average (7.4)
Average age at graduation for the degree course	27.7	Q3 (28.0)	Min (24.5)	27.7	27.7	27.7	27.7
% of males in the degree course	0.43	Min (0.05)	Max (0.95)	0.43	0.43	0.43	0.43
Second-level residuals	0	Min (-4.00)	Max (7.00)	0	0	0	0
Third-level residuals	0	Min (-0.44)	Max (0.79)	0	0	0	0

TABLE 7

Estimated probability of working in a Region different from the one of residence, by individual profile

	Base profile	The lowest extreme	The highest extreme	Profile A	Profile B	Profile C	Profile D
1 year	7.4	0.0	–	12.3	50.3	1.2	63.5
3 years	8.2	–	–	13.7	49.4	1.4	66.1
5 years	9.1	–	100.0	15.1	50.5	1.5	68.7

their studies in a region different from the one of residence and those who are employed in northern Italy report a probability of 50.3% and 63.5% respectively. By contrast, their colleagues who studied in a northern region show a probability of mobility of only 1.2%, all other characteristics being equal.

5.5. *Results: ranking of degree courses*

To conclude the analysis we present a ranking of the 80 degree courses based on the third-level v_{00k} residuals relating to the random intercept (see Figure 3 for the courses placed in the extreme positions of the ranking) which indicate the extent to which the probability of mobility changes for an average individual (i.e. with base characteristics) who attended a specific degree course with respect to an individual who attended an average course (i.e. with $v_{00k} = 0$). As already underlined in Section 5.2, given the non-significance of the random coefficient of the growth trajectory, it is possible to rely on a single ranking of degree courses which, in this way, will replace the three (apparently) different rankings obtained from the two-level cross-sectional and longitudinal analyses. It should be noted, however, that each of the three rankings of degree courses that resulted from the two-level cross-sectional and longitudinal analyses is highly correlated with the ranking reported in Figure 4: as a matter of fact, the Spearman's Rho cograduation index shows values ranging approximately between 83% and 86%.

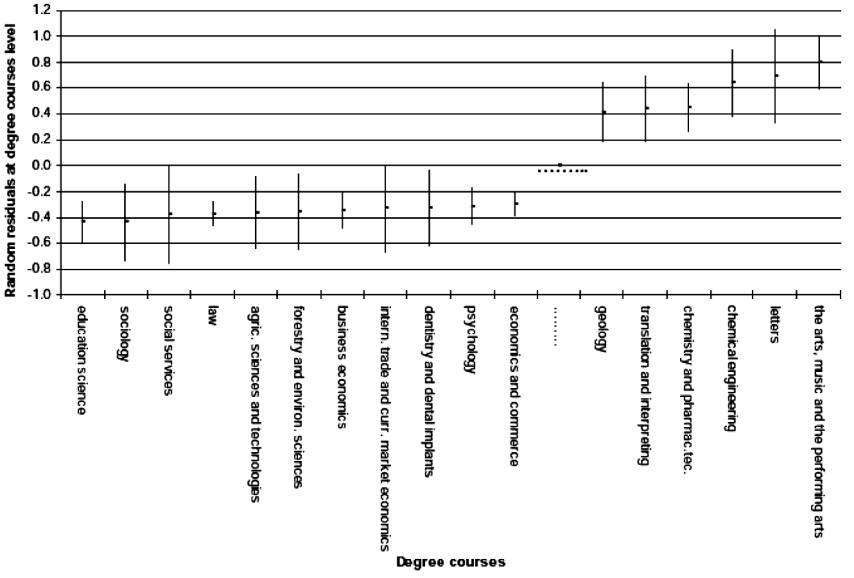

Figure 3 – Ranking of (extreme) degree courses as a function of third-level residuals.

Figure 3 reports the value of v_{00k} and the corresponding 95% confidence interval for only those degree courses that are positioned at the extremes of the ranking meaning that they are significantly different from the other courses. As a matter of fact, since the tendency towards mobility of two degree courses can be considered as significantly different only if the respective confidence intervals do not overlap, this condition is met only by the degree courses that are positioned at the extremes of the ranking, in particular in the highest end. This is in line with

the observations made in Section 5.2 concerning the fact that the aggregation of graduates in different degree courses (1.8% of total variance) can explain the variability of the mobility phenomenon only to a limited extent. Having regard to this consideration, it is nevertheless possible to identify degree courses which, by comparison to others, induce a significantly greater tendency towards mobility. These are in particular: the arts, music and the performing arts, letters, chemical engineering, chemistry and pharmaceutical technology, translation and interpreting, geology (see the 6 courses that are positioned at the top right of Figure 3). By contrast, graduates from the following degree courses show in general a lower tendency to mobility: economics and commerce, psychology, dentistry and dental implants, international trade and currency market economics, business economics, forestry and environmental sciences, agricultural sciences and technologies, law, social services, education science (see the 11 courses positioned at the bottom left of Figure 3). In particular, for an average individual who graduated from a degree course included in the first group, the probability of mobility ranges between 10.8% (geology) and 15.0% (the arts, music and the performing arts), whereas for an average individual coming from the second group the same probability ranges between 4.9% (economics and commerce) and 5.6% (education science).

6. CONCLUSIONS

This article outlines the results of the analysis of cross-sectional data obtained from the ALMALAUREA surveys on graduates from the years 2000, 2001 and 2002 interviewed at 1, 3 and 5 years from graduation: the survey comprised a total of about 31,600 degree holders. The goal of the analysis was to measure the effect of the education received (degree qualification) on the phenomenon of mobility of graduates for occupational reasons as well to identify any other factor that could possibly affect such phenomenon.

Starting with a brief description of the data sets, the article presents two different types of analyses – the first being a cross-sectional analysis and the second a longitudinal analysis – which were conducted with the aim of identifying any biases in the results obtained with the cross-sectional approach.

These two different methodological approaches highlighted substantially different conclusions in terms of significance of the determinants found to be statistically significant and ranking of the degree courses. In particular, the longitudinal analysis showed that gender, age at graduation, graduation mark and satisfaction with the job have a significant impact on mobility for job reasons, an effect which found no confirmation in the cross-sectional analysis. The rankings between degree courses developed on the basis of the second-level residuals resulting from the two types of analyses showed major differences. The obvious conclusion to be drawn from the above considerations is that a great deal of caution must be exercised when drawing inferences from the findings of cross-sectional analyses given the fact that such inferences are very likely to be affected by substantial biases.

The use of a three-level logistic regression model (first level unit: measurement occasions; second-level unit: employed graduates; third-level unit: degree courses) in the longitudinal analysis showed that degree courses do play a significant impact on the tendency towards occupational mobility; however, other variables, in particular context-related and individual factors, were found to have the biggest impact on mobility for job reasons. More specifically, among context-related factors, the geographical localization of the university of graduation, the geographical localization of the workplace and primary mobility (i.e. having studied in a region different from the one of residence) were indicated as exercising the strongest impact on graduates' likelihood to move for job reasons. Those who graduated in universities located in the Centre or North of Italy are found to be less inclined to mobility than those who completed higher education in a university located in southern Italy. Graduates employed in central or northern regions typically display a considerably higher tendency to mobility than their counterparts who found employment in the South. Finally, students who move away from their region of residence to pursue university studies in another region are much more likely to find employment in the region (generally in the Centre-North of the country) where they completed their education than in the region of origin (generally in southern Italy). Obviously, social and economic conditions have the greatest impact on mobility for job reasons both directly, since the wealthier regions in the Centre-North offer greater employment opportunities to graduates, and indirectly, because by determining primary mobility for study reasons they also lead, at a later stage, to greater mobility for job reasons.

Contrary to what one would reasonably expect, some individual factors and internal context-related characteristics turned out to be non-significant. Among them there were some individual characteristics of the graduate such as the secondary school-leaving certificate mark and the degree mark, some peculiar characteristics of the employer, such as the economic sector and the characteristics of the job (for example type of employment agreement, income level and use of skills) and, finally, the peculiar characteristics of the degree course such as the average graduation mark, the average secondary school-leaving certificate mark, the percentage of students who attended a lyceum and the percentage of working students. The individual variables which were found to be highly significant are completion of post-graduate studies, being married and having at least one graduate parent, having children, age at graduation, satisfaction for the job and being a working student.

Regarding the evaluation of a "time" effect on mobility probability, the analysis indicated that both the individual subjects and the individual degree courses display the same growth trajectory. This means that the differences observed in the degree courses' rankings obtained by the two-level cross-sectional and longitudinal analyses are not statistically significant; therefore a single ranking of degree courses can be used. The following degree courses were found to determine a significantly greater tendency towards mobility than other courses: the arts, music and the performing arts, letters, chemical engineering, chemistry and pharmaceutical technology, translation and interpreting, geology.

It is furthermore interesting to note that, with the exception of primary mobility, all the other explanatory variables show no interactions with time; therefore, the extent to which the covariates under consideration have been shown to affect the likelihood of mobility does not change significantly between one, three and five years from graduation.

As a whole, the likelihood of mobility tends to increase linearly over the years: with each additional year the odds ratio increases by 12%. This phenomenon may be determined by the need, felt by some graduates, to move away from their region of residence in an effort to find employment opportunities that were not available at home. Another possibility is that the positive mobility trend may simply be a consequence of the (delayed) entry onto the labour market by those graduates who pursue post-graduate studies and who, as it turned out, generally show a greater propensity to move for work reasons.

The findings reported in this article are focused exclusively on a single aspect of graduates' employment conditions: mobility; the same approach could be fruitfully applied to investigating and evaluating other aspects in order to provide a comprehensive picture of the employment situation of young people with a university education.

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SUMMARY

Graduates job mobility: a longitudinal analysis

As part of the analysis of the external effectiveness of university education, a special area of attention is represented by graduates' mobility for occupational reasons. Understanding whether or not the various types of degree courses affect mobility to a significant extent and estimating the net effect induced by individual and context-related characteristics as well as the tendency of this phenomenon over time will help provide information support to universities for use in their decision-making processes. This article proposes a multi-level longitudinal analysis to investigate the above aspects. The analysis draws upon the ALMALAUREA database relative to graduates from the years 2000, 2001 and 2002 interviewed at 1, 3 and 5 years from graduation.