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University and labour market outcomes: what matters?

The case of Italy?

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Introduction

One of the major elements coloring European higher education was the Bologna process that was initiated in the Bologna declaration of June 1999 and currently instigates higher education reform in 45 European countries. The Bologna process aims to create a European Higher Education Area by 2010, by implementing reforms that harmonize higher education within Europe (Eurydice, 2007). By means of these reforms it is aimed to create a more competitive and more attractive higher education across Europe. The key elements of the Bologna process are the adoption of a common university system of degrees based on three cycles, the promotion of mobility by implementing the 'Diploma Supplement' and establishing a credit transfer system, and, finally, the favoring of European cooperation in quality assurance to facilitate the comparison of qualifications across Europe. To evaluate the progress of these reforms and to support quality assurance it is crucial to think about and discuss the features of a valid evaluation system.

Currently several national and international evaluation systems for higher education institutions exist in the form of rankings. Well-known and often cited are two international rankings: the *Academic ranking of World Universities* (ARWU) from Shanghai's Jiao Tong University, released for the first time in 2003 (last ranking in February 2007) and the *World University Ranking (WUR)* from the *Times Higher Education Supplement (THES)*, first released in 2004 (last ranking in 2006).

In the *ARWU,* universities are ranked in accordance to their academic and research performances using as criteria the number of Nobel laureates, highly cited researchers, articles published in Nature and Science, articles in Science Citation Index (SCI)-expanded and Social Science Citation Index (SSCI), and a composite indicator of academic performance normalized by the size of the institution. In the THES *World University Ranking (WUR)*, the opinion of scientists and international employers plays a crucial role. Around 3700 researchers and employers are asked to indicate the best universities. This "peer review" counts for 50% in the total score of a university. In addition, the following other criteria are used: research impact in terms of citations per faculty member, staff/student ratio, percentage of students and staff recruited internationally.

However, these international rankings are often criticized because of the sole focus on academic research output, thus ignoring e.g. non-publicized output and labor market output for the students. The applied approach also disadvantages universities that are more oriented towards social sciences and humanities and universities from non-English speaking countries.

Some national examples of higher education quality evaluation systems can be found across Europe. In Germany the 'Centrum für Hogschulentwicklung' (CHE) (www.che.de) makes a ranking of more than 280 higher education institutions in Germany, Austria and Switzerland. Austrian universities are included in the ranking in 2004 and Swiss universities are included in 2005 (German-speaking universities). This ranking does not provide an overall ranking, but a detailed analysis: the ranking deliberately chooses not to add the different aspects of the survey together to produce an overall score. Instead of league positions for the individual universities league groups are reported. Universities are placed into one of three groups: Top Group, Middle Group or Bottom Group. The provided ranking is subject-specific. Aggregation at the level of whole universities offers no useful information as a decision-making aid for prospective students who want to study a specific subject. In the future the applied methodology will be extended to the Netherlands and Flanders in a CHE-pilot project (November 2007).

In Italy, the newspaper *La Repubblica* started in 2000 with the publication of performance-based league tables of universities by field of study. These rankings are based on raw data from a number of sources including the Italian National Statistical Office (ISTAT) and the Ministry of Education, University and Research (MURST). The criteria used for these tables refer to different aspects of university quality (research outcomes, student participation, student progression and achievement, teaching and the degree of internationalization), but labor market performance of the graduates is not included as a criterion. Moreover, these league tables contain 'gross' performance indicators, implying that they do not take into account e.g. the selective inflow of students and researchers into the university.

Purpose of the study

The current paper aims to elaborate on and contribute to the development of valid evaluation systems for higher education institutions, while focusing on the labor market opportunities of the graduates. As a case study, data regarding the labor market position of Italian university graduates will be investigated.

Labor market is a crucial aspect in the evaluation of performance of higher education institutions. In their discussion on the use of statistics and indicators to evaluate universities in Europe, Trinczek and West (1999) point to the increasing importance of the education-employment relationship in the evaluation of higher education. To justify the public expenditure on higher education one expects the system to produce qualifications that are relevant for the labor market. Also, if the labor market opportunities of graduates from different universities differ significantly,

this might indicate to different quality of the courses offered at the universities. However, one should be aware that this kind of differences might also merely indicate a different perceived reputation of the universities by the employers. Finally, students' choices can benefit from information about the labor market opportunities and introducing market principles can increase the competition amongst universities and, hopefully, increase quality of the provided education.

Theoretical background

A first part of this section discusses the use of performance indicators in education. This will point to certain caveats with regard to this use, caveats that in the remainder of the paper will be taken into account. The second part of this section more specifically will focus on the link between education and labor market performance. Finally, the specific context of the Italian university structure will be introduced.

Performance indicators in (higher) education

Following Goldstein and Spiegelhalter (1996) a performance indicator can be defined as a "summary statistical measurement on an institution or system which is intended to be related to the 'quality' of its functioning" (p.385). An institution or system can refer to any type of structure, but in the current context will refer to schools or higher educational institutions c.q. universities.

The introduction of performance indicators, in education but in other fields as well, can be seen to serve three general goals (Goldstein & Myers, 1996; Marshall, Shekelle, Leatherman & Brook, 2000; Rowe, 2000; Visscher, Karsten, de Jong & Bosker, 2000). A first goal is public accountability of the educational institutions for their performance. The two other goals relate to creating a quasi-market situation in education. The use of performance indicators, as a second goal, allows consumers (parents or students) to make an informed choice about where to 'purchase' education. A third goal is to influence, through a market-like mechanism, the behaviour of the providing institution and, hence, the quality of the provided product c.q. education. Pugh, Coates and Adnett (2005) point to a fourth goal, being to inform policy makers on elements like budget allocations and policy initiatives (see e.g. Jongbloed & Vossensteyn, 2001, for a discussion of the degree of performance based university funding in 11 OECD-countries).

A very crude use of performance indicators are the so-called 'league tables' in which institutions are listed based on raw, unadjusted data. However, there is a general consensus that institutions

cannot be held responsible for elements influencing their performance that are beyond their control and, thus, that rankings based on raw, unadjusted data are not desirable. This means that certain factors should be taken into account before any meaningful comparison can be made, results need to be contextualized.

Together with their introduction, the use of performance indicators has always been controversial and a source for debate (e.g. Jones, 2000). In this debate some limitations of the use of performance indicators arise and next to the intended effects as mentioned above some unintended effects surface when performance indicators are applied (Visscher et al., 2000). One general criticism was expressed by Goldstein and Myers (1996) pointing to the general misconception that the use of any information on performance is often perceived to be better than no information. However, it is crucial to be aware of the problems that can be related to the presentation of the information, the limitations and the risks involved. One should be aware of the implications of providing the information and should avoid misinterpretations by carefully pointing to caveats. We will now more specifically discuss some of the risks and limitations related to the use of performance indicators.

If the applied methodology or the data used are fundamentally flawed, institutional damage can be caused by incorrect inferences about the performance. Moreover, inevitably, if rankings are made, adjusted or not, there will be 'winners' and 'losers'. A process of 'naming and shaming' might be triggered, reinforcing and enhancing the resulting ranking of institutions and making it very difficult for the 'losers' to improve their position and performance (Rowe, 2000). Among the unintended effects are also a focus of the educational institutions on the educational aspects that are captured by the performance indicators, and, consequently, possible neglect of other aspects.

Certain limitations can be considered to be inherent to the use of performance indicators (Goldstein & Myers, 1996). First of all, results are always based on the performance of a prior group of students and, thus, it might be possible that the current state of the educational institution might be different from the reported one. Second, the statistical procedures used (i.e. for the adjustments for background characteristics) only deliver estimates within a certain margin of error. As a result there is always some uncertainty about the exact position of the institution. Finally, there might be relevant, external factors that are not taken into account when estimating the performances. The absence of these factors will distort the estimation and the comparisons being made.

Because of these limitations of and risks to the use of performance indicators some principles should be applied in presenting the results on performance indicators (Goldstein & Myers, 1996;

Rowe, 2000). The first principle is that of *contextualization*. Fair comparisons can only be made if the appropriate adjustments are made for external/contextual factors (e.g. characteristics of the inflowing students). A second principle pertains to the inherent *uncertainty* of the results. There is a need for interval estimation for the results in which this uncertainty is explicitly displayed. Thirdly, results should be presented for *multiple indicators* to avoid unwanted concentration on one aspect of performance. A fourth principle applies when institutions can be identified in the presentation of the results and states that there should be the possibility of *institutional response* to their results. The first three principles will be explicitly applied in the current paper. Because of the absence of the identification of individual universities the fourth principle is redundant.

Research on labor market outcomes and (higher) education

A study of Gangl (2000) focuses on the entry in the labor market across Europe. He studied cross-national differences in entering the labor market for 12 European countries, based on 1992-1997 data from the Labor Force Survey. Using multilevel analysis it became possible to address microlevel and macrolevel aspects concurrently, rather than strictly focusing on macrolevel factors. The study showed that, controlling for differing economic contexts for the countries, institutional differences, both with regard to education and labor market, between countries play a crucial role in the cross-national differences in labor market entry. However, the focus of the study lies on the country level determinants of labor market opportunities. Other studies investigate the impact of the educational institutions on the labor market position of their graduates and will be discussed in the remainder of the section.

Bosker, van der Velden and van de Loo (1997) look at the effects of colleges for higher vocational education on the labor market opportunities of their students in the Netherlands. They investigate more specifically the impact on unemployment, the level of employment, hourly wage and monthly wage. Applying multilevel modeling their results show that colleges hardly differ in the labor market characteristics of their graduates. Also, the labor market performance of the colleges change considerably once input variables are taken into account. McGuinnes (2003) studied the impact of university quality on the labor market outcomes for a cohort of UK graduates. Again results indicated that the labor market position of graduates only depended to a limited extent on the university attended. Both studies did, however, indicate that field of study showed to be an important determinant of labor market success of the graduates. Naylor, Smith and McKnight (2002) investigated results regarding the earnings of graduates for UK universities, based on 1993 data. They did find an impact of the university on the earnings but again it was shown that there was a substantial difference between adjusted (contextualized) and unadjusted

university results. The dependent variable in this case, however, was not the individually reported earnings but an average earning that was linked to an occupation, thus reducing the variance at the level of the individual respondent. Several recent studies treated the relationship between universities and labor market outcomes in Italy (Biggeri, Bini & Grilli, 2001; Brunello & Capellari, 2005; Di Pietro & Cutillo, 2006).

Context: Italian university structure

Before the Bologna-reform of higher education, the structure of education in universities in Italy was mainly based on one level. A university offered the qualification of *Laurea*, whose duration varied across fields of study but was at least four years. By the end of the 1980's so-called '*Diplomi Universitari*' were introduced with a duration of three years to respond to an increasing demand for shorter studies. However, the proportion of students enrolled in the latter courses was limited because they were only offered in a limited number of fields of study and the diploma was hardly recognized when someone wanted to pursue another degree afterwards. After the Bologna reform a uniform three-cycle system was introduced. In Italy this reform came into effect in the academic year 2001/2002. In addition, a national credit system was introduced together with diploma supplement certification. Also, a national committee in charge of the evaluation and accreditation of the university system was formed. Finally, the reform increased the autonomy of the universities and, consequently, there is greater issue of accountability for the universities.

Data

The ISTAT-survey

The data for this study stem from a survey executed by the Italian National Statistical Institute (ISTAT) in 2004. This survey targeted respondents that graduated from an Italian University in 2001. This group of students graduated in the pre-Bologna reform university structure. The focus of the survey lies on the labor market experiences of the respondents during the three years following their graduation from university. The survey contains extensive information on demographic characteristics of the respondents as well as the educational background and information on the family background of the respondent. The survey was carried out using a computer-assisted telephone interview.

Sample

The target population for this survey consisted of 155.664 students that graduated from an Italian university in 2001. The sampling procedure used stratification for gender, university and field of

study (*corso di laurea*). Resulting from a response rate of 67.6 of an initial sample of about 39.000 students, in the end 26.006 students participated in the survey, representing about 16% of the targeted population.

Method

Because of the grouping structure in the data it is necessary to take this structure into account when performing the analyses. There are two possible approaches to dealing with such multilevel data using either models with fixed coefficients or models with random coefficients (Snijders & Bosker, 1999). The choice between these approaches can be based on several grounds (for a discussion see Snijders & Bosker (1999)), but an important aspect is whether the considered groups can be regarded as a sample from a population in which case a random coefficients model is appropriate. Given the research goal of the present paper this seems to be an appropriate approach. The models were estimated using the MLwiN-software (Rasbash, Steele, Browne & Prosser, 2004).

The analyses were performed stepwise (Van Damme et al., 2002). The starting point was a model with a random intercept without any explanatory variables. This is referred to as the empty model. In this model the total variance in the data is partitioned into a variance component for each level of the data. In this case three variance components will be distinguished: one pertaining to the university level, one to the faculty level and, finally, one level that refers to the individual respondents. In a next step explanatory variables will be included into the model. First, we will include field of study, then region and finally all remaining explanatory variables are added to the model. These analyses will allow us to identify the relevant variables.

The applied model can be described as follows for respondent *i* of faculty *j* in university *k*:

$$y_{ijk} = \beta_{0jk} + \beta_1 x_{ijk} + \varepsilon_{ijk} \qquad (1)$$

$$\beta_{0jk} = \beta_0 + \mu_{0jk} + \nu_{0k} \qquad (2)$$

where

$\nu_{0k} \sim N(0,\sigma^2_{\nu 0})$ = university level variance

$\mu_{0jk} \sim N(0,\sigma^2_{\mu 0})$ = faculty level variance

$\varepsilon_{ijk} \sim N(0,\sigma^2_{\varepsilon})$ = individual level variance

Note that in the empty model no explanatory variables are included and, as a consequence, the model simplifies to

$$y_{ijk} = \beta_{0jk} + \varepsilon_{ijk} \qquad (3)$$

and the variances can be used to partition the variability in the data.

This approach will enable us to see which variables play an important role in the labor-market situation of someone who recently graduated from university and where the main determinants should be situated: at the level of the individual, the faculty or the university? In other words, to what extent does the university have an impact on the labor market position of its graduates?

Variables

Dependent variables

First, the job opportunities of the graduates will be studied. This is done by using a dependent variable that distinguishes three groups in the graduates: respondents that are pursuing further studies, respondents that are unemployed and, finally, graduates that are employed at the time of the survey.

A second part of the analyses focuses on wage as the dependent variable. First, the equations are estimated for the hourly wage calculated based on the available data in the survey. The respondents reported their monthly salary together with the number of hours paid work they perform each week. As an approximation for the hourly wage the monthly salary was divided by four times the number of hours of paid work per week. In a next step the natural logarithm of this hourly wage was taken and included as the dependent variable (Wooldridge, 2003). Secondly, the monthly salary was used as a dependent variable. The monthly wage reflects the actual income of the respondent and in that way reflects more accurately the actual financial situation. This means that the results for the monthly wage provide an important complementary picture to the results for the hourly wage.

Both results will be discussed separately, first focusing on the employment status and then followed by the results on the wage level.

Explanatory variables

The available and relevant variables from the survey could be classified in four groups. A first group of variables refers to the educational background of the respondent. The second group of variables concerns the labor background. The third group describes demographic variables for the

respondent and, finally, a group of variables pertains to the family background of the graduate. The variables will be discussed likewise.

Educational background respondent

A first group of variables pertained to the educational background of the respondent. Regarding the secondary education of the respondent information was available on the field of study and the result obtained when graduating from secondary school, the so-called *maturità*. The field of study was recoded in four groups: vocational, technical, general and other. The results for secondary school were expressed as a variable with a maximum score of 60.

A second group of variables described the course of the university studies for each respondent. Information was available whether respondents finished their studies within due time and, if not, how many years longer it took them. It was also asked if the respondent already had obtained another degree before ('*laurea*' or '*university diploma*'). The result obtained when graduated was also known as a six-category ordinal variable. Additionally, it was registered if someone graduated '*cum laude*'. Other information pertained to the attendance of classes (four categories), if the respondent had interrupted a study before and if the university was at the same place as where the student lived.

Labor background respondent

Two variables were included into the analyses that referred to the labor background of the respondent. First, it was considered to be relevant to take into account of the fact that the respondent was working during its studies, let it be occasional work or a continuous job. Second, it was included whether or not someone took the national exam ('*abilitazione professionale*') that is mandatory to be allowed to perform a professional activity as a self-employed worker.

Demographic variables

Some demographic information on the respondent was included. The gender of the respondent was included, whether someone had the Italian nationality, whether someone had children and the marital status. The latter variable consisted of four categories: single, living together/married, separated/divorced, widowed. Also the current region of residence of the respondent was included. This variable was recoded distinguishing five regions within Italy (North-west, North-east, Central, South, Islands).

Family background

The information on the family background that was included pertained primarily to the educational and occupational status of both parents. For both variables the respondents were asked to report on the status of the parents when the respondent was 14 years old. For the educational status a distinction in six categories was made: no degree, primary school degree, lower secondary education, higher secondary education, university degree and, finally, a '*laurea*' or doctoral degree. For the occupational status of the father five categories were used: employed, looking for a job, pensioned, deceased or other condition. For the mother a sixth category was added: housewife. Additionally, information on the fact if someone was a single child was used.

Results employment status

Sample

For the employment status analyses the sample size was reduced because of missing data for some variables of interest. For 332 respondents their labor-situation was unknown. Apart from this group, an additional group of respondents had to be excluded because of missing data on the relevant background variables. The final sample included in the current analyses consisted of 24074 respondents. These respondents were grouped in 490 faculty/university combinations and 68 universities.

In this sample 19.72% of the respondents were still students at the time of the survey, 9.65% were unemployed and 70.63% employed. This illustrates that to get a more complete picture of the employment status of the graduates it is important to not only focus on the distinction employed-unemployed but to include the comparison to pursuing further studies simultaneously in the analysis. Before presenting the results of the analyses, we will first discuss the descriptive statistics for the current sample. The discussion will focus on the composition of the group of graduates with regard to the explanatory variables. The raw data for the labor market position are provided as well but it is important to be aware that these are data without any other factor taken into account.

Educational background respondent

Students graduating from university mostly got a secondary school degree from general education and only a limited group had a vocational degree. One of the striking elements in the data about the educational background of the respondents is that about three quarters of the students do not finish their tertiary degree within the foreseen number of years ('*fuori corso*'). Moreover, it takes these students on average more than two years longer to finish the degree. Only a limited group of students obtained another academic degree before the *laurea*.

Table 1 *Descriptive statistics employment position graduates (educational background)*

		Educational background		
	N=24074	Student	Unemployed	Employed
Secondary school type				
General school	64.68%	24.73%	9.21%	66.06%
Technical school	26.32%	10.84%	9.48%	79.67%
Vocational school	3.26%	12.24%	11.73%	76.02%
Other type	5.74%	8.24%	14.24%	77.51%
Result secondary education	49.41	51.35	48.31	49.02
Finished course				
In time	26.52%	28.84%	6.16%	65.01%
Longer	73.48%	16.43%	10.92%	72.66%
How many years?	2.55	2.29	2.74	2.58
Other degree?				
No	96.01%	20.27%	9.75%	69.97%
Laurea	0.54%	16.28%	8.53%	75.19%
Diplome Univ.	3.46%	4.81%	7.09%	88.10%
Graduation result				
Cat_1	0.17%	2.44%	7.32%	90.24%
Cat_2	3.29%	7.96%	10.49%	81.54%
Cat_3	7.94%	11.51%	10.47%	78.02%
Cat_4	12.86%	10.69%	10.09%	78.62%
Cat_5	42.44%	16.93%	10.24%	72.83%
Cat_6	33.31%	29.96%	8.24%	61.80%
Cum laude	23.91%	33.45%	7.66%	58.89%
Attendance				
Never	5.36%	8.91%	10.85%	80.23%
Sometimes	20.00%	12.32%	13.05%	74.64%
Regular	51.24%	14.32%	10.12%	75.56%
Mandatory	23.40%	40.33%	5.47%	54.21%
Interrupted study				
No	88.11%	20.66%	9.71%	69.63%
Si	11.89%	12.75%	9.26%	78.00%
University same place				
No	62.36%	18.56%	10.12%	71.32%
Si	37.64%	21.64%	8.88%	69.48%

About a quarter of the students graduated cum laude. Most students regularly attended classes, while for somewhat less than a quarter of the students classes were mandatory. The vast majority

did not interrupt another study before. About two thirds graduated from a university that was not located in the place they lived.

Labor background respondent

About half of the students carried out an occasional job during their studies and about 40% did not have any job during that time. A substantial group of 14% had a continuous job while being a student. About half of the graduates took the national exam for professional qualification.

Table 2 *Descriptive statistics employment position graduates (labor background)*

		Labor background		
	N=24074	Student	Unemployed	Employed
Working during studies				
No	38.53%	31.19%	11.83%	56.98%
Occasional work	47.39%	14.78%	9.36%	75.86%
Continuous work	14.09%	4.95%	4.69%	90.63%
Exam professional qual.				
No	51.13%	12.41%	12.34%	75.25%
Si	48.87%	27.37%	6.84%	65.79%

Demographic variables

The sample consisted of a slightly higher number of females than males. A very limited number of the respondents did not have the Italian nationality. The vast majority did not have a family yet at the time of the survey.

Table 3 *Descriptive statistics employment position graduates (demographic variables)*

		Demographic variables		
	N=24074	Student	Unemployed	Employed
Gender				
Male	48.14%	17.80%	3.69%	75.51%
Female	51.86%	21.50%	12.41%	66.10%
Italian nationality				
No	0.34%	24.69%	9.88%	65.43%
Si	99.66%	19.70%	9.65%	70.65%
Children				
No	89.33%	20.82%	8.83%	70.36%
Si	10.67%	10.51%	16.59%	72.90%
Marital status				

Single	71.64%	22.05%	9.19%	68.77%
Married/living together	28.23%	14.17%	10.86%	74.97%
Separated/divorced	0.67%	8.07%	7.45%	84.47%
Widowed	0.06%	0.00%	21.43%	78.57%
Region				
North-west	27.51%	15.34%	5.10%	79.55%
North-east	19.94%	16.90%	6.17%	76.94%
Central	23.96%	20.61%	8.93%	70.46%
South	19.61%	24.49%	17.92%	57.58%
Islands	8.98%	26.58%	15.21%	58.21%

Family background

Somewhat over half of the fathers finished at least upper-secondary education, but a considerable group only finished primary education or did not have any degree. A comparable pattern is found for the mother, with a lower number of university degrees. With regard to the occupational status of the father, almost all of the graduates' fathers were employed when the graduate was 14. With regard to the mother's occupational status about half of them was employed and almost all the others were housewives. The majority of the graduates was not a single child.

Table 4 *Descriptive statistics employment position graduates (family background)*

		Family background		
	N=24074	Student	Unemployed	Employed
Educational status father				
No degree	0.78%	8.02%	16.58%	75.40%
Primary education	15.41%	14.18%	11.08%	74.74%
Lower-secondary education	24.87%	16.47%	10.10%	73.43%
Upper-secondary education	34.32%	17.92%	9.03%	73.05%
Diplome univ.	0.74%	23.16%	7.34%	69.49%
Laurea or PhD	23.89%	29.54%	9.01%	61.45%
Educational status mother				
No degree	0.97%	12.88%	21.89%	65.24%
Primary education	19.43%	14.45%	11.27%	74.28%
Lower-secondary education	27.69%	16.50%	9.24%	74.26%
Upper-secondary education	35.07%	20.58%	9.52%	69.90%
Diplome univ.	1.48%	23.25%	11.20%	65.55%
Laurea or PhD	15.36%	30.32%	7.74%	61.94%
Occupational status father				
Employed	96.19%	19.77%	9.61%	70.62%
Looking for a job	0.45%	17.43%	18.35%	64.22%

Pensioned	1.75%	17.77%	9.24%	72.99%
Deceased	1.46%	18.18%	9.38%	72.44%
Other condition	0.15%	31.43%	20.00%	48.57%
Occupational status mother				
Looking for a job	0.48%	13.91%	12.17%	73.91%
Pensioned	2.76%	24.40%	7.83%	67.77%
Deceased	0.41%	12.24%	8.16%	79.59%
Employed	51.30%	21.20%	8.87%	69.94%
Housewife	44.96%	17.88%	10.66%	71.46%
Other condition	0.09%	18.18%	4.55%	77.27%
Single child				
No	84.25%	19.72%	10.00%	70.28%
Si	15.75%	19.73%	7.81%	72.47%

Field of study

Medicine, engineering and economics-statistics are by far the fields with the highest number of graduates. Psychology and physiotherapy only deliver a small number of graduates. Note that over 60% of the medicine graduates pursue further studies, while on the other hand almost none of the graduates in teaching and physiotherapy continue to be a student.

Table 5 *Descriptive statistics employment position graduates (field of study)*

		Field of study		
	N=24074	Student	Unemployed	Employed
Science	4.96%	18.91%	10.29%	70.79%
Chemistry-pharmaceutics	5.16%	14.64%	4.51%	80.85%
Geology-biology	4.80%	21.97%	11.07%	66.96%
Medicine	16.62%	61.49%	3.32%	35.18%
Engineering	14.18%	6.15%	4.34%	89.51%
Architecture	4.59%	5.06%	10.13%	84.81%
Agricultural engineering	3.73%	12.60%	11.48%	75.92%
Economics-statistics	14.08%	11.00%	9.44%	79.56%
Political-social sciences	5.09%	4.49%	10.20%	85.31%
Law	9.25%	24.53%	19.05%	56.42%
Literature	5.87%	9.84%	19.69%	70.47%
Linguistics	3.38%	3.94%	18.45%	77.61%
Teaching	3.60%	2.77%	13.28%	83.95%
Psychology	2.28%	10.93%	12.02%	77.05%
Education-physics	2.41%	2.76%	7.41%	89.83%

Multinomial logistic model

If the studied dependent variable is categorical, in the multilevel equation a logistic link function, instead of the usual linear link function, will be used. More specifically a multinomial logistic model will be applied, since the dependent variable consists of three unordered categories (employed, student, unemployed). As with dummy-coded independent variables one of the categories will be chosen as a reference. This means that the resulting parameters will refer to the effect of a 1-unit increase of the variable on the log-odds of being in this specific category rather than in the reference category. It might be easier to interpret the exponential of the parameter that refers to the multiplicative effect of 1-unit increase on the odds of being in a specific category rather than the reference category.

In the current analyses 'employed' will be used as a reference category. The analyses were performed in several steps. In a first step an empty model was estimated to identify what contribution each level makes to the total variability. Some specific problems rise for the evaluation of significance of variance components in the case of logistic models.

Estimation in the case of multinomial logistic models is done using quasi-likelihood methods (see Rasbash, et al., 2004, for more detailed information on the estimation procedures). This renders the likelihood value unreliable and, hence, a likelihood ratio test is unavailable to compare models. An alternative is to use a Wald-test (compare the variance parameters to the standard error), but this test is approximate because variance parameters are not normally distributed.

In logistic models the level 1-variance is not estimated because it is function of the explanatory variables included in the model. For instance, if y_{ijk} is a binary variable the variance equals π_{ijk} (1-π_{ijk}), where π_{ijk} differs depending on the value of the explanatory variables. As a solution to this issue the distribution for ε_{ijk} was chosen to be logistic with a variance of $\pi^2/3 \approx 3.29$. As a consequence, the variance at the higher levels can be computed using 3.29 as the variance component for the first level, i.e. the respondent.

In later models explanatory variables were added and it was investigated what the impact on the observed variability was.

By applying the multinomial model the equation that compares the probability of being a student to the probability of being employed and the equation that compares the probability of being unemployed to being employed are estimated jointly. The results for both comparisons will be reported in separate columns of the tables, but it is important to be aware that they were always modeled simultaneously.

Empty model: identifying the variance components

For the part of the analysis that referred to the probability of being a student none of the variability could be attributed to the university level. So, there was no overall effect of the university on this. On the other hand 34.5% of the variance was situated at the faculty level. This means that the majority of the variability was related to characteristics of the individual respondents (65.5%), but a considerable amount was related to the faculty.

Regarding the probability of being unemployed there was both a significant variance at the university level as the faculty level. In both cases about 9% of the variance could be situated at that level.

Table 6 *Empty model employment position graduates*

Parameter	Student		Unemployment	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	-1.861	0.062	-2.081	0.087
RANDOM				
University	0.000	0.000	0.368	0.086
Faculty	1.442	0.117	0.378	0.048
Respondent	n/a	n/a	n/a	n/a

Because of the joint estimation of the equations for ‘student’ and ‘unemployment’ it is possible to estimate the covariance between the residuals at the faculty level. This covariance was 0.229 with a standard error of 0.56. Faculties with a higher number of graduates that are still students tend to have a slightly higher number of unemployed graduates.

Taking into account field of study

As field of study plays an important role in the job opportunities and also is related to different traditions of prolonged study, it was thought useful to look at the variance components when this variable is controlled for. In fact, field of study is probably responsible for a large amount of the variability at the faculty level, so, by including it in the equation it can be seen how much of this variability remains.

As expected, including field of study had a considerable impact on the variance components. For the ‘student’-part of the equation the variability at the faculty level has decreased by 87% and for ‘unemployment’ no variance at the faculty level remained. There has been a small increase in the

variance at the university level though, which can be attributed to the fact that the level-1 variance is dependent on the variables included in the equation.

Table 7 *Model employment position graduates including field of study*

Parameter	Student		Unemployment	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	-1.337	0.108	-1.980	0.128
RANDOM				
University	0.000	0.000	0.405	0.079
Faculty	0.187	0.026	0.000	0.000
Respondent	n/a	n/a	n/a	n/a

After controlling for the field of study of the variability in the probability of being a student 5.4% could be situated at the faculty level. For being unemployed, 11% of the variability was related to the university. No covariance between the residuals at the faculty level was estimated because all faculty variance for unemployment was captured by the field of study.

Explaining the variance: region

As region is a crucial determinant in the labor market opportunities, it was included in the equation separately to investigate the impact on the remaining variability. Region was included using four dummies and the North-West as a reference.

Table 8 *Model employment position graduates including field of study and region*

Parameter	Student		Unemployment	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	-1.706	0.109	-2.615	0.120
RANDOM				
University	0.000	0.000	0.043	0.014
Faculty	0.122	0.020	0.000	0.000
Respondent	n/a	n/a	n/a	n/a

Including region further reduces the variance at the faculty level in being a student. Another additional 35% of the variance was captured by regional characteristics. By including field of study and region into the equation less 10% of the original variance at the faculty level remains.

The faculty still has some impact on the probability of being a student compared to being employed, but it is limited to about 3.5% of the total variance.

With regard to unemployment about 90% of the variance at the university level could be explained by the current region of residence of the respondent. As a consequence, very limited variability in unemployment at the level of the university is left (somewhat over 1%), after region is controlled for.

The main determinants for the labor market position of the Italian graduate with regard to the employment/unemployment/student distinction seem to be, next to characteristics of the graduate, the specific characteristics of the field of study and the region. In a subsequent analysis it will be investigated which characteristics of the graduates have an effect on their labor market position.

Explaining the variance: respondent characteristics

Consequently the respondent characteristics regarding the educational, labor and family background, together with some demographic information were included in the equation. The data on the obtained result in secondary education was centered on its mean.

Table 9 *Full model employment position graduates*

Parameter	Student		Unemployment	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	-3.279	1.093	-2.145	0.768
RANDOM				
University	0.000	0.000	0.026	0.011
Faculty	0.116	0.020	0.000	0.000
Respondent	n/a	n/a	n/a	n/a

Because of differential composition of faculties and universities for these individual level variables they can also explain some of the variance at higher levels. The variance at the faculty level is slightly reduced for ‘student’, the university level variance for unemployment diminished even further and in this model this variance is almost non-existing.

Educational background respondent

With regard to the comparison being unemployed or employed the impact of the educational background appears to be rather limited. The two most important factors are the result that was obtained in secondary education and the number of years it took longer than the foreseen time to

finish the degree. A bit counterintuitive might be the positive impact of an interrupted study for the employment probability. This, however, might be hypothesized to be partially attributable to a higher age of these respondents, which, in its turn, might be related to a bigger need for employment. Also school type had some impact on the employment status of the graduate.

Table 10 *Parameter estimates model employment position graduates (educational background)*

Parameter	Educational background			
	Student		Unemployed	
	Estimate	S.E.	Estimate	S.E.
Secondary school type				
General school	0.582***	0.128	-0.202	0.125
Technical school	0.387**	0.133	-0.229	0.128
Other type	0.243	0.168	-0.331*	0.147
Result secondary education	0.011***	0.003	-0.011**	0.004
Finished course				
Longer	-0.305***	0.066	0.017	0.087
How many years?	-0.062**	0.022	0.098***	0.024
Other degree?				
Laurea	0.506	0.260	0.199	0.318
Diplome Univ.	-0.487**	0.188	-0.247	0.160
Graduation result				
Cat_2	0.875	1.043	0.447	0.656
Cat_3	1.198	1.037	0.359	0.649
Cat_4	1.049	1.036	0.446	0.647
Cat_5	1.405	1.035	0.438	0.646
Cat_6	1.574	1.036	0.416	0.650
Cum laude	0.411***	0.072	-0.094	0.092
Attendance				
Never	-0.194	0.115	-0.141	0.106
Sometimes	-0.056	0.060	0.059	0.059
Mandatory	-0.180**	0.063	-0.066	0.083
Interrupted study	-0.599***	0.070	-0.205**	0.075
University same place	-0.142***	0.041	-0.036	0.050

In general, the educational background seems to have a larger impact on the probability of being a student than it has on the probability of being unemployed. For instance, graduating *cum laude* in this case becomes highly significant. Also school type now clearly has an effect with people from general and technical education having a higher probability to pursue further studies than people with a vocational secondary education. Having interrupted a study before has a negative impact on the chances of being a student, as for people who already obtained a 'diploma

universitario'. Although the former one can also be considered as a selection criterion for further studies, both results can also indicate that having spent already a considerable number of years as a student reduces the willingness or possibility (because of lack of financial resources) to continue studying. A similar interpretation can be made for the results pertaining to the time spent to finish the degree. This concurrently can be resulting from it being used as a selection criterion, but from 'study fatigue' as well.

Labor background respondent

Table 11 *Parameter estimates model employment position graduates (labor background)*

Parameter	Labor background			
	Student		Unemployed	
	Estimate	S.E.	Estimate	S.E.
Working during studies				
Occasional work	-0.404***	0.043	-0.580***	0.051
Continuous work	-1.163***	0.093	-1.676***	0.100
Exam professional qual.	-0.423***	0.068	-0.193**	0.069

Labor background does seem to have a considerable impact on the labor market position of the graduate. The included variables at the same time reduce the probability of prolonging studies and the probability of being unemployed. This effect is, not unexpectedly, very clear for graduates who had a continuous job at the time of graduation. It also makes sense that the graduates who took the national exam for professional qualification are less likely to continue to be a student and are more likely to be employed. For occasional work there is also a clear effect, but interpretation is less straightforward. Maybe this result can be attributed to a less financially favorable background that forces them to do occasional work during their studies, but at the same time forces them to enter labor market as soon as possible instead of pursuing further studies.

Demographic variables

Demographic variables seem to have a considerable impact on the labor market position of the graduates. Female graduates have at the same time a higher probability of being a student and being unemployed, implying that three years after graduation a considerably smaller group of females will have entered the labor market. Nationality on the other hand does not have an impact, but non-Italians are a very small group, which is reflected in the large standard error. Having a family or not is clearly reflected in the occupational position. Having a child decreased the probability of being a student, but at the same time increased the probability of being unemployed. Being married or living together on the other hand also decreases the chances of

being a student, but also results in a lower probability of being unemployed. The same goes for being separated or divorced. These results might partially be attributed to the higher age of this group of people.

Table 12 *Parameter estimates model employment position graduates (demographic variables)*

Parameter	Demographic variables			
	Student		Unemployed	
	Estimate	S.E.	Estimate	S.E.
Female	0.208***	0.042	0.497***	0.053
Italian nationality	0.087	0.312	-0.694	0.374
Children	-0.189*	0.087	0.796***	0.081
Marital status				
Married/living together	-0.246***	0.053	-0.176**	0.064
Separated/divorced	-0.684*	0.337	-0.712*	0.323
Widowed	-	-	0.324	0.711
Region				
North-east	0.200**	0.077	0.174	0.098
Central	0.393***	0.074	0.623***	0.089
South	0.807***	0.075	1.311***	0.085
Islands	0.604***	0.096	1.181***	0.110

With regard to the current region of residence a clear pattern raises with the more southern regions having a higher probability of unemployment but at the same time a higher number of students. One might hypothesize from this result that university graduates, because of the low employment prospects, decide to invest in further studies and postpone the actual entry into the labor market.

Family background

In general the family background has a very limited impact on the probability of being a student. If the father had no degree when the respondent was 14, there is a lower chance of being a student. However, this pertains to a very small group of the respondents. The same goes for the positive effect of the group 'other condition' with respect to the occupational status of the father. There is a minor positive effect when the father obtained a *laurea* or a PhD, which is the case for a considerable part of the respondents.

Also for unemployment the impact of the family background is limited. There is a clear negative effect if the mother has no degree on the employment probability of the respondent, but again this

is only the case for a limited number of the respondents. Strangely enough, a *laurea* or PhD for the father results in a higher probability of being unemployed.

Table 13 *Parameter estimates model employment position graduates (family background)*

Parameter	Family background			
	Student		Unemployed	
	Estimate	S.E.	Estimate	S.E.
Educational status father				
No degree	-0.763*	0.339	-0.026	0.252
Primary education	0.008	0.078	0.042	0.085
Lower-secondary education	0.065	0.058	0.057	0.067
Diplome univ.	0.282	0.229	-0.230	0.318
Laurea or PhD	0.124*	0.055	0.205**	0.069
Educational status mother				
No degree	0.437	0.250	0.848***	0.209
Primary education	0.054	0.075	0.093	0.084
Lower-secondary education	0.078	0.058	0.001	0.068
Diplome univ.	-0.033	0.161	0.357	0.188
Laurea or PhD	0.108	0.061	-0.146	0.082
Occupational status father				
Looking for a job	0.089	0.296	0.512	0.267
Pensioned	-0.036	0.153	-0.243	0.178
Deceased	0.092	0.163	-0.014	0.193
Other condition	1.104*	0.431	0.701	0.466
Occupational status mother				
Looking for a job	-0.370	0.314	-0.011	0.301
Pensioned	0.189	0.117	0.041	0.157
Deceased	-0.564	0.355	-0.197	0.403
Employed	0.010	0.045	-0.028	0.053
Other condition	0.593	0.627	-1.069	1.055
Single child	-0.005	0.055	-0.012	0.070

Field of study

The results for field of study show that clearly graduates in medicine have a much higher probability of pursuing further studies. To a lesser extent this is also the case for graduates from law. In linguistics, teaching, and political sciences the chances of the respondents being a student three years after graduation are considerably lower. Graduates in engineering and chemistry-pharmaceutics show a lower probability of being unemployed. An opposite result is found for law and literature graduates. However, overall the differences between fields of study when

comparing employment to unemployment are less prevalent than when comparing employment to pursuing further studies.

Table 14 *Parameter estimates model employment position graduates (field of study)*

Parameter	Field of study			
	Student		Unemployed	
	Estimate	S.E.	Estimate	S.E.
Chemistry-pharmaceutics	-0.066	0.157	-0.937***	0.182
Geology-biology	0.314*	0.141	0.149	0.144
Medicine	2.233***	0.145	-0.328*	0.160
Engineering	-1.063***	0.150	-0.842***	0.144
Architecture	-1.117***	0.207	-0.081	0.157
Agricultural engineering	-0.141	0.168	0.167	0.156
Economics-statistics	-0.506***	0.128	-0.233	0.120
Political-social sciences	-1.337***	0.189	0.015	0.144
Law	0.715***	0.127	0.689***	0.119
Literature	-0.626***	0.151	0.664***	0.128
Linguistics	-1.675***	0.220	0.449**	0.142
Teaching	-1.770***	0.253	0.113	0.158
Psychology	-0.028	0.219	0.469*	0.183
Education-physics	-1.140***	0.342	0.257	0.233

In Table 14 all fields of study can be compared to the occupational status for science graduates, but it is also valuable to make the pairwise comparison for all the other fields of study. To do so these results are plotted by constructing for each field of study a confidence interval around the estimated parameter. By checking the overlap of the confidence intervals one can evaluate statistical significance. If the intervals overlap the difference is not significant, if there is no overlap between the intervals the fields of study do differ significantly. To test the difference between two fields of study at the .05-level, confidence intervals need to be constructed by multiplying the standard error by 1.39 (Goldstein & Healy, 1995)[1] and not the commonly used 95% confidence interval calculated multiplying the standard error by 1.96.

[1] "It is a common statistical misconception to suppose that two quantities whose 95% confidence intervals just fail to overlap are significantly different at the 5% significance level." (Goldstein & Healy, 1995, p.175)

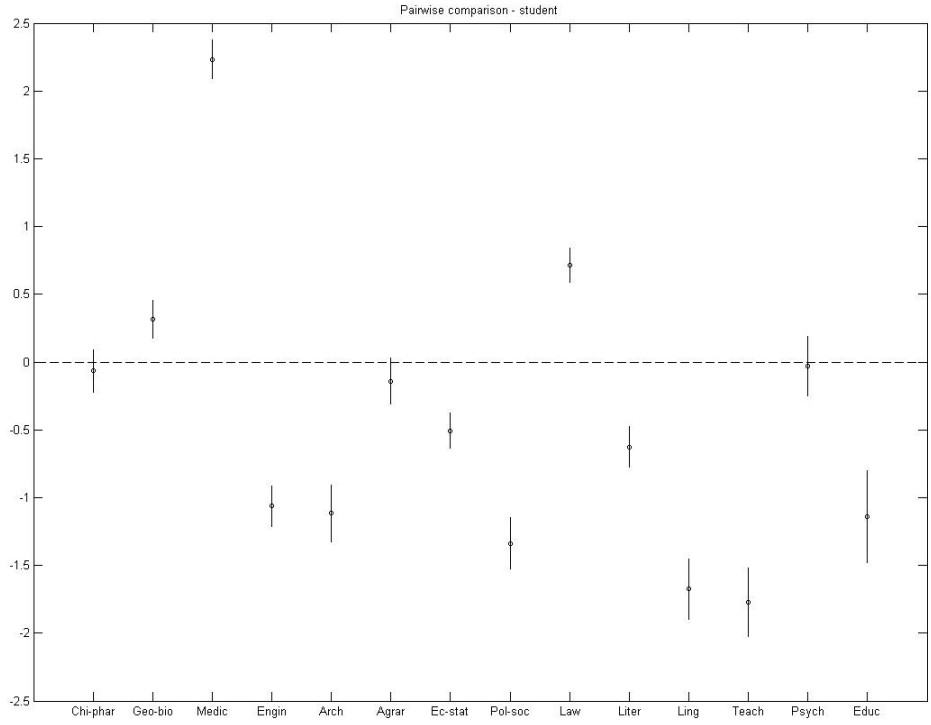

Figure 1: Pairwise comparison fields of study: employment-student

These pairwise comparisons are plotted in Figure 1 for the comparison employment-study and Figure 2 for the comparison employment-unemployment. The result for science is reflected in the intercept and is indicated as a dashed line.

In Figure 1 the exceptional position of medicine is clearly illustrated. All the other fields are situated more closely together, but still some considerable differences can be observed. With regard to unemployment Figure 2 clearly illustrates the good performance of graduates from engineering and chemistry/pharmaceutics. They outperform all other fields when it comes to the number of unemployed students three years after graduation. In this plot the performance of medicine graduates is less extreme but still very good as most other fields show a significantly higher unemployment probability.

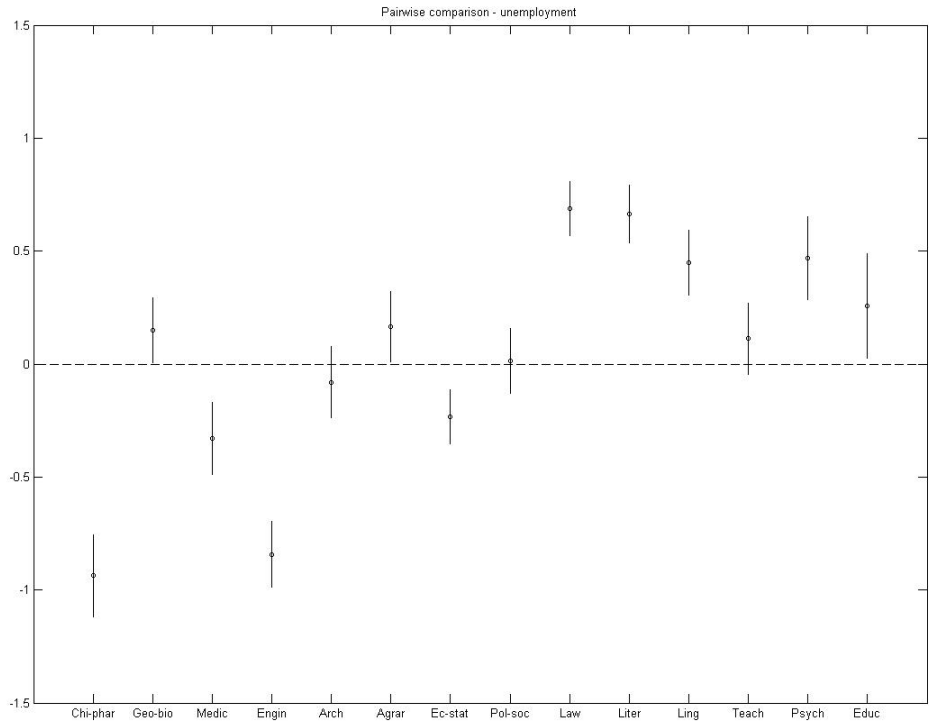

Figure 2: Pairwise comparison fields of study: employment-unemployment

Results wages

This section of the paper concentrates on the results for the wage level, both the hourly wage and the monthly wage. Results will be discussed simultaneously for both variables. Before discussing the results of the analyses, the composition of the sample for the included variables will be discussed.

Sample

For the present analyses the sample size was reduced because of the exclusion of certain groups of respondents and because of missing data for variables of interest. A large part of respondents was excluded because of the fact that they were either not employed at the time of the survey (7489) or only have a seasonal or occasional job (1933). For this group no data on the salary is available. Additionally, for 332 respondents their labor-situation was unknown. Moreover, 1326 respondents do indicate that they perform paid working hours, but do not report a monthly salary and where thus also excluded from the sample. This exclusion resulted in a reduced sample of 14926 respondents for which data on the salary was available. Apart from this group, an

additional group of respondents had to be excluded because of missing data on the relevant background variables. The final sample included in the current analyses consisted of 13979 respondents. These respondents were grouped in 487 faculty/university combinations and 67 universities.

Descriptive statistics

The following tables (15-19) present the composition of the sample for the current analyses together with the average hourly wage and the average monthly wage. Again these averages can provide some idea of where the main differences lie, but one should be aware that these are raw results in which none of the possibly crucial determinants are taken into account. Also, the composition of the sample changes for some aspects because of the differing probability of being employed for certain groups of respondents. For instance, the proportion of students graduating from medicine is much smaller in this sample, as more of these graduates pursue further studies and as a consequence do not receive a salary.

Empty model: identifying the variance components

The empty model without any explanatory variable provides us with information on the partitioning of the variability in the data over the different levels of the grouping structure. In the present case it allows to see how much of the variability in the wages can be attributed to the universities, the faculties within the universities or the individual respondents.

The first model that was estimated included three levels in accordance with the data structure. This model resulted in a zero variance for the university level for the hourly wage. Because the default setting in MLwiN is to replace negative variance with a zero variance, it might be worthwhile to allow a negative variance at this level to check what the actual value of this variance is. This revealed that there was a very small negative variance detected at this level. The observation of a small negative variance is considered not to be very strange if the true value for the variance is zero or close to zero because in that case one is measuring near the boundaries of the parameter space.

Educational background respondent

Table 15 *Descriptive statistics hourly and monthly wage (educational background)*

	Educational background		
	N=13979	Average hourly wage	Average monthly wage
Secondary school type			
General school	59.59%	8.68	1222
Technical school	30.85%	8.60	1245
Vocational school	3.30%	9.04	1256
Other type	6.26%	9.68	1078
Result secondary education	49.09	-	-
Finished course			
In time	23.53%	9.58	1277
Longer	76.47%	8.47	1204
How many years?	2.57	-	-
Other degree?			
No	94.89%	8.60	1220
Laurea	0.59%	8.92	1315
Diplome Univ.	4.52%	11.36	1246
Graduation result			
Cat_1	0.21%	9.06	1278
Cat_2	3.89%	8.66	1315
Cat_3	8.92%	8.50	1265
Cat_4	14.65%	8.54	1238
Cat_5	44.33%	8.56	1214
Cat_6	27.99%	9.18	1197
Cum laude	18.77%	9.42	1205
Attendance			
Never	6.30%	9.48	1282
Sometimes	21.45%	8.58	1199
Regular	56.58%	8.38	1199
Mandatory	15.67%	9.89	1306
Interrupted study			
No	87.12%	8.63	1218
Si	12.88%	9.36	1244
University same place			
No	62.92%	8.78	1227
Si	37.08%	8.65	1218

Labor background respondent

Table 16 *Descriptive statistics hourly and monthly wage (labor background)*

	Labor background		
	N=13979	Average hourly wage	Average monthly wage
Working during studies			
No	29.52%	8.65	1213
Occasional work	51.03%	8.32	1187
Continuous work	19.46%	9.92	1324
Exam professional qual.			
No	57.57%	8.42	1170
Si	42.43%	9.15	1290

Demographic variables

Table 17 *Descriptive statistics hourly and monthly wage (demographic variables)*

	Demographic variables		
	N=13979	Average hourly wage	Average monthly wage
Gender			
Male	51.80%	9.01	1336
Female	48.20%	8.43	1098
Italian nationality			
No	0.17%	10.28	1361
Si	99.73%	8.72	1221
Children			
No	88.83%	8.51	1213
Si	11.17%	10.43	1284
Marital status			
Single	68.57%	8.47	1206
Married/living together	30.60%	9.25	1251
Separated/divorced	0.77%	11.17	1411
Widowed	0.06%	12.33	1201
Region			
North-west	32.52%	8.96	1279
North-east	22.14%	8.64	1226
Central	24.11%	8.59	1211
South	14.49%	8.55	1153
Islands	6.75%	8.79	1113

Family background

Table 18 *Descriptive statistics hourly and monthly wage (family background)*

	Family background		
	N=13979	Average hourly wage	Average monthly wage
Educational status father			
No degree	0.78%	9.77	1261
Primary education	16.55%	8.63	1178
Lower-secondary education	26.37%	8.60	1207
Upper-secondary education	35.96%	8.66	1231
Diplome univ.	0.70%	9.41	1273
Laurea or PhD	19.64%	9.04	1256
Educational status mother			
No degree	0.85%	9.83	1221
Primary education	20.88%	8.67	1188
Lower-secondary education	29.33%	8.72	1229
Upper-secondary education	34.74%	8.68	1233
Diplome univ.	1.34%	9.05	1197
Laurea or PhD	12.86%	9.89	1228
Occupational status father			
Employed	96.03%	8.72	1222
Looking for a job	0.43%	8.36	1217
Pensioned	1.87%	8.71	1203
Deceased	1.55%	8.86	1216
Other condition	0.12%	11.83	1028
Occupational status mother			
Looking for a job	0.55%	8.31	1034
Pensioned	2.70%	8.45	1203
Deceased	0.44%	8.02	1211
Employed	50.64%	8.66	1219
Housewife	45.56%	8.83	1227
Other condition	0.10%	7.84	1003
Single child			
No	83.34%	8.73	1219
Si	16.66%	8.72	1233

Field of study

Table 19 *Descriptive statistics hourly and monthly wage (field of study)*

	Field of study		
	N=13979	Average hourly wage	Average monthly wage
Science	5.21%	9.28	1200
Chemistry-pharmaceutics	6.48%	8.49	1285
Geology-biology	4.47%	8.29	1129
Medicine	4.84%	12.59	1535
Engineering	19.54%	8.66	1379
Architecture	4.90%	7.78	1206
Agricultural engineering	3.81%	7.96	1137
Economics-statistics	17.56%	8.08	1240
Political-social sciences	6.66%	8.18	1192
Law	7.07%	7.85	1119
Literature	5.72%	8.74	990
Linguistics	3.70%	8.49	1055
Teaching	4.59%	8.64	1021
Psychology	2.37%	9.37	1000
Education-physics	3.08%	12.56	1187

The three-level empty model showed that apparently none of the variability in the wage-levels could be attributed to an overall effect of the university in which the respondent was enrolled.

Based on this result it was chosen to continue with a model that drops the university level from the equation. This empty model reveals that of the total variance in hourly wage 11.7% is situated at the faculty level and the remaining 88.3% of the variance is situated at the level of the individual respondent.

Table 20 *Empty model hourly wage*

Parameter	Empty model 3L		Empty model 2L	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	2.092	0.005	2.089	0.007
RANDOM				
University	-0.000	0.000	-	-
Faculty	0.015	0.001	0.014	0.001
Respondent	0.113	0.001	0.113	0.001
DEVIANCE	9847.096		9850.103	

A comparable result was obtained for the monthly wages. No significant variance was found at the level of the university, so, also for the monthly wage no overall effect of the university was found. As a consequence the university level was dropped from the model and a 2-level model was estimated. In this model 11.5% of the variance was situated at the faculty level. The remaining variability was related to the respondent level. In order to facilitate presentation of the results monthly wages were presented in thousands.

Table 21 *Empty model monthly wage*

Parameter	Empty model 3L		Empty model 2L	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	1.172	0.010	1.172	0.009
RANDOM				
University	0.001	0.001	-	-
Faculty	0.024	0.002	0.025	0.002
Respondent	0.192	0.002	0.192	0.002
DEVIANCE	17223.380		17225.040	

Taking into account field of study

First the field of study is added to this empty model because this allows taking into account field-specific labor market characteristics. As a reference category 'science' was used and the other fields were dummy coded. The basic characteristics of the model are described in Table 22.

Table 22 *Model hourly and monthly wage including field of study*

Parameter	Empty model + field of study			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	2.149	0.015	1.167	0.022
RANDOM				
University	-	-	-	-
Faculty	0.002	0.000	0.006	0.001
Respondent	0.113	0.001	0.192	0.002
DEVIANCE	9371.125		16845.550	

For the hourly wage by including the field of study into the equation the vast majority (87.7%) of the differences between faculties is explained. If the field of study is taken into account only 1.6% of the variability can be attributed to the faculties and the remaining 98.4% of the differences in wage level is due to factors related to the individual respondents. Also for the monthly wage the majority (76%) of the faculty variance is explained. Only 3% of the remaining variability is situated at the faculty level for the monthly wage.

Basically this means that in general within a field of study the overall impact of the university is fairly limited and that the main factor in determining the wage level, both hourly as monthly, is related to the characteristics of the respondent. The variance at the faculty level is still significant though, so some differences are still observed.

Explaining the variance: respondent characteristics

To get some more insight in the factors that influence the wage-level a model is estimated with the respondent characteristics included, both for the hourly wage and the monthly wage. These variables can explain variance at the level of the respondent, but can possibly also explain variance at the higher level of the faculty due to differential composition of the faculties for these variables. All described variables were included at once into the model. For the categorical variables dummy-coding was used and the reference categories used are indicated in Tables 1-5. To facilitate interpretation of the intercept the continuous variable 'result secondary education'

was centered on its mean. The overall result for both models is described in Table 23. The results for the specific variables will be discussed separately below.

Table 23 *Full model hourly and monthly wage*

Parameter	Full model			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
FIXED				
Intercept	2.263	0.084	1.298	0.108
RANDOM				
University	-	-	-	-
Faculty	0.001	0.000	0.003	0.001
Respondent	0.106	0.001	0.176	0.002
DEVIANCE	8403.369		15565.890	

If the respondent characteristics are added to the equation about 92% of the differences in hourly wage between faculties can be explained and 88% in monthly wage. If we take into account the above mentioned respondent characteristics and the field of study almost all of the remaining variability in the wage level can be attributed to specificities of the individual respondents. The variance at the faculty level, albeit small, for both variables is still significant[2] (Verbeke & Molenberghs, 2000), so there are some differences between faculties in the expected wage level. Actually, this implies that within certain fields some universities have higher wage level expectations but in general this effect is fairly limited.

At the respondent level only somewhat over 6% of the observed variance could be explained by the included variables for the hourly wage and 8.3% for the monthly wage. This means that of the differences between respondents within faculties only a limited part could be captured by the included variables. In total 16% of the variance in hourly wage levels is explained by the field of study and the included respondent characteristics. For the monthly wage 17.5% of the variance could be captured. In the end for the hourly and monthly wage respectively only 1% and 1.7% of the variance is situated at the faculty level.

The following tables present the parameters for each of the groups of explanatory variables. For each parameter the standard error is indicated together with the significance. Significance was tested at the 5%, 1% and 0.1% level, indicated by the number of stars. For each group of variables

[2] The deviance increases with 26 and 58 respectively if faculty level is dropped from the model.

first the results for the hourly wage will be discussed, followed by a discussion for the monthly wage.

Educational background respondent

In Table 24 the parameters for the variables regarding the educational background of the respondent are presented. The influence of the secondary education on the current hourly wage level of the respondent showed to be limited to the group of 'other' type of schools, being '*scuola magistrale*', '*istituto magistrale*' and '*istituto d'arte*'. This group consists of a disproportional high number of teachers explaining the high hourly wage as the number of official paid hours for a fulltime job is lower for teachers. The obtained result in secondary education did not influence the wage level. Regarding the academic career of the student, an important aspect in the wage level turned out to be the fact if the student had obtained another degree before the current one, more specifically a '*diploma universitario*'. Also a significant positive effect was seen for graduating cum laude, although other categories referring to the graduation result did not influence the wage level. Students that did not finish there studies within due time had a significantly lower wage level compared to students that did finish in time. The number of years the students finished out of time did not matter.

Results regarding class attendance are somewhat unexpected as every group performs better than the group of students that regularly attended the classes. Most striking is the clear positive effect for students that never attended classes. This cannot be attributed to the fact that this group might be students that had a continuous job during their studies because this variable is also included in the model. Interrupting another study before did not have a negative impact on the wage level. If the location of the university was in the same place as where the respondent lives it had a positive effect on the hourly wage level.

The correspondence of the result for monthly wage to the hourly wage result is only limited. The highly significant effect of 'Other type'-schools disappears, which supports the explanation for the significant effect for hourly wage. Again finishing the course in due time has a positive effect on the wage level, and, there is an additional effect of the number of years out of time. Graduating *cum laude* now only has a limited positive effect. Again class attendance clearly has an effect on the monthly wage, but strangely enough there is a disadvantage for the students that regularly attend classes. The location of the university no longer has a significant impact. On the other hand an interrupted study now has a small positive effect.

Table 24 *Parameter estimates hourly and monthly wage (educational background)*

Parameter	Educational background			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
Secondary school type				
General school	0.009	0.016	-0.032	0.021
Technical school	0.015	0.016	-0.025	0.021
Other type	0.101***	0.020	-0.017	0.025
Result secondary education	0.001	0.000	0.000	0.001
Finished course				
Longer	-0.040***	0.010	-0.043***	0.013
How many years?	0.003	0.003	-0.010*	0.004
Other degree?				
Laurea	0.018	0.037	0.041	0.048
Diplome Univ.	0.084***	0.017	0.025	0.022
Graduation result				
Cat_2	-0.012	0.061	0.075	0.079
Cat_3	-0.025	0.061	0.053	0.078
Cat_4	-0.019	0.060	0.058	0.078
Cat_5	-0.007	0.060	0.076	0.078
Cat_6	-0.006	0.061	0.071	0.079
Cum laude	0.049***	0.011	0.036*	0.015
Attendance				
Never	0.068***	0.013	0.091***	0.017
Sometimes	0.018*	0.008	0.022*	0.010
Mandatory	0.014	0.010	0.033**	0.012
Interrupted study	0.013	0.009	0.025*	0.011
University same place	0.017**	0.006	0.013	0.008

Labor background respondent

The available information on the labor background of the respondent indicated that occasional work did not have an impact on the hourly wage, but if the respondent already had a continuous job at the time of the studies wage was considerably higher. This can be expected based on job experience that results in a higher salary. Also people that took the national exam for professional qualification have a significantly higher hourly wage level.

Also for the monthly wage there is a clear positive effect of having a continuous job during the studies. However, occasional work now also has a (smaller) positive effect. The national exam for professional qualification does not have a positive effect on the monthly wage level.

Table 25 *Parameter estimates hourly and monthly wage (labor background)*

Parameter	Labor background			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
Working during studies				
Occasional work	0.010	0.007	0.028**	0.009
Continuous work	0.114***	0.009	0.184***	0.012
Exam professional qual.	0.060***	0.009	-0.005	0.011

Demographic variables

When one takes into account the field of study and other respondent characteristics females still have a considerably lower hourly wage. On the other hand nationality does not have an impact on the wage level, but the proportion of non-Italian respondents is very low so the power for this test is limited (which is reflected in the standard error).

The higher wage level for people with children and married people probably can be partly explained by different tax levels for people that have children and are married as net wages are reported. Also people that are separated or divorced have slightly higher wage levels than single people. This effect probably can be mainly attributed to a higher age for this group. For a lot of respondents age is not known but for those it is known, it shows that of the divorced group the majority is in the highest age group, while for the singles the majority is in the two middle age groups. Partly age also explains the effect for being married.

Table 26 *Parameter estimates hourly and monthly wage (demographic variables)*

Parameter	Demographic variables			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
Female	-0.076***	0.006	-0.181***	0.008
Italian nationality	-0.080	0.054	-0.023	0.069
Children	0.088***	0.011	0.045***	0.014
Marital status				
Married/living together	0.029***	0.007	0.046***	0.009
Separated/divorced	0.072*	0.032	0.178***	0.042
Widowed	0.132	0.116	0.088	0.150
Region				
North-East	-0.021*	0.009	-0.024*	0.012
Central	-0.039***	0.009	-0.057***	0.012
South	-0.062***	0.010	-0.115***	0.013
Islands	-0.032*	0.013	-0.135***	0.018

The region that the respondent is currently residing in clearly has an impact on the wage level. All regions show a significantly lower hourly wage level than the North-West. This difference is the biggest for the South of the country. For the demographic variables the results for the hourly wage and monthly wage is quite similar, although the effect of being divorced and for the Islands is stronger for the monthly wage.

Family background

In general the impact of the family background on the hourly wage is very limited. The educational status of neither of the parents has an effect on the hourly wage level.

Table 27 *Parameter estimates hourly and monthly wage (family background)*

Parameter	Family background			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
Educational status father				
No degree	0.011	0.036	-0.009	0.046
Primary education	-0.017	0.010	-0.047***	0.013
Lower-secondary education	-0.010	0.008	-0.022*	0.010
Diplome univ.	0.022	0.034	0.057	0.044
Laurea or PhD	0.013	0.009	0.013	0.011
Educational status mother				
No degree	0.010	0.035	-0.023	0.045
Primary education	-0.014	0.010	-0.027*	0.013
Lower-secondary education	-0.004	0.008	-0.004	0.010
Diplome univ.	0.001	0.025	-0.047	0.033
Laurea or PhD	-0.002	0.010	-0.028*	0.013
Occupational status father				
Looking for a job	-0.022	0.042	0.005	0.055
Pensioned	-0.003	0.021	0.019	0.027
Deceased	-0.001	0.022	-0.015	0.029
Other condition	0.171*	0.080	-0.073	0.103
Occupational status mother				
Looking for a job	-0.048	0.038	-0.144**	0.049
Pensioned	-0.035*	0.018	-0.041	0.023
Deceased	-0.070	0.042	-0.064	0.054
Employed	-0.014*	0.006	-0.015	0.008
Other condition	-0.083	0.088	-0.159	0.113
Single child	-0.010	0.008	-0.007	0.010

The occupational status of the father also has no impact, except for the container-category 'other condition', which shows a higher wage level. This group represents only a very small portion of the respondents but still the effect turns out to be significant. For the occupational status of the mother there is a small negative effect if the mother was pensioned when the respondent was 14 or if she was employed. Being a single child had no impact on the wage.

For the monthly wage the educational status of the parents did have some impact. If the father had degree of primary education, this was clearly reflected in a lower monthly wage level. To a lesser extent this is also the case of the father obtained a degree of lower-secondary education. For the educational status of the mother a slightly negative effect was observed of the mother had a primary education degree. Strangely enough there was also a comparable negative effect if the mother had obtained a *laurea* or a PhD. With regard to the occupational status of the parents a negative effect on the monthly wage was found if the mother was looking for a job at the time the respondent was 14 years old.

Fields of study

Table 28 presents the estimates of the parameters for different fields of study, together with the respective standard errors. It shows that the hourly wage for all fields of study differ significantly from the wage level for 'sciences', taking into account the characteristics of the respondent.

Table 28 *Parameter estimates hourly and monthly wage (field of study)*

Parameter	Field of study			
	Hourly wage		Monthly wage	
	Estimate	S.E.	Estimate	S.E.
Chemistry-pharmaceutics	-0.082***	0.020	0.125***	0.028
Geology-biology	-0.115***	0.020	-0.036	0.028
Medicine	0.171***	0.023	0.284***	0.031
Engineering	-0.089***	0.018	0.167***	0.025
Architecture	-0.237***	0.023	0.008	0.031
Agricultural engineering	-0.174***	0.022	-0.057	0.030
Economics-statistics	-0.099***	0.016	0.056*	0.022
Political-social sciences	-0.148***	0.019	-0.042	0.026
Law	-0.188***	0.018	-0.060*	0.025
Literature	-0.114***	0.020	-0.207***	0.027
Linguistics	-0.100***	0.021	-0.097***	0.029
Teaching	-0.130***	0.022	-0.195***	0.030
Psychology	-0.063*	0.027	-0.194***	0.037
Education-physics	0.074*	0.029	-0.231***	0.040

For the monthly wage this is not always the case and, moreover, for some fields the sign of the difference is opposite to the one for the hourly wage. For engineering e.g. the hourly wage is significantly lower than that for science, while the monthly wage is significantly higher.

In Table 28 all fields of study can be compared to the wage level for sciences, but it is also valuable to make the pairwise comparison for all the other fields of study. To do so these results are plotted by constructing for each field of study a confidence interval around the estimated parameter. By checking the overlap of the confidence intervals one can evaluate statistical significance.

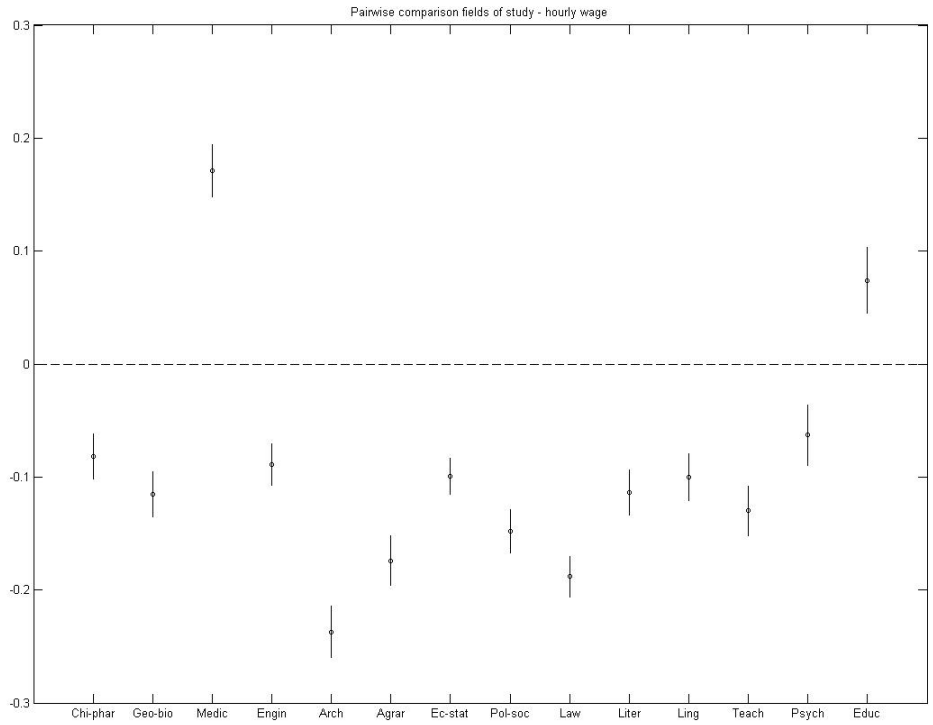

Figure 3: Pairwise comparison fields of study – hourly wage

If the intervals overlap the difference is not significant, if there is no overlap between the intervals the countries do differ significantly. To test the difference between two fields of study at the .05-level, confidence intervals need to be constructed by multiplying the standard error by

1.39 (Goldstein & Healy, 1995)[3] and not the commonly used 95% confidence interval calculated multiplying the standard error by 1.96. These pairwise comparisons are plotted in Figure 3 for the hourly wages and Figure 4 for the monthly wages. The result for science is reflected in the intercept and is indicated as a dashed line.

It can be seen from Figure 3 that respondents graduated as physicians clearly have a higher hourly wage level than any other field of study. Other fields with a rather high wage level are science and physiotherapy. On the other hand the hourly wage level for architecture is lower than the wage level in all the other fields. Also law, agricultural engineering and political-social sciences show considerably lower hourly wage levels. The differences for the other fields are more limited. It is important to be aware that these results take into account the different elements included in the model, so they do not reflect the raw wage differences.

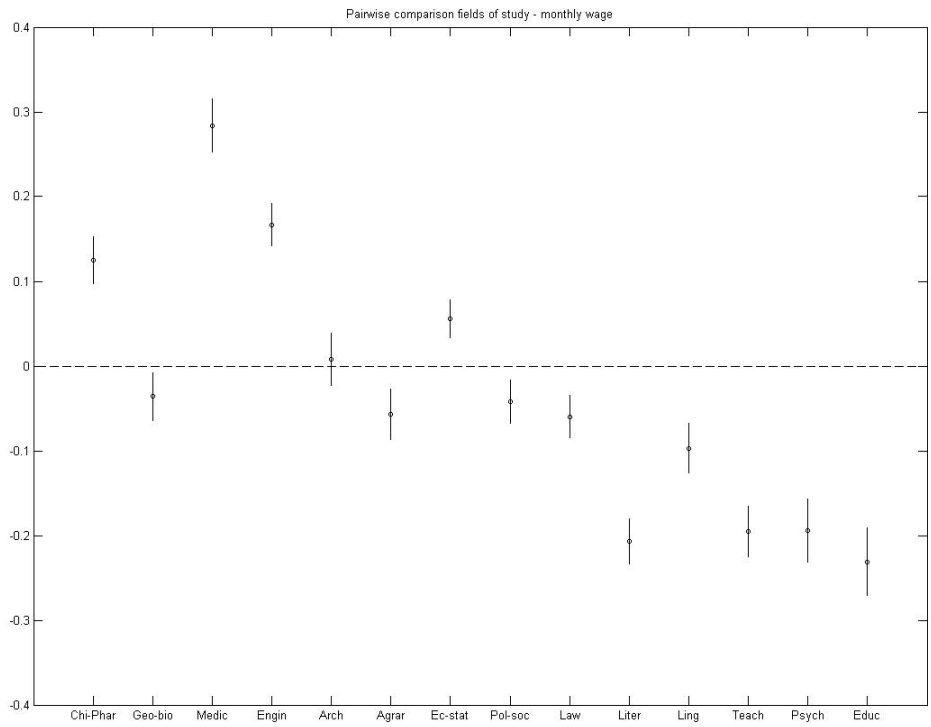

Figure 4: Pairwise comparison fields of study – monthly wage

[3] "It is a common statistical misconception to suppose that two quantities whose 95% confidence intervals just fail to overlap are significantly different at the 5% significance level." (Goldstein & Healy, 1995, p.175)

As was already mentioned above, the pattern for the monthly wage differs considerably from the pattern that was observed concerning the hourly wage (see Figure 4). Again medicine is the field with clearly the highest wage, but apart from that the results are very different. The graduates from physiotherapy are now at the lower end of the wages, while engineers and chemists are now situated at the high end of the scale. Other fields that are now considerably lower are literature, teaching and psychology.

Discussion

The current study investigates the impact of universities in Italy on the labor market position of their graduates. More specifically, the effect on the employment status and wage level three years after graduation is studied. To perform the analyses multilevel modeling is applied, thus enabling to disentangle the impact of the universities from other factors at play.

Employment status

With regard to the employment status of the graduates three groups were distinguished: students, unemployed respondents and employed respondents. The latter group was used as a reference group and it was estimated which factors had an effect on the probability of being a student and the probability of being unemployed. There was no overall impact of the university on the probability of being a student. However, the faculty did have a considerable impact and could account for about 35% of the observed differences. When the field of study was entered into the equation almost 90% of the variability at the faculty level could be attributed to the field of study. By including region as an explanatory factor some more of the faculty variance was explained. Taking into account these two elements 3.5% of the variability was accounted for by the faculty the respondent graduated from, and clearly the most important factor was the individual graduate.

On the probability of being unemployed in the unadjusted model 9% of the variability could be attributed to the university and the same percentage was accounted for by the faculty. When field of study was included all the variance at the faculty level disappeared while the university variance remained stable. However, if region was added to the equation about 90% of the variability at the university level was accounted for. This resulted in only about 1% of the remaining variability that could be attributed to aspects of the university attended.

The main determinants for the employment status of the Italian graduate seem to be specific characteristics of the graduate, but field of study and the region where the graduate currently resides turn out to be crucial determinants as well. The field of study was crucial both in

determining the probability of being a student and being unemployed and region was a very important element in the employment probabilities of the graduates.

In a final model all respondent characteristics were included in the model. This shows that demographic variables have a considerable impact on the employment status of the graduates, with females having a higher unemployment probability and at the same time showing a higher probability of being a student. The same pattern can be seen on the geographical north-south axis. The labor background of the graduate also turns out to be an important determinant of the labor market position. Previous job experience drastically reduces the probability of pursuing further studies, but also reduces the probability of being unemployed. The same pattern shows for people who took the national exam to become an independent worker. The educational background has some impact, but mostly for pursuing further studies. For the unemployment probability the effect is fairly limited. The impact of the family background on the employment status of the graduate turns out to be very limited.

Wages

Both the empty model for the hourly wage as the one for the monthly wage showed that there was no significant overall effect of the university on the wage level of the graduates. For both variables somewhat less than 12% of the variation in the results could be attributed to the faculty the respondent graduated from. Then, field of study was added to the model to take into account field specific labor market characteristics. Almost 90% of the faculty variance in hourly wage was captured by the field of study. For the monthly wage about three quarters of this variance was accounted for by the field of study. Of the remaining variance 1.6% and 3% respectively are related to the faculty. This means that in general the impact of the faculty is very limited, only for some fields of study there will be significant differences in the wage levels between different universities.

When one takes a look at the complete model with all explanatory variables included, again, the demographic variables had a considerable impact. Female graduates again are disadvantaged and geographically the north-south axis shows a decreasing wage level. Having a family or not was reflected in the wage level as well. Previous job experience, not unexpectedly, bore some positive effect. The educational background had a limited impact on the wages. As for the employment status, family background turns out to not be a major determinant of the salary three years after graduation.

Conclusions

An important aspect in the interpretation of the current results is that it concerns people that finished a university course, which in itself a selected group that differs from the group entering higher education. Hence, all reported effects need to be interpreted within these qualifications. For instance, the small effect of family background of course cannot be converted into a general statement about the influence of family background on someone's labor market position.

Of course the reported results only concern Italian universities and cannot be used to draw general conclusions about the impact of universities on the labor market position of their graduates. Moreover, the data pertain to the situation three years after graduation. Results might be different if a different timeframe was studied. However, some general conclusions can surely be drawn from the present results.

The use of multilevel models, which are commonly applied in school effectiveness research, show to be a very useful tool to get a clear picture of the general impact of higher education institutions on different relevant indicators of educational quality. The use of these models can easily be extended to indicators on research performance or other indicators that are thought to be relevant in the accountability of educational institutions. By decomposing the total variability in the indicator into several sources, corresponding to the different levels of the structure, one cannot only make a statement about whether the university matters. It enables to establish as well to which extent the university matters, what the relative impact of the university is compared to other sources of variability like the faculty or the individual graduate.

The main determinant of the labor market position of the university graduate turn out to be characteristics that are related to the individual student, both for the employment status as the wage level. In general the university attended might have some impact but it is fairly limited when local labor market characteristics are corrected for and when the field of study is taken into account. This result is in line with the studies of Bosker et al. (1997) and McGuinness (2003).

As a consequence it is clear that raw ranking of educational institutions (the so-called league tables) is a dangerous exercise. This is a well-established fact within school-effectiveness research, but this kind of league tables are still widely spread when it concerns the performance of higher education institutions. Not only it has become clear that *uncontextualized*, unadjusted rankings disregard crucial factors that institutions cannot be held accountable for, like the labor market characteristics of the region. This reflects the first principle that was introduced by Goldstein and Myers (1996). It was also shown that the vast majority of the universities will not show any significant differences in their performance in the relevant indicators. At best for certain fields of study a group of better performing and underperforming universities could be

distinguished from the big 'bunch' of universities in the middle. This result points to the necessity of incorporating the principle of *uncertainty* when performances are reported. Although some university might be ranked higher than another one, this does not imply that their performance actually is different. By using *multiple indicators*, the third principle of Goldstein and Myers (1996), it is possible to get a more detailed picture of the impact of universities on the labor market position of their graduates.

In line with Goldstein and Spiegelhalter (1996) the current analyses show that one should be aware of the limitations of rankings, even with adjustment for input factors that lie beyond the institution's control, in judging differences between educational institutions. Their value mainly lies in the identification of institutions at the extremes that should be considered for further investigation. As Goldstein and Spiegelhalter (1996) state: "we can use rankings as screening instruments, but not as definitive judgments on individual institutions" (p.397).

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Abstract

Labor market performance of graduates is an important aspect in the evaluation of institutions for higher education. In this report we investigate the determinants of the labor market performances for tertiary students in Italy. More specifically, the impact of the university on wage level and employment probability is studied, after controlling for relevant characteristics of student inflow and aspects of the labor market context. It is shown that it is crucial to take into account these aspects to make an accurate evaluation of the university impact on the labor market performance of their graduates. The main determinant of the labor market position of the university graduate turn out to be characteristics that are related to the individual student, both for the employment status as the wage level. In general the university attended might have some impact but it is fairly limited. Raw ranking of educational institutions (the so-called league tables) is shown to be a dangerous exercise. Uncontextualized, unadjusted rankings disregard crucial factors that institutions cannot be held accountable for. This is a well-established fact within school-effectiveness research, but this kind of league tables are still widely spread when it concerns the performance of higher education institutions.

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