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UNIVERSITY-TO-WORK TRANSITIONS: THE CASE OF PERUGIA

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ABSTRACT[°]

The paper investigated on job transitions of graduates at the University of Perugia into the territory of the province of Perugia.

In short, the paper has the following structure: after a review of the literature on university-to-work transition, original empirical results - adopting different statistical and econometric instruments - are presented and, finally, some policy implications are highlighted.

University administrative information and data from the job centres of the province of Perugia are matched to reconstruct the timing of the university to job transitions of graduates at the University of Perugia since January 2004 to July 2009.

Non-parametric Kaplan-Meier (KM) method and Cox proportional hazard model with competing risk are used, respectively, to estimate the survival functions and to determine the role of individual and studying characteristics in affecting the employment probabilities of graduates from a supply side point of view.

Notwithstanding the paper is in a preliminary version, some key results are useful for deriving crucial considerations and policy implications.

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1   Introduction

The integration of young people into the labour market is a key policy issue of the European Employment Strategy. In particular, the European Employment Guidelines stress the need to build employment pathways for young people and to reduce youth unemployment. Notice that, in Europe, youth unemployment rates are generally more than twice as high as the adult rates, with significant differences across countries (Quintini et al. 2007) and regions (Perugini and Signorelli 2010a and 2010b); they have dramatically risen again after the recent global economic crisis (ILO, 2010; Choudhry et al. 2010).

A first possible cause of high youth unemployment and low quality employment is the mismatch between the knowledge acquired through formal education and the skills demanded by employers. Many young people are unemployed or cannot find jobs which are adequate to their educational path, causing high youth unemployment rates and/or low-quality employment (unstable jobs or career patterns, low wages, etc.).

The school-to-work transition (STWT) processes and their changes over time has been widely investigated in the literature. Clark and Summers (1982) analyse the determinants of the higher flows in and out of unemployment for young compared with adult people. O'Higgins (2005) examines the difficulties of integrating young people into "decent work"; the importance of the "quality" of youth employment, e.g. in terms of wages, weight of the informal sector, and underemployment, is highlighted as well. The persistence of youth unemployment, initially considered by Heckman and Borjas (1980), is also the focus of Ryan (2001). Even macroeconomic variables - e.g. the labour demand level and relative wages (see O'Higgins, 2007) – may affect the school-to-work transition. As to the education systems in Europe, that can be classified according to their flexibility vs. rigidity and to their "dual" vs. "sequential" approach to training (Caroleo and Pastore, 2003 and 2007), they determine, on one hand, the "quality" of education and the performance of students and interact, on the other hand, with the STWT institution in influencing the youth labour market performance.

Considering that in the existing huge literature on "youth labour market performance" and STWT (see next section) the empirical investigations on the University-to-work transitions (UTWT) at regional/local level are still very rare, in this paper we produce a first empirical investigation of the UTWT in the case of Perugia (as University institutions and as provincial labour market).

2   Literature Review

According to the existing literature, many factors (including also the macroeconomic conditions and the set of labour market institutions) contribute to the youth labour market performance. It is well-known that unemployment, in general, depends significantly on macroeconomic cyclical conditions: however, macroeconomic performance and cyclical behaviour

cannot explain many "persistent" employment difficulties of young people. As a matter of fact, the main reason of the generally worse youth labour market performance with respect to adults is related to the lower level (and/or different quality) of human capital (and productivity), which ceteris paribus makes employers prefer adult people to young. The educational level is the most immediate variable measuring "human capital", but young people lack the other two components of human capital, namely generic and job-specific work experience. From both a theoretical and an empirical viewpoint, Carmeci and Mauro (2003) have shown that educated youngsters need to acquire firm-specific knowledge by working activities for "schooling" human capital to become productive. Caroleo and Pastore (2007), arguing that the "youth experience gap" is a key factor in explaining youth unemployment, classify the EU countries into five groups (the North-European, the Continental European, the Anglo-Saxon, the South-European and that of new member states) according to the institutional setting and the mix of policy instruments (including various degrees and types of labour market flexibility), of educational and training systems, passive income support schemes and fiscal incentives.

The links between the "institutional framework" and policies to contrast youth unemployment are discussed in a wide and recent literature (e.g. Brunello et al. 2007, Checchi 2006, European Commission 2008 chapter 5). The impact of the institutional settings has been previously stressed by many authors (e.g. Bertola-Blau-Kahn 2002, Jimeno and Rodriguez-Palanzuela 2002, Newmark and Wascher 2004; Biagi-Lucifora 2005, Kolev and Saget 2005; Bassanini and Duval 2006); in particular, many authors have analysed the effects of temporary jobs (e.g. Booth et al. 2002; Quintini and Martin 2006) or of minimum wage regulations (e.g., Abowd at al. 1997, Neumark and Wascher 1999). A part of the literature point on the role of temporary contracts in favouring the transition of young people to labour market. Ichino et al. (2005), Barbieri and Sestito (2008) and Picchio (2008) obtained measures of the springboard effect, net of observed and unobserved differences. Gagliarducci (2005) finds a springboard effect only in the case of temporary contracts of sufficient duration. Berton et al. (2008) find evidence of the springboard effect, but also, in some cases, of a trap effect: they find, in fact, a significant permanence in instable contracts within the same firm, that could be explained with the advantage in terms of reduction of labour costs.

Many other researches consider the human capital a prominent element in the explanation of the determinants of youth labour market performance (by considering the multiple features characterizing the transition of young people from school to the labour market, the risk of unemployment they face, their performance at work, the quality and stability of their positions). In particular, young people with low human capital and low skills are more exposed to long duration unemployment, to unstable and low quality jobs, perhaps to social exclusion (Oecd, 2005). The microeconomic literature considers the educational choices as the optimal outcome of comparing the investment costs in education and the expected returns (probability to get a job, future incomes, better occupations and careers, social esteem, etc.). However, the decision of extending the study period and the choice of the type and level of school, as well as the final outcomes, depend also on

the family (socio-economic and cultural) background. In fact, the participation to (different levels of) education is positively correlated, in all countries, with household background in terms of education and/or employment, with obvious effects in terms of social mobility; remarkable differences between countries exist and persist over time (Hertz et al. 2007); the objective of equal (or similar) educational and employment opportunities is far to be reached (Checchi 2003; Brunello-Checchi 2005; Checchi, Fiorio and Leonardi, 2008).

As already highlighted in the introduction, an important cause of high youth unemployment and low quality employment - low entrance wages, bad-quality jobs, diffusion of non standard labour contracts - has been found in the mismatch between the knowledge acquired through formal education and the skills required by the local/regional labour market. In general, the difference between educational supply and labour demand is in stronger connection to the performance of local economies than is the level of educational stock itself (Rodriguez-Pose, 2005): a good level of formal education can have a limited impact on economic growth and performance if it is not suitable to the market needs. This is why the problem of an efficient - in terms of demand/supply match - investment in (higher) human capital and the measurement of (both private and social) returns on investment, e.g. in terms of increased labour productivity, is permanently in the agenda of the policymakers (at EU, national and regional/local levels).

In the European context, in addition to Eurostat surveys (2003), Andrews et al. (2001) investigate the role of qualitative mismatch between demand and supply, while Hannan et al. (1999) realised a comparison of the STWTs by considering the differences in the educational institutions and in the labour markets. Iannelli e Soro-Bonmati (2003) showed the "youth transition" differences between South (Italy and Spain) and North Europe, focusing also on the role of the family. Some authors used ECHP data in empirical researches in European countries (e.g. Betti et al., 2005; Righi and Sciulli, 2009), in particular Bernardi et al. (2000) compared Italy and Great Britain especially focusing on the role of institutional and individual aspects. Other researches investigated single countries: Nguyen and Taylor (2003) investigated - for Brithish young - the relationships between (i) job opportunities and school programmes and (ii) lenght of the transition and the probability of finding a job; Blazquez-Cuesta and Garcia-Perez (2007) highlighted (i) the negative role of the decentralisation of the Spanish educational systems on the process of STWT, (ii) the positive role of public expenditure for education in increasing job opportunities and (iii) the existence of an U-inverted dynamic of the probability of finding a job with respect to the time/lenght of transition. As for the Italian case, some authors used a compared approach with respect to many other countries (Boschetto et al., 2006), while other researches used national or regional data (e.g. Mariani et al., 2001; D'Agostino et al., 2000a and 2000b).

On the supply side of education, the quality of the educational system (capital endowment of schools, teachers' experience and "quality"), together with teaching and grading practices, has a considerable impact on human capital accumulation. The empirical research makes use of the Oecd's PISA (Programme for International Student Assessment) and ALL (Adult Literacy and Lifeskills), providing data about adults' skills and their occupational status and wage (see e.g. Porro-

Iacus 2007 and Checchi et al. 2007). A last relevant strand of the literature examines the links between education systems, investments in training and active labour policy instruments. It seems to emerge the possibility of either a "training trap" (Caroleo and Pastore, 2003 and 2005; Dietrich, 2003) or a "locking-in effect" due to lower intensity in searching a permanent job (van Ours, 2004; Caroleo and Pastore, 2008).

The phenomena of overeducation represent a challenge for the human capital theory (Sloane 2003; McGuinness 2006). It shows itself when the human capital of a worker is much greater than that required by his tasks (Groot 1996; Goldin Katz 2009) representing a case of waste of resource for the individual and the state (Freeman 1976, Frank 1978). Recent researches focused on some methodological and empirical aspects of overeducation (Green et al. 1999; Chevalier 2003; Mc Guinness 2006; Dolton, Silles 2007; Chevalier and Lindley 2009). A promising, but still under-developed strand of the literature, focuses on the impact of local labour markets in determining the individual risk of overeducation. In this context, the spatial distribution of jobs and workers, as well as the possibility of workers to move or commute seem to have an important role in determining the probability of overeducation of different individuals (Büchel e van Ham 2003; Sanroma e Ramos 2004; Cahuzac e di Paola 2004; Linsley 2005a, 2005b).

As already highlighted in the introduction, it should be noted that the existing huge literature on "youth labour market performance" and STWT usually consider the key role of the "educational systems" (sometimes distinguishing for the different school levels), while empirical investigations on the University-to-work transitions at regional/local level are still very rare. In this paper we try to go in the direction of investigating key characteristics of the transitions of the graduates in the University of Perugia in the local labour market (defined by the Province of Perugia).

3   Data and preliminary evidence

The descriptive and econometric analysis that we propose is based on a sample obtained matching University of Perugia administrative information and data from the job-centres of the province of Perugia. This allows us reconstruct the timing of the university to job transitions of graduates at the University of Perugia since January 2004 to July 2009 that have found a job in the province of Perugia[3]. Since its construction, our data does not include censored observations.

Table 1 presents information regarding the share of graduates of the University of Perugia, distinguishing according to the faculty and degrees[4], that have found a job in the province of Perugia in the period ranging from 2004 to 2009 (according to our data they are about 33%).

Table 1. Graduates at the University of Perugia and employed in the province of Perugia

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[3] Since matches outside to the province of Perugia are not identifiable, durations of censored are likely to be over-estimated. This may have consequences in terms of timing comparison among faculties in case the placement of graduates from different faculties is heterogeneous across provinces.

[4] Our analysis singles out: pre-reform degree (PRD), post-reform first level degree (FLD) and post-reform second level degree (SLD), including both the unique cycle second level degree and the *magistrale* degree.

	Pre-reform degree				Post-reform first level degree				Post-reform second level degree				Total			
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia
Agriculture	266	188	454	41.41%	250	136	386	35.23%	88	73	161	45.34%	604	397	1001	39.66%
Economics	870	551	1,421	38.78%	1,282	671	1,953	34.36%	386	287	673	42.64%	2538	1509	4047	37.29%
Pharmacy	440	197	637	30.93%	80	32	112	28.57%	110	46	156	29.49%	630	275	905	30.39%
Law	1,409	343	1,752	19.58%	413	83	496	16.73%	313	65	378	17.20%	2135	491	2626	18.70%
Engineering	956	704	1,660	42.41%	865	348	1,213	28.69%	284	305	589	51.78%	2105	1357	3462	39.20%
Arts and Philosophy	2,355	1,251	3,606	34.69%	2,247	743	2,990	24.85%	571	301	872	34.52%	5173	2295	7468	30.73%
Medicine	1,016	172	1,188	14.48%	683	669	1,352	49.48%	436	68	504	13.49%	2135	909	3044	29.86%
Veterinary Science	361	34	395	8.61%	8	3	11	27.27%	111	8	119	6.72%	480	45	525	8.57%
Education	459	450	909	49.50%	771	340	1,111	30.60%	188	326	514	63.42%	1418	1116	2534	44.04%
Mathematics, Physics and Natural Science	616	430	1,046	41.11%	765	284	1,049	27.07%	171	111	282	39.36%	1552	825	2377	34.71%
Political Science	404	260	664	39.16%	797	303	1,100	27.55%	223	105	328	32.01%	1424	668	2092	31.93%
Total	9,152	4,580	13,732	33.35%	8,161	3,612	11,773	30.68%	2,881	1,695	4,576	37.04%	20194	9887	30081	32.87%

Looking at the table above, the percentage of graduates working in the province of Perugia is quite homogenous among faculties, even though the faculties of Law, Medicine and Veterinary Science represent an exception. In any case, the use of alternative econometric methods seem to confirm the robustness of our estimation results[5].

Table 2 reports differences in employment rates in the province of Perugia according to the residence[6], showing relevant heterogeneities.

Tabella 2. Graduates at the University of Perugia, residence and employment

	Not residents in the province of Perugia				Residents in the province of Perugia				
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	% Graduates resident in the province of Perugia
Agriculture	403	121	524	23.09%	201	276	477	57.86%	47.65%
Economics	1,694	271	1,965	13.79%	844	1238	2082	59.46%	51.45%
Pharmacy	485	73	558	13.08%	145	202	347	58.21%	38.34%
Law	1,327	118	1,445	8.17%	808	373	1181	31.58%	44.97%
Engineering	1,139	289	1,428	20.24%	966	1068	2034	52.51%	58.75%
Arts and Philosophy	3,875	670	4,545	14.74%	1298	1625	2923	55.59%	39.14%
Medicine	1,279	116	1,395	8.32%	856	793	1649	48.09%	54.17%
Veterinary Science	368	20	388	5.15%	112	25	137	18.25%	26.10%
Education	993	184	1,177	15.63%	425	932	1357	68.68%	53.55%
Mathematics, Physics and Natural Science	868	173	1,041	16.62%	684	652	1336	48.80%	56.21%
Political Science	858	147	1,005	14.63%	566	521	1087	47.93%	51.96%
Total	13289	2182	15471	14.10%	6905	7705	14610	52.74%	48.57%

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[5] Among others, the determinants of the timing of transitions are also estimated using OLS and Heckman selection model (1979). The latter model corrects OLS estimates from estimation bias from selection into employment in the province of Perugia. We find that estimation results are quite consistent and that the Inverse Mill's ratio coefficient is not significant, pointing in the direction of negligible selection effect.

[6] Information distinguishing among pre and post reform degrees are presented in the Appendix.

4 Descriptive analysis and non-parametrical estimates

4.1 Descriptive analysis

A preliminary graphical analysis is presented in figures 1 and 2. They, respectively, report: The Kernel density distribution of the daily duration of transitions, distinguishing among faculties; The average and the median transition time for each faculty.

Combining graphical information, we obtain a preliminary outline of the university to job transition of the graduates at the University of Perugia working in the province of Perugia.

Graduates at the faculties of Pharmacy, Medicine and Education transit faster to employment in province of Perugia. This is testified from the strong positive skew of duration distribution (figure 1) and from average and median transition time (figure 2). On the contrary, graduates at the faculties of Law, and partly, MFN Sciences and Arts and Philosophy, spent more time to transit. With respect to average and median transition time, graduates in Economics, Political Science and Veterinary Science perform slightly better, while graduates at the faculties of Engineering and Agriculture perform slightly worst.

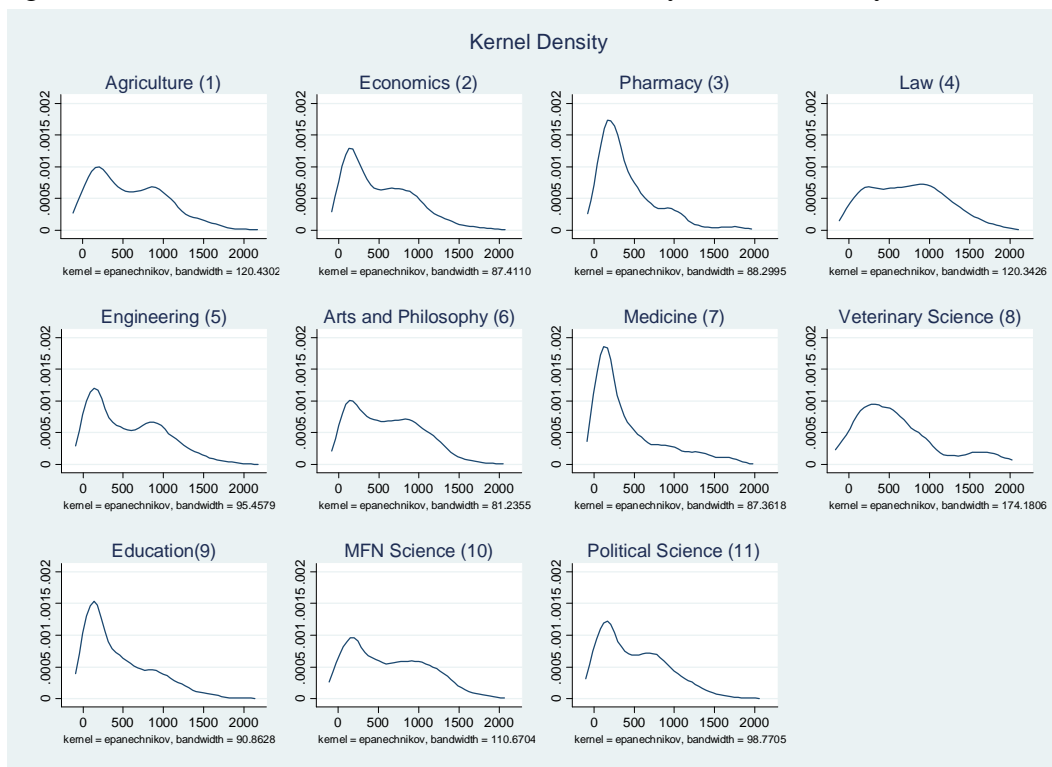Figure 1. Transition time distribution for each faculty (Kernel density)
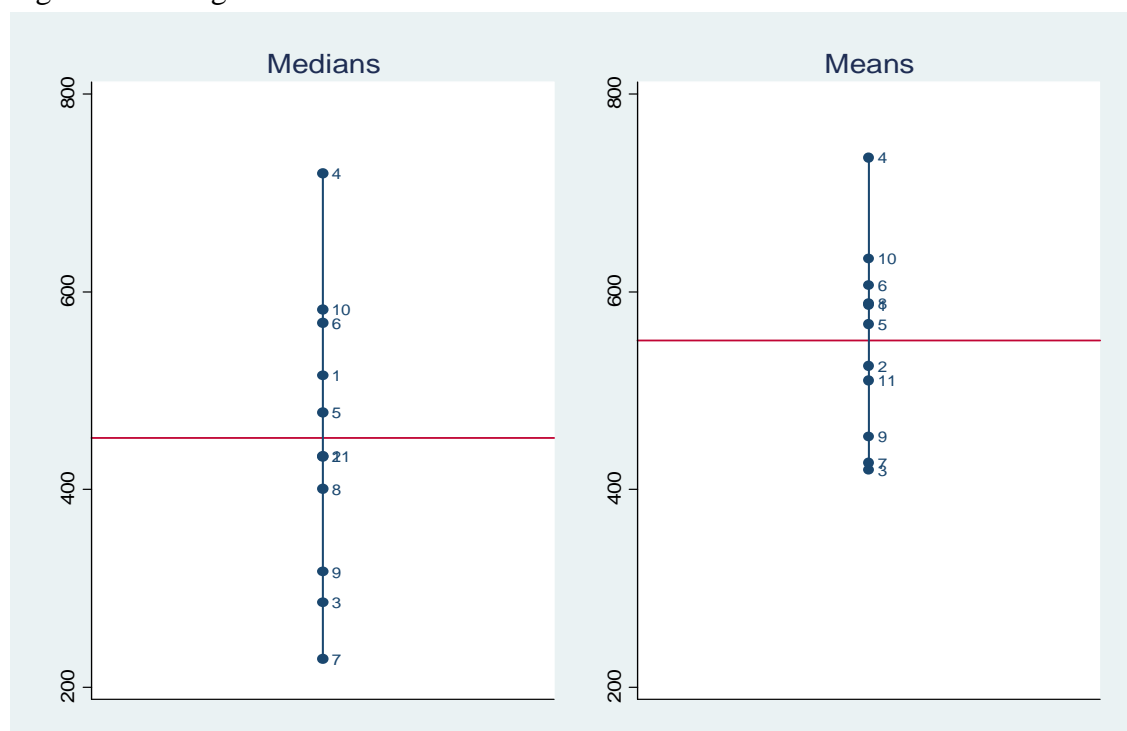
Figure 2. Average and median transition time

Table 3 informs about the timing of transition for each faculty distinguishing among degrees and job-contract destination (apprenticeship/training contract, interim contract, project-contract, fixed-term contract and permanent contract)7. The type of degree is a source of heterogeneity in terms of transition time. Graduates in the pre reform period spent, in average, 710 days to find the first job, while graduates in post reform with a first level degree spent 280 days and those with a second level degree spent 240 days. Even though observational results indicates that pre reform degree perform worse than other degrees, this result may be explained, at least partly, by the timing of the enrolment and, consequently, of the award of the degree. In fact, as the reform was introduced in 2001, is more likely to observe longer transition time among pre reform graduates than post reform graduates. In other words, we potentially observe only post reform graduates transiting rapidly to job positions, while we observe both pre reform graduates transiting rapidly and slowly. Moreover, we are more likely to observe post reform graduates that conclude rapidly their degree and that, quite consequently, transit more rapidly to a job positions because of their good observable and unobservable abilities. Econometric analysis may help to disentangle this source of bias introducing specific award time dummies.

Differences at faculty level also may depend by the educational pattern linked with the degree course attended. For example, the good performance of the graduates of the Faculty of Medicine may be partly explained by optimal performance of the graduates of the first level degree, while pre reform degree and post reform second level degree are more likely associated with slower transitions. Similar considerations seem to emerge for the Faculty of Pharmacy, while graduates at

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7 Among these, graduates with Nursing degrees represent 33% of graduates at the faculty of Medicine and their average timing of transition is just 230 days.

the Faculty of Law tend to display uniformly bad performances and post reform second level graduates of the Faculty of Political Science perform quite good. Finally, table 3 also shows that the destination contract8 contribute to determine different transition times, even though it is less relevant than faculty.

Table 3. Average transition time by faculty, degree and destination contract

	Apprenticeship	Interim	Project	Fixed-term	Permanent	Total
Pre reform degree						
Agriculture	651.09	562.90	743.75	838.28	767.36	758.48
Economics	565.70	688.82	825.66	743.27	745.75	704.16
Pharmacy	306.00	501.54	527.00	501.47	551.08	487.93
Law	858.53	830.36	928.41	764.55	826.81	831.33
Engineering	555.89	489.89	797.61	644.75	635.12	665.10
Arts and Philosophy	613.43	628.37	748.09	742.48	655.80	708.34
Medicine	715.10	253.57	813.97	915.74	862.21	846.78
Veterinary Science	697.25	267.60	912.29	491.83	1156.50	632.85
Education	555.16	577.29	744.28	679.64	730.81	688.79
Mathematics, Physics and Natural Scienc	597.22	654.65	837.68	837.64	797.07	790.52
Political Science	453.27	653.08	793.81	677.09	632.38	662.54
University of Perugia	588.64	627.62	785.59	725.55	712.53	710.52
Post reform first level degree						
Agriculture	661.24	568.71	549.05	389.80	740.40	522.26
Economics	532.70	446.95	538.34	444.64	522.31	495.96
Pharmacy	315.80	422.20	131.11	311.00	334.75	280.55
Law	672.58	511.33	923.00	574.13	563.90	640.89
Engineering	717.35	478.67	814.80	455.77	731.46	680.78
Arts and Philosophy	568.38	470.00	580.71	528.51	512.41	542.83
Medicine	323.73	232.33	407.53	279.98	456.96	320.83
Veterinary Science	258.50	813.00	-	-	-	443.33
Education	401.12	280.11	401.20	375.92	302.69	373.46
Mathematics, Physics and Natural Scienc	622.33	401.17	588.63	418.17	626.93	526.60
Political Science	438.94	391.52	560.18	449.14	472.45	467.52
University of Perugia	552.94	410.12	572.02	402.63	499.85	481.22
Post reform second level degree						
Agriculture	303.08	79.67	183.90	252.08	252.67	242.22
Economics	180.43	150.25	301.66	202.48	264.06	207.60
Pharmacy	200.00	123.50	263.00	234.88	250.33	226.51
Law	354.13	233.63	321.38	153.29	464.50	284.50
Engineering	167.00	83.00	268.08	140.34	246.76	215.27
Arts and Philosophy	196.32	207.60	333.84	287.14	312.91	283.38
Medicine	559.60	370.67	365.63	458.67	445.00	426.82
Veterinary Science	398.00	132.00	659.67	-	312.00	452.13
Education	307.43	-	137.23	204.23	316.33	203.34
Mathematics, Physics and Natural Scienc	241.15	243.70	289.33	246.60	647.25	281.30
Political Science	154.35	185.33	174.00	152.17	290.33	169.21
University of Perugia	209.09	186.72	273.41	226.84	309.42	239.62

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[8] Apprenticeship and training contracts were considered jointly since their similarity in terms of contents and transition time, while workers with VAT number were joined to Project workers because their similarity and their negligible size.

4.2 Kaplan-Meier estimates

The Kaplan-Meier procedure is a non-parametric method to estimate survival functions. It allows to represent the probability of being in the original condition[9] after t time units spent in looking for a job. Figure 3, shows the survival function into non-employed condition for the graduates at the University of Perugia in the years considered and that have found a job in the province of Perugia. Kaplan-Meier estimates make it clear that the median of the survival function is about 450 days; i.e. the faster 50% graduates to find a job spent about 15 months before to find it. On the other hand, the slower 25% graduates to find a job spent between 850 and 2000 days before to find it, i.e. between 28 and 66 months after the degree attainment.

Figure 3. Kaplan-Meier survival function
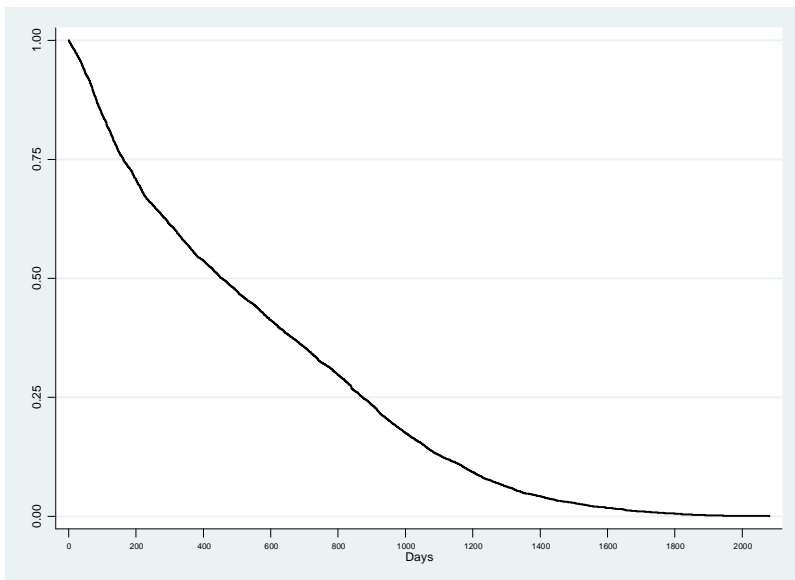
Kaplan-Meier method is applied also to investigate the heterogeneity arising from the type of degree obtained and the destination contract. Figure 4 shows the Kaplan-Meier survival functions according to different types of degree. Non-parametric estimates confirm descriptive evidence: the post-reform second level degree guarantees a faster transition, while the pre reform degree determines longer transitions. As anticipated these results may be partly explained by other factors a part from the efficacy of the degree *per se.* In any case may be interesting to highlight the predicted average time of transitions according to the Kaplan-Meier method: about 200 days for the post reform second level degree, about 450 for the post reform first level degree and about 700 days for the pre reform degree.

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[9] Implicitly we are assuming that the individual has not had previous job relationships in other provinces.

Figure 4. Kaplan-Meier survival function by type of degree
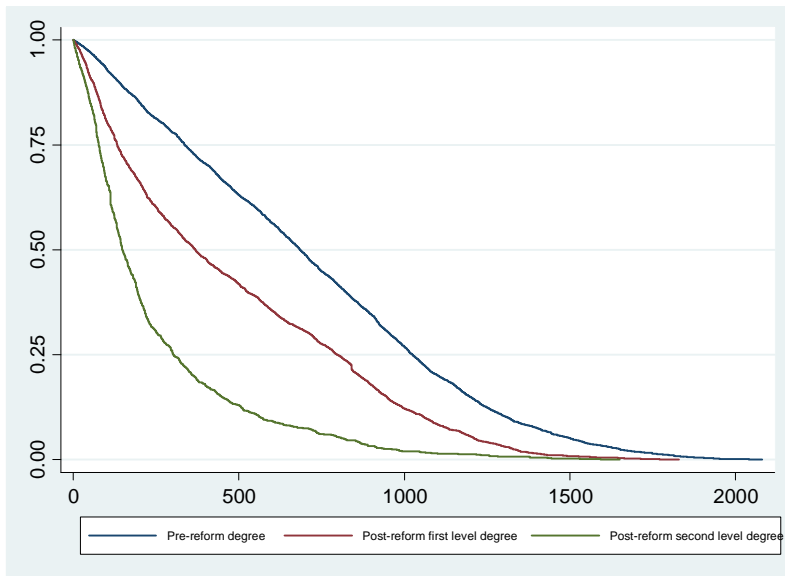
The same analysis is repeated with respect to the destination contract. This corresponds to a competing risks analysis, i.e. now we have a multiple failure rather than a single failure case, for which we are conditioning with respect to the exit contract. Figure 5 clarifies that graduates leaving non-employment condition with an apprenticeship, interim or fixed-term contract spent about 350-400 days before to find a job. Graduates transiting to a project or a permanent contract spent about 530 days before to leave non employment state. Importantly, focusing on the faster 2/3 graduates to transit, the previous difference is greater, while it tends to decrease until to disappear for graduates spending a longer time before to find a job.

Figure 5. Kaplan-Meier survival function by destination contract
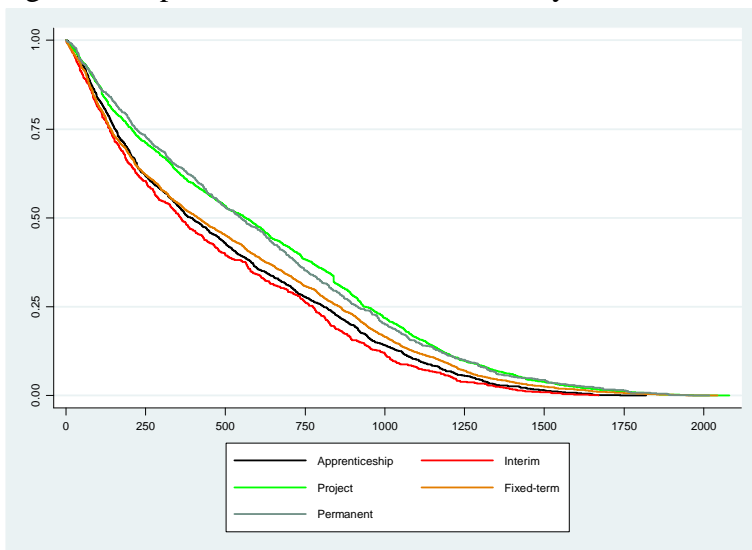
Finally, the Kaplan-Meier analysis is applied distinguishing by faculties and destination contracts (figure 6). A first indicator of the rapidity of transition associated to each faculty, may be

seen in the distance between the survival functions and the horizontal axis. Consistently with previous evidence, graduates at the Faculty of Law and Arts and Philosophy display more critical situations. The survival functions of the Faculties of Medicine and Pharmacy lie closer to the horizontal axis, meaning faster transitions. The destination contracts seem to play a role in determining stronger differences in transition times for the Faculties of Agriculture, Pharmacy, Medicine, and overall, Veterinary Science.

Figure 6. Kaplan-Meier survival function by faculty and destination contract
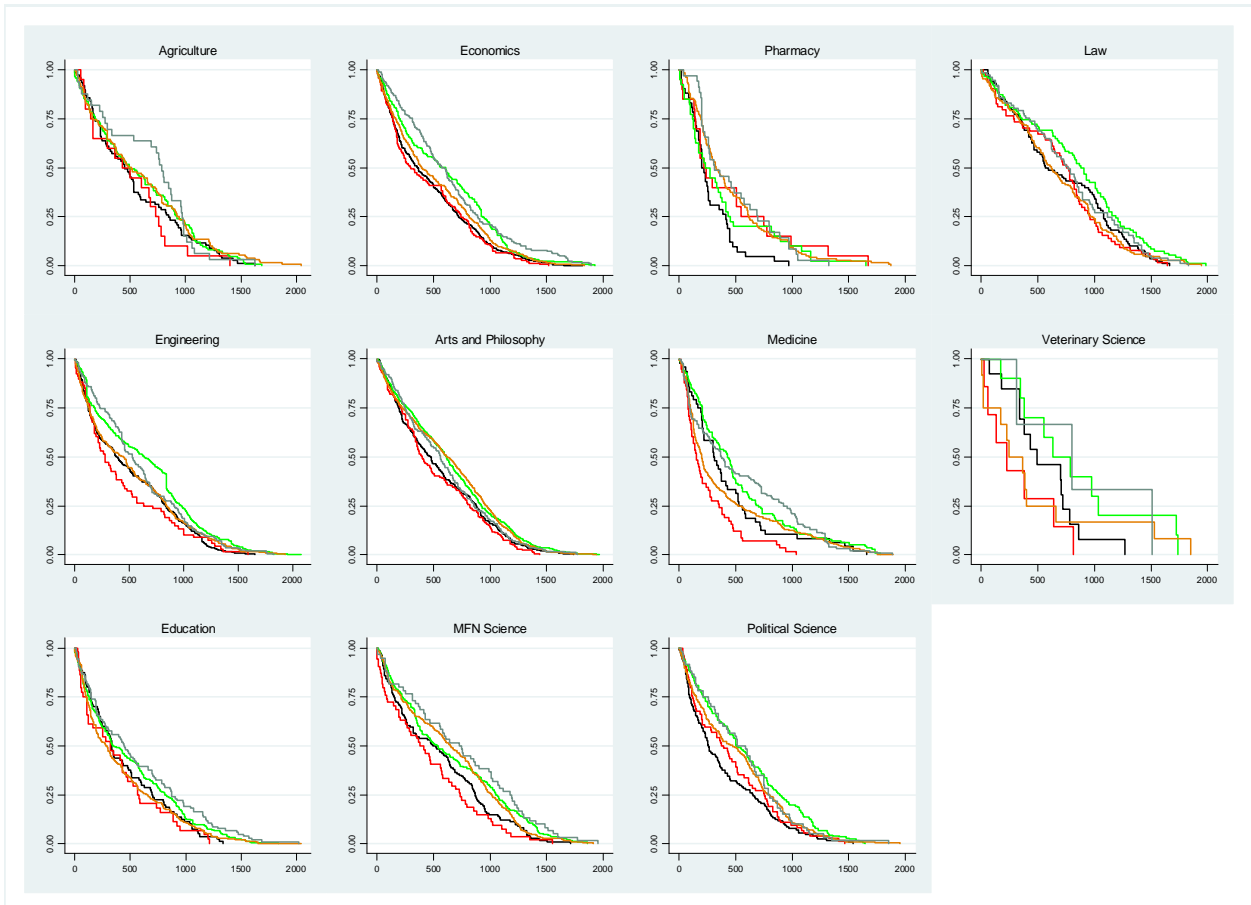
5   Econometric analysis

5.1 The Cox model

Duration models is now applied to investigate the university to job transition. The survival time is defines as the elapsed time between the end of the university and the begin of the first job after that the degree was obtained. Since destination contracts are identifiable, we carry out a

competing risks analysis. The continue random variable T, measured on daily basis, represents the survival time, and its distribution function reads:

$$F(t) = P(T < t)$$

(1)

The density function reads $f(t)$, while the survival function, i.e. the probability of surviving until time t or longer in non employment status is:

$$S(t) = P(T \geq t) = 1 - F(t)$$

(2)

Assuming independent risks, it is possible to handle separately the risk to fail into one of the J exit-status considered. Specifically, the risk to fail into the state j at the time t corresponds to the hazard function $\lambda_j(t)$ and measures the instantaneous failure rate given survival until time t into the non employment status. The hazard function for the exit into state j reads

$$\lambda_j(t) = \lim_{\delta \to 0} \frac{P(t \leq T < t + \delta \mid T \geq t)}{\delta}$$

(3)

Each hazard function is estimated applying a *Cox proportional hazard model* (Cox, 1972), that is a semi-parametric method of analyzing the effects of covariates on the hazard function assuming a non parametric baseline hazard. Considering n individuals for each sub-groups (according to the exit status), the Cox model for each sub-group may be written as follows:

$$\lambda_{ij}(t) = \exp(x_{ij}\beta_j)\lambda_{0j}(t) \qquad i = 1, 2, ..., n$$

(4)

in which x_{ij} is a vector of covariates for individual i transiting into the state j, β_j is a vector of unknown parameters to be estimated, $\lambda_{ij}(t)$ is the hazard function of individual i transiting into j and $\lambda_{0j}(t)$ is the baseline hazard function for transitions into state j.

Not making any assumption about the distributional form of the baseline hazard, the Cox model avoids estimation bias deriving from assuming misleading parametric distribution. Cox (1972) proposed a partial likelihood (PL) method rather than maximum likelihood to estimate unknown parameters. The PL for each destination reads:

$$PL_j = \prod_{k=1}^{K} L_{Kj}$$

(5)

where L_{Kj} represents the probability that a particular individual i transiting into j experiences the event at $t=t_i$, given that one observation amongst many at risk experiences the event.

5.2 Estimation results

Estimation results of the Cox model are presented in table 4. The first column is referred to parameter estimation for the single risk analysis, i.e. without distinguishing among destination contracts. Columns 2-6 report estimation results from the competing risks analysis, in which are considered five destination states: apprenticeship contracts, interim contracts, project contracts, fixed-term contracts and permanent contracts.

Beginning from the first column results, we find that gender and nationality are not statistically significant. Being resident in the province of Perugia increases the transition probability by 11%. As expected, as the age of degree increases the probability of finding a job decreases (by 1% for each year more). The type of degree (the pre-reform and the post-reform ones) is relevant to determine the timing of transition. The Cox model results lead to very different conclusions with respect to evidence from descriptive and Kaplan-Meier analysis. Specifically, introducing time dummies regarding the year in which the degree was attained, we are able to correct estimates from bias arising from the different timing of getting different degrees. With respect to the post-reform first level degree, our base-category, having a pre-reform degree increases the transition probability by 16%, while having a post-reform second level degree increases by 42% the transition probability with respect to the base-category. This strongly contradicts previous evidence and underlines the importance of implementing econometric analysis with suitable controls to avoid misspecification and misinterpretation problems.

Staying more time enrolled in the university increases the transition probability. Even though this contradicts the evidence of the age of degree, it may be explained by the association of longer enrollment with more performer degrees. Higher degree mark determines a lower transition probability. It possibly descends by an existing relationship between degree mark and reservation wage. Higher degree mark determines higher reservation wages, hence lower acceptance rates and lower transition probabilities. Having experienced job experiences during the university period increases the transition probability, indicating the relevance of cumulating practical on the job experiences. Finally we control for faculty dummies, considering the Faculty of Medicine as the base-category. Graduates at the Faculties of Pharmacy, Agriculture, Economics and Education experience not statistically significant differences in transition probabilities with respect to the base-category. Other graduates are all disadvantaged, even if experiencing different gaps. With respect to the base-category, graduates at the Faculty of Political Science experience a transition probability lower by 18%. The transition probability among graduates at the Faculty of Engineering, Arts and Philosophy and MFN Sciences is lower, respectively, by 21%, 22% and 24%. Finally, the transition probability is lower by 32% among graduates at the Faculty of Law and by 44% among graduates at the Faculty of Veterinary Science. In any case heterogeneous transition probabilities may be found into each faculty according to the degree. In table A4 we report faculty dummies estimates distinguishing among pre-reform, post-reform first level and post-reform second level degrees. With respect to the Faculty of Medicine, most of the good performances of other faculties

depend by the good results of the graduates with a pre-reform and post-reform second level degrees.

On the other hand, among graduates of the Faculty of Medicine, are particularly positive the performances of those with a post-reform first level degree. This may result both from the relevance of specialization to find a job in the medical labour market and by the specific insertion pattern into the labour market of other graduates. We begin considering graduates with a pre-reform degree. Taking the Faculty of Medicine as base-category, graduates of the Faculty of Pharmacy experience a transition probability 73% higher. Graduates of the Faculties of Agriculture and Economics experience a transition probability 45% higher than the base-category graduates, followed by graduates of the Faculty of Education (+39%), Engineering and Political Science (+29%) and Arts and Philosophy (+25%). Graduates of other faculties show not significant differences with respect to the graduates of Faculty of Medicine.

We now consider graduates having a post-reform first level degree that, in general, we have found to be those experiencing the slower transitions. Among them, graduates at Faculty of Medicine, experience the best performance, together with graduates at the Faculty of Pharmacy. This confirms the rapidity of transitions for graduates attending technical and specific specialization academic courses. Other graduates experience longer transitions. Among them the stronger disadvantage is found for graduates of the Faculties of Engineering (-54%), Law (-45%), Arts and Philosophy (-41%), Political Science (-38%) and MFN Sciences (-37%). Graduates of the Faculties of Agriculture and Economics experience a transition probability lower by 28% than the graduates of the Faculty of Medicine, while those with a degree in Education experience a 21% lower transition probability. Among graduates with a post-reform second level degree, we find a more heterogeneous picture, and it seems quite inverted with respect to the graduates with a post-reform first level degree. Many estimated faculty dummies are not significantly different from the base-category, for which we have found a quite slow transition. On the contrary, graduates at Faculties of Economics and Education experience optimal performances (+65%). It follows graduates at the Faculties of Engineering (+52%) and Political Science (+51%).

These results have some implications. First, the university system reform has acted differently of the timing of transition among different faculties. On the one hand, this seems to be linked to the specific patterns characterizing the transition for each type of graduate. On the other side, it seems to indicate that is not the type of faculty to determine the performances but rather the specialization associated to the degree course. This seems particularly true among graduates in medical disciplines. Moreover, even though other educational patterns show more homogenous performances, both in positive and negative terms, the introduction of the reform has determined greater advantage for some faculties. A relative improvement in the timing of transition, toward employment positions in the province of Perugia, is found for the graduates at the Faculties of Education, Economics, Engineering and Political Science.

Results from the competing risks analysis show that controls act quite differently according to the exit contracts. For brevity, we only comment estimates that strongly differ from the single risk analysis. For example, for transitions toward project-contract, males transit faster than females,

while for other contracts their transitions are longer. Being resident in the province of Perugia affects very differently the timing of transition accordingly to the destination contract. It strongly increases the probability of finding an apprenticeship contract (+30%), a fixed-term contract (+29%) and, overall, a permanent contract (+42%), while it decreases the probability of finding more precariousness contracts, i.e. project-contracts (-9%) and overall interim contracts (-38%).

Quite surprisingly, being Italian strongly decreases the probability of finding a permanent job in the province of Perugia (-35%). Contrarily to other contractual forms, the age of degree increases the probability of finding a stable job relationship (+5.5%).

Having a post-reform first level degree decreases the probability of finding whatever type of contract, except interim contracts, while graduates with a pre-reform degree are those experiencing the greater probability of finding a permanent contract. The enrollment time and the mark's degree do not determine relevant heterogeneities among destination contracts, even though spending a longer time enrolled seems to be more likely associated with exits on interim contracts and less likely with exits on project contracts. Having previous job experiences increases the probability of transitions toward project and fixed-term contracts while decreases those toward apprenticeship contracts.

Finally, we found that the faculty attended affects quite differently the destination contract. For example, graduates at the Faculty of Medicine rarely transit toward an apprenticeship contract, while graduates in Economics, Agriculture and Engineering is very likely to find an apprenticeship contract as first job. Among graduates transiting toward interim contracts, the faster ones are the graduates at the Faculty of Law and Economics, while those having a degree in Engineering and Education transit slower to this type of contract. Transitions toward project contracts seem to be faster for gradates at the Faculty of Agriculture, Engineering and Political Science, while having a degree in Medicine is more likely to lead to a fixed-term contract. Finally, the timing of transition toward a permanent contract is relatively shorter for graduates at the Faculty of Medicine, overall for those with post-reform first level degree. With respect to the base-category, graduates at the Faculty of Veterinary Science spend almost 80% time more to transit to a permanent contract, followed by graduates at the Faculty of MFN Science (+68%), Arts and Philosophy (-63%), Agriculture (+52%), Political Science (+49%), Law (+45%), Education (+44%), Engineering (+37%) and Economics (+30%). Graduates at the Faculty of Pharmacy do not show significant differences with the base-category graduates.

Table 4. Determinants of the probability of finding a job in the province of Perugia: Cox model estimates

	Tutti			A/T			INT			Co.Pro.			TD			TI		
	H.R.	S.e.	P-v	H.R.	S.e.	P-v	H.R.	S.e.	P-v	H.R.	S.e.	P-v	H.R.	S.e.	P-v	H.R.	S.e.	P-v
Maschio	0.971	0.022	0.201	0.914	0.048	**0.084**	1.004	0.082	0.957	1.109	0.051	**0.024**	0.917	0.035	**0.022**	0.984	0.068	0.811
Perugia	1.111	0.028	**0.000**	1.296	0.076	**0.000**	0.623	0.050	**0.000**	0.911	0.044	**0.051**	1.287	0.056	**0.000**	1.416	0.121	**0.000**
Italia	1.001	0.072	0.985	1.635	0.321	**0.012**	0.764	0.160	0.199	0.996	0.170	0.981	1.000	0.115	0.998	0.649	0.114	**0.014**
Età laurea	0.991	0.004	**0.030**	0.872	0.016	**0.000**	0.932	0.021	**0.002**	0.971	0.010	**0.006**	1.004	0.006	0.518	1.055	0.010	**0.000**
Vecchio ordinamento	1.159	0.038	**0.000**	1.490	0.121	**0.000**	0.875	0.105	0.267	1.300	0.086	**0.000**	1.145	0.060	**0.010**	1.219	0.114	**0.034**
Laurea triennale	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
Laurea specialistica	1.421	0.054	**0.000**	2.178	0.211	**0.000**	0.913	0.137	0.546	2.001	0.158	**0.000**	1.227	0.075	**0.001**	1.139	0.155	0.339
Permanenza	1.012	0.006	**0.046**	1.021	0.023	0.364	1.079	0.030	**0.006**	1.036	0.014	**0.008**	1.008	0.009	0.388	0.996	0.013	0.761
Voto	0.993	0.002	**0.000**	0.985	0.004	**0.000**	0.982	0.005	**0.001**	1.010	0.004	**0.007**	0.992	0.003	**0.002**	0.990	0.004	**0.021**
Esperienze lavoro	1.011	0.002	**0.000**	0.950	0.013	**0.000**	1.012	0.008	0.123	1.021	0.002	**0.000**	1.012	0.003	**0.000**	0.981	0.016	0.226
Agraria	0.906	0.056	0.112	3.420	0.634	**0.000**	0.723	0.190	0.217	2.089	0.273	**0.000**	0.537	0.054	**0.000**	0.478	0.093	**0.000**
Economia	0.938	0.041	0.142	5.651	0.863	**0.000**	1.366	0.218	**0.051**	1.026	0.122	0.831	0.466	0.032	**0.000**	0.704	0.082	**0.003**
Farmacia	1.036	0.074	0.621	2.714	0.588	**0.000**	1.072	0.286	0.796	1.139	0.213	0.485	0.896	0.089	0.269	0.826	0.160	0.325
Giurisprudenza	0.684	0.041	**0.000**	2.477	0.457	**0.000**	1.490	0.289	**0.040**	1.044	0.150	0.764	0.382	0.037	**0.000**	0.553	0.083	**0.000**
Ingegneria	0.786	0.036	**0.000**	3.607	0.570	**0.000**	0.621	0.116	**0.011**	1.913	0.206	**0.000**	0.322	0.024	**0.000**	0.633	0.077	**0.000**
Lettere e Filosofia	0.781	0.032	**0.000**	2.555	0.395	**0.000**	0.914	0.143	0.565	1.606	0.166	**0.000**	0.533	0.031	**0.000**	0.367	0.043	**0.000**
Medicina e Chirurgia	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
Medicina Veterinaria	0.556	0.086	**0.000**	2.750	0.877	**0.002**	1.439	0.587	0.372	0.794	0.264	0.488	0.267	0.078	**0.000**	0.217	0.127	**0.009**
Sc. Formazione	0.959	0.044	0.363	1.334	0.246	0.118	0.635	0.129	**0.026**	1.584	0.183	**0.000**	0.933	0.058	0.265	0.557	0.074	**0.000**
Sc. Mat. Fis. Nat.	0.737	0.037	**0.000**	2.289	0.388	**0.000**	0.840	0.162	0.364	1.958	0.219	**0.000**	0.425	0.033	**0.000**	0.325	0.051	**0.000**
Scienze Politiche	0.821	0.043	**0.000**	2.829	0.483	**0.000**	1.287	0.230	0.159	1.813	0.220	**0.000**	0.445	0.038	**0.000**	0.507	0.080	**0.000**
No. of subjects	9642																	
LR chi2(18)	7422.4			2273.3			897.8			2613.2			3211.0			426.0		
Prob > chi2	0.000			0.000			0.000			0.000			0.000			0.000		
Log likelihood	-74862.8			-14090.4			-5716.3			-17872.1			-28131.3			-8053.3		

6   Final Considerations

The existing huge literature on "youth labour market performance" and STWT is accompanied by still rare empirical investigations on the University-to-work transitions (UTWT) at regional/local level. In this paper we produce first empirical results on UTWT in the case of Perugia (as University institutions and as provincial labour market). In particular, University administrative information and data from the job centres of the province of Perugia are matched to reconstruct the timing of the university to job transitions of graduates at the University of Perugia since January 2004 to July 2009. So, our paper is not a general assessment of the UTWT of all graduates at the University of Perugia, considering that those with job transitions out of the province are not considered in the analyses. In the period since January 2004 to July 2009 about 33% of graduates of the University of Perugia have found a job in the province of Perugia.

Descriptive statistics inform us that the probability of employing with a permanent contract is quite low, about 11%, while fixed-term contracts (38%), "project contracts" (25%), training contracts (19%) and temporary-agency contracts (7%) are the possible alternatives. The observed mean duration of transition is 550 days, while the median value is 450 days.

According to KM estimates, graduates transiting to apprenticeships or training contracts and to temporary agency contracts leave unemployment faster, while transitions to permanent contracts require longer waiting. According to KM estimates a quite relevant heterogeneity emerges among the faculties attended. Another source of strong heterogeneity among graduates of the University of Perugia arises from the type of the degree achieved. The predicted median duration for individuals with a pre 2001 reform degree was about 700 days, while it is about 370 days for the first level post 2001 reform degree and 150 days for the second level post 2001 reform degree. In this context, some faculties have exploited better the passage from the pre to the post reform period.

According to the Cox model estimation results, and controlling for year dummies, we find that having a pre 2001 reform degree performs better than a 3 years' post 2001 reform degree (+16%), while the employment probabilities are strongly increased from having a second level post 2001 reform degree (+42%). Negative effects are also found with respect to the age at which his/her graduates and, interestingly, to the final mark. Graduates with higher final marks spent more time before to find a job. It is possibly indicative of their higher reservation wages, representing higher expectations about job and wage qualities, negatively affecting the range of employment opportunities. On the contrary, the time spent to finish the degree course, and having previous job experiences have a moderate positive effect on the employment probabilities. With respect to the faculty dummies, taking the faculty of Medicine as the base-category, we find that only the graduates in Pharmacy and in Educational Science perform similarly, while others experience slower transitions. Specifically, graduates of the faculty of Law and of the faculty of Veterinary are

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the slower ones. In this context, as the competing risks analysis shows, some heterogeneities emerge with respect to explanatory variables effects according to the exit contract. The more relevant show that being a male increases the probability of transiting toward a "project contract" and decreases the probability of transiting toward an apprenticeship contract. To be born in Umbria quite strongly increases (+42%) the probabilities of employing with a permanent contract. On the contrary, having previous job experiences does not increase significantly the probability of reaching a stable job.

The above preliminary results are a first step for further investigations useful for the necessary improvement of the complex relationship between the University of Perugia and the regional/local economy and labour markets.

7   Bibliografia

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8 Appendix

Tabella A1. Graduates (pre 2001 reform degree) in the University of Perugia, residents or not residents in the province of Perugia, according to employment condition

	Pre reform degree								
	Not residents in the province of Perugia				Residents in the province of Perugia				
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	*% Graduates resident in the province of Perugia*
Agriculture	183	65	248	26.21%	83	123	206	59.71%	45.37%
Economics	590	84	674	12.46%	280	467	747	62.52%	52.57%
Pharmacy	338	48	386	12.44%	102	149	251	59.36%	39.40%
Law	836	79	915	8.63%	573	264	837	31.54%	47.77%
Engineering	542	157	699	22.46%	414	547	961	56.92%	57.89%
Arts and Philosophy	1,822	301	2,123	14.18%	533	950	1,483	64.06%	41.13%
Medicine	590	41	631	6.50%	426	131	557	23.52%	46.89%
Veterinary Science	282	16	298	5.37%	79	18	97	18.56%	24.56%
Education	259	74	333	22.22%	200	376	576	65.28%	63.37%
Mathematics, Physics and Natural Science	346	90	436	20.64%	270	340	610	55.74%	58.32%
Political Science	231	55	286	19.23%	173	205	378	54.23%	56.93%
Total	6019	1010	7029	14.37%	3133	3570	6703	53.26%	48.81%

Tabella A2. Graduates (post reform first level degree) in the University of Perugia, residents or not residents in the province of Perugia, according to employment condition

	Post reform first level degree								
	Not residents in the province of Perugia				Residents in the province of Perugia				
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	*% Graduates resident in the province of Perugia*
Agriculture	161	38	199	19.10%	89	98	187	52.41%	48.45%
Economics	792	121	913	13.25%	490	550	1,040	52.88%	53.25%
Pharmacy	63	13	76	17.11%	17	19	36	52.78%	32.14%
Law	318	19	337	5.64%	95	64	159	40.25%	32.06%
Engineering	419	75	494	15.18%	446	273	719	37.97%	59.27%
Arts and Philosophy	1,615	251	1,866	13.45%	632	492	1,124	43.77%	37.59%
Medicine	385	60	445	13.48%	298	609	907	67.14%	67.09%
Veterinary Science	6		6	0.00%	2	3	5	60.00%	45.45%
Education	593	71	664	10.69%	178	269	447	60.18%	40.23%
Mathematics, Physics and Natural Science	420	62	482	12.86%	345	222	567	39.15%	54.05%
Political Science	475	60	535	11.21%	322	243	565	43.01%	51.36%
Total	5247	770	6017	12.80%	2914	2842	5756	49.37%	48.89%

Tabella A3. Graduates (post reform second level degree) in the University of Perugia, residents or not residents in the province of Perugia, according to employment condition

| | Post reform second level degree | | | | | | | | |
| | Not residents in the province of Perugia | | | | Residents in the province of Perugia | | | | |
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	*% Employed in the province of Perugia*	*% Graduates resident in the province of Perugia*
Agriculture	59	18	77	23.38%	29	55	84	65.48%	52.17%
Economics	312	66	378	17.46%	74	221	295	74.92%	43.83%
Pharmacy	84	12	96	12.50%	26	34	60	56.67%	38.46%
Law	173	20	193	10.36%	140	45	185	24.32%	48.94%
Engineering	178	57	235	24.26%	106	248	354	70.06%	60.10%
Arts and Philosophy	438	118	556	21.22%	133	183	316	57.91%	36.24%
Medicine	304	15	319	4.70%	132	53	185	28.65%	36.71%
Veterinary Science	80	4	84	4.76%	31	4	35	11.43%	29.41%
Education	141	39	180	21.67%	47	287	334	85.93%	64.98%
Mathematics, Physics and Natural Science	102	21	123	17.07%	69	90	159	56.60%	56.38%
Political Science	152	32	184	17.39%	71	73	144	50.69%	43.90%
Total	2023	402	2425	16.58%	858	1293	2151	60.11%	47.01%

Tabella A4 - Fixed effects according to faculty and degree

| | Laurea V.O. | | | Laurea Triennale V.O. | | | Laurea Specialistica N.O. | | |
	H.R.	S.e.	P-v	H.R.	S.e.	P-v	H.R.	S.e.	P-v
Agraria	1.454	0.156	**0.000**	0.716	0.071	**0.001**	1.305	0.228	0.128
Economia	1.450	0.130	**0.000**	0.715	0.042	**0.000**	1.650	0.233	**0.000**
Farmacia	1.726	0.185	**0.000**	1.056	0.195	0.768	1.093	0.216	0.654
Giurisprudenza	0.997	0.096	0.976	0.549	0.066	**0.000**	1.062	0.198	0.746
Ingegneria	1.293	0.112	**0.003**	0.465	0.035	**0.000**	1.519	0.211	**0.003**
Lettere e Filosofia	1.250	0.104	**0.007**	0.587	0.034	**0.000**	1.122	0.156	0.408
Medicina e Chirurgia	-	-	**-**	-	-	**-**	-	-	**-**
Medicina Veterinaria	0.920	0.174	0.659	0.456	0.265	0.176	0.575	0.218	0.145
Sc. Formazione	1.395	0.128	**0.000**	0.792	0.055	**0.001**	1.647	0.226	**0.000**
Sc. Mat. Fis. Nat.	1.068	0.098	0.475	0.626	0.047	**0.000**	1.167	0.186	0.331
Scienze Politiche	1.292	0.130	**0.011**	0.620	0.045	**0.000**	1.507	0.257	**0.016**
No. of subjects	4554			3554			1534		
LR chi2(22)	2752.570			2439.430			715.630		
Prob > chi2	0.000			0.000			0.000		
Log likelihood	-32307.067			-24218.036			-9352.393		

Tabella A5 - Descriptive statistics

Variabili	Media	Dev. Std.
Maschio	0.379	0.485
Perugia	0.784	0.412
Italia	0.979	0.144
Età laurea	25.949	3.447
Vecchio ordinamento	0.472	0.499
Laurea triennale	0.369	0.482
Laurea specialistica	0.159	0.366
Permanenza	5.305	2.932
Voto	103.508	7.061
Esperienze lavoro	1.053	5.186
Agraria	0.040	0.195
Economia	0.151	0.359
Farmacia	0.029	0.166
Giurisprudenza	0.050	0.217
Ingegneria	0.138	0.345
Lettere e Filosofia	0.231	0.422
Medicina e Chirurgia	0.094	0.292
Medicina Veterinaria	0.005	0.068
Sc. Formazione	0.114	0.318
Sc. Mat. Fis. Nat.	0.083	0.276
Scienze Politiche	0.066	0.249
Laurea 2004	0.175	0.380
Laurea 2005	0.216	0.412
Laurea 2006	0.221	0.415
Laurea 2007	0.182	0.386
Laurea 2008	0.148	0.355
Laurea 2009	0.058	0.234

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