Laboratory of Economics and Management

Sant'Anna School of Advanced Studies
Piazza Martiri della Libertà, 33 - 56127 PISA (Italy)
Tel. +39-050-883-343 Fax +39-050-883-344
Email: lem@sssup.it Web Page: http://www.lem.sssup.it/

LEM

Working Paper Series

Do On-Line Labor Market Intermediaries Matter? The impact of AlmaLaurea on University-to-Work Transition

Manuel F. Bagues*
Mauro Sylos Labini§

*Universidad Carlos III, Madrid, Spain
§IMT Lucca Institute for Advanced Studies, Italy

2005/15 **October 2007**

ISSN (online) 2284-0400

Do On-Line Labor Market Intermediaries Matter? The impact of *AlmaLaurea* on University-to-Work Transition [1]

Manuel F. Bagues
Universidad Carlos III

Mauro Sylos Labini
IMT Lucca Institute for Advanced Studies

ABSTRACT

This paper evaluates the impact of the availability of electronic labor markets on university-to-work transition. In particular, we analyze the effect of the intermediation activity carried on by the interuniversity consortium *AlmaLaurea* on graduates' labor market outcomes. Different timing of universities' enrolment in *AlmaLaurea* produces counterfactuals that allow us to overcome the problems faced by previous empirical investigations. The evaluation is performed applying the difference-in-differences method to a repeated cross section data set. It is shown that, if the usual assumption concerning parallel outcomes holds, *AlmaLaurea* reduces individual unemployment probability and improves matching quality. Interestingly, it is also found that on-line intermediaries foster graduates' geographical mobility.

JEL Classification: J64, J68, G14.

Keywords: Labor Markets Intermediaries, Job Search, Electronic Markets.

This version: October 22, 2007

---

[1]We thank David Autor and Anne Polivka for very helpful comments. We have also benefitted from the comments of participants of seminars at University of Oviedo, University of Bologna, 4th IZA/SOLE Transatlantic meeting, Bocconi University, S. Anna School of Advanced Studies, University of Alicante, 6th Villa Mondragone Workshop, XI Spring Meeting of Young Economists, and NBER Conference on Labor Market Intermediation. The usual disclaimers apply. The empirical analysis would not have been possible without the data and help provided by ISTAT (the Italian Statistical Office). The econometric analysis was carried out at the ADELE Laboratory. We also thank Michele Rostan for providing the data of the European Project "Careers after Higher Education: a European Research Study". Corresponding author Mauro Sylos Labini: `m.syloslabini@imtlucca.it`.

1. Introduction

The internet and, more generally, electronic technologies have a great potential in changing the way employer-employee matches are made (Autor 2001). In fact, the last ten years have seen a well documented increase in the number of internet job boards and corporate web sites devoted to job applications, and in the shares of job seekers and recruiters using on-line resources. For example, according to Taleo Research the incidence of Fortune 500 companies using their career web site as a corporate job board increased from 29 percent in 1998 to 92 percent in 2002. Moreover, the importance of on-line technologies may be underestimated since the possible uses of the internet in job search are multifaceted and goes well beyond viewing ads or posting résumés (Kuhn 2000).[2]

Having said that, however, it has been extremely difficult to assess the impact of on-line technologies on labor market outcomes. The internet is believed to increase the amount of information available to recruiters and job seekers and at the same time to improve their ability to screen on-line applications and opportunities. Both aspects are likely to decrease the cost of job search and therefore to improve matching productivity (Pissarides 2000).

Nevertheless, it has also been noted that even if searching on-line had private individual benefits, it does not follow that the equilibrium effects on labor market outcomes are socially beneficial (Autor 2001). In a recent empirical investigation Kuhn and Skuterud (2004) also find that – once individual observable characteristics are controlled for – internet seekers do not have shorter unemployment duration than other searchers and in some specification even longer duration. As acknowledged by the authors, these results may be contaminated by selection into internet job search on unobservables that are negatively correlated with employability. However, it is also possible that internet search is counterproductive at the individual level because of the negative signal it might send to employers. Workers may still use the internet, the authors argue, because it is very cheap and they are not aware of this drawback.

Therefore, despite their rapid diffusion, whether on-line electronic technologies are capable of increasing the overall efficiency with which workers and jobs are matched or, conversely, they are mere cheaper substitutes for more traditional means (e.g. newspaper ads or face-to-face intermediation) is still an open issue.

This paper evaluates the impact of the availability of electronic labor markets on university-to-work transition. In particular, we study the effects of a specific electronic

[2]In a recent report, the US Congressional Budget Office has pointed out that "internet job searching may also have played a role in reducing the natural rate (of unemployment)" (CBO 2002).

intermediary, the interuniversity consortium *AlmaLaurea*, on graduates' unemployment, mobility, and matching quality. To put it in a nutshell, *AlmaLaurea* collects and organizes on-line information concerning college graduates' curricula and conditional on their permission sells it to firms in electronic format. Hence, similarly to other commercial job boards, it makes information about searching candidates available on-line. However, it also contains information on almost the entire universe of graduates from the institutions that it serves.

The present case study provides exceptional evidence on the effect of online labor market intermediaries for two basic reasons: first, *AlmaLaurea*'s impact is observed during a time period in which e-recruitment was almost non-existent in Italy. *AlmaLaurea* was founded in 1994 and, to the best of our knowledge, untill 1999 there were no major internet job boards operating in Italy. Second, different timing of universities' enrolment in *AlmaLaurea* produces counterfactuals that allow us to overcome the problems faced by previous empirical investigations. Even if today most Italian universities are member of the consortium, *AlmaLaurea* started to sell graduates curricula only in a subset of universities. We identify the average effect of *AlmaLaurea* on graduates from this initial subset—i.e. the ones that might have used its service—comparing their employment outcomes with the ones of graduates from universities that were member. Hence, we estimate the effect of the *availability* of electronic intermediaries and not the private benefits of using them.

More formally, the effect of *AlmaLaurea* is measured using the difference-in-differences approach applied to a repeated cross section data set. This is built merging two distinct (but almost identical) surveys run by the Italian Statistical Office (ISTAT) on representative samples of two cohorts of university graduates interviewed three years after graduation. Given that *AlmaLaurea* intermediation activity only started in a subset of universities in between the graduation time of the two cohorts, we split the sample in two distinct groups of graduates: those that completed their degree in a university that joined *AlmaLaurea* in 1996 and 1997 (the treatment group) and those that graduated from universities that did not belong to *AlmaLaurea* during such period (the control group). The subtleties of envisaging academic institutions participation in *AlmaLaurea* as a quasi-natural experiment are discussed more thoughtfully below. Here it suffices to say that, first, in the period studied individual decisions concerning college enrolment were made before the existence of *AlmaLaurea*; second, graduates and universities in the two groups are not statistically different in observable characteristics; third, according to personal conversations with the consortium director, *AlmaLaurea* early membership has been quite accidental and mostly based on informal relationships among a few faculties.

AlmaLaurea, as we shall discuss more thoroughly below, displays a number of features that make it likely to be effective: first, it collects official information concerning also individ-

uals who decide not to post their résumés on-line and partly discloses it to firms. Second, it accomplishes very high enrolment rates among graduates. We conjecture that both features are likely to reduce adverse selection.

According to our analysis, *AlmaLaurea* decreases unemployment probability by about 2 points and has a positive effect on wages and two self reported measures of job satisfaction. Interestingly, we also find that it fosters graduates' geographical mobility.

To check whether the above findings are robust, we test for pre treatment parallel outcomes finding that graduates from the two groups of universities had similar employment dynamics before *AlmaLaurea* started to operate. An additional threat to our results may stem from the adverse consequence of *AlmaLaurea* for graduates of other universities. To control for this possibility, we build alternative control and treatment groups based on geographical proximity. We do not find any evidence for the above negative effect.

Our work is related to the growing number of studies that investigate the effect of the internet and electronic technologies on the labor market (Autor 2001; Freeman 2002). Kuhn and Skuterud (2004) study the impact of Internet job search on the probability of finding a job for the unemployed. No discernible differences between on-line and traditional searchers makes them conclude that either on-line search is ineffective or Internet job searchers are negatively selected. Stevenson (2007) investigates the importance of on-line technologies on employed on-line job search. She finds that in the United States state-level rise in Internet penetration is associated with state-level rise in employer-to-employer worker flows. In this paper, we focus on university-to-work transition.

Our study is also significant for policy evaluation and guidance: to begin with, the consortium *AlmaLaurea* is co-financed by the Italian Ministry of Education, therefore clear evidence on its effectiveness is useful for evaluating how public money is spent.[3] Moreover, if *AlmaLaurea* proves to be an effective institutional arrangement, other European countries might learn from its example improving public policy aimed at facilitating university-to-work transition.

The rest of the paper is organized as follows. Section 2 provides an outlook of the Italian university-to-work transition, describes in dept the *AlmaLaurea* consortium, and briefly discusses the economics of on-line labor market intermediaries. Section 3 outlines the identification assumptions needed for our empirical strategy to be valid. Section 4 is

[3]Given that we do not know the magnitude of public money put in *AlmaLaurea*, we are not able to measure if *AlmaLaurea* is a worthwhile social investment, but simply if students from *AlmaLaurea* universities benefited from it.

concerned with the description of the data used in the analysis. Section 5 presents the main results. Sections 6 and 7 try to overcome the major threats faced by our empirical approach. Finally, Section 8 concludes.

2. Background

2.1. University-to-Work transition in Italy

Labor market functioning is deeply affected by different kinds of information imperfections and asymmetries. Education-to-work transition is particulary exposed to such imperfections: first-time job seekers typically lack work experience and this negatively affects both their outlooks concerning employment opportunities and jobs characteristics and employers' screening options.

In most countries unemployment rates are lower for university graduates than for the rest of labor force and highly educated people experience a smoother entry into working life (OECD 2007). As shown in Table 1, however, international comparisons depict Italian university-to-work transition as one of the most problematic cases among industrialized countries.[4] Three main explanations can be put forward. First, frictions stem from the *supply* side: education provided by Italian universities might be poor enough to oblige graduates to undergo further training, either formal or informal, before getting into their working life. Second, the slow transition rates may be due to labor *demand* characteristics. It turns out that the Italian industrial structure, compared to other developed countries, is biased in favor of small firms and low tech industries that typically do not employ highly qualified workers. Finally, inefficiencies may stem from the *matching* mechanisms, harmed by information imperfections and, possibly, by the lack of intermediaries.

AlmaLaurea potentially improves labor market functioning for two basic reasons. First, it reduces search costs for both firms and workers by making verified qualification, grade and study data readily available. Second, it may mitigate adverse selection by making feasible to compare searching students to others in their cohorts.

Universities are often active actors in labor market intermediation. For instance, most academic institutions set up and manage placement offices and, more rarely, their faculties establish informal ties with firms.[5] However, when universities receive financial resources on

[4]See also the data in Mannheim Centre for European Social Research (2002).

[5]See Rebick (2000) for an insightful account of the Japanese case.

Table 1: **Employment Rates of University Graduates by Age Classess - 2004**

	Age Class		
Country	*25-29*	*30-34*	*35-39*
Denmark	79.7	87.7	91.2
Finland	84.4	86.7	87.9
France	80.1	85.0	87.5
Greece	72.2	85.5	87.9
Italy	**58.0**	**81.9**	**89.4**
Spain	76.3	85.9	86.7
Sweden	76.6	88.2	88.3
UK	90.5	98.1	90.1

Source: Eurostat.

a relatively egalitarian basis and their graduates' labor market performance does not affect their financial endowments, they might lack incentives to be concerned about their students' placement. In Italy before the existence of *AlmaLaurea* public universities were barely doing any formal intermediation activity.[6] Table 2 refers to 1995 graduates and displays across a selected sample of European countries the share of graduates who used the help of their institutions' placement office (first column) and the share of graduates who get their first job through this channel (second column). With the notable exception of Germany, Italy ranks well below in both respects.[7]

2.2. *AlmaLaurea* features

AlmaLaurea was founded in 1994 and began on-line intermediation in 1995 when in Italy, to the best of our knowledge, there were no other internet job boards. Monster and InfoJob, today's most popular e-recruitment sites according to Nielsen/NetRatings, started up respectively in 2001 and 2004.[8]

[6]Indeed, there is anecdotal evidence saying that several departments provided on informal bases unorganized paper based information concerning their graduates to recruiting companies.

[7]Percentages displayed are calculated using the data set built by a Project funded by the European Community under the Targeted Socio-Economic Research (TSER) named "Careers after Higher Education: a European Research Study". See `http://www.uni-kassel.de/wz1/tseregs.htm` for details.

[8]It turned out to be impossible to establish with some precision the timing of the first Italian internet job-board. Nevertheless, according to personal communications with industry experts in the field the first

Table 2: **University Graduates Using University Placement Offices**

Country	*Utilization rates (%)*	*Used to get the first job (%)*
Italy	10.3	1.42
Spain	39.3	3.96
France	18.1	3.21
United Kingdom	37.6	6.61
Germany	6.6	0.54

Notes: The relevant questions (asked in 1998 to graduates who obtained their degree between autumn 1994 and summer 1995) were: (i) "How did you search for your first job after graduation?"; (ii) "Which method was most important for getting your first job after graduation?". Multiple options follow, among which "I enlisted the help of a careers/placement office in my higher education institution". The ratios displayed are computed respectively over graduates who have sought a job and over those graduates that have been employed at least once.
Source: Authors' calculation based on the data set produced by the Project funded by the European Community under the Targeted Socio-Economic Research (TSER) "Careers after Higher Education: a European Research Study".
Details on the project and downloadable material can be found at `http://www.uni-kassel.de/wz1/tseregs.htm`.

Initially run by the Statistical Observatory of the University of Bologna, *AlmaLaurea* is today managed by a consortium of 50 private and public universities with the support of the Ministry of Education. Member universities pay a one-time association fee (ranging between 2582 and 5165 euros according to university dimensions) and an annual subscription fee for the collection and the insertion of new data in the *AlmaLaurea* database (4.96 euros for each student in the data base).

AlmaLaurea institutional objectives are twofold. First, it provides member academic institutions with reliable information concerning their graduates. Second, it aims at facilitating graduates' labor market transition.

As far as the first objective is concerned, *AlmaLaurea* manages a database which collects information on graduates drawing it from three distinct sources. First, academic institutions provide official data concerning grades, course durations, and degrees received by their alumni. Second, undergrads provide several pieces of information including military service obligations, periods of study abroad, work experience, and a self-evaluation concerning foreign languages and computer skills. Finally, graduates have the option to upload and update on-line their curricula up to three years after graduation.[9] In accordance with Italian privacy law, only a subset of the information in the database can be disclosed to third parties.[10]

With respect to the second objective, *AlmaLaurea* manages a service that makes elec-

one was JobPilot, which was founded in 1999 and was acquired by Monster in 2005.

[9]Recently, such option has been extended up to five years.

[10]More information can be found on-line at `http://www.almalaurea.it/eng/index.shtml`

Table 3: **The evolution of *AlmaLaurea***

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Number of universities	15	20	22	25	25	27	37	39	44	50
Share of graduates	.24	.31	.34	.39	.39	.37	.43	.51	.57	.67
Number of CV in *AlmaLaurea*	62745	105409	153843	213976	286345	367497	477282	624960	792575	900000
Number of CV sold	3973	15999	115603	194635	164209	271364	389625	-	-	-
CV sold in the same region (share)	.55	.72	.50	.37	.35	.30	.30	-	-	-

Source: Authors' calculation based on data provided by *AlmaLaurea*. "Share of graduates" refers to the share of graduates in *AlmaLaurea* universities with respect to the entire population of graduates in Italian universities. Data on CV sold for 2005, 2006, and 2007 are not available. Data for 2007 are estimates calculated in June 2007.

tronically available to firms graduates' CV. A CV is an electronic file containing biographical information, graduation age, university and high school grades, information on eventual internships, experience abroad, post graduate education, language and computer skills, work experience, and work preferences (i.e. kind of occupation desired, favorite location, and preferred contract). Graduates may also add additional information and a cover letter.[11]

The service is free for graduates. Firms and other institutions may also freely browse individual curricula and observe populational aggregate information, but need to pay if they want to contact a given graduate. The price ranges between 0.5 and 10 Euros per CV, depending on the type of subscription and the number of curricula acquired.[12]

Table 3 gives an outlook of *AlmaLaurea*'s history and performance. It displays the number of universities enroled, the share of graduates from *AlmaLaurea* universities, the number of résumés available for firms, and the ones sold by the consortium.

2.3. *AlmaLaurea* and the Economics of Electronic Labor Markets

The *AlmaLaurea* recruitment service turns out to be an insightful example concerning how on-line communication technologies (coupled with more traditional forms of intermediation) might ameliorate the way in which employers and employees match in the labor market.

[11] A sample CV (in Italian) is available: `http://www.almalaurea.it/info/aiuto/aziende/esempio_cv.shtml`.

[12] More specifically, firms can choose among two different modalities. First, the so-called self-service modality can be used. After paying a fixed fee of 50 Euros, any number of CV can be acquired at the cost of 10 Euros per CV. Second, firms can choose the subscription modality, which allows them to prepay a whole package of CV downloadable during a period of one year. The offers range from 200 CV for around 500Euros up to 5000CVs for 2600Euros. More detailed information is available (in Italian) at `http://www.almalaurea.it/info/condizioni/buono_ordine_abbonamenti.pdf`.

To keep it simple, on-line labor market intermediaries are expected to decrease search costs for both employers and employees. Standard search theory predicts that, everything equal, this should lead to better matches. Conversely, the effects on unemployment duration are ambiguous. In fact, even if Burdett and Ondrich (1985) suggest that this is unlikely, on-line technologies might induce both job seekers and employers to be choosier and increase their reservation wages and screening standards (Pissarides 2000). Finally, on-line labor market intermediaries are also expected to weaken constraints posed by geographical distance (Autor 2001). Consistently, in the *AlmaLaurea* case most graduates' curricula are bought by firms located in region different from the one where individual graduated (see Table 3).

On a different ground, a likely consequence of lower costs in distinct job search channels is that job seekers *ceteris paribus* will apply for more jobs. Especially when employers perceive such *excess application* as a problem, adverse selection is likely to undermine the effectiveness of cheap search methods (Autor 2001).

Except for the time required to update personal information, *AlmaLaurea* is completely free for students and therefore it is potentially exposed to the adverse selection problem underlined above: employers might expect that individuals who upload and update their résumés on-line are somehow negatively selected. However, *AlmaLaurea*'s organizational features are likely to make its intermediation activity less exposed to the above risk for two basic reasons.

First, as explained above, part of the information contained in *AlmaLaurea* data set concerns the entire graduates population and it is provided directly by academic institutions. This information is organized and freely available on-line on *AlmaLaurea* website.[13] For every member university and degree, the website provides information on average grades, the share of students that completed on time their degree, and the share of individuals that have studied abroad with a EU subsidized program. Therefore, employers who buy a CV may detect relevant differences between a selected job seeker and the entire graduate population. The adverse selection problem is hence considerably reduced.

Second, academic institutions that joined *AlmaLaurea* are able to enroll the overriding majority of their graduates. For instance, more than 92% of 1998 graduates updated their curriculum vitae at least once. High participation rates have been very effective in building a good reputation and make adverse selection unlikely. To sum up, we expect that the organizational features of *AlmaLaurea* prevent it from the usual shortcomings suffered by on-line labor markets.

---

[13] See (in Italian) `http://www.almalaurea.it/cgi-php/aziende/profilo/profilo.php`.

3. The Empirical Strategy

The basic goal of this paper is to evaluate the impact of a treatment, i.e. the availability of on-line labor market intermediaries, on an array of labor market outcomes, i.e. the probability of being unemployed, mobility, and matching quality. This section formalizes and explicitly discusses our empirical approach and outlines the strategies employed to assess its validity.

One of the most serious empirical problems in assessing the impact of on-line intermediaries is that job seekers and firms typically self select in the adoption of on-line technologies. It is therefore difficult to identify to which extent the correlation between their use and labor market outcomes stems from technology itself or from important and difficult to measure individual characteristics.

In this paper we can rely on a transparent exogenous source of variation, i.e. the timing of universities' enrolment in *AlmaLaurea*. This heterogeneity allows to apply the difference-in-differences (DID) method to a repeated cross-section data set. This helps to overcome the above problem.

The simple DID framework can be described as follows. The causal effect of a treatment on an outcome is defined as the difference between two potential outcomes (Rubin 1974; Heckman 1990). Of course, it is impossible to observe such an effect for a given individual. However, it is possible to identify an average effect if the population of interest is observed in at least two distinct time periods, only a fraction of the population is exposed to treatment, and parallel paths over time for treated and controls is assumed. The main intuition is that, under this design, an untreated group of the population is used to identify time variation in the outcome that is not due to treatment exposure.

More formally, each individual i belongs to one group, $G_i \in \{0, 1\}$, where for convenience group 1 is the treatment group and 0 the control one. Moreover, individual i is observed only in time period $T_i \in \{0, 1\}$. Let $I_i = G_i \cdot T_i$ denote an indicator for the *actual* subministration of treatment.[14] $Y_i^N(t)$ and $Y_i^I(t)$ represent two *potential* outcomes: respectively, the one that i would have attained at time t if not treated and the one if treated before t.

The fundamental problem to identify the treatment effect on individual i, defined as $Y_i^I(t) - Y_i^N(t)$, is that for any particular individual, one does not observe both potential outcomes. What one does observe is in fact the *realized* one, that can be written as $Y_i(t) =$

[14]Note that in our simple setting I_i assumes value 1 only for the treatment group ($G_i = 1$) in the post treatment period ($T_i = 1$).

$Y_i^I(t) \cdot I_i + Y_i^N(t) \cdot (1 - I_i)$.

If it is assumed that

$$E[Y_i^N(1) - Y_i^N(0)|G_i = 1] = E[Y_i^N(1) - Y^N(0)|G_i = 0], \tag{1}$$

then, it easily follows that

$$\begin{aligned} E[Y_i^I(1) - Y_i^N(1)|G_i = 1] = \quad & E[Y_i(1)|G_i = 1] - E[Y_i(0)|G_i = 1] \\ & -\{E[Y_i(1)|G_i = 0] - E[Y_i(0)|G_i = 0]\}. \end{aligned} \tag{2}$$

In words, if the average outcomes for treatment and control groups had parallel paths over time in absence of the treatment, then the so-called average treatment effect on the treated (ATT) can be expressed as something whose sample counterpart is observable, i.e. as the average variation of the treatment group purged by the average variation of the control one.

In the present study, it is hence assumed that in absence of *AlmaLaurea* the average occupational outcomes of graduates from early joining universities (hereafter *AlmaLaurea* universities) would have followed the same dynamics of the ones of graduates from universities that either joined later or did not join (hereafter non-*AlmaLaurea* universities). Thus the average effect of *AlmaLaurea* is simply obtained subtracting the dynamics of graduates of the control group from the dynamics of those graduated from the treatment one.

The above estimator is easily obtained as

$$Y_i = \mu + \gamma \cdot G_i + \delta \cdot T_i + \alpha \cdot (G_i \cdot T_i) + u_i \quad , \tag{3}$$

where α is the ATT and the assumption stated in equation 1 is equivalent to mean independence.

The validity of our approach faces a number of threats. As far as the so-called internal validity is concerned, i.e. the causal effect within the context of the study, two problems can be spelled out.[15] First, the compositional effect: the use of repeated cross-sections is only valid when the composition of the target population does not change between the two periods, i.e. $u_i \perp T_i \mid G_i$. Given that individual decisions concerning college enrolment were taken before the existence of *AlmaLaurea*, we can presume that this problem is not very severe in our case. However, following standard practice, we shall test whether the means of relevant characteristics of the population within each group did change unevenly between the pre-treatment and the post-treatment period.

[15] See Meyer (1995) for a comprehensive discussion concerning internal validity in this framework.

Second, the assumption of parallel dynamics in the absence of treatment between the two groups (equation 1) turns out to be a strong one. It is possible, in fact, that the two groups have different trends for reasons different from the treatment. However, if non-parallel dynamics are due to observables, it is possible to overcome the problem including covariates. The present work, as we shall carefully discuss in Section 4, relies on a large array of individual and university covariates. Nevertheless, if the dynamics of the outcome variables of the two groups are affected by unobservables, identification breaks down.[16] In section 6, we shall try to overcome this important problem using data of one additional pre-treatment period in order to test for non-parallel paths between treatment and control groups before the treatment.

An additional issue concerns the unit of analysis of our ATT. To be sure, *AlmaLaurea* might not be an appropriate individual level treatment since member institutions are enrolled at once and it is possible that there are important interactions among each university students. If, for instance, the impact of *AlmaLaurea* on a given student depends on the characteristics of students of her cohort, we measure the effect on university employment performance rather than the individual one. Even if in the present study we model *AlmaLaurea* as an individual level treatment, in future research we aim at investigate the possibility of within university spillovers.

On a similar ground, to be valid, the DID approach assumes no interactions among the agents of treatment and control groups. If for example *AlmaLaurea* graduates improve their occupational outcomes harming non-*AlmaLaurea* graduates, our estimates are not very interesting, at least for policy guidance. In section 7, we shall try to assess this problem identifying additional control and treatment groups which includes only graduates from those universities that are located in the same geographical region.

Finally, if one wishes to generalize the results found to different individuals and contexts, external validity is also important. It is possible that *AlmaLaurea* would not have had an effect for graduates of universities different from the ones that joined. This would explain, moreover, why a number of universities joined earlier, i.e. they knew that they were going to benefit the most from it. We do not think this is a major problem here since, as mentioned in the introduction, membership has been quite accidental, at least during the first years. Nevertheless, below we test whether universities in the two groups significantly differ in their observable characteristics.

---

[16] Given that decisions to enrol in *AlmaLaurea* are made by universities, we are mostly concerned with university unobservables.

Table 4: **Universities in *AlmaLaurea***

1994	University of Bologna starts collecting electronic data concerning its graduates
1995	University of Bologna starts selling data
1996	University of Modena-Reggio Emilia, Ferrara, Parma, and Florence start selling data
1997	University of Catania, Trieste, Udine, Messina, Chieti, Trento, Molise, and Venice School of Architecture start selling data
August 1998	University of Turin and Eastern Piedmont start selling data

Note: Venice School of Architecture started selling from January the first. For consistency was included in 1997 group. Universities of Siena and Lecce joined in 1997, but did not start to sell CV untill 1999 and 2003 respectively.
Source: All the information is on *AlmaLaurea* web site.

4. The Data

Our data on graduates are drawn from two almost identical surveys named *Indagine Inserimento Professionale Laureati* (Survey on University-to-Work Transition) run in 1998 and 2001 on individuals graduated, respectively, in 1995 and 1998.[17]

To implement the econometric approach described in Section 3 we include in our main treatment group those individuals graduating from universities that joined *AlmaLaurea* in 1996 and 1997. As displayed in Table 4, this includes universities of Modena-Reggio Emilia, Ferrara, Parma, Florence, Catania, Trieste, Udine, Messina, Chieti, Trento, Molise and Venice School of Architecture. Students in the treatment group account for about 18 per cent of the sample (see Table 5).

In section 5.2, we also exploit an additional source of variation. As shown in Table 4, universities of Turin and Eastern Piedmont start selling graduates CVs only after August 1998. Thus, graduates from these universities are used for an additional treatment group in a difference-in-differences setting in which the "before and after" is time graduation before and after August 1998 and only graduates of this year are considered.[18]

Unfortunately, ISTAT does not provide information concerning graduation month for 1995 graduates. Therefore, graduates from Bologna are not considered in the analysis.[19]

[17]The publicly available micro-data do not include information concerning the university the interviewed individual graduated from. Therefore, we carried out the analysis at the ADELE ISTAT laboratory in Rome. One edition of the Survey has been used by Brunello and Cappellari (2005).

[18]In Italy graduates may complete their degree at different points of time in the same academic year, depending on when they finish their dissertation.

[19]Bologna is also a very special case, the most "self-selected" one, given that it is the university where

Table 5: **Sample Design and Means of Key Variables**

	All	*AlmaLaurea*	non*AlmaLaurea*
1998 Survey:			
Number of Graduates	15282	3512	11770
Weighted Share		.188	.812
2001 Survey:			
Number of Graduates	18181	3515	14666
Weighted Share		.183	.817
	All	*AlmaLaurea*	non*AlmaLaurea*
Means of selected sample characteristics in 1998:			
Share of Female	.527	.528	.527
	(.004)	(.010)	(.005)
Age	27.45	27.61	27.41
	(.038)	(.086)	(.042)
High School Grade	48.38	47.87	48.49
	(.066)	(.151)	(.074)
Means of selected sample characteristics in 2001:			
Share of Female	.551	.567	.548
	(.004)	(.009)	(.004)
Age	27.47	27.55	27.45
	(.028)	(.063)	(.031)
High School Grade	48.96	48.62	49.04
	(.057)	(.130)	(.064)

Notes: Standard errors in parenthesis. Shares, means and standard errors are computed with stratification weights. High school grades range from 36 to 60. Only individuals that answered to the question concerning their employment status have been considered.

Table 6: **Universities Characteristics**

	All	*AlmaLaurea*	non*AlmaLaurea*
Universities in 1995			
Number of universities	59	12	47
Average number of students	23946	22033	24434
	(3742)	(4569)	(4568)
Average number of students per professor	31.09	26.27	32.32
	(2.59)	(2.53)	(3.17)
Average share of delayed students	.288	.278	.291
	(.010)	(.026)	(.011)
Universities in 1998			
Number of universities	61	12	49
Average number of students	25473	24134	25801
	(3875)	(5096)	(4679)
Average number of students per professors	31.82	26.50	33.12
	(2.36)	(3.15)	(2.82)
Average share of delayed students	.362	.396	.354
	(.011)	(.029)	(.012)

Notes: Averages are computed at university level. Standard errors in parenthesis

The ISTAT target samples consist of 25716 individuals in 1998 and 36373 individuals in 2001. They represent respectively the 25% and 28.1% of the total population of graduates from Italian universities. The response rates have been of 64.7% and 53.3% for a total of 17326 and 20844 respondents.[20] Once we eliminate those individuals who did not answered to the question concerning their employment status, those who have missing values for key variables, and graduates from Bologna, Turin and Eastern Piedmont, we remain with 15282 and 18181 observations respectively. In both years the sample is stratified according to sex, university and university degree and in the analysis below all estimations are performed using stratification weights.

AlmaLaurea get started. However, results do not change qualitatively either if we include Bologna graduates in the control group or we consider them in the treatment one.

[20]Differences in response rates probably stem from different interviewing technologies used in the surveys: in 1998 ISTAT mailed paper-based questionnaires, while in 2001 the C.A.T.I. (Computer Assisted Telephone Interview) technique was used. In principle this change should affect distinct universities in a homogenous way and therefore it should not represent a major concern for our analysis.

The surveys collect information concerning individuals' (i) school and university curricula, (ii) labor market experience, and (iii) demographics and social backgrounds. Table 5 depicts summary statistics for key variables. In the analysis below, individual level right-hand variables are grouped in two subsets. The first includes those characteristics that are predetermined with respect to college efforts and outcomes: sex, age, high school grade, 14 dummies for high school type, 1 dummy for having another university degree, 5 dummies for each parent's level of education, 104 dummies for province of residence before college enrolment, and 345 dummies for departments (university*field of study). The second contains indicators related to college curricula that could—at least potentially—be influenced by *AlmaLaurea*: university grade and number of years taken to get the degree.

As shown in Table 5, with the only exception of the share of women that increased in both groups, the remaining variables did not experienced notable variations within group across time. Moreover, control and treatment groups present very similar characteristics in both years, reducing the possibilities of major interactions (beyond the treatment itself) at the individual level between being enroled in a college member of *AlmaLaurea* and graduating in 1998.

In order to control for observable variations in college quality, we also use data on college characteristics provided by ISTAT in a yearly bulletin named *Lo Stato dell'Universitá* (University Indicators) for the academic years 1991-98. In particular, we collect information at the level of single university on the number of students, professors, and delayed students.[21] As depicted in Table 6, universities in the treatment group enrol a lower number of students per professor with respect to the ones in the control group. This difference however is not statistically significant. The two groups show very similar average rates of delayed students. Both indicators are generally considered proxies for universities teaching qualities.[22] Note also that even if the share of delayed students has increased in both groups, the increase is steeper in the treatment group. As far as the overall number of students is concerned, the two groups of universities show very similar averages.

Finally, to control for mayor economic shocks that may affect graduate labor market performance, we collect information concerning Gross Domestic Product (GDP) and unemployment rates at the provincial level.[23]

---

[21]In Italy most students graduate beyond the official limit.

[22]As discussed in Bagues et al. (2007) both indicators have drawbacks in a system (like the Italian one) where most universities can not restrict entry and therefore the number of students per professor depends on education demand.

[23]Italy is composed by 104 provinces which correspond approximately to US counties.

The present study considers three basic outcome variables measured three years after graduation: occupational status, which takes value 1 if a given individual is unemployed and 0 otherwise;[24] regional mobility, taking value 1 if the individual resides in a different region with respect to the one where she graduated;[25] and finally wage, measured as net monthly wage expressed in euros and self reported by the interviewed. Moreover, we also consider two additional proxies of matching productivity. The first concerns the perceived level of adequacy of the knowledge acquired at university with respect to the content of the present job. The second measures the perceived stability of the job. Both variables are self reported and take values from 1, not satisfied at all, to 4, very satisfied.

5. The Impact of *AlmaLaurea*

5.1. Universities that joined in 1996 and 1997

A first outlook of the impact of *AlmaLaurea* is obtained comparing time differences in means of key outcomes within each group (treatment and control). Table 7 shows that unemployment rates decreased sharply from 1998 to 2001 for the whole target population.[26] Moreover, and most importantly for the present paper, those in the treated group have improved their occupational status the most: unemployment rate decreased about 3.5 points more in this group with respect to the control one. Note also that the ranking between the two groups reverses. This mean that the same qualitative result would be obtained using changes in employment logs as outcome variable.

As far as mobility is concerned, rates remained stable for *AlmaLaurea* students, while decreased for non-*AlmaLaurea* ones. Hence, graduates in the treatment group increased their regional mobility of about 1 point relatively to graduates in the control group. This difference, however, is not statistically different from zero. Note also that graduates in the treatment group are more mobile than the ones in the control one. Finally, as far as matching quality is considered, monthly wages increased about 44 euros more for *AlmaLaurea*

[24]Following standard definitions, we consider unemployed those individuals that declare not to have worked during the week before the interview and are searching for a job.

[25]Italy is composed by 20 regions.

[26]Italian labor market conditions have improved substantially in between 1998 and 2001. According to ISTAT, standardized unemployment rates for the entire population were 11.7 in 1998 and 9.4 in 2001. The change was from 12.8 to 9.8 for university graduates with age between 25 and 39. It could be that our figure displays a steeper decrease both because individuals in the sample are younger and because of the change in the survey technology mentioned above.

Table 7: **Unemployment, Mobility and Wages by Year and *AlmaLaurea***

Unemployment				
		1998	*2001*	**Diff.**
AlmaLaurea		.228	.094	-.134
non AlmaLaurea		.205	.107	-.098
Diff.				**-.036** ***
St. Err.				*(.011)*
Mobility				
		1998	*2001*	**Diff.**
AlmaLaurea		.297	.292	-.005
non AlmaLaurea		.219	.203	-.016
Diff.				**.011**
St. Err.				*(.014)*
Wage				
		1998	*2001*	**Diff.**
AlmaLaurea		899.7	1118.4	218.7
non AlmaLaurea		980.9	1155.1	174.2
Diff.				**44.5** ***
St. Err.				*(16.8)*

Notes: Unemployment rates have been computed using stratification weights. We consider unemployed those individuals that did not work during the week before the interview and are searching for a job. Average gross monthly wages are expressed in Euros and have been calculated for 20838 individuals that provide it. The bold differences are the results of a difference in difference estimation, where $Diff = (Y^{01}_{Alma} - Y^{98}_{Alma}) - (Y^{01}_{nonAlma} - Y^{98}_{nonAlma})$. In parenthesis are displayed robust standard errors of regressions of the dependent variables on dummies for year, belonging to *AlmaLaurea*, and their interaction.

Table 8: **The Effect of *AlmaLaurea* on Unemployment Probability**

	(1)	(2)	(3)	(4)
AlmaLaurea	-.020** (.008)	-.021** (.008)	-.021** (.008)	-.016* (.008)
2001	-.101***(.013)	-.103*** (.013)	-.099*** (.013)	-.073*** (.013)
Female	.060***(.006)	.061*** (.005)	.061*** (.005)	-.061*** (.005)
Age	-.002** (.001)	-.004*** (.001)	-.004*** (.001)	-.004*** (.001)
High School Grade	-.002***(.0003)	-.001*** (.0004)	-.001*** (.0004)	-.001*** (.0004)
University Grade		-.001** (.005)	-.001** (.001)	-.001** (.0006)
Students per faculty			-.002*** (.001)	-.002*** (.001)
Share of delayed Students			-.018 (.073)	-.076 (.077)
GDP				-.001*** (.0003)
Provincial unemployment				.009*** (.003)
Dummies on year delay		YES	YES	YES
R-squared	0.147	0.147	0.149	0.150
Obs.	33463	33463	33463	33463

Notes: Results of four different specifications of a linear probability model are displayed. Dependent variable assumes value 1 if the individual declares not to work and is looking for a job, 0 otherwise. All specifications include university*department fixed effects, 14 dummies for high school type, 11 dummies for having another university degree, 5 dummies for each parent's level of education, 104 dummies for province of residence before college enrolment. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics, and column 4 includes Provincial GDP and unemployment rate. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

graduates than for the control group.

In order to interpret the above results as the sole effect of *AlmaLaurea*, one needs to assume that in absence of the treatment the averages of the two groups would have experienced the same variation (equation 1). This is indeed a strong restriction when the treatment (i.e. graduating from a university enroled in *AlmaLaurea*) is not randomly assigned across individuals. The remaining part of the paper uses the approaches outlined in Section 3 to assess the extent to which the observed changes may be interpreted as the effect of *AlmaLaurea*.

The basic identification assumption of the difference-in-differences method (equation 1) may be too stringent if treatment and control groups are unbalanced in covariates that are thought to be associated with the dynamics of the outcome variable. Therefore, to begin with, we follow the traditional way to accommodate this problem introducing linearly a set of controls X_i in equation 3, which becomes:

$$Y_i = \mu + \beta \cdot X_i + \gamma \cdot G_i + \delta \cdot T_i + \alpha \cdot (G_i \cdot T_i) + u_i \quad , \tag{4}$$

Tables 8, 9, and 10 report OLS estimations of the above equation where the outcome is respectively unemployment, mobility and log wages. All standard errors are corrected for

Table 9: **The Effect of *AlmaLaurea* on Mobility**

	(1)	(2)	(3)	(4)
AlmaLaurea	.024** (.011)	.024** (.012)	.027** (.012)	.024** (.012)
2001	-.008 (.007)	-.008 (.007)	.007 (.008)	-.009 (.011)
Female	-.022***(.004)	-.022*** (.005)	-.022*** (.005)	-.022*** (.005)
Age	-.001** (.001)	.0004 (.0006)	.0003 (.0006)	.0002 (.0006)
High School Grade	.001** (.0003)	.0002 (.0003)	.0003 (.0003)	.0004 (.0003)
University Grade		.0003 (.0006)	0003 (.0006)	.0001 (.0006)
Students per faculty			.001 (.001)	-.001 (.001)
Share of delayed Students			-.209*** (.001)	-.179** (.077)
GDP				-.0005 (.001)
Provincial unemployment				-.005 (.004)
Dummies on year delay		YES	YES	YES
R-squared	0.282	0.283	0.283	0.283
Obs.	33463	33463	33463	33463

Notes: Results of four different specifications of a linear probability model are displayed. Dependent variable assumes value 1 if an individual resides in a distinct region with respect to the one where he attended university, 0 otherwise. All specifications include university*department fixed effects, 14 dummies for high school type, 11 dummies for having another university degree, 5 dummies for each parent's level of education, 104 dummies for province of residence before college enrolment. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics, and column 4 includes Provincial GDP and unemployment rate. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

the nonindependence of employment outcomes of individuals graduating in the same region, degree, and year.[27] The analysis is structured along the classification described in Section 4 and hence four specifications are displayed: column 1 includes only individual characteristics that are predetermined to university entry; column 2 considers also potentially endogenous individual controls; column 3 incorporates time-variant university characteristics; finally, column 4 displays results of a regression where province unemployment and GDP per capita are included. Note that all specifications include university time departments dummies.

Table 8 shows that, conditional on individual characteristics, if a university affiliates to *AlmaLaurea* the probability that its graduates are unemployed three years after graduation significantly decreases about 2 points. Potentially endogenous individual regressors (column 2) and university controls (column 3) do not affect our results. Conversely, controlling for provincial unemployment rates and GDP (column 4) reduces the magnitude of the coefficient to about 1.6 points and its statistical significance. However, the coefficient is still statistically significant at the 10 per cent level.

[27]If we cluster standard errors at university level most of the coefficients are not statistically significant at the 10 per cent level.

Table 10: **The Effect of *AlmaLaurea* on Wages**

	(1)	**(2)**	**(3)**	**(4)**
AlmaLaurea	.034* (.017)	.036** (.018)	.035* (.018)	.031* (.018)
2001	.222***(.015)	.227*** (.015)	.227*** (.016)	.201*** (.020)
Female	-.153***(.008)	-.157*** (.008)	-.158*** (.008)	-.158*** (.008)
Age	.013***(.002)	.017*** (.001)	.017*** (.002)	.017*** (.002)
High School Grade	.005***(.0005)	.003*** (.0006)	.003*** (.0006)	.003*** (.0006)
University Grade		.005*** (.0008)	.005*** (.0008)	.005*** (.0008)
Students per faculty			.003* (.001)	.002 (.001)
Share of delayed Students			.020 (.100)	.055 (.102)
GDP				.002*** (.0005)
Provincial unemployment				-.011** (.005)
Dummies on year delay		YES	YES	YES
R-squared	0.252	0.259	0.259	0.260
Obs.	20838	20838	20838	20838

Notes: Results of three different specifications of a OLS model are displayed. Dependent variable is the logarithm of monthly net wages. All specifications include university*department fixed effects, 14 dummies for high school type, 11 dummies for having another university degree, 5 dummies for each parent's level of education, 104 dummies for province of residence before college enrolment. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics, column 4 includes provincial GDP and provincial unemployment rates. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9 shows that also regional mobility rates have different dynamics for graduates in *AlmaLaurea* universities: depending of the controls used, *AlmaLaurea* has a positive and statistically significant effect on mobility that ranges from 2.3 to 2.8 points.[28]

As mentioned, lower search costs are expected to improve the quality of labor market matches. Table 10 shows that according to our analysis *AlmaLaurea* significantly increases monthly wage by more than 3 percent.[29] It is also found that *AlmaLaurea* increases graduates satisfaction with respect to the adequacy of the knowledge acquired at university and job stability.[30]

[28]Similar results are obtained if we consider provincial mobility instead.

[29]This result needs to be interpreted with caution because of possible different composition of the two sample. In fact wage regressions are run only with those individuals who are employed).

[30]Results are not reported but are available upon request by the authors.

5.2. Universities that join in 1998

The above findings may be driven by time varying omitted university characteristics. To investigate whether this is the case, in this section, we exploit an additional source of exogenous variation. Universities of Turin and Easter Piedmont joined *AlmaLaurea* in August 1998 and hence sold résumés on-line only for those 1998 graduates that completed their degree after summer. Hence, in a second difference-in-differences setting the new treatment group is composed by graduates from these two universities and the before and after is graduation after August. In this specification only 1998 data are considered and dummies for month of graduation are included. As shown in Table 11, *AlmaLaurea* has significantly decreased unemployment probability by about 2.5 points, which is a similar magnitude to the one above. However, no significant effect is observed neither on mobility nor on wages.

6. Unparallel Outcomes

Possibly, the most important threat to the internal validity of the above results concerns the extent to which the "parallel trends" assumption stated in equation 1 is valid. A standard way of assessing its plausibility is using data from pre-treatment periods to check whether trends were indeed parallel in the past. If this is the case, it is more likely that the results found stem from the treatment itself.

ISTAT run a previous edition of the University-to-work survey on 1992 graduates interviewed in 1995.[31] As showed in Figure 1, before 1998 the employment rates dynamics of the control and the treatment groups have been remarkably similar. More formally, we run the DID method with linear controls employing data concerning 1992 and 1995 graduates, when *AlmaLaurea* was not operating yet. Table 12, shows that the magnitude of the DID coefficient concerning unemployment is positive, negligible, and it is not statistically different from zero. As far as mobility is concerned, a similar result is obtained: the *AlmaLaurea* coefficient is not statistically different from zero. This suggests that the coefficients depicted in Table 8 and Table 9 do not stem from groups unparallel trends.

Of course, the above checks do not control for time specific unparallel outcomes. In fact, possible interactions between *AlmaLaurea* enrolment and unobserved time variant characteristics are not easy to be ruled out. One might argue, for example, that those universities that self-selected in the treatment group are the ones that improved the most their unobservable teaching quality. This might affect occupational outcomes of their graduates.

[31] Unfortunately 1995 survey does not reports data on wages.

Table 11: **The Effect of *AlmaLaurea*: the case of Turin and Eastern Piedmont**

PANEL A

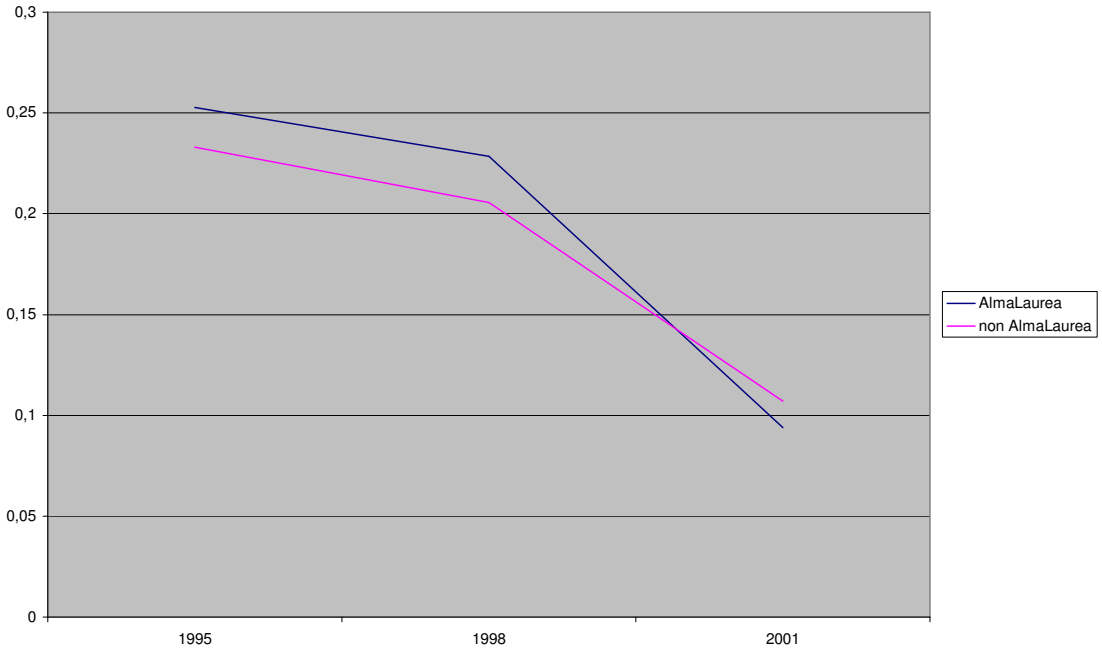
Unemployment			
	pre August	*post August*	**Diff.**
Turin and Eastern Piedmont	.038	.016	-.022
non Turin and Eastern Piedmont	.102	.104	.002
Diff.			**-.024** **
St. Err.			*(.011)*
Mobility			
	pre August	*post August*	**Diff.**
Turin and Eastern Piedmont	.165	.164	-.001
non Turin and Eastern Piedmont	.227	.228	.001
Diff.			**.002**
St. Err.			*(.026)*
Wage			
	pre August	*post August*	**Diff.**
Turin and Eastern Piedmont	1151.4	1103.9	-47.5
non Turin and Eastern Piedmont	1152.3	1134.1	-18.2
Diff.			**-29.4**
St. Err.			*(32.1)*

PANEL B

	Unemployment	**Mobility**	**Log Wage**
AlmaLaurea	-.025*** (.008)	.009 (.022)	-.016 (.018)
Female	.043*** (.005)	-.021*** (.007)	-.149*** (.009)
Age	-.002* (.001)	.0005 (.001)	.017*** (.002)
High School Grade	-.001*** (.0002)	.0001 (.0003)	.002*** (.0006)
University Grade	-.001** (.0006)	.0004 (.001)	.005*** (.001)
Dummies on year delay	YES	YES	YES
Dummies for month of graduation	YES	YES	YES
R-squared	0.122	0.251	0.226
Obs.	20547	20547	12975

Notes: The analysis is performed on 1998 graduates. Treatment group is composed by graduates from Universities of Turin and Eastern Piedmont. Before and after is graduation before and after August. All specifications include university*department fixed effects. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Fig. 1.— **Shares of Unemployed Graduates**



Note: Only graduates from those university degrees that were in the database in 1995 were considered.

Table 12: **Pre-adoption falsification test of *AlmaLaurea***

	Unemployment	**Mobility**
AlmaLaurea	.004 (.013)	.011 (.012)
1998	-.027*** (.008)	.005 (.006)
Female	.079*** (.008)	-.026*** (.005)
GDP	-.001** (.0004)	-.003 (.003)
Provincial unemployment	.003 (.002)	.001 (.002)
R-squared	0.150	0.322
Obs.	27373	27565

Notes: In the first column dependent variable assumes value 1 if a given graduate is unemployed, 0 otherwise. In the second column dependent variable assumes value 1 if a given individual resides in a different region with respect to the one where she attended universities. Only individuals graduated in 1992 and 1995 are considered. *AlmaLaurea* assumes value 1 for 1995 graduates from universities that enrol in *AlmaLaurea* in between 1995 and 1998. All specifications include university*department fixed effects. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: **The Effect of *AlmaLaurea* using a placebo treatment group**

	Unemployment	**Mobility**	**Log Wage**
Placebo *AlmaLaurea*	.024	-.017	.011
	(.025)	(.026)	(.036)
R-squared	0.152	0.389	0.260
Obs.	26278	26278	16464

Notes: Placebo *AlmaLaurea* assumes value 1 for graduates for 1998 universities of Siena and Lecce, 0 otherwise. All specifications include the full set of control used in column 4 of Tables 8, 9, and 10. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.

To investigate this possibility we build a placebo treatment group composed by graduates from universities of Siena and Lecce. According to *AlmaLaurea* official sources, these universities decided to join *AlmaLaurea* in 1997, but did not start selling their students' résumés on-line until 1999 and 2003 respectively. If also these graduates experienced an improvement vis-a-vis the others, the likelihood that *AlmaLaurea* enrolment proxies for something else is higher. We run a regression identical to the one in equation 4 but with graduates from Siena and Lecce as treatment group and non-*AlmaLaurea* universities as control. Table 13 shows that this group experienced a slight increase in unemployment and wage and a decrease in both mobility. None of these changes is statistically significant different from zero. These findings provide evidence against the possibility that enrollment in the treatment group is correlated with unobservables that independently cause employment improvements.

Table 14: **The Effect of *AlmaLaurea*: alternative control group based on geographical proximity**

	Unemployment	**Mobility**	**Wage**
AlmaLaurea	-.035**	.024*	.053
	(.017)	(.026)	(.039)
R-squared	0.149	0.492	0.263
Obs.	6225	6225	3521

Notes: Only graduates from regions that have both *AlmaLaurea* and non-*AlmaLaurea* universities are included. All specifications include the full set of controls used in column 4 of Tables 8, 9, and 10. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year. * significant at 10%; ** significant at 5%; *** significant at 1%.

7. Alternative Control Group and Displacement Effect

The DID design can be further strengthen using alternative treatment and comparison groups. In fact, this is likely to reduce the importance of biases or random variation occurring in a single setting (Meyer 1995). In the ideal specification, treatment and control groups should face the same time specific shocks: the more similar the control group is to the treatment one the better. Given that our dependent variables concern labor market outcomes and that according to our data when the survey takes place more than 75 per cent of Italian graduates reside in the region where they attend university (see Table 7), a new sample is created including only graduates from regions where both *AlmaLaurea* and non-*AlmaLaurea* universities are present.

In 3 Italian regions this is the case: Tuscany, Abruzzo, and Sicily. Graduates in these regions represent about 17 per cent of the entire population and, within this group, about 57 per cent of graduates are in the treatment group universities. More precisely, as shown in Figure 2, *AlmaLaurea* universities are Florence, Chieti, Catania and Messina. Non *AlmaLaurea* ones are Pisa, Siena, L'Aquila, Teramo, and Palermo. As depicted in Table 14, with respect to the general case, in this setting *AlmaLaurea* has a stronger effect on employment probability (3.5 points) and wages (5 per cent) and about the same impact on mobility rates. Wage result is not statistically significant. Overall, however, the general results are confirmed and even strengthen.

The control performed above is also helpful in checking for an additional potential problem of our analysis. As mentioned mentioned in Section 3, graduates from nearby universities might be used to assess whether there is a displacement effect on non-*AlmaLaurea* students due to a reallocation of hiring. Interactions are in fact more likely among graduates' occupational outcomes of nearby universities. Hence, for example, the impact of *AlmaLaurea* might

Fig. 2.— **Regions where both *AlmaLaurea* and non-*AlmaLaurea* universities are located**

Note: In the map only those cities which have an university are displayed.

Table 15: **The effect of *AlmaLaurea* on nearby universities.**

	Unemployment	**Mobility**	**Wage**
AlmaLaurea	-.008	.006	.010
	(.012)	(.015)	(.023)
R-squared	0.152	0.295	0.260
Obs.	26436	26436	16464

Notes: Only individuals that graduated from universities that did not belong to *AlmaLaurea* are included. The variable *AlmaLaurea* takes value 1 if a 1998 graduates get her degree from a non-*AlmaLaurea* university that is located in a region where there are *AlmaLaurea* universities, 0 otherwise. All specifications include the full set of controls used in column 4 of Tables 8, 9, and 10. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
* significant at 10%; ** significant at 5%; *** significant at 1%.

be exaggerated if individuals in the control group were negatively affected by *AlmaLaurea* itself. For instance, Pisa is in principle a better control group for Florence than Bari; nevertheless, the risk that its graduates' labor market performance is negatively affected by the presence of *AlmaLaurea* in Florence is higher. To control for this possibility we perform a difference-in-differences analysis using as treatment group non-*AlmaLaurea* universities in regions where there are *AlmaLaurea* universities and as control the rest of non-*AlmaLaurea* ones. As shown in Table 15, there are no significant differences in the trajectories of the two groups. This suggests that there are no major interactions among the graduates of the two groups and *AlmaLaurea* has not negative spillovers on universities located close-by.

8. Conclusions

The last ten years have witnessed a large increase in the importance of online labor market intermediaries. While their diffusion may potentially improve labor market functioning increasing the total quantity and quality of matches, solid pieces of evidence on their benefits are still missing. Moreover, recent works have underlined the possibility of adverse selection in the use of electronic intermediaries (Kuhn and Skuterud 2004).

In this article we exploit the exceptional case study provided by the early adoption of the online intermediary *AlmaLaurea* by several Italian universities. The absence of other on-line intermediaries for those universities that had not adopted *AlmaLaurea* at the time of our study provides us with an adequate control group to estimate the effect of the treatment.

We employ the difference-in-differences method exploiting a repeated cross section data set. Given that enrolment in *AlmaLaurea* is not random, evaluating its impact is not trivial. However, assuming parallel outcomes between treatment and control group makes our

estimation valid. The time variant indicators of individual and university quality and standard tests aimed at ruling out alternative explanation do not raise major concern on this important assumption.

The evidence shows that online labor market intermediary adoption has a positive effect on graduates labor market outcomes three years after graduation. In particular, it is found that *AlmaLaurea* decreases graduates' unemployment probability by about 2 points. Our study also suggests that on-line labor market intermediaries have a positive effect on wages and workers' geographical mobility.

The results presented in this paper also contribute to the policy discussion on university-to-work transition. The poor labor performance of Italian graduates has been traditionally ascribed to demand and supply factors. We show that graduate labor market functioning can also be improved with the introduction of on-line intermediaries.

In future research we aim at exploring whether the positive impact of electronic labor market intermediaries affected evenly the whole graduate population. Moreover, while in this paper we focus on average outcomes, the effect on outcome distribution remains an issue for further research.

REFERENCES

Autor, D.H. (2001). "Wiring the Labor Market." *Journal of Economic Perspectives*, 15, 25-40.

Bagues, M., M. Sylos Labini and N. Zinovyeva (2007). "The Endogeneity of University Grading Standards and Labor Market Mismatch: Evidence from Italy." *Mimeo*, University of Strasbourg.

Brunello, G. and L. Cappellari (2005). "The Labour Market Effects of Alma Mater: Evidence from Italy." *IZA Discussion Paper*, No. 1562. Forthcoming in *Economics of Education Review*.

Burdett, K. and J. Ondrich (1985). "How Changes in Labor Demand Affect Unemployed Workers." *Journal of Labor Economics*, 3(1), 1-10.

Congressional Budget Office (2002). *The Effect of Changes in the Labor Markets on the Natural Rate of Unemployment*, April.

Freeman, R.B. (2002). "The Labor Market in the New Information Economy." *Oxford Review of Economic Policy*, 18(3), 288-305.

Heckman, J.J. (1990). "Varaieties of Selection Bias." *American Economic Review*, 80(2), Paper and Procedings, 313-318.

Kuhn, P. (2000). "The Internet and Matching in Labor Markets" in *New Economy Handbook*. D.C. Jones ed. Amsterdam, Elsevier.

Kuhn, P. and M. Skuterud (2004). "Internet Job Search and Unemployment Duration." *American Economic Review*, 94(1), 218-232.

Mannheim Centre for European Social Research (2002). "Indicators on School-to-Work Transitions in Europe." Mannheim: Mzes.

Meyer, B.D. (1995). "Natural and Quasi-Experiments in Economics." *Journal of Business & Economic Statistics*. 13, 151-161.

Pissarides, C. (2000). *Equilibrium Unemployment Theory*. 2nd Edition. Cambridge MA, The MIT Press.

OECD (2007). *Education at a Glance*. Paris, Organization for Economic Co-operation and Development.

Rebick, M.E. (2000). "The Importance of Networks in the Market for University Graduates in Japan: a Longitudinal Analysis of Hiring Patterns." *Oxford Economic Papers*, 52, 471-496.

Rubin, D.B. (1974). "Estimating Causal Effects of Treatments in Randomized and Nonrandomized Studies." *Journal of Educational Psychology*, 66, 688-701.

Stevenson, B. (2007). "The Internet and Job Search." *Mimeo*, University of Pensilvania.