

Do On-Line Labor Market Intermediaries Matter?

The impact of *AlmaLaurea* on University-to-Work Transition ¹

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ABSTRACT

This paper empirically addresses the effects of on-line labor market intermediaries. In particular, it is concerned with the impact of the intermediation activity carried on by the interuniversity consortium called *AlmaLaurea* on graduates labor market outcomes. We argue that the existence of counterfactuals and the organizational features of *AlmaLaurea* allow us to overcome the problems faced by previous empirical investigations. The evaluation is performed using the difference-in-differences method applied to a repeated cross section data set. It is shown that, if the usual assumption concerning parallel outcomes holds, *AlmaLaurea* has a positive effect on individual unemployment probability and different measures of matching quality. Most interestingly, it is also found that online intermediaries foster graduates' geographical mobility.

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1. Introduction

The internet, and electronic technologies more generally, 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 percent 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 resumes (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 (e.g. Autor (2001)).

To be sure, a recent empirical investigation has raised doubts even on its private benefits. Kuhn and Skuterud (2004) have found 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 unobservable worker characteristics that are negatively correlated with employability. However, it is also possible that internet search is counterproductive at individual level because of negative signals it sends to employers. Workers may still use the internet, the authors argue, because it is very cheap and they are unaware 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 addresses the effects of a specific electronic labor market intermediary, the

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

interuniversity consortium called *AlmaLaurea*, on labor market outcomes. *AlmaLaurea* works very similarly to other internet job boards. To put it in a nutshell, it collects and organizes on-line information concerning college graduates curricula conditional on their permission and provides it to firms in electronic format, subject to the payment of a fee.

The present case study provides exceptional evidence on the positive effects of online labor market intermediaries for two basic reasons: first, we observe *AlmaLaurea*'s effects during a time period in which e-recruitment was almost non-existent in Italy. *AlmaLaurea* was founded in 1994, and in a subset of Italian universities started to sell graduates' resumes on-line in October 1996. To the best of our knowledge, at that time there were no other internet job boards operating in Italy. Second, we do not measure the effect of *AlmaLaurea* on graduates who actually use its service. Rather, we are able to measure the average effect on all graduates from universities that belong to *AlmaLaurea* comparing their employment outcomes with the remaining graduates. In other words, we estimate the *overall* effect of this electronic intermediary and not the private benefits of using it.

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 ISTAT (the Italian Statistical Office) on representative samples of Italian university graduates of 1995 and 1998 and interviewed three years after graduation. Given that *AlmaLaurea* intermediation activity get only started in a subset of Italian universities after 1995, we split the sample in two distinct groups of graduates: the ones that completed their degree in a university that joined *AlmaLaurea* between 1996 and 1998 (the treatment group) and the ones that graduated from a university which did not belong *AlmaLaurea* during such period (the control group). The subtleties of envisaging academic institutions participation to *AlmaLaurea* as a quasi-natural experiment shall be 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 do not have mayor difference in observable characteristics; and, third, according to personal conversation with the consortium director, *AlmaLaurea* membership has been quite accidental and mostly based on informal relationships among a few faculties.

AlmaLaurea, as we shall discuss more thoroughly below, displays also a few feature that makes it likely to be effective: first, it collects also official information concerning those individuals who decide not to post their resumes 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 like the one discussed by Autor (2001).

We find that *AlmaLaurea* decreases unemployment probability of about 2 points and

have a positive effect on wages. Most interestingly, we find that that it fosters graduates' geographical mobility. 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. Moreover, if *AlmaLaurea* proves to be an effective institutional arrangement, other European countries might learn from its example improving their public policies aimed at facilitating university-to-work transition.

The paper is organized as follows. Section 2 provides an outlook of the Italian peculiarities concerning university-to-work transition, describes in dept the *AlmaLaurea* consortium, and briefly discusses its economic implications. Section 3 outlines the identification assumptions needed for our empirical strategy to be valid. Section 4 is concerned with the description of the data used in the analysis. Section 5 presents the most important results. Sections 6 and 7 try to overcome the major threats faces 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. *A fortiori*, if one focuses on education-to-work transition, one wants to recognize that this segment of the labor market is particularly exposed to such imperfections. In fact, first time job seekers lack typically work experience and this negatively affects both the accurateness of 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.³ However, university graduates transition process may be harmed by the high specialization they have typically acquired and various kinds of mismatching are likely in countries that lack proper coordination mechanisms between individual educational choices, systems of education, and productive structures dynamics.

As showed in Table 1, international comparisons depict Italian university-to-work tran-

³See OECD (2005).

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

<i>Country</i>	<i>Age Class</i>		
	<i>25-29</i>	<i>30-34</i>	<i>35-39</i>
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.

sition as one of the most problematic cases among industrialized countries.⁴ Three main explanations can be put forward. First, severe frictions might stem from the *supply* side: education provided by Italian universities might be poor enough to force graduates to undergo further training, either formal or informal, before getting into working life. Second, the slow transition rates may be due to labor *demand* characteristics. It happens, in fact, that the Italian industrial structure, compared to other developed countries ones, 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.

Disentangling the above explanations goes beyond the scope of this paper. Instead, we concentrate on the third issue addressing the importance of a specific institutional arrangement aimed at reducing information imperfections and ameliorating matching efficiency.

Labor market intermediaries may reduce information imperfections undermining university-to-work transition. Distinct institutional arrangements may either spontaneously emerge or be purposefully designed in order to ameliorate information flows, ranging from market-like ones (e.g. private job hunting organizations) to centralized public placement offices.

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

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

⁵See Rebeck (2000) for an insightful account of the Japanese case.

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

<i>Country</i>	<i>Utilization rates (%)</i>	<i>Used to get the first job (%)</i>
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 obtain their degree between autumn 1994 and summer 1995) were: (i) "How did you try to find the first job after graduation?"; (ii) "Which method was the most important one for getting your first job after graduation?". Multiple options follow, among which "I enlisted the help of a careers/placement office of my institution of higher education". Multiple options follow, among which "I enlisted the help of a careers/placement office of my institution of higher education". The ratios displayed have been computed respectively over the ones who have sought for a job and over the ones that have been employed at least once.

Source: Our elaboration from the data set produced by a 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>.

resources on relatively egalitarian bases and their graduates' labor market performance does not affect their financial endowments, they might lack the right incentives to be concerned about their students' placement. In Italy until 1994, when *AlmaLaurea* was founded by the University of Bologna, public universities were barely doing any formal intermediation activity.⁶ Table 2 refers to 1995 graduates, a period in which *AlmaLaurea* was not operating, and displays across a selected sample of European countries (a) the shares of graduates who have used the help of their institutions' placement office among the ones who have sought for a job after graduation and (b) the shares of graduates who get their first job through this channel among the ones that have been employed. With the notable exception of Germany, Italy ranks well below in both respect.⁷

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

As mentioned in the introduction, *AlmaLaurea* began to do on-line intermediation in 1996 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,

⁶There is anecdotal evidence that on informal bases several departments provided (unorganized) paper based information concerning their graduates to recruiting companies.

⁷Percentages 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.

started up respectively in 2001 and 2004.⁸

Initially run by the Statistical Observatory of the University of Bologna, *AlmaLaurea* is today managed by a consortium of more than 45 private and public universities with the support of the Ministry of Education. Its institutional objectives are twofold. First, *AlmaLaurea* provides to its member academic institutions reliable information concerning their graduates. Second, it aims at facilitating graduates access to the labor market through the creation of an innovative service that makes electronically available to firms a rich data set concerning graduates characteristics, conditional upon the payment of an annual fee, that ranges from 440 to 2,600 euros, according to the amount of data downloadable.

Member universities pay a one-time association fee (ranging between 2,582 and 5,165 euros according to the number of graduates of each university) and an annual subscription fee determined each year by the Board of Directors (also proportional to the number of graduates from each institution) for the collection and the insertion of new data in the *AlmaLaurea* database.

The database combines information 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 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 is available for consultation by employers.¹⁰

Table 3 gives an outlook of *AlmaLaurea*'s performance. It displays the number of resumes sold by the consortium and the number of CV available from 1998 to 2001.

AlmaLaurea recruitment service provides 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. 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. On the other hand, the effects of more favorable search technolo-

⁸It turned out to be impossible to establish with some precision the timing of the first Italian internet job-boards. Nevertheless according to personal communications with industry experts in the field the first one was JobPilot, which was founded in 1999 and was acquired by Monster in 2005.

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

¹⁰More information can be found on-line at <http://www.alma laurea.it/eng/index.shtml>

Table 3: *AlmaLaurea*

	1998	1999	2000	2001
Number of CV sold	3973	15999	115603	194635
Number of purchases	130	524	2500	3167
Share of CV bought by firms located within the same region	.55	.72	.50	.37
Number of CV in <i>AlmaLaurea</i>	62745	105409	153843	213976
Share on the entire graduate population	.24	.31	.34	.39

Source: Authors' calculation based on data provided by *AlmaLaurea*

gies on unemployment duration are ambiguous, since they might induce both job seekers and employers to be choosier and increase their reservation wages and screening standards (Pissarides 2000). However, Burdett and Ondrich (1985) suggests this is unlikely.

Nevertheless, 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).

AlmaLaurea organizational features are likely to make its intermediation activity less exposed to the above risks. To be sure, *AlmaLaurea* is completely free for students (except for the time spent updating personal information) and therefore it is potentially exposed to the adverse selection problem underlined above: employers might expect that individuals who update their resumes on line are somehow negatively selected. Nevertheless, first, as explained above part of the information contained in *AlmaLaurea* data set concerns the entire graduates population, given that it is provided directly by academic institutions. Therefore, employers may detect relevant differences (e.g. university grades, internship attendance,...) between enrolled job seekers and the entire graduate population.¹¹ Adverse selection problem is so considerably reduced. Second, academic institutions that joined *AlmaLaurea* are able to enroll the overriding majority of their graduates.¹² 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.

Finally, on line labor market intermediaries are also expected to weaken constraints

¹¹*AlmaLaurea* web site allows to do it on-line.

¹²For instance, more than 92% of 1998 graduates updated their curriculum vitae at least once.

posed by geographical distance (Autor 2001). In *AlmaLaurea* case, as shown in Table 3, most of graduates’ curricula are bought by firms located in a different region.

3. The Empirical Strategy

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

In this paper we can rely on a transparent exogenous source of variation (i.e. enrolment in *AlmaLaurea*) and the estimation approach used, the difference-in-differences (DID) method applied to a repeated cross-section data set, does not suffer the above problem. As mentioned, the basic goal is to evaluate the impact of a treatment, i.e. the university affiliation to *AlmaLaurea*, on an array of outcomes concerning their graduates, i.e. the probability of being employed, mobility, and measure of matching quality. This section formalizes and explicitly discusses our empirical approach and outlines the strategies we employ to asses its validity.

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 one observes the population of interest at least at 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 may be used to identify time variation in the outcome that is not due to treatment exposure.

The standard model for the DID design may be described as follows. 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.¹³ $Y_i^N(t)$ 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 that i would have attained at time t if treated before t .

¹³Note that in our simple setting I_i assumes value 1 only for the treatment group ($G_i = 1$) in the post treatment period ($T_i = 1$).

The fundamental problem for identifying the treatment effect on individual i , defined as $Y_i^I(t) - Y_i^N(t)$, is that for any particular individual i at time t , one does not observe both potential outcomes. What one does observe is in fact the *realized* one, that can be written as $Y_i(t) = Y_i^I(t) \cdot I_i + Y_i^N(t) \cdot (1 - I_i)$.

If one assumes that

$$E[Y_i^N(1) - Y_i^N(0)|G_i = 1] = E[Y_i^N(1) - Y_i^N(0)|G_i = 0], \quad (1)$$

then it is easy to show that

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

In words, if the average outcomes for treatment and control groups would have 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 group. In our case, assuming that in absence of *AlmaLaurea* the average occupational outcomes of students graduating in universities that have joined *AlmaLaurea* would have followed the same dynamics of that of those graduating from universities that did not join, we can identify the average effect of *AlmaLaurea* for those individuals who graduated from *AlmaLaurea* universities. Such an effect is simply obtained subtracting the dynamics of graduates of the control group from the dynamics of those graduated from *AlmaLaurea* universities. This estimator can easily be obtained as

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

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,¹⁴ two problems can be spelled out. 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 period, i.e. $u_i \perp T_i | G_i$. Given that individual decisions concerning college enrolment were made before the existence of *AlmaLaurea*, we can presume that this problem is not very

¹⁴See Meyer (1995) for a comprehensive discussion concerning internal and external validity in our framework.

severe in our case. However, following a 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. Special attention will be given to those personal characteristics that may have been affected by *AlmaLaurea* enrollment.

Second, the assumption of parallel dynamics in the absence of treatment between the treatment and control group (see equation 1) is indeed 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 in the model. The present work, as we shall carefully discuss in Section 4, considers an 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. Given that decision of enrolment in *AlmaLaurea* is taken by universities, we are mostly concerned with university unobservables. In particular, one might conjecture that universities that decide to join the consortium differ in some important respects, which also affect the dynamics of graduates employment outcomes. In section ??, we shall try to overcome this important problem using data on an additional pre-treatment period in order to test for non-parallel paths between the original treated and control group before the treatment.

Third, an important issue concerns the possible presence of general equilibrium effects (Heckman et al. 1998). To be valid, the DID approach assumes no interactions among the agents of the two groups. On the contrary, if for example *AlmaLaurea* graduates improve their occupational outcomes harming non *AlmaLaurea* graduates, the ATT is not a very interesting effect, at least for policy reasons. In section 7, we shall try to assess this problem identifying an additional control group which includes the graduates of those universities which are geographically located nearby the ones that joined the consortium.

Finally, if one wishes to generalize the results found to different individuals and contexts, external validity is also important. In particular, to repeat, the identified average effect in equation 2 concerns the treatment group. One may argue that *AlmaLaurea* would not have had an effect for graduates of universities different from the ones that joined. This would explain, moreover, why only a few universities self-selected, i.e. universities that actually joined *AlmaLaurea* are the ones that knew that they would have benefitted 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 of the two groups significantly differ in their observables.

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

1994	University of Bologna starts to collect electronic data about its graduates A prototype technology to sell data to firms on floppy disks is set up
1995	University of Bologna starts selling data on floppy disks
1996	University of Modena, Ferrara, Parma, Reggio Emilia and Florence join A prototype technology to sell data on the internet is set up
February 1997	University of Catania joins and the Internet service starts to operate
May 1997	University of Trieste, Udine and Messina join
August 1997	University of Chieti, Trento and Molise
January 1998	Venice School of Architecture join
August 1998	Univesity of Turin and Eastern Piedmont join

Note: We consider that a given University joins *AlmaLaurea* when its graduates' data start to be available for sale.
Source: All the information is on *AlmaLaurea* web site.

4. The Data

As already mentioned, *AlmaLaurea* was founded in 1994 and since then more than 45 universities have enroled in the consortium. Table 4 sums up the timing of university enrollments relevant for the present study.

Our data source concerning graduates is built from two distinct (but 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 1998.¹⁵ To implement the econometric approach described in Section 3, our treatment group includes graduates from universities that joined *AlmaLaurea* after 1995 and started selling on-line resumes by January 1998. Therefore, graduates from universities of Parma, Reggio Emilia, Modena, Florence, Catania, Trieste, Udine, Messina, Chieti, Trento, Molise and the Venice School of Architecture are in our main treatment group.

Turin and Eastern Piedmont universities joined in August 1998. Since ISTAT does not provide the exact graduation timing of 1995 graduates, this does not allow us to split them correctly between the treatment and control groups. However, given that this information is available for 1998, Turin and Eastern Piedmont graduates are used in the next session for an additional difference-in-differences analysis in which the before and after is graduation before and after August. As far as university of Bologna is concerned, we do not know the

¹⁵The 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).

exact 1995 month in which it started to sell curricula in electronic format. Therefore all graduates from this university are excluded from the analysis.¹⁶ To sum up, students in the treatment group account for about 18 per cent of the Italian graduate population.

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.¹⁷ Once we eliminate those individuals who have answered to the question concerning their employment status, 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.

The surveys collect information concerning individuals' (i) school and university curricula, (ii) labor market experience, and (iii) demographics and social backgrounds. Table 5 depicts samples characteristics, means, and standard errors 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, i.e. sex, age, high school grade, parents' education, siblings, province of residence before college enrolment, and department fixed effects. The second contains indicators related with college curricula, i.e. grade and years taken to get the degree, that may at least potentially be influenced by *AlmaLaurea*.

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 enrolled in a college member of *AlmaLaurea* and graduating in 1998.

In order to control for observable variation in college quality, we also use data concerning college characteristics provided by ISTAT in a yearly bulletin named *Lo Stato dell'Università* (University Indicators) for the academic years 1991-98. In particular, we collect information

¹⁶Results do not change qualitatively if we include Bologna graduates in the control group.

¹⁷Differences 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. We expect this change affected distinct universities in homogenous way and therefore it does not represent a major concern for our analysis.

Table 5: Sample Design and Means of Key Variables

	All	<i>AlmaLaurea</i>	<i>nonAlmaLaurea</i>
<i>1998 Survey:</i>			
Number of Graduates	15282	3512	11770
Weighted Share		.188	.812
<i>2001 Survey:</i>			
Number of Graduates	18181	3515	14666
Weighted Share		.183	.817
<hr/>			
	All	<i>AlmaLaurea</i>	<i>nonAlmaLaurea</i>
<i>Means of selected sample characteristics in 1998:</i>			
Share of Female	.527 (.004)	.528 (.010)	.527 (.005)
Age	27.45 (.038)	27.61 (.086)	27.41 (.042)
High School Grade	48.38 (.066)	47.87 (.151)	48.49 (.074)
<i>Means of selected sample characteristics in 2001:</i>			
Share of Female	.551 (.004)	.567 (.009)	.548 (.004)
Age	27.47 (.042)	27.55 (.028)	27.45 (.063)
High School Grade	48.96 (.057)	48.62 (.130)	49.04 (.064)
<hr/>			
	All	<i>AlmaLaurea</i>	<i>nonAlmaLaurea</i>
<i>Universities in 1995</i>			
Number of students per faculty	35.16 (.284)	28.50 (.114)	36.71 (.348)
Share of Delayed Students	.411 (.001)	.433 (.001)	.406 (.001)
<i>Universities in 1998</i>			
Number of students per faculty	35.27 (.246)	28.72 (.110)	36.74 (.299)
Share of Delayed Students	.410 (.001)	.429 (.001)	.406 (.001)

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.

at the level of single college on the number of students, professors, and delayed students.¹⁸ As depicted in the bottom part of Table 5 individual in the treatment group graduated from universities with a lower number of students per professor but a lower share of delayed students. Both indicators are generally considered proxies for universities qualities. Anyway within group such indicators have not experienced significant changes.

The most important left-hand variables in the present study are occupational status three years after graduation¹⁹ and mobility, namely if the individual is living in a different province with respect to the one where she graduated. Moreover, for those who are employed, we also focus on proxies concerning matching productivity, i.e. wages and two distinct measures of job satisfaction. The first concerns the perceived level of adequacy of the knowledge acquired at university with respect to the content of the present job and the second measures the perceived stability of the present job. Both variables are self reported and assume value from 1, not satisfied at all, to 4, very satisfied.

5. The Impact of *AlmaLaurea*

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 6 shows that unemployment rates decreased sharply from 1998 to 2001 for the whole target population.²⁰ 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. Similarly, as far as mobility is concerned, *AlmaLaurea* is associated with more mobility. In fact, graduates in the treatment group increased their mobility about 2.5 points relatively to graduates in the control group. This difference, however, is only marginally different from zero. Finally, as far as matching quality is considered, monthly wages increased about 44 euros more for *AlmaLaurea* graduates than

¹⁸In Italy most students graduate beyond the official limit.

¹⁹Following 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. One might think that three years after graduation is a quite long period to assess unemployment probability. Unfortunately, as discussed in the introduction and depicted in Table 1, this is not the case in Italy.

²⁰Italian labor market conditions have improved substantially in between 1998 and 2001. 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.

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 enrolled in *AlmaLaurea*) is not randomly assigned across individuals. The remaining part of the paper uses the approach 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:

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

Tables 7, 8, and 9 report OLS estimation of the above equation where the outcome is respectively unemployment, mobility and wages. The analysis is structured along the classification described in Section 4 and therefore four specifications are displayed: the first (column 1) includes only predetermined individual control; the second (column 2) considers also potentially endogenous individual controls like university grade and time taken to complete the degree; finally, column 3 incorporates time-variant university characteristics and province GDP.

Table 7 shows that irrespectively of the controls considered, if a university is affiliated to *AlmaLaurea*, the probability that its graduates are unemployed three years after graduation decreases about 2 points. University controls if anything reinforce the result. Together with lower unemployment rates, Table 8 shows that as expected also mobility rates have increased with *AlmaLaurea*. Depending of the controls used, such increase ranges from 2.6 to 3.5 points.

As mentioned, according to job search theory lower search costs are expected to improve the quality of labor market matches. Table 9 shows that according to our analysis *AlmaLaurea* has increased monthly wage of about 30 euros.²¹ The general result is confirmed using

²¹This result needs to be interpreted with caution because of possible different composition of the two sample (Recall that run the regression only on those who are employed).

Table 6: Unemployment, Mobility and Wages by Year and *AlmaLaurea*

Unemployment				
	1998	2001	Diff.	
<i>AlmaLaurea</i>	.228	.094	-.134	
<i>non AlmaLaurea</i>	.205	.107	-.098	
Diff.			-.036 ***	
<i>St. Err.</i>			<i>(.011)</i>	
Mobility				
	1998	2001	Diff.	
<i>AlmaLaurea</i>	.570	.566	-.004	
<i>non AlmaLaurea</i>	.480	.449	-.031	
Diff.			.025 *	
<i>St. Err.</i>			<i>(.015)</i>	
Wage				
	1998	2001	Diff.	
<i>AlmaLaurea</i>	899.7	1118.4	218.7	
<i>non AlmaLaurea</i>	980.9	1155.1	174.2	
Diff.			44.5 ***	
<i>St. Err.</i>			<i>(16.8)</i>	

Notes: Unemployment rates have been computed using stratification weights. 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 $Diff = (Y_{Alma}^{01} - Y_{Alma}^{98}) - (Y_{nonAlma}^{01} - Y_{nonAlma}^{98})$. In parenthesis are displayed robust standard errors of regressions of the dependent variables on dummies for year, belonging to *AlmaLaurea*, and their interaction.

Table 7: The Effect of *AlmaLaurea* on Unemployment Probability

	(1)	(2)	(3)
<i>AlmaLaurea</i>	-.020** (.008)	-.021** (.008)	-.021** (.010)
1998	-.101*** (.013)	-.103*** (.013)	-.104*** (.013)
Female	.060*** (.006)	.061*** (.005)	.061*** (.005)
Age	-.002** (.001)	-.004*** (.001)	-.004*** (.001)
High School Grade	-.002*** (.0003)	-.001*** (.0004)	-.001*** (.0004)
University Grade	NO	-.001** (.005)	-.001** (.001)
Dummies on year delay	NO	YES	YES
Dummies for parents education	YES	YES	YES
Students per faculty	NO	NO	-.0002 (.0008)
Share of delayed Students	NO	NO	.146 (.388)
Province GDP	NO	NO	YES
R-squared	0.147	0.147	0.149
Obs.	33463	33463	3305

Notes: Results of three different specifications of a linear probability model are displayed. All specifications include university*department fixed effects. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics and province GDP. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: The Effect of *AlmaLaurea* on Mobility

	(1)	(2)	(3)
<i>AlmaLaurea</i>	.026*** (.009)	.029*** (.009)	.035*** (.010)
1998	.007 (.006)	.009 (.006)	.026*** (.013)
Female	-.025*** (.005)	-.025 (.005)	-.024*** (.004)
Age	-.0003 (.001)	-.0005 (.001)	-.001 (.001)
High School Grade	-.0001 (.0003)	.0003 (.0003)	.001** (.0003)
University Grade	NO	-.002** (.001)	-.002*** (.001)
Dummies on year delay	NO	YES	YES
Dummies for parents education	YES	YES	YES
Students per faculty	NO	NO	.0006 (.001)
Share of delayed Students	NO	NO	-.804 (.404)
Province GDP	NO	NO	YES
R-squared	0.410	0.410	0.383
Obs.	33877	33463	33305

Notes: Results of three different specifications of a linear probability model are displayed. All specifications include university*department fixed effects. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics and province GDP. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year. * significant at 10%; ** significant at 5%; *** significant at 1%.

the two mentioned proxies of matches' quality.²²

Finally, we are able to perform a similar analysis using only data on 1998 graduates. In this case the treatment group is composed by graduates from universities of Turin and Eastern Piedmont and the before and after is graduating before and after August, that is when the two institutions adopted *AlmaLaurea*. In this specification dummies for month of graduation are included. As shown in Table 10, *AlmaLaurea* has significantly decreased unemployment probability by about 2.5 points. However, no significant effect is observed neither on mobility not on wages.

6. Unparallel Outcomes

This section tries to control for major shortcomings faced by the internal validity of our approach. Possibly, the most important threat to our results concerns the extent to which we can justify the "parallel trends" assumption stated in equation 1. A simple way of assessing its plausibility is using data from previous periods in which neither treatment nor control group were treated in order to see whether trends were parallel. If the change happened only immediately after the reform and not in previous period, it is more likely that it stems from the treatment itself.

ISTAT run a previous edition of the University-to-work survey on 1992 graduates interviewed in 1995. As showed in Figure 2, 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 11, shows that the magnitude of the DID coefficient concerning unemployment is positive, negligible, and it is not statistically different from zero. A similar result is obtained as far as mobility is concerned: the *AlmaLaurea* coefficient is not statistically different from zero at the 10 per cent level. These checks rule out the possibility that the coefficients depicted in Table 7 and Table 8 stem from groups unparallel trends.²³

Of course, the above checks do not control for time specific unparallel outcomes. In fact, possible interactions between *AlmaLaurea* enrolment and unobserved university 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

²²Results are not reported but available upon request.

²³Unfortunately 1995 survey does not reports data on wages.

Table 9: The Effect of *AlmaLaurea* on Wages

	(1)	(2)	(3)
<i>AlmaLaurea</i>	28.4 (17.82)	31.1* (18.05)	35.15** (.18.23)
1998	-193.8*** (12.42)	-198.96*** (12.51)	-201.93*** (12.18)
Female	-161.4*** (9.1)	-165.4*** (.005)	-165.83*** (9.81)
Age	14.27*** (1.59)	19.32*** (.001)	19.35*** (1.94)
High School Grade	4.70*** (.412)	2.79*** (.462)	2.75*** (.455)
University Grade	NO	4.35*** (.739)	4.42*** (.724)
Dummies on year delay	NO	YES	YES
Dummies for parents education	YES	YES	YES
Students per faculty	NO	NO	-.271 (.270)
Share of delayed Students	NO	NO	590.1 (420.3)
Province GDP	NO	NO	YES
R-squared	0.224	0.230	0.231
Obs.	20838	20838	20737

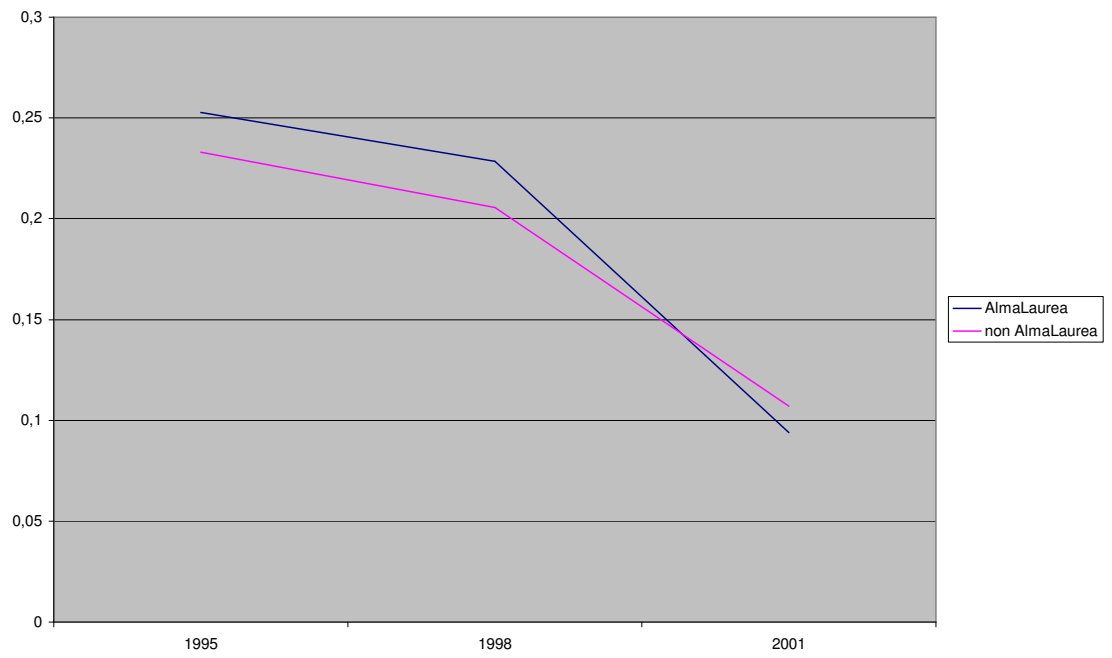
Notes: Results of three different specifications of a linear probability model are displayed. All specifications include university*department fixed effects. Column 1 includes only predetermined individual control, column 2 considers all individual controls, column 3 incorporates time variant universities characteristics and province GDP. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: The Effect of *AlmaLaurea*: the case of Turin and Eastern Piedmont

	Unemployment	Mobility	Wage
<i>AlmaLaurea</i>	-.025*** (.008)	.027 (.031)	-16.23 (24.35)
Female	.043*** (.005)	-.024*** (.005)	-173.33*** (11.80)
Age	-.002* (.001)	-.001 (.001)	20.27*** (2.18)
High School Grade	-.001*** (.0002)	.001* (.0004)	2.105*** (.576)
Dummies for parents education	YES	YES	YES
Month of graduation	YES	YES	YES
University Grade	YES	YES	YES
Dummies on year delay	YES	YES	YES
Students per faculty	YES	YES	YES
Share of delayed Students	YES	YES	YES
Province GDP	YES	YES	YES
R-squared	0.123	0.375	0.227
Obs.	20441	20441	12907

Notes: Treatment group are graduates from Universities of Turin and Eastern Piedmont. 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 11: **The Effect of "fake" *AlmaLaurea* three years before**

	Unemployment		Mobility	
<i>AlmaLaurea</i>	.006	(.013)	.016	(.012)
1995	-.027***	(.008)	.005	(.006)
Female	.079***	(.008)	-.028***	(.005)
Dummies for parents education	YES		YES	
R-squared	0.149		0.420	
Obs.	27373		27565	

Notes: Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
 * significant at 10%; ** significant at 5%; *** significant at 1%.

most their unobservable teaching quality. This might affect occupational outcomes of their graduates.

In order to investigate this possibility we perform two test. First, we build a fake treatment group composed by two universities, Siena and Lecce, that according to official sources decided to join *AlmaLaurea* in 1997, but did not start selling their student CVs on line until 1999 and 2003 respectively. If also these universities 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. Table 12 shows that this group experienced a slight increase in unemployment, rate vis-a-vis graduates from other universities. This reduces the probability that enrolment in the treatment group correlates with unobservables that cause employment improvement.

Second, if there were major interactions between *AlmaLaurea* enrolment and unobserved university time variant characteristics, one might expect that graduates from those universities would have experienced changes in their education performance precisely in those years. To check for this possibility we measure the effect of *AlmaLaurea* on university grade. As shown in Table 13 not significant effect is observed.

7. Alternative Control Groups and General Equilibrium Effect

The DID design can be further strengthened by the use of additional comparison groups. This is likely to reduce the importance of biases or random variation occurring in a single comparison group (Meyer 1995). The ideal additional control group is the one who faces the same time specific shocks of the treatment one, therefore the more similar the control is to

the treatment the better. The lack of strong reputation effects among Italian universities makes that the most reasonable way of building such group is along the geographic dimension. Nevertheless, we face a trade-off here. In fact, having only graduates from nearby universities as counterfactuals exacerbates the general equilibrium effects mentioned in Section 3. Interactions are in fact more likely among graduates occupational outcomes of nearby universities. Therefore, the effects of *AlmaLaurea* might be exaggerated if individuals in the control group are negatively affected by *AlmaLaurea* itself.²⁴ To make a concrete example, Pisa is in principle a better control group for Florence than Bari, but the risk is that its graduates may be affected negatively by the decreased costs firms face in hiring Florence graduates stemming from *AlmaLaurea*.

We built an additional control group focusing on graduate from on universities that locate close to the ones belonging to our treatment group. The formal rule we follow to select these universities is: first, for each university in the treatment group all those university which are in the same region²⁵ are included. Second, if all universities in a given region are in the treatment group, those universities which locate in the confining region sharing the longer border are included. Figure 13 shows the described procedure. Following the first rule, for university of Florence we include Pisa and Siena, for Catania and Messina we include Palermo, and for Chieti we include L’Aquila and Teramo. Moreover, given that all universities in Emilia Romagna, Friuli Venezia Giulia, Trentino and Molise are in *AlmaLaurea*, all universities located in Lombardia, Veneto²⁶ and Campania are considered. In this new setting the treatment group represents about 28 per cent of the entire population.

As shown in the first column Table 14, *AlmaLaurea* now has an effect of 3.1 points in decreasing unemployment, about one point higher than the effect shown in Table 7.²⁷ As shown in the second column of the same Table, if only faraway universities are considered as controls, the impact of *AlmaLaurea* on unemployment is about 1 point. The extent to which this stems from the better quality of the control group or conversely to *AlmaLaurea* general equilibrium effect is an open issue. In any case, the two coefficient may be considered as lower and upper bounds of the true effect.

²⁴Indeed, the fact that *Almalaura* has an impact on mobility rates makes this case plausible.

²⁵Italy is divided in 20 regions.

²⁶this is both a control for Friuli Venezia Giulia and Trentino

²⁷Effects on mobility and wages are similar to the ones obtained in the general case.

Fig. 2.— Universities in *AlmaLaurea* and in the alternative control group



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

Table 12: The Effect of *AlmaLaurea* using a placebo treatment group

	Unemployment	Mobility	Wage
Placebo <i>AlmaLaurea</i>	.009(.023)	-.003(.026)	-22.87(23.61)
R-squared	0.152	.389	0.227
Obs.	26278	26278	12907

Notes: Graduates in the true *AlmaLaurea* treatment group are not included. 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* on grades.

	University Grades
<i>AlmaLaurea</i>	-.109(.179)
R-squared	0.494
Obs.	33463

Notes: Italian university grades range from 66 to 110. 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 14: The Effect of *AlmaLaurea* using alternative control groups

	1	2
<i>AlmaLaurea</i>	-.031***(.009)	-.009(.009)
R-squared	0.161	0.136
Obs.	22110	18222

Notes: In the first column only graduates from nearby universities are included in the control group. In the second only graduates from non-nearby universities. Robust Standard Errors in parenthesis. All regression are clustered at region*degree*year.
 * significant at 10%; ** significant at 5%; *** significant at 1%.

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. Recent works have underlined the possibility of adverse selection in the use of electronic intermediaries.

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* 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 graduates 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 around 2 per cent, increases monthly wages by about 35 euros and improves two distinct self-reported measures of job satisfaction. Moreover, the analysis also highlights the positive effect of online labor market intermediaries on workers' geographical mobility. Individuals graduating from a university belonging to *AlmaLaurea* increased their relative probability to move to a different province of around 2.5 points.

Our results also contribute to the policy discussion on university-to-work transition. Italian case is interesting for a number of reasons and its poor performance have always been ascribed to either demand or supply factors. We show that graduates labor market functioning can be improved by new intermediaries.

In future research we aim at exploring the pros and cons of similar labor market intermediaries, trying to single out with more precision the key features that make of *AlmaLaurea* a successful case.

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