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by

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**University choice, research quality and graduates' employability: Evidence from Italian national survey data \***

by

Daria Ciriaci <sup>♦</sup>, Alessandro Muscio <sup>\*</sup>

**Abstract.**

Universities have come under increasing pressure to become key drivers of economic development in the age of the knowledge economy. Yet we know very little about the impact of university quality and scientific excellence on the probability of graduates finding jobs. This paper investigates the determinants of Italian graduates' employability 3-years after graduation, with special reference to university quality measured in terms of research performance and teaching quality. The empirical evidence sheds light on the pivotal role of academic institutions in economic systems, proving that their contribution to employment growth could be substantial. Our analysis supports the promotion of policy initiatives to improve the quality of academic institutions, and the accountability of research results. As we also observe wide regional differences, we argue that university quality emerges as a supply tool for policy makers aiming at boosting young and skilled labour demand in less developed regions.

**1. Introduction**

Enhancing the performance and international attractiveness of higher education institutions, raise the overall quality of all levels of education and training in the EU, and improving the employment situation of young people are key challenges of Europe 2020 (European Commission, 2010). The need to modernize European higher education by benchmarking university performance and educational outcomes is increasingly debated. A better educational level help employability and progress in increasing the employment rate helps to reduce poverty (European Commission, 2010). Since 2000, the Italian Government has reformed the academic system in the attempt to increase the participation rate of young people in higher education, and adapting the supply of human capital to

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\* The views expressed are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission. The authors thanks the Director of ISTAT for access to individual data of the *Indagine statistica sull'inserimento professionale dei laureati del 2004* and the Manager of the Adele Laboratory, for collaboration and help. Corresponding author: Daria Ciriaci.

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the growing demand for skilled labour in the knowledge-based society<sup>1</sup>. Despite this, to our knowledge there has been no attempt since these reforms were implemented, to assess the role of university quality as a determinant of Italian graduates' employability. In the literature, despite the agreement that the probability of employment after graduation is strongly determined by the type of secondary schooling and university discipline chosen - combined with individual characteristics such as gender, marital status, presence of children - there is less consensus about how the choice of a university, and thus its quality, impacts on employability. Regardless of the difficulties involved in a standard approach to measuring university quality (Black and Smith, 2006; Boero *et al.* (2004); Bratti *et al.* 2004; Smith *et al.*, 1999), lack of data allowing individual and institutional characteristics to be matched has meant that this issue has been relatively unexplored and information on the impact of university quality on labour market outcomes for tertiary graduate students is relatively scarce. Although this is an open issue, there is a body of empirical evidence showing that scientific excellence has positive effects on local economic development processes, technology transfer, and firms' innovation activity (Geuna and Muscio, 2009), and that 'good' universities may act as magnetic poles for good brains (Ciriaci, 2010).

The present paper investigates the impact of university quality on medium-long term employability (three years after graduation) of those Italian graduate students who completed their studies under the 'new university system'. To this end we use individual-level data from the most recent survey conducted by the Italian National Statistical Institute (ISTAT) on labour market entry conditions for a cohort of 2004 Italian graduates, three years after graduation (ISTAT, 2009). This database is matched with data on university quality, published by the Italian National Evaluation Council (CIVR), an institutional body of the Italian Ministry for Education, University and Research (MIUR). To our knowledge, this is the first work to assess the role of university quality on medium-long term employability, using CIVR data on scientific excellence. As in Italy there is not a tradition of publishing university league tables, university enrolment is not restricted, fees are generally low - and are not a significant explanatory variable of students' migration choices (Dotti *et al.*, 2010) -, and students' mobility is of a limited entity (and almost completely limited to South Italy graduates<sup>2</sup>; Ciriaci, 2010, 2006 and 2005, Jahne, 2001) self selection on unobservable is likely to be a limited issue. Nevertheless, we checked the correlation between variables used as proxies for graduates' ability and those used to proxy university quality, assuming that if there is not selection on observable, it is likely to assume there is not even on unobservable. Clearly, we also control for the impact on employability of the entire variables available in the dataset to identify graduates' personal characteristics, family and educational background (high school type and grade, and university performances variables), and the characteristics of the local labour market. Furthermore, we run separate regressions for those who finished their high-school course with a grade of 60 over 60 and those who did not, and for those who graduated with *summa cum laude* and those who did not, assuming that student's unobservable ability can be proxy by his/her high-school and university performance. As given the persistent socio economic differences between Southern and Central-Northern provinces a likely source of self selection could be graduates' residence before the enrolment at the university, we also use the pre-enrolment residence of the respondents and the province where they studied to identify those who lived and studied in a Central-Northern province, and we run the regression only on this sub sample as robustness check.

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1 This transformation is affecting many aspects of the university system: the length of undergraduate degree programmes, the content and structure of degrees, the distinction between first level (bachelors) degrees and second level (post-graduate) degrees following a '3+2' model, and the pre-requisites for and objectives of degree programmes (Boero *et al.*, 2001).

2 In this paper, Italian central-northern regions are Lazio, Tuscany, Umbria, Marche, Emilia-Romagna, Liguria, Valle d'Aosta, Piedmont, Lombardy, Trentino A.A., Friuli Venezia-Giulia, Veneto. The southern regions are Campania, Abruzzi, Molise, Puglia, Basilicata, Calabria, Sicily and Sardinia, which comprise the so-called 'Mezzogiorno'.

The analysis is conducted at the Italian NUTS3 territorial level (provinces) to allow a better match between employment outcomes and local labour market conditions. In fact, there are wide regional differences in graduate employment (Ciriaci, 2006 and 2005; Brunello *et al.* 2001), due to the persistence of socio-economic divergences between central-northern and southern regions (Ciriaci and Palma, 2008; Graziani, 1978; Quattraro, 2009; Saraceno, 1983). Three years after graduation, 65 out of 100 graduates in the southern region are employed, while in the Central-Northern region the rate of employment is 11 points higher - 76 out of 100 (SVIMEZ, 2009). Furthermore, the empirical evidence also confirms that studying in a central-northern university brings high returns in terms of employability (Ciriaci, 2009): the rate of unemployment among southern graduates who studied in a central-northern university is 28.9%, significantly lower than the 35.1% who attended a southern university. Thus, the role of university quality as an employability-enabler might differ across the Italian territory.

The paper is organized as follows: Section 2 presents a review of the literature on the labour market outcomes of graduate students; Section 3 describes the dataset, and presents and discusses the estimated equation; Section 4 discusses the empirical results for the determinants of employment probabilities for Italian graduates, one and three years after graduation. Section 5 presents some concluding remarks and provides some implications for policy.

## **2. University quality and the determinants of graduate employment: A literature review**

There is a great deal of empirical evidence in the economic literature on the employment outcomes of graduates - measured commonly as earnings, and over-education (the extent to which graduates are employed in non-graduate jobs). Less attention has been paid to the impact of university choice on the probability of finding a job. This is due perhaps to the fact that most of the literature is based on UK and US evidence, where more importance is given to the quality of the employment obtained than to the probability of being employed, since the former is seen increasingly as a key indicator of success in a competitive market. However, in countries, such as Italy, that are characterized by significant unemployment of graduates, the employability of the young and skilled labour force is still a crucial issue.

There are several ways that university quality (measured by spending per student, staff-student ratios, quality of research, etc.) might influence labour market outcomes. McGuinness (2003) points out that, *ceteris paribus*, resource levels are generally linked to teaching standards and teaching quality. The quality of research is associated with human capital improvements through the influence of peer group learning and spillovers from better quality academic environments (McGuinness, 2003), and for potential employers are a signal of quality (Spence, 1973). Furthermore, other university reputation related benefits might originate in the more influential networks which generally characterize more selective or private universities (Brunello and Cappellari, 2008; McGuinness, 2003).

In general, the empirical evidence on the role of university reputation on graduates' labour market outcomes tend to differ depending on the country considered. The labour market outcomes of UK graduates (Hussain *et al.*, 2009; Bratti *et al.*, 2004; Bratti, 2002; Smith and Naylor, 2001; Dolton and Vignoles, 2000; Smith *et al.*, 1999) depend to a limited extent on the university attended, particularly when university rankings are adjusted for individual characteristics (d'Hombres *et al.*, 2008), while studies in the US support the existence of a significant positive relation between the reputation of the university or college and a graduate's labour market performance (Black and Smith, 2004; Brand and Halaby, 2006; Card and Krueger, 1992). For instance, McGuinness (2003), assessing the impact of university quality on the labour market outcomes of a cohort of UK graduates, after controlling for pre-entry qualifications, finds that they depend more on the subject studied and the degree obtained, than on the university attended. In other words, in the UK job market it is the quality of the student rather than the quality of the university attended that is more

important. Thus, for most students, the choice about which university to apply to is less important for determining labour market success than the choice of which subject to study, and the type of degree obtained. Different results emerge from the strand of the literature that focuses on the role of university quality in the US: it is generally recognized that college quality matters for labour market outcomes, although, in terms of eventual earnings, the percentage of variance explained by total college quality tends to be small (James et al., 1989).

To our knowledge, there are only three studies focusing specifically on the impact of university quality on labour market performances of Italian graduate students. D’Hombres *et al.* (2008) investigate what determines the labour market performance of Italian 2001 Laurea graduates. They show that, controlling for pre-university performance, family background is not significantly correlated with the labour market outcomes of Italian graduates but that there is significant correlation with the degree studied. They also find wide regional differences. Brunello and Cappellari (2008) investigate what determines the earnings and employment prospects of Italian graduates. They find that “Alma Mater” has an influence on the probability of being employed and on the net monthly wages of Italian graduates, at least in the short run: college related differences are significant both among and within Italian regions, but not sufficiently large to trigger substantial mobility flows from poorly performing to better performing universities. The authors find that attending a private university – conditional on the field of study – has a significant payoff. Furthermore, the student-lecturer ratio, and the number of students in the college negatively affect employment earnings. Finally, Di Pietro and Cutillo (2006) investigate whether university quality is a significant determinant of the labour market outcomes of Italian graduates measured as graduate over-education (the extent to which Italian graduates are employed in non-graduate jobs), and earnings. As a proxy for university quality they use the performance-based, university league tables published by the newspaper La Repubblica.<sup>3</sup> Both Brunello and Cappellari (2008) and Di Pietro and Cutillo (2006) employ individual level data on 1998 Italian graduates interviewed three years after graduation, published by ISTAT (2001). The main empirical finding from these two studies, and the most relevant to the present work, is that graduates from research-oriented universities are likely to achieve better labour-market performance than their peers who graduate from less research-active institutions, which is in line with the results for the US labour market.

### 3. Empirical analysis

#### 3.1. Description of the data

This section analyses effect of university quality on the employability of Italian graduates. To this end, we use individual-level data from the most recent survey of Italian graduates, conducted by ISTAT to investigate graduates’ labour market entry conditions. The survey was conducted in 2007 on a cohort of students who graduated in 2004 and included 47,342 individuals, interviewed by Computer-Assisted-Telephone-Interview (CATI), with a response rate of 69.5%. The number of individuals interviewed was chosen to limit expected sample errors to set beforehand levels<sup>4</sup>. The sample is stratified and derived by dividing the population by sex, attended university and field of study (see ISTAT, 2009). The sample represents 17.3% of the cohort of 2004 Italian graduates (260,070 individuals). The respondents attended university courses in 16 different scientific disciplines in 67 private and public universities. ISTAT attributed to each individual in the sample a weight - the carry-over coefficient -, namely the number of units of the population of the original universe represented by individual *i* himself/herself. The ISTAT survey collects information on

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<sup>3</sup> These performance indicators reflect the analysis conducted by the Centre for Social Studies (CENSIS, 2000).

<sup>4</sup> Estimates are correct in the 95% of the cases (ISTAT, 2009; *see* Appendix D).

previous educational attainment, degree results, employment status, and parents' socio-economic status, as well as a range of personal characteristics.

**Table 1. Top-15 universities by attendance**

		n.	%	Average VTR rating (0 to 1)
1	Bologna	2,461	5.20	0.82
2	Padova	2,284	4.83	0.86
3	ROMA "La Sapienza"	2,185	4.62	0.81
4	Torino	1,892	4.00	0.82
5	Milano	1,827	3.86	0.84
6	Pavia	1,518	3.21	0.82
7	Napoli "Federico II"	1,466	3.10	0.79
8	Firenze	1,377	2.91	0.80
9	Pisa	1,303	2.76	0.80
10	Chieti-Pescara	1,249	2.64	0.82
11	Milano Politecnico	1,236	2.61	0.83
12	Genova	1,214	2.57	0.79
13	Siena	1,203	2.54	0.82
14	Milano "Cattolica del S. Cuore"	1,149	2.43	0.81
15	Roma "Tor Vergata"	1,117	2.36	0.81
16	other...	23,810	50.35	-
Total		47,291	100.00	

**Source:** authors' calculations based on ISTAT and MIUR data

We matched the ISTAT database on the labour market entry conditions for 2004 Italian graduates to CIVR university-level data on Italian university quality.<sup>5</sup> In its attempt to improve the efficiency and effectiveness of the higher education sector in Italy<sup>6</sup>, the Italian Government has encouraged the publication of university performance measures. Thus, in 2005 CIVR conducted the first and only national evaluation of research activity (VTR) in Italy covering research activities conducted in the period 2001-03 (MIUR, 2007). The VTR rates and ranks university research performance, assessing a certain number of research outputs defined on the basis of university size. Each research output is rated on the basis of a peer review evaluation (excellent=1.0, good=0.8, acceptable=0.6, poor=0.2, not classifiable=0). The weighted sum of the ratings divided by the number of products submitted to the evaluation provides a score – a rating - for each academic institution reviewed. This match allowed us to use institutional level evaluation ratings, classified by scientific areas.

MIUR (2007) classifies universities according to size as follows: small universities up to 10,000 students; medium universities 10,000 to 15,000 students; large universities 15,000 to 40,000 students; mega universities over 40,000 students. In our sample 36.3% of graduates attended a mega university, 48.0% attended a large university, 7.7% attended a medium university and 8.0% were enrolled at a small university. Enrolment of over 50% of the students interviewed by ISTAT

<sup>5</sup> The analysis of the shortcomings of aggregate university performance measures is beyond the scope of this paper (for a discussion see Black and Smith, 2006; Bratti *et al.* 2004). Research assessment exercises often explicitly ignore the publications of most full-time researchers - on the grounds that they are employed on fixed term contracts -, but this does not apply to the VTR evaluation which does not explicitly exclude fixed term employed researchers' outputs from the evaluation, and includes a weighting for staff affiliation (e.g. publications with two authors from two different institutions are weighted 50% to each institution).

<sup>6</sup> See Di Pietro and Cutillo (2008).

was split across 15 university institutions. Table 1 reports the Top-15 Italian universities by student attendance and VTR rating. The majority of the top-15 academic institutions received an average VTR rating of 0.82, well above the national average of 0.77 (scores range from 0.0 to 1.0). Table 2 reports the distribution of university attendance by scientific area. The majority of graduates included in the sample were enrolled in medical faculties (24%) or on courses in economics-statistics (11.8%) and engineering (10.6%).

**Table 2.** University attendance by scientific area

	n.	%
Sciences	1,710	3.62
Chemistry-pharmaceutics	2,052	4.34
Geo-biology	2,105	4.45
Medicine	11,370	24.04
Engineering	5,032	10.64
Architecture	2,299	4.86
Agriculture	1,263	2.67
Economics-statistics	5,585	11.81
Political sciences	3,885	8.21
Law	3,795	8.02
Literature	2,296	4.85
Languages	1,505	3.18
Teaching	1,478	3.12
Psychology	1,054	2.23
Physical education	1,678	3.55
Total	47,300	100.00

Source: authors' calculations based on ISTAT and MIUR data

Finally, the data were matched with ISTAT NUTS3 regional data on unemployment and value added to control for Italian regional economic differences.

## 4. Econometric analysis

### 4.1. The estimated equation

In order to investigate the determinants of Italian graduates' employability, the probability of being employed (1 and 3 years after graduation) is modelled as follows:

$$P_{ijur} = \beta_0 + X_{ijur}\beta_1 + G_{ijur}\beta_2 + Q_{ijur}\beta_3 + R_{ijur}\beta_4 + \varepsilon_{ijur} \quad (1)$$

where  $i = 1 \dots 47,342$  (individuals interviewed);  $j = 1 \dots 15$  (field of study);  $u = 1 \dots 64$  (universities attended);  $r = 1 \dots 103$  (Italian provinces). Given the non-linearity of the employed/not employed status, we adopt a probit econometric approach: the dependent variable  $P_{ijur}$  takes the value 1 if individual  $i$  is employed, and 0 otherwise. Specifically, we employ a robust weighted probit regression model in which the individual weights are the carry-over coefficients of the original universe.

Similar to the existing studies on labour market outcomes, the analysis relies on the assumption that the relevant variables have not been omitted (Hussain *et al.*, 2009). In fact, the problem of self-selection (e.g. Chiswick, 2000; Borjas, 1987) might arise in this kind of analysis: certain characteristics/skills (e.g. innate individual ability, level of human capital accumulated by the



student, and income constraints) may make it more likely that some individuals enrol at a university and complete their studies (graduate). It follows then, that employed graduates may not be representative of a random sample of the source province population, but rather a sample systematically selected from the relevant distribution.<sup>7</sup>

For this reason, we include a large set of control variables  $X_{ijur}$  with information related to the respondent's personal characteristics and family and education background. Personal characteristics include sex, age, marital status, and progeny. In particular, being married may provide an incentive to find a job, especially for males given that in Italian households they usually have the greater financial responsibility (Di Pietro and Cutillo, 2006). In line with previous work (Di Pietro and Cutillo, 2006; Dolton and Vignoles, 2000), we control for being female, with children, since the decision to participate in the labour force is likely to be non-random. That is, information on the presence of children is used as an exclusion restriction since it is likely to influence the labour supply, especially of female graduates. Age is expected to negatively affect the probability of finding a job, based on the assumption that the older the graduate, the longer the period he/she needed to complete his/her higher education studies (and, *ceteris paribus*, the lower his/her "ability"). While sex, age and family are clearly observable, there are unobservable individual characteristics such as, ability and ambition, and for this reason we include controls for education history. These include student's high school type and grade, his/her high school and university performance and attainment of post-graduate qualifications (second level degree, one and/or two year master's course, diploma degree). Among the variables related to family background, we consider education level and parents' professions (based on the assumption that the value of networks is higher for individuals from a well educated family; Brunello and Cappellari, 2008; Brunello and Checchi, 2005).

As in Italy there is not a tradition of publishing university league tables, university enrolment is not restricted, fees do not vary over the territory, and students' mobility is of a limited entity (and limited to South Italy graduates; Ciriaci, 2010, 2006 and 2005, Jahne, 2001) self selection on unobservable is likely to be a limited issue. Nevertheless, we checked the correlation between variables used as proxies for graduates' ability and those used to proxy university quality, assuming that if there were no selection on observable, it would be possible to assume there is not even on unobservable (*preliminary results go in this direction*). Finally, as individuals also may be self-selected on the basis of field of study, we include a set of 14 faculty group dummies ( $G_{ijur}$ ).<sup>8</sup>

Geographical factors are likely to influence Italian graduates' employability that is why the unemployment rate is included as control variable. Finally, since there is theoretical and empirical evidence to show that human capital accumulation is faster in bigger metropolitan areas (Glaeser and Resseger, 2010; Glaeser and Mare, 2001), we control for the existence of agglomeration economies (the ratio of value added of the administrative province in which the individual is resident, and national value added, averaged over 2001-05). These last two variables are included in  $R_{ijur}$ .

As noted by Black and Smith (2006), most previous studies on the impact of university quality on labour market outcomes employ a single measure of university quality in regressions such as (1). However, as university quality is a multi-dimensional attribute (Hussain *et al.*, 2009), we prefer to consider a set of university quality variables ( $Q_{ijur}$ ) including the ranking of the university attended by individual  $i$  (measuring the 'prestige' of the university), university size, and the number of students per lecturer. Finally, as private universities provide valuable network effects (Brunello and

<sup>7</sup> See Heckman and Robb (1985).

<sup>8</sup> The regressions do not take account of individuals that graduated from the areas of physical education and defence and security because there are no university quality data available for these areas.

Cappellari, 2007), and may facilitate the access of graduates to employment, a dummy is included to control for this effect. Table 3 presents the control and explanatory variables included in the model and Table 4 reports the descriptive statistics. The following section reports the results of the econometric analysis.

#### **4.2. Estimation of the determinants of graduate employment three years after graduation**

This section provides empirical evidence on the determinants of graduates' employability within three years after graduation. The results are reported respectively in Table 5. Since the dependent variables are based on discrete choices (employed/not employed), we employ probit models and calculate the corresponding marginal/impact effects, which are reported in the last column in both tables.<sup>9</sup>

The results show that in the longer term, students' characteristics and family background are quite important. Being a female, and especially with children, negatively affects the probability of finding a job within three years after graduation. The effects are similar for parents' educational attainment levels, which negatively affect employability. In other words, the lower the educational level of the parents, the higher the probability that the graduate will (have the necessary drive to search for and) find a job (or will settle for a second-best option). Because of the high positive correlation between education level and income level, if we assume that the level of education of a graduate's parents is a proxy for his/her socio-economic background (data on family's income are not available), the empirical findings would suggest that the incentive to find a job is higher for graduates with lower family economic status.

Furthermore, the probability of finding a job is not correlated to school and educational success, in line with Bacci *et al.* (2008), while previous work experience turned out to be quite statistically significant: being in employment prior to graduation positively affects the probability of being employed three years after graduation. As far as field of study is concerned, 2004 graduates from Geo-Biology, Law and Psychology have a lower probability of being employed in 2007 than graduates from other scientific areas.

However, in line with the empirical literature on Italian labour market outcomes of tertiary education (ISTAT, 2009; Ciriaci, 2007, 2005; ISTAT, 2006) graduates in engineering, economics-statistics, political-science, chemistry-pharmaceutics, and architecture are more likely to be employed in the long run. Moreover, enrolment on a postgraduate course positively affects graduates' employability except in the case of the two-year 'laurea specialistica' postgraduate degrees: the probability of being employed three years after graduation is lower for graduates who choose the 3+2 degree course. On average, a master course is more beneficial in terms of getting a job, most probably because of agreements with private organizations for sponsorship for master students which allow students to participate in training programmes and/or look for work.

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<sup>9</sup> Logit regressions provide remarkably similar econometric results.

**Table 3.** Variables used in the econometric regressions

Acronym variable	Description	Source
<b>Dependent variables</b>		
employed_2007	Dummy variable taking on the value one if the individual is employed in 2007, zero otherwise.	ISTAT survey data
employed_2005	Dummy variable taking on the value one if the individual is employed in 2007, zero otherwise.	ISTAT survey data
<b>Student's characteristics</b>		
female	Dummy variable taking on the value one if the individual is a female, zero otherwise.	ISTAT survey data
children	Dummy variable taking on the value one if the individual has children, zero otherwise.	ISTAT survey data
female_with_children	Dummy variable taking on the value one if the individual is female and has children, zero otherwise.	ISTAT survey data
age_class	Age of the individual in classes (increasing from 1 to 8)	ISTAT survey data
married_or_divorced	Dummy variable taking on the value one if the individual is a married or divorced/separated, zero otherwise.	ISTAT survey data
<b>Family background</b>		
father_position	Dummy variable taking on the value one if the father of the individual is self employed or an executive/manager, zero otherwise.	ISTAT survey data
edu_level_father	Indicator of the level of education attained by the individual's father.	ISTAT survey data
edu_level_mother	Indicator of the level of education attained by the individual's mother.	ISTAT survey data
<b>Field of Study and University background</b>		
scientific_area	15 field of study dummies (Sciences, Chemistry/Pharmacy, Geo/Biology, Medicine, Engineer, Architecture, Agrarian, Economics/Statistics, Political Sciences, Literature, Linguistic, Teaching, Law, Phicology).	ISTAT survey data
3yr_degree	Dummy taking on the value one if the individual concluded a first level degree, zero otherwise.	ISTAT survey data
university_final_mark	Higher university score.	ISTAT survey data
diploma_degree	Dummy taking on the value one if the individual concluded a diploma degree, zero otherwise.	ISTAT survey data
1yr_master_degree	Dummy taking on the value one if the individual concluded a 1year master, after 3year degree, zero otherwise.	ISTAT survey data
2yr_postgrad_degree	Dummy taking on the value one if the individual concluded a second level degree, zero otherwise.	ISTAT survey data
1yr_postgrad_master_degree	Dummy taking on the value one if the individual concluded a 1year master after a second level degree, zero otherwise.	ISTAT survey data
work_before_graduation	Dummy taking on the value one if the individual started working before graduation, zero otherwise.	ISTAT survey data
<b>University quality</b>		
university_rating	Average rating of the University attended	MIUR (2007)
university_size	4 University dimension dummies (small, medium, big, very big).	MIUR (2007)
university_private	Dummy taking on the value one if the University attended by the individual was private, zero otherwise.	MIUR
n_students_per_lecturer	Number of student per lecturer in the University attended by the individual.	MIUR (2007)
<b>Employment and Economic opportunities</b>		
added_val_uni/tot	Ratio between the value added of the county where the individual studied and the national value added (average 2001-05).	ISTAT National Accounts
local_unemp_rate	Average unemployment rate in the county of residence of the individual in 2007 over the period 2004-07.	ISTAT National Accounts

**Table 4.** Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
employed_2007	46196	0.71	0.45	0.00	1.00
university_rating	47291	0.79	0.05	0.52	0.92
n_students_per_lecturer	47291	31.37	15.98	10.43	183.91
university_private	47300	0.06	0.23	0.00	1.00
university_size	47291	42255.9	31459.5	459.0	132575.0
		9	9	0	0
female	47300	0.53	0.50	0.00	1.00
children	47300	0.13	0.33	0.00	1.00
female_with_children	47300	0.07	0.26	0.00	1.00
age_class	47300	7.22	0.70	1.00	8.00
married_or_divorced	47300	0.27	0.44	0.00	1.00
father_position	47300	0.05	0.21	0.00	1.00
edu_level_father	46900	3.88	1.30	1.00	6.00
edu_level_mother	47092	3.71	1.25	1.00	6.00
hs_lyceum	47300	0.42	0.49	0.00	1.00
hs_grade	47300	49.24	7.35	36.00	60.00
3yr_degree	47300	0.44	0.50	0.00	1.00
university_final_mark	47300	103.22	6.99	66.00	110.00
work_before_graduation	47300	0.20	0.40	0.00	1.00
1yr_master_degree	47300	0.05	0.22	0.00	1.00
2yr_postgrad_degree	47300	0.15	0.36	0.00	1.00
1yr_postgrad_master_degree	47300	0.03	0.16	0.00	1.00
scientific_area_1	47300	0.04	0.19	0.00	1.00
scientific_area_2	47300	0.04	0.20	0.00	1.00
scientific_area_3	47300	0.04	0.21	0.00	1.00
scientific_area_4	47300	0.24	0.43	0.00	1.00
scientific_area_5	47300	0.11	0.31	0.00	1.00
scientific_area_6	47300	0.05	0.22	0.00	1.00
scientific_area_7	47300	0.03	0.16	0.00	1.00
scientific_area_8	47300	0.12	0.32	0.00	1.00
scientific_area_9	47300	0.08	0.27	0.00	1.00
scientific_area_10	47300	0.08	0.27	0.00	1.00
scientific_area_11	47300	0.05	0.21	0.00	1.00
scientific_area_12	47300	0.03	0.18	0.00	1.00
scientific_area_13	47300	0.03	0.17	0.00	1.00
scientific_area_14	47300	0.02	0.15	0.00	1.00
added_val_uni/tot	46229	0.03	0.03	0.00	0.10
local_unemp_rate	46229	6.74	4.06	2.55	18.50

**Table 5. Results**

Dependent variable: employed_2007	coefficient	robust s.e.		Marginal (or impact) effect	
	(1)	(2)		(3)	
female	-0.097	(0.022)	***	-0.030	§
children	0.095	(0.098)		0.029	§
female_with_children	-0.376	(0.101)	***	-0.128	§
age_class	-0.109	(0.026)	***	-0.034	
married_or_divorced	0.199	(0.036)	***	0.059	§
father_position	0.070	(0.048)		0.021	§
edu_level_father	-0.033	(0.011)	***	-0.010	
edu_level_mother	-0.039	(0.012)	***	-0.012	
3yr_degree	0.053	(0.026)	**	0.016	§
university_final_mark	-0.002	(0.002)		0.000	
diploma_degree	-0.060	(0.025)	**	-0.019	§
1yr_master_degree	0.219	(0.047)	***	0.063	§
2yr_postgrad_degree	-0.516	(0.032)	***	-0.178	§
1yr_postgrad_master_degree	0.048	(0.069)		0.014	§
work_before_graduation	0.658	(0.052)	***	0.172	§
university_rating	0.881	(0.249)	***	0.272	
university_size	0.000	(0.000)	**	0.000	
university_private	0.243	(0.045)	***	0.069	§
n_students_per_lecturer	0.000	(0.001)		0.000	

Other controls: scientific area,  
unemp. rate, value added ratio.

Number of obs 44715

Pseudo R2 0.124

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

§ impact effect for discrete change of dummy variable from 0 to 1

The estimates indicate that neither studying in a large institution nor in an institution with better lecturer per student ratios has a relevant effect on employability. In contrast, the coefficient of university rating is statistically significant and, as expected, positive. Graduating from research-oriented institutions, that score well in quality evaluation, pays off in terms of long-term employability. The corresponding marginal effect indicates that a 1-point increase in the VTR rating provides a 0.25-point increase in the probability of being employed in 2007. Moreover, studying in a private university increases the chances of long-term employability. In line with previous empirical studies (Brunello and Cappellari, 2005), this suggests that private universities are involved in valuable networks and have efficient careers services available to their graduates. Similar evidence is found in the case of prestigious research institutions. In fact, there is empirical evidence that research prestige is associated with extensive university-industry networks (Smith and Katz, 2000).

## 5. Conclusions

The central role of universities traditionally has been to train students and prepare them for a professional career. The findings from this study show that encouraging academic scientific research would be beneficial to this aim and shed light on the pivotal role of academic institutions in economic systems, proving that their contribution to employment growth could be substantial.

The goal of the analysis was to measure the effect of the quality of the university attended on the probability of Italian graduates to find an employment three years after graduation, as well as to identify any other factor that could possibly affect their employability. To this aim we gave a special reference to the multi-dimension nature of university quality using as proxies of it both the quality of research and of teaching, and controlling for universities' fixed effects and dimension. To this end, we used the most recent ISTAT survey on the labour market entry conditions of 2004 Italian graduates, and we matched it with the results of the national evaluation of Italian universities' quality carried out by the CIVR in 2005, using the university attended by the individual as merging variable. This evaluation covered the research activities conducted in the period 2001-03, therefore when the students/graduates interviewed by ISTAT in 2007 were attending university.

The empirical analysis in this paper provides two key findings: geographical location and research quality are key enablers of employability for young graduates. The outcomes of the first result are straightforward: in order to find a job, holding all the other factors constant, graduates need to be resident in areas of low unemployment. However, if the sharp regional economic inequalities for Italy are considered, we come to the obvious conclusion that this aspect is difficult to tackle in the absence of aggressive policy measures targeting entrepreneurship, local investment and creation of favourable business conditions.

Therefore, although enhancing university quality is a necessary, but not a sufficient condition to foster students' employability, we can draw some relevant policy implications from the second outcome. The indicator of research quality used in this paper picks up an institutional prestige effect, which has a number of positive effects for employability. Our results show that attending a research-oriented university –after having controlled for the well-known Italian regional economic disparities - improves employability, reducing brain waste, especially from rural areas.

Therefore, our analysis argues strongly for the promotion of policy initiatives to improve the quality of academic institutions, and the accountability of research results. The scientific prestige of academic institutions does matter and, thus, the choice of which university to enrol in may be important in terms of allowing graduates easier access to the labour market.

Our results would suggest that systemic interventions to create centres of excellence in areas such as Southern Italy would be very beneficial. Furthermore, developing centres of excellence for scientific research and framing the conditions for innovation and high tech entrepreneurship can make regions attractive to both home and foreign students and young graduates. Policies should include promotion of entrepreneurship, training and education, mechanisms influencing the allocation of capital, public research and its links with business.

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