

Transition from University to the Job Market. A Time Analysis of the University of Cagliari Graduates

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Summary. To investigate the transition from University to work, and indirectly assess the effectiveness of university education, time analysis can play a key role. The period that elapses between graduation and finding work is usually influenced by various factors. In this work, an analysis of such determinants is performed by means of non-parametric and parametric survival models.

Keywords. Transition to work; Time intervals; Graduates; Kaplan-Meier model; Weibull model.

1. Transition times between graduation and employment

The transition from university to the job market is a basic aspect to be considered when assessing the efficacy of the higher education system in Italy (Giambalvo, 1996; Ortu *et al.*, 2000). Any analysis of the outcomes of the university system has to evaluate the success of graduates in finding a job in a short time.

The occupation of graduates must be evaluated both in relation to the employment rate and job qualification, and to time needed to reach a given target. The length of a transition period may be influenced by several factors. By analysing these factors, we can understand how the missions of state-run universities to educate its citizens and to satisfy the demands of the labour society are accomplished.

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Moreover, considering the “3+2” reform of the Italian university system, this aspect is an essential instrument to correct and improve the process of university education. Therefore, in this work, we will study transition times with semi-parametric and parametric techniques on a sample of graduates of University of Cagliari, in order to evaluate the importance of some covariates.

After the presentation of some general traits of the graduates of the University of Cagliari (Section 2), we will analyse their transition times (Section 3) and draw some general conclusions from the obtained results (Section 4).

2. The University of Cagliari graduates

Our data comes from a survey on graduates of the University of Cagliari, undertaken in autumn 2003. Our research, realized with a CATI system, involved 4,363 graduates (aged 37 years or less at graduation) who had their degree in years 1999 and 2000.

We selected a sample size of 1,112 (one out of four population units). For each subject, the professional status at the interview was noted: i.e. whether employed, unemployed (before employed), seeking for first employment, enrolled in a masters or PhD course, not interested in finding an occupation. Moreover, those in employment were asked whether they had started in their current job before or after completing their degree.

According to these variables, we selected a sub-sample of 906 graduates who were employed when interviewed and had begun their present job after the graduation. We concentrated our analysis on the employment status during a given period. Each of the 906 graduates was observed for a period ranging from 35 to 56 months (TIME) and their unemployment (transition) times were evaluated retrospectively. If a subject was not working at the end of survey period, his/her exposure time was truncated.

The criterion variable TIME is computed as difference between the student's first employment time and that of graduation. If, during the observational period, the subject had obtained a master/PhD/specialization title, the time span (both truncated and complete) was recalculated subtracting the frequency period because we hypothesised that during post-graduate education subjects did not look for jobs.

For an explanatory analysis of transition times, we considered the covariates: sex (SEX), type of degree (TY_DEG), degree final mark (MARK), delay in finishing university studies (obtained by subtracting the statutory time for university studies from the time taken) (LAG), completion of master, or Ph.D., or other specialisation courses (POST).

Concerning the variable MARK (the interval is 66-110), we decided to create two levels (≤ 105 and ≥ 106) in line with its distribution (Fig. 1). The variable LAG was categorised in three levels: “ ≤ 1 year”, “2-3 years”, “ ≥ 4 years”.

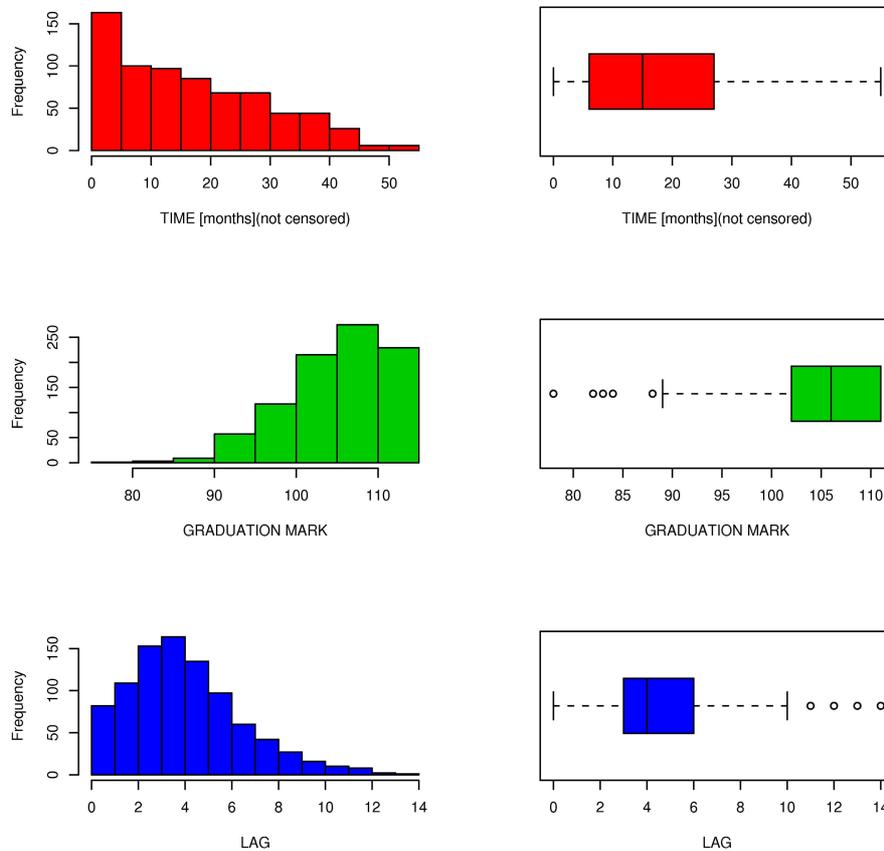


Figure 1. Graphics for variables TIME (only not censored), MARK and LAG

As for variable TY_DEG, we consider four groups: Economics-Law-Social Sciences (EGS), Scientific-Technical subjects (SCT), Life and Health Sciences (SVS) and Humanities-Education-Behavioural Sciences (UEC)² (the classification rationale is explained by Porcu & Puggioni, 2003).

Table 1, and Figures 1 and 2 show the distribution of the examined variables. It is important to point out the negative asymmetry for variable MARK and high values for the average (105.0) and for the median (106.0). Contrariwise, the variable TIME shows a positive asymmetry (the average being equal to 17.4 and the median being 15.0 months) according to previous studies (Ortu *et al.*, 2000).

² EGS group: degrees in Economics, Law and Political Science; SCT group: Engineering, Physics, Mathematics, Chemistry and Geology; SVS group: Medicine, Biology, Natural Sciences and Pharmacology; UEC group: Literature, Languages and Educational Sciences (Pedagogy and Psychology).

Table 1. Synthetic statistics for variables TIME, MARK and LAG on sample of survey.

<i>Covariates</i>	<i>Min</i>	<i>Q₁</i>	<i>M_e</i>	μ	<i>Q₃</i>	<i>Max</i>	σ
<i>TIME*</i>	0.00	6.00	15.00	17.36	27.00	55.00	12.94
<i>MARK</i>	78.00	102.00	106.00	105.02	110	110	5.73
<i>LAG</i>	0.00	3.00	4.00	4.47	6.00	14.00	2.47

* Relative to non truncated observations

One noteworthy finding, considering its negative implication for an evaluation of the performance of our university system, is the average value for the variable LAG (4.47 years) and the median (4.00 years). We can conclude that in Sardinia the average time a student spends at university amounts to twice the statutory duration with a consequent and evident increase in costs for a university system that is clearly inefficient.

In Figure 2, we can observe distributions of some variables on a sub-sample of 906 subjects. The employment rate is 78% (707 events of interest and 199 censured), in which there is a prevalence of female (62%) graduates not involved in post-graduate education (53%), and the principal degree categories are EGS (36%) and UEC (30%).

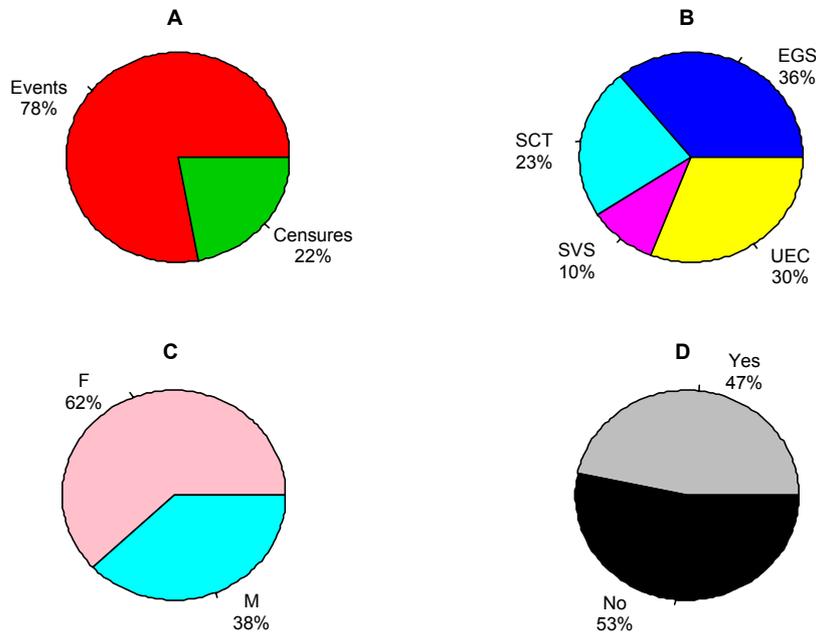


Figure 2. Variables indicating the event (A) and TY_DEG (B), SEX (C) e POST (D)

3. Analysis of transition times

In order to study the transition times and the importance of some covariates on times, we initially applied the Kaplan-Meier (KM) method, a non parametric technique (Section 3.1) and then a parametric one (Section 3.2). The total duration of the follow-up was 56 months (March 1999 – October 2003), and the longest time-event was 55 months.

The survival function on all observations (Fig. 3) displayed a uniform trend with a median of 21 months and with 25% of the graduates who found a job within 8 months from graduation. We found that truncated observations (the unemployed) appear after 35 months (the minimum period of observation referring to graduates that are more recent).

The regularity of the survival function is an indirect indicator of the labour market's inability to absorb graduates. When there is a good level of demand for graduate employees, we would expect the survival function to have an "L" form. In other words, the majority of graduates would find a job in a short time and only a minority would require longer finding employment. In our opinion, this aspect is all the more relevant if we consider that the variable TIME does not incorporate the time for post-graduate education, as if someone who is studying for a post-graduate qualification would not in the job market³.

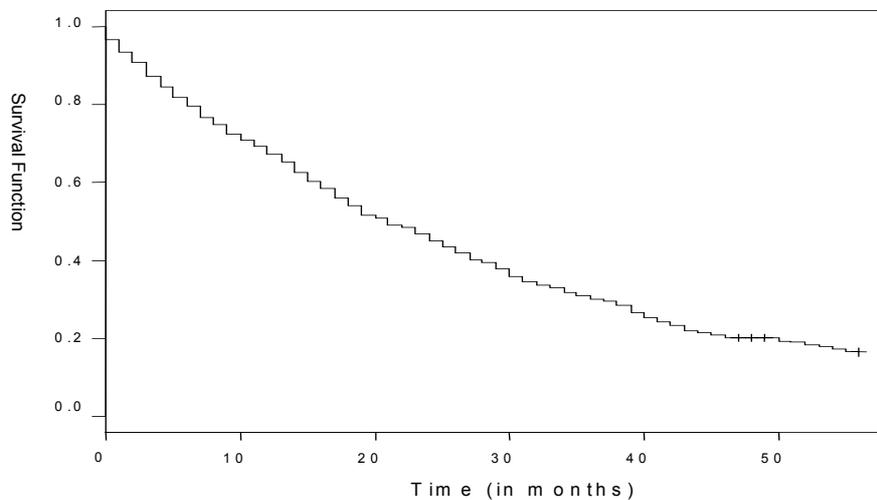


Figure 3. Kaplan-Meier survival function on 906 observations

³ The hypothesis is conservative. In a context of relative backwardness of an economic system such as Sardinia's, it is plausible that a large percentage of graduates view post graduate education as a sort of status in which they can study and work simultaneously.

3.1. Non parametric analysis: the effect of covariates

We carried out a non-parametric analysis of transition times in relation to some covariates SEX, MARK and POST (Fig. 4) considering the stratification of observations according to the levels of covariates. No covariates proved significant because the survival curves for each level of covariates were similar, in particular for the POST variable. This is an interesting result for three reasons: a) the local labour market's inability to employ graduates with an post graduate qualification; b) the low quality of post-graduate education in Sardinia⁴; c) the possibility that post-graduate education is a way of overcoming the gaping divide between demand for and supply of graduates in Sardinia.

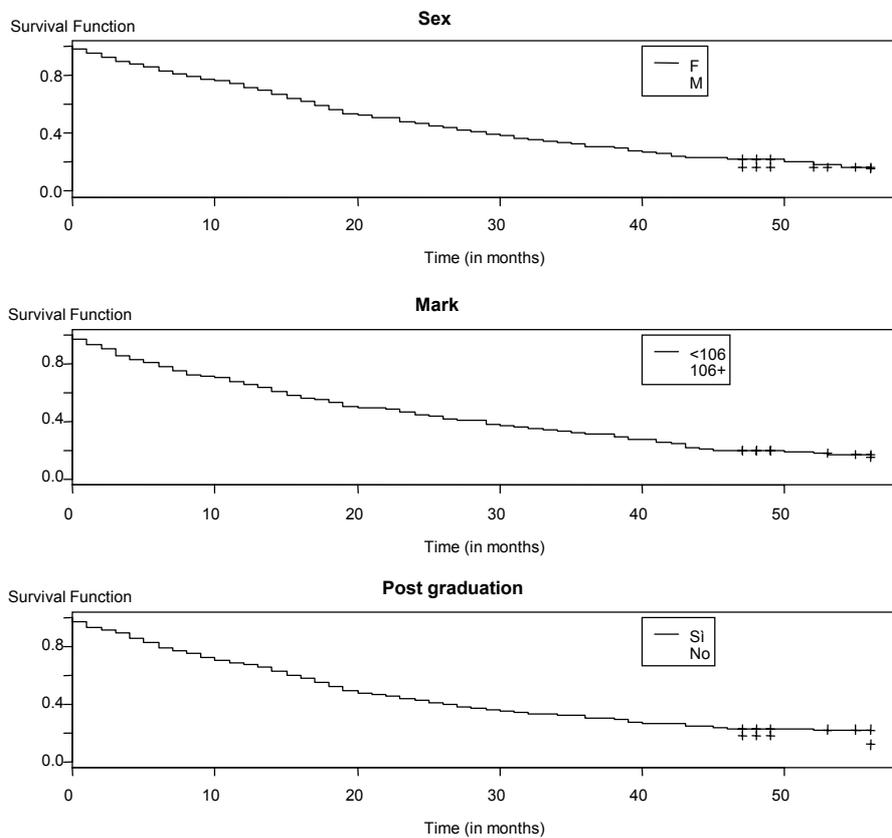


Figure 4. KM survival function for variables SEX, MARK and POST

⁴ In our sample, in most cases post-graduate education was not a PhD or a Master programme but a shorter duration course.

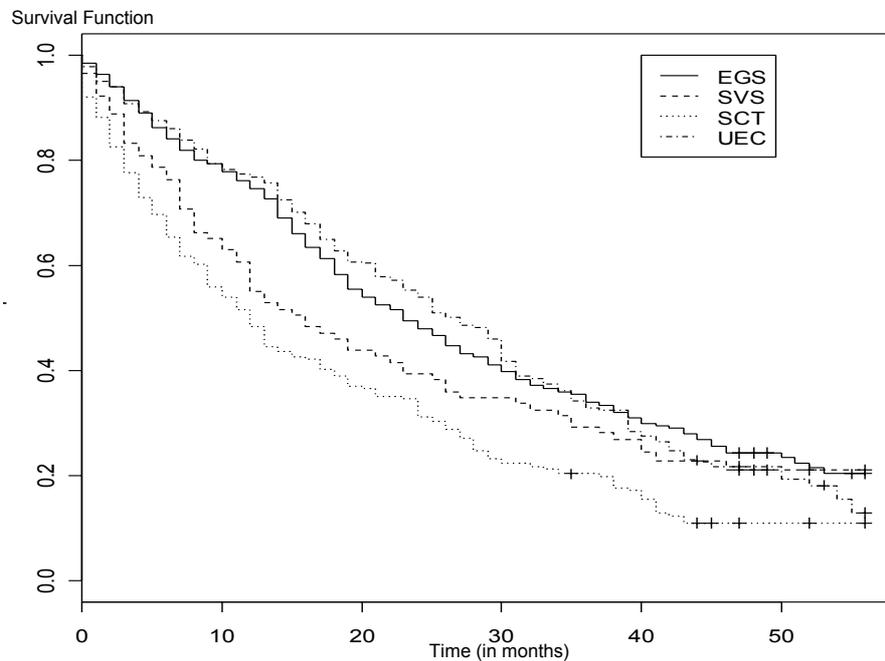


Figure 5. KM Survival Functions for variable TY_DEG

The stratified analysis of transition times by type of degree (TY_DEG) is rather interesting. As we can observe (Figure 5), survival functions for graduates SCT and SVS show how their transition times are lower than they are for other graduates (in particular for SCT) and that the shape of their curves is more similar to “L” than in the other groups, which is the typical situation for short time events.

The comparison between medians and quartiles (Table 2) provides us with further points for reflection. On average, an SCT graduate finds a job in half the time it takes UEC or EGS graduates to find one. It is interesting to notice how the longest observation time of the event for SCT graduates (43 months) is lower by almost one year than for graduates of groups EGS (53 months) and UEC (55 months).

Such evidence is a well-known factor among those who analyse university education performance; our evidence stems from a context (Sardinia) of relatively low economic development. Therefore, this would indicate that even in a region where the services, and in particular the public ones, are particularly demanding for the new employment, graduates of groups EGS and UEC do not have a greater probability of finding a job⁵.

⁵ Nevertheless, it is reasonable to believe that this evidence is influenced by the persistence of a blocking of employment opportunities in the public sector.

Log-rank, Wilcoxon and Likelihood Ratio tests were applied to test the hypothesis of homogeneity of survival curves for each category of covariate TY_DEG. They are significant in all cases ($p < 0.0001$).

The analysis of transition times for the LAG variable (Figure 6) does not show any differences in distributions of times, even though those who complete a degree course with a lag of one year have shorter transition times (Table 2). Moreover, for the same category of graduates, Q_1 and M_e are quite similar to the corresponding values for other categories, while values of Q_3 and Max appear lower.

Table 2. Some statistics on transition times for covariates TY_DEG and LAG

<i>Variables</i>	<i>Min</i>	Q_1	M_e	Q_3	<i>Max</i>
<i>TY_DEG:</i>					
<i>EGS</i>	0	12	23	46	53
<i>SCT</i>	0	4	12	28	43
<i>SVS</i>	0	7	16	40	46
<i>UEC</i>	0	14	26,5	42	55
<i>LAG:</i>					
≤ 1	0	8	18	34	45
2-3	0	8	19	38	55
> 3	0	9	23	43	54

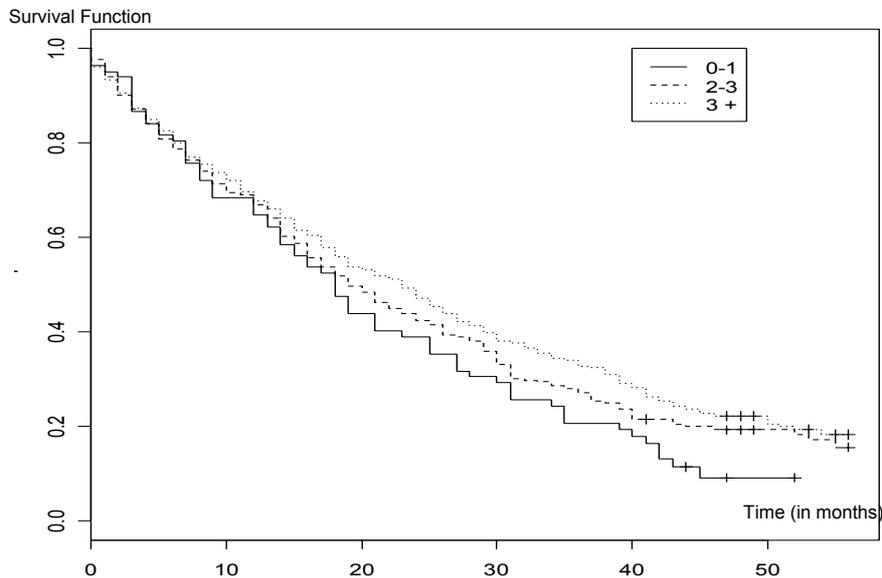


Figure 6. KM Survival Functions for variable LAG

This meant that only Log-Rank and LR tests were significant (at 5% level), but this was the case for the Wilcoxon Test (not significant because of the intersection of curves in the initial part of the follow-up).

3.2 Parametric analysis of covariate effects

Non-parametric analysis enabled us to distinguish between different durations of times in a status of unemployment. Nevertheless, it could not actually measure the strength of the effects of covariates. That is why we applied a parametric Weibull survival model⁶.

The hazard function of the model is defined as

$$h_i(t) = \exp(\beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_p x_{pi}) h_0(t),$$

where $h_0(t) = \lambda \gamma t^{\gamma-1}$ distributes as the Weibull function, with λ being a scale parameter and γ a shape parameter.

The results of the application of the model (Table 3), show clearly how the principal covariates that influence the likelihood of finding employment are LAG ($p=0.0136$) and TY_DEG ($p<0.0001$).

Table 3. Significance of factors and parameters applying a Weibull model

<i>Covariates</i>	<i>Estimates</i>	<i>Standard error</i>	<i>Chi square</i>	<i>p-value</i>
INTERCEPT	3.6241	0.1327	746.23	<0.0001
SEX				0.6940
F vs M	0.0389	0.0989	0.15	0.6940
MARK				0.9686
≥ 106 vs < 106	0.0037	0.0929	0.01	0.9686
CORSO				0.7660
Yes vs No	0.0262	0.0880	0.09	0.7660
LAG				0.0136
≤ 1 vs > 3 years	-0.4269	0.1541	7.68	0.0056
2-3 vs > 3 years	-0.1682	0.0999	2.84	0.0922
TY_DEG				<0.0001
EGS vs UEC	-0.0652	0.1163	0.31	0.5747
SCT vs UEC	-0.6104	0.1305	21.87	<0.0001
SVS vs UEC.	-0.2329	0.1587	2.15	0.1422
λ scale parameter	1.1359	0.0375		
γ Weibull shape	0.8803	0.0290		

⁶ We applied the parametric Weibull model to test the existence of a linear relation between $\log(times)$ and $\log[-\log S(t)]$, where $S(t)$ represents the survival function calculated with the Kaplan-Meier method. We did not apply the semi-parametric Cox model because we did not verify for all covariates the hypothesis of the proportional odds of events for each different category of covariates.

These results were by no means unexpected because they were disclosed in the non parametric KM analysis and in other studies (Tedesco, 2002; Porcu & Puggioni, 2003a), albeit with different research objectives.

The analysis of estimated parameters clarifies the role of the above-mentioned factors.

First of all, with regard to the time taken to obtain a degree, it is evident that a lag of 2 to 3 years, with respect to a baseline lag of 3 or more, does not cause any significant reduction of transition times ($p > 0.09$).

On the contrary, what appears to be evident and statistically significant is the reduction of transition times for those who finish their university career either within the statutory time or with a minimum lag (one additional year) compared to the baseline ($\hat{\beta} = -0.4269$; $p = 0.0056$).

As regards type of degree, the only significant parameter is for the category SCT ($\hat{\beta} = -0.6104$; $p < 0.0001$); the estimate for this parameter is particularly high because $\exp(-0.6104) = 0.5431$: in other words, the probability of a SCT graduate getting a job is almost twice as high as it is for a UEC graduate (baseline).

Results for the SVS group were quite interesting: the parameter is not significantly different from that obtained with the non-parametric KM analysis. The high value for dispersion of the estimate (0.1587) is probably due to the substantial number of those not employed (more than 25%) in this group of graduates and this causes the parameter to be non significant.

4. Conclusions

Our research represents the first analysis of transition times undertaken on a sample of graduates at the University of Cagliari with the aim of defining a general context in which to carry out an in-depth study of the problem of transition from university to job market.

We observed a linear survival function which shows that the labour market can absorb the supply of graduates, which shows the existence of endogenous and exogenous obstacles to employment. One such exogenous obstacle is the lack of new openings for jobs in the public sector, which, in a region such as Sardinia, represents the principal employer for graduates in several areas, and in particular in the education sector.

In contrast with the results of other research on the efficiency of employment markets, no significant differences were recorded between genders (but lack of new job positions in the public sector can mask the effect of gender). Similar results have been obtained with the variables degree classification (MARK) and postgraduate education. This may indicate that these are not discriminating factors in obtaining a job. This is in contrast with general opinion, in particular in the opinion of students.

The flattening toward high level frustrates any possibility of selection based on the criteria of final degree mark, while for post-graduate education the result is surprising because it seems that the choice to attend a postgraduate programme is dictated more by the lack of available employment than the idea of getting a higher qualification for the market.

Among the significant factors, we quoted the effect of the type of degree and, to a lesser extent, that of the duration of university studies.

As far as type of degree is concerned, only the SCT (Scientific-Technical) group shows significantly shorter transition time, as well as a lower percentage of censures (unemployed) at the end of the observation period.

A similar trend was observed for graduates of group SVS (Life and Health Sciences), but the large number on censures (explained by the high percentage of graduates that attend specialisation programmes for medical doctors) and the low values for transition, or those finding work in a short time made the parameter in the Weibull model non significant.

As for the duration of studies, we have the confirmation that those who get their degree in a short time have a higher probability of obtaining a job in a short time in comparison with those who complete their degree with a lag of four years or more (this was the case for more than 50% of our sample).

In conclusion, the labour market in Sardinia, displays a striking inability to select graduates based on their *curricula*. Probably, the labour market is saturated in traditional economic sectors (public administration) and, because there is no innovative post-industrial development policy, we might see a rise in the phenomenon of graduate emigration, which recent research (Porcu & Puggioni, 2003b) puts at about 10%.

References

- COLLETT D. (1994) *Modelling Survival Data in Medical Research*, Chapman & Hall, London.
- GIAMBALVO O. (1996) Tempi di attesa per l'inserimento nel mercato del lavoro di una leva di laureati. In: *Rivista Italiana di Economia Demografia e Statistica*, **L(1)**: 243-267
- KLEIN J.P., MOESCHBERGER M.L. (2003) *Survival Analysis. Techniques for Censored and Truncated Data*, 2nd ed., Springer, New York.
- PORCU M., PUGGIONI G. (2003a) Laurea e abbandono universitario. Uno studio comparativo dei due eventi su un campione di immatricolati dell'Università di Cagliari. In: FABBRIS L. (ed) *LAID-OUT: scoprire i rischi con l'analisi di segmentazione*, vol.3, CLEUP, Padova: 25-40.
- PORCU M., PUGGIONI G. (2003b) Transizione Università-Lavoro. Analisi preliminare sui laureati della Sardegna nel periodo 1992 – 2001. In: CIVARDI M. (ed) *Transizione Università-Lavoro: la definizione delle competenze*, CLEUP, Padova: 81-96.
- TEDESCO N. (2002) Analisi di segmentazione di una coorte di immatricolati

- dell'Università di Cagliari. In: G PUGGIONI (ed) *Modelli e metodi per l'analisi dei rischi sociali e sanitari*, CLEUP, Padova: 141-160.
- TEDESCO N., PUGGIONI G., ORTU. A. (2000) Inserimento nel mercato del lavoro dei laureati in Scienze Politiche dell'Università di Cagliari dal 1987 al 1996. In: CIVARDI M., FABBRIS L. (ed) *Valutazione della didattica con sistemi computer-assisted*, CLEUP, Padova: 135-154.