

# CRISEI

Centro di Ricerca Interdipartimentale in Sviluppo Economico e Istituzioni

## *Discussion Paper Series*

**Overeducation at a glance. Determinants and wage effects  
of the educational mismatch, looking at the AlmaLaurea  
data**

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**Discussion Paper  
No.18  
Settembre 2012**

**ISSN: 2280-9767**



**CRISEI - Università di Napoli - Parthenope**

# Università degli Studi di Napoli- Parthenope

## CRISEI

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# Overeducation at a glance. Determinants and wage effects of the educational mismatch, looking at the AlmaLaurea data

Floro Ernesto Caroleo<sup>¥</sup> e Francesco Pastore<sup>§</sup>

## Abstract<sup>#</sup>

This paper provides the first available estimates of the impact of overeducation on wages of AlmaLaurea university graduates. The analysis focuses on jobs held 5 years after the graduation attained in 2005. Overeducation / overskilling are relatively high when compared to those in similarly advanced economies, and persistent over the years after graduation. *Ceteris paribus* they tend to be more frequent among children of parents with lower educational levels, through school tracking. The degrees more frequently associated to overeducation are: Agriculture, Arts, Education, Languages, Physical Education, Political Sciences and Psychology. Working while studying and having started the university later than the curricular years are also factors. Moreover, we estimate a conditional wage penalty of about 10% of the median wage when we adopt the “to get” (overeducation) and of about 6.7% when we adopt the “to do” (overskilling) definition. However, the personal attributes that dispose individuals to be mismatched might also reduce the probability of finding a job. Controlling for this source of sample selection bias by using the Heckit procedure, we find that the wage penalty associated to overeducation / overskilling goes up to 35 and 74 percent, respectively. This is support for the job competition and the job assignment models versus the search theoretical model, suggesting that the non-employed would be more likely overeducated / overskilled if they found a job.

**JEL classification:** C25; C26; C33; I2; J13; J24.

**Keywords:** School-to-Work Transition; University graduates; AlmaLaurea; Overeducation; Overskilling; Earnings; (Ordered) Probit; sample selection bias; Heckit; Italy.

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<sup>#</sup> Acknowledgements. Most part of this research was conceived during several periods of stay of Francesco Pastore at the AlmaLaurea headquarters in Bologna. We are grateful to Andrea Cammelli, Angelo Di Francia and Silvia Ghiselli for providing us with the AlmaLaurea data and for very helpful suggestions on data analysis. Previous versions of this paper have been presented at: AlmaLaurea Conference, University of Bologna (11<sup>th</sup> of March 2011), IAB of Nuremberg (26<sup>th</sup> of May 2011), XXVI AIEL Conference, Catholic University of Milan (15<sup>th</sup> of September 2011), University of Naples “Parthenope” (30<sup>th</sup> of September 2011), University of Naples “Federico II” (26<sup>th</sup> of October 2011), Second University of Naples (22<sup>nd</sup> of December 2011), XXVII AIEL Conference (27-28<sup>th</sup> of September 2012). We thank all seminar participants. We are also grateful to Lilia Costabile, Giuseppe Croce, Claudio Lucifora, Nadia Netti, Patrizia Ordine, Marco Pecoraro, Claudia Pignini, Giuseppe Rose, Dario Sciulli and Peter Sloane for valuable comments. This notwithstanding, the authors are solely responsible for the opinions expressed in this paper.

## Introduction

The mismatch between the educational level of workers and that required by the jobs available in the labour market represents one of the most debated dimensions of the educational and skill mismatch that mainly affects university leavers. Both the horizontal and vertical dimensions of the mismatch are expected to increase in the near future. First, many observers believe that the horizontal mismatch, which happens when the level of schooling is appropriate, but the type of schooling is not (Sloane, 2003), is bound to increase due to two main factors: a) the mounting complexity of the industrial structure, which causes, indeed, a mismatch between the composition of labour demand and supply by educational types and skills; b) and the insufficient coordination of educational institutions with labour market evolutions (see, among others, Robst, 2007; and Nordin, Perrson and Rooth, 2010).

Moreover, the increasing educational level of the youngest generation causes growing concern that the mismatch will take the form of (vertical) overeducation, which happens when the years of schooling required for the job is lower than the years of schooling completed (so-called excess schooling), and overskilling, which happens when the skills required to do the job are lower than the skills individuals have. This is especially true in those countries, like Italy, where the production system is oriented towards traditional manufacturing sectors and therefore the demand for human capital is expected to remain low and stable.

In this direction, it is interesting to note that while technological change and globalization have entailed a skill-bias in the evolution of labour demand in the Anglo-Saxon countries, instead, in other advanced economies in Western Europe the increased educational level has not been associated with a parallel raise in the share of skilled occupations, therefore generating skills mismatch (see Manacorda and Petrongolo, 2000, for a comparative analysis of several OECD countries).

Overeducation causes a penalty to individuals in terms of earnings and employment opportunities and a waste of resources to the society at large in terms of state investment into education that do not bear its yields (Groot 1996, Büchel et al., 2003, McGuinness, 2006).

Comparative evidence based on REFLEX<sup>1</sup> data suggests that Italy has a higher than average share of overeducated workers. Slightly different is the case of overskilling, which is much more common than overeducation and for which Italy tends to the sample average (McGuinness and Sloane, 2010; Verhaest and van der Velden 2010; Barone and Ortiz 2011). The (conditional) wage penalty associated to overeducation in simple OLS estimates is generally found to be lower than average, though. Cutillo and Di Pietro (2006) and McGuinness and Sloane (2010) find a wage penalty of 10% or less, lower than that found elsewhere.

Nonetheless, many authors hypothesise that the personal attributes that dispose individuals to be mismatched might also reduce the probability of finding a job. This might be likely to underestimate the extent of overeducation in Italy and, indirectly, the true (negative) wage effect of overeducation in OLS estimates. Cutillo and Di Pietro (2006) use the 2001 ISTAT enquiry on professional integration of 1998 graduates and find that once controlling for both endogeneity and sample selection bias by a bivariate selectivity model, the wage penalty of overeducation reaches about 40%.

This paper provides the first available estimates of the impact of overeducation on wages of AlmaLaurea<sup>2</sup> university graduates registered in the years before the implementation of the Bologna process, so-called pre-reform graduates. All individuals in the sample graduated in 2005 in any type of university degree and are observed one, three and five years after graduation. We study the determinants of the mismatch by using the only questions available in the AlmaLaurea data. More specifically, overeducation is defined as referring to those individuals who declare that their university degree was neither required by law, nor useful to access their current job (question A17). Overskilling is defined as referring to those individuals who declare that the competences acquired during their university studies were not used in their current job.

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<sup>1</sup> REFLEX is a survey carried out among a representative sample of graduate from tertiary education, having got the degree in the academic year 1999/2000, in 16 European countries (Allen and van der Velden, 2007).

<sup>2</sup> AlmaLaurea is a consortium including a large and growing number of Italian universities. The aim of the consortium is to provide a framework to facilitate interaction of graduates and firms by collecting information on curricula of graduates and making it available to firms wishing to fill in their job vacancies. It also collects valuable information on individual and educational characteristics of graduates at the time of graduation and on their employment status after one, three and five years from graduation. Information on characteristics at graduation and employment status, available in separate files and databases, can be, in fact, matched to form a unique data set useful for evaluation of the success of universities in producing human capital that the market is actually requesting.

Like in other types of data, also in the AlmaLaurea data, the share of the overeducated shrinks in the years after graduation, but is still non-negligible after 5 years. The size of the phenomenon is in the AlmaLaurea lower than in the REFLEX data. Overeducation falls from 13.2% after one year to 8.0% after five years. The comparable figures for overskilling are 16.5% and 11.4%. In addition, overskilling is like in other countries, generally greater than overeducation.

The determinants are quite similar for overeducation / overskilling. Such individual characteristics as gender, civil status and having children seem to have little impact on the probability to be overeducated, probably because they are observed at the time of graduation. Unemployment duration, the final grade at high secondary school, holding a professional / technical / pedagogic diploma, having found a job through a network of family and friends are factors that correlate with the educational mismatch. Vice versa, having completed some post-graduate training or an advanced master course, finding a job after being a *stageur* or attending other on-the-job training programmes, moving to a place different from the one where the degree was achieved are all factors able to reduce the chance of experiencing the educational mismatch (OECD, 2011, chap. 4). Interestingly, like in Franzini and Raitano (2009) the probability of overeducation (but not overskilling) is higher in low, not in high unemployment regions. This is probably due to the relatively higher share of public sector jobs in the more disadvantaged Southern regions.

We estimate by OLS a conditional wage penalty of about 10% of the median wage for overskilling and of about 42.5% for overeducation. This is quite a low wage effect in comparison to other countries that have reached a similar level of development, which might have supply and demand-side explanations. On the one hand, institutional factors, such as the strong compression of the wage distribution, are important. On the other hand, the supply of human capital might be increasing at a faster pace than the demand. These findings are consistent with a theory where labour demand is less skill biased and, therefore, where the unemployment rate of university graduates is relatively higher than elsewhere.

To test this last hypothesis, we move away from traditional OLS estimates, towards modelling strategies able to control for and assess the impact of the greater / lower probability of non-employment of those graduates whose personal attributes would dispose them to be mismatched if they found a job. In fact, as Nicaise (2001) note, according to the job competition (but also the job assignment) model, it is likely that the wage penalty of overeducation is lower than actual when it is estimated only among the employed who are overeducated. The latter represent the smoothest form of educational mismatch: in other words, the personal attributes that dispose individuals to be mismatched might also reduce their probability of finding a job. In fact, the most dramatic penalty of possessing educational characteristics that are not much on demand in the labour market is in terms of a reduced probability to find a job.

An alternative hypothesis is also in order. According to the search theoretical model, unemployment is a voluntary choice and the most skilled individuals prefer to stay in the unemployment pool waiting for a better job offer to come. In this case, the OLS would return upward biased estimates of the wage effect of overeducation.

We control for the possible sample selection bias arising from measuring overeducation only among the employed by the Heckit econometric specification of the earnings equation, where the usual OLS estimates are corrected for the lower / higher employment opportunities of the individuals that have attributes not much on demand in the labour market. When controlling for this source of sample selection bias, we find that the wage penalty associated to overeducation / overskilling goes up to 35 and 74% respectively. Our findings provide indirect support for the job competition and the job assignment model versus the search theoretical model, suggesting that the non-employed would be more likely to be overeducated if they found a job. In other words, the sample selection correction confirms that there is positive selection into employment of the most skilled among those experiencing the educational / skill mismatch with respect to labour demand. This finding is partly in line with that of Cutillo and Di Pietro (2006) based on different data.

The outline of this paper is as follows. Section one summarises the relevant literature by focusing especially on the Italian case. Section two describes the AlmaLaurea data set adopted and discusses the methods of analysis implemented. Section three presents the results. A final section summarises the main findings and discusses the implications, developing demand and supply side considerations. The concluding section also discusses possible policy suggestions to reduce the impact of overeducation.

## 1. The state of the art

### ***1.1. Theoretical explanations of overeducation***

Sloane (2003), McGuinness (2006) and Leuven and Oosterbeek (2011) provide introductory, but comprehensive accounts of the theoretical interpretations of overeducation. The human capital theory helps understanding overeducation as a consequence of a lack of the work-related component of human capital. In a sense, overeducation is a sign of low, not of high skills: the overeducated are those university graduates who have higher educational level than high school graduates, but have not enough general and/or job specific work experience. This theoretical framework helps understanding why overeducation is typical of young people, despite their increasing educational level. The persistence of overeducation among the adults is a clear challenge for this interpretation, since with time passing young people should get the experience they need to reach the level of adults, unless some persistent, often unobserved low ability / skill problem affects the permanently overeducated.

An alternative explanation is provided by the job competition model brought to the fore by Lester C. Thurow for the first time. Excess schooling is a consequence of the competition for jobs: everybody is involved into a competition for the few jobs available in the labour market. The competition is based on accumulating education, which is in some cases more than that requested to get a job, which generates overeducation. According to this theory, unemployment is essentially involuntary in nature and, as a consequence, the most skilled among graduates are the first to get job offers and accept them as the best alternative, also independent of education. Wages do not depend on individual, but on job productivity and individuals need to acquire the necessary work experience to access the jobs they aim to. To do so, they have to queue for the job and wait until when they acquire the necessary job-specific work experience to do the job. In other words, the job allocation process is like a lottery for the best job opportunity to come.

With the assignment theory, Sattinger (1993) attempted to reconcile the two previous theories. On the one hand, like the job competition model, the job assignment model assumes that the jobs available in the economy are limited, which makes any job-worker match unique and therefore providing a type of remuneration that is job specific and independent of the human capital endowment of the individual; on the other hand, like the human capital theory, it assumes that with their investment in human capital individuals are able to compete for the best job and wages are bound to be influenced by the human capital level of individuals. Overeducation arises because wages will neither be entirely related to acquired schooling and other individual attributes, like in the human capital model, nor to the nature of the job, like in the job competition and job assignment model.

The job search theoretical model assumes, instead, that unemployment is largely a voluntary choice. People accept a job offer when it brings with it a wage higher than their reservation wages. The most skilled graduates prefer to wait into the non-employment pool until when they get the best job offer they can. High skill individuals have higher reservation wages and wait for a longer time than the least skilled graduates, who tend to choose the first job offer they get, even if it involves overeducation. Overeducation arises because the least skilled individuals get the first job offer they can because their reservation wage is low.

Overeducation may result also from career mobility theories: wages tend to grow over time together with the work experience accumulated by individuals. It is therefore physiological that firms and graduates generate job-worker matches with low earnings in the short run, but good career prospects in the long-run.

The policy implications of these theories are different as to the tools that are necessary to reduce the educational / skill mismatch. The human capital model would suggest investing in work-related training, considered as an important aspect of the process of human capital formation that the educational system fails to provide. The job competition and job assignment models would suggest not investing so much in education or also in training, but rather in the production system so as to favour skill-intensive productions, the only ones that are able to absorb the increasing human capital level of the population. Similar to the human capital model, the job search model would suggest instead pointing to increase those components of the human capital that affect the motivation to search for jobs that are more adequate to young people ambitions. Finally, career mobility theories would suggest stimulating overeducation in early careers as an initial option for young people wishing to access later on jobs that require their actual educational / skill level.

### ***1.2. The empirical literature***

While early studies have focused on the USA (Freeman, 1976), more recently, overeducation and skill-mismatch patterns have been noted also in other economies, including several European countries (see, for overviews, Büchel et al., 2003; Rubb, 2003; McGuinness, 2006; Leuven and Osterbeek, 2011) and also Italy (AlmaLaurea 2005; Di Pietro and Urwin 2006; Ordine and Rose, 2009; Ortiz 2010). These studies have addressed the following issues:

- a) Size and cross-country determinants of overeducation;
- b) Within-country determinants and by educational qualification;
- c) Penalty in terms of earnings and employment probabilities;
- d) Shortcomings of OLS and corrections for measurement errors, sample selection and endogeneity bias.

For shortness' sake, the rest of this section will not even attempt to summarise the literature on the above points, but will rather just mention some findings that are of interest for the ensuing analysis. Issue a) is one of the most complex to deal with, due to the lack of comparative data. In addition, whatever the measure of overeducation / overskilling adopted, measurement errors are very common, inviting to take the greatest caution when studying this form of educational / skill mismatch (see, among others, Chevalier, 2003; and the recent survey by Leuven and Oosterbeek, 2011).

Expectations based on theoretical reasoning and early evidence on the skill mismatch across OECD countries (Manacorda and Petrongolo, 2000) point to lower overeducation in the EU as compared to the USA. In fact, although there is large confirmation that technological change has been in the EU, and especially in Southern European countries, less skill biased than in the USA, nevertheless, the supply of human capital is also on average much lower in the EU.

Nonetheless, supply side considerations suggest that also in (Southern) European countries, overeducation might have become an issue in recent years, due to the dramatic increase in the supply of human capital in a context of sluggish economic growth and innovation rates. The human capital boom has been the consequence also of policy intervention. Continuous reforms of the educational system starting from 1999 have been aimed, among others, at reducing the direct and indirect cost of education, in order to favour the increase in educational attainment.

A recent, but flourishing stream of literature is attempting to estimate the relative impact of demand and supply side variables in cross-country panel data analyses. The authors find that demand side variables and differences in the imbalances between the composition by field of study of the demand for and supply of education are more important than institutional factors (Davia et al., 2010; Verhaest and van der Velden, 2010; Croce and Ghignoni, 2011).

As to point b), overeducation is typically attributed to similar observed characteristics, such as holding a degree in the Arts or Social Sciences, the fact of studying and working, the tendency to work before starting to attend a university programme.

Even if the return to education (Point c) is still positive for the overeducated and higher than that obtained by workers holding only a secondary high school diploma (Brynin and Longhi, 2009; Franzini Raitano 2009; Wasmer et al, 2005), nonetheless, they invariably get a wage penalty for being overeducated as compared to their peers employed in positions for which they hold the required diploma. Leuven and Oosterbeek (2011) report a row wage penalty associated to overeducation of less than 10% as compared to the return to required schooling.

Moreover, generally speaking, the wage gap for overskilling is lower than that for overeducation (see, among others, Sloane et al., 1999; Wasmer et al., 2005). The greater probability of overrating overskilling as compared to overeducation might explain this. In addition, overeducation is more likely to signal an objective disadvantage at the work place. Dolton and Silles (2008) find a wage penalty of about 16% for overskilling and of 23% for overeducation. McGuinness and Sloane (2010) find an average wage penalty associated to overskilling of about 10%, but of about 30% in the case of overeducation in a sample of seven EU countries, using the REFLEX dataset.

The points c) and d) appear more and more closely related to each other, since many authors have raised the concern that simple OLS estimates tend to dramatically underestimate the wage penalty associated to overeducation. Three types of possible sources of bias have been highlighted in the literature: a) endogeneity; b) sample selection; c) measurement errors. While endogeneity tends to generate upward corrections of the wage penalty, and measurement errors tend to generate a downward correction, sample selection bias has a potentially ambiguous effect.

Measurement errors might tend to reduce the wage penalty since often individuals believe, subjectively, more than they do objectively, to be overeducated (or also overskilled) when they are not. This might tend

the wage penalty of the overeducated to be lower on average, since it is computed also on individuals that are not genuinely overeducated. It is important to detect the cases of measurement errors to understand whether and how many individuals are not overeducated. In fact, as the measurement based on statistical overeducation shows, there are also many cases of under-education. If not adequately accounted for, they might tend to overestimate the wage penalty associated to overeducation, since the baseline group of the non overeducated might possibly include also the undereducated, whose wage is proven to be lower than average. Chevalier (2003), Mavromaras et al. (2010) and Pecoraro (2011) elaborate ways to measure the wage effect of genuine versus apparent overeducation by looking at the relation between overeducation and job satisfaction.

Endogeneity arises if overeducation is assumed to be related to unobserved characteristics, such as a lower level of skills and motivation of the overeducated. Now, if the overeducated are less motivated than average, it is likely that the wage penalty is higher than that typically found. In fact, once controlling for unobserved motivation and skills, overeducation should generate a greater wage penalty.

Nicaise (2001) is among the first to notice that ignoring the non-employed might generate a bias on returns to education whose direction is in principle ambiguous. Applying her line of reasoning to the case of overeducation, according to the job competition and job assignment models, sample selection bias arises because of the fact that the educational mismatch appears first of all in the form of a higher probability of non-employment and only at a later stage takes the form of a wage penalty. Once controlling for the selection bias arising from the presence of non-employment, the wage penalty of those experiencing an educational mismatch might be much higher. Conversely, according to the search theoretical model, unemployment is a voluntary choice and the most skilled graduates prefer to wait into non-employment until when they get the best job offer they can. Accordingly, sample selection causes an upward bias in OLS estimates.

Once controlling for endogeneity and sample selection bias, most authors find that the wage penalty associated to overeducation increases lending support to the job competition and job assignment models (see, among others, Cuttillo and Di Pietro, 2006). In addition, the upward bias tends to outweigh the downward bias due to measurement error in panel data analysis (Dolton and Silles, 2008).

### *1.3. The case of Italy*

The empirical literature on Italy has especially aimed at catching the specificity of the country, namely its low level of both demand and supply of human capital. Table A.1. in the Appendix provides a synoptic view of the literature currently available on Italy. From the demand side, Manacorda and Petrongolo (2000), among others, note that the production structure is still based on labour intensive traditional manufacturing. Therefore, the origin of educational mismatch could be found in the weak demand of more educated workers compared with the skill formation supplied by the educational system (Caniarca and Sgobbi, 2009). From the supply side, Checchi (2003), Pastore (2009) and Franzini and Raitano (2009), among others, note the lowest level and quality of educational attainment of young people as compared to the EU average<sup>3</sup>.

A large literature points to the inefficiency of the educational system in generating a sufficient level and composition of skills for the labour market demand. Ordine and Rose (2009), for example, model the hypothesis that inefficient educational choices due to the different educational quality supplied by the universities can generate overeducation. It is mirrored not only in the low level of education attainment, but also in the dramatic social immobility. Education attainment is especially low among the poorest segments of the population, due to school tracking (see, among others, Checchi, Ichino e Rustichini, 1999; Cappellari, 2004; Brunello e Checchi, 2007; Bratti, Checchi and De Blasio, 2008; Checchi, 2010). In addition, Caroleo and Pastore (2012) note a strong correlation between the father educational level and that of their children by type of university degree: in particular, most children whose parents both hold a university degree tend to gather in those fields of study that give access to liberal professions, where the intergenerational transfer of human capital is greatest.

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<sup>3</sup> In the last decade, Italy has witnessed several reforms of the university system aimed at reducing the indirect cost of education, one of the highest in the world, due to the long time that is necessary to attain a degree and complete the school-to-work transition (Pastore, 2009). As a consequence, the number of graduates has slightly increased, although at a slower pace than the EU average, making the country still score as one of the lowest in terms of educational levels in Europe.



All this considered, in principle, it is hard to say whether overschooling is higher or lower than elsewhere. Istat estimated that the undereducated were 1.9 million (9% of employment), whereas the overeducated amounted to 3.7 million (16.5%) in 2006. The existing comparative evidence hints that the country has a higher than average share of overeducated workers, suggesting that demand is more at risk of losing the race with the supply of human capital than elsewhere. Horizontal overeducation might also be an important component, due to the low degree of orientation of high school diploma students, the scant integration of the educational system with the labour market and the high share of graduates in humanities and other arts degrees.

In their study of the REFLEX data, McGuinness and Sloane (2010, Table 3.6) find that the extent of the educational mismatch is in Italy one of the highest among the EU countries included in their sample (Davia, McGuinness and O'Connell, 2010; Verhaest and van der Velden, 2010). With a share of 23% of overeducated workers at the time of their first job and of 13% five years after graduation, Italy is the third last performer, standing only after Spain and the UK, that have a share of overeducation equal to 17% and 14%, respectively, five years after graduation. In other EU countries in the sample, overeducation is almost always under the threshold of 10%.

Slightly different is the case of overskilling, which is much more common in the REFLEX sample and for which Italy tends to the country average. This is due to the tendency of overskilling to be much more common than overeducation. In Italy, overskilling equals 21% at the first job and 11% five years after graduation. Italy is still under Spain and the UK only, but this time also other countries have similar levels, fluctuating from 8% in Portugal and Norway to 19% in Belgium and 21% in France.

Ferrante (2010, p. 89-93) uses AlmaLaurea data to assess the impact of a number of individual characteristics on the effectiveness of the university degree in providing a job that is up to the educational and skill level of the individual. The author delivers indications relative to the sign and the statistical significance of the variables used. He reports that the variables that correlate positively and in a statistically significant way with the effectiveness of the university degree in an ordered probit framework include: a high school diploma with a score of 55-60 out of 100; a high university final grade; a longer length of job search; experiencing some postgraduate training; holding a university degree in engineering, chemistry and pharmacy, law. The negative and statistically significant determinants include: holding a diploma of technical high school, rather than gymnasium; belonging to the working class; starting their career via starter or atypical working contracts, such as apprenticeship, *stage*, temporary contract; holding an arts degree or a degree in education, psychology, social sciences. Moreover, the author finds a statistically significant positive effect of the effectiveness of the university degree on job satisfaction.

The wage penalty of overeducated or overskilled university graduates is found to be lower in Italy than in other countries and in some case not statistically significant (Wasmer et al. 2005; Brynin and Longhi 2009; Ordine and Rose, 2009). Using the 2001 ISTAT enquiry on professional integration of 1998 graduates, Cutillo and Di Pietro (2006) find a wage penalty for university graduates ranging between 2.4% and 5.7% in simple OLS estimates based on an ISTAT database. McGuinness and Sloane (2010) find a wage penalty of about 10%. Interestingly, in the case of Italy, they find a higher wage penalty for the overskilled (-11%) than for the overeducated (-4%). The latter is not statistically significant. They also find a wage penalty of about 8% in the case of under-skilling.

Using the ISFOL PLUS data, Aina and Pastore (2012) find a strong correlation of overeducation with delayed graduation and a wage penalty associated to overeducation of about 20%, slightly higher than in previous studies.

According to some authors, the return to education of overeducated graduates is anyway positive even if lesser than that of well-matched counterparts (Caniarca and Sgobbi 2009; Franzini and Raitano 2009). This suggests the low wage penalty associated to the educational and skill mismatch suggests that firms have strong incentives to hire a worker holding a university degree rather than a high secondary school diploma even if the university graduate is bound to remain overeducated. This can be understood considering the highest unemployment rate existing traditionally in the country and the abundance of non-employed job seekers especially among the youngest segments of the population. Although lower than that among young people holding a high school diploma, the unemployment rate of university graduates is higher in Italy than in other EU countries. As already noted in the previous section, this poses an apparent problem of sample selection bias when estimating the wage effect of overeducation and seems to line in favour of the job competition and job assignment models, rather than the job search theoretical model.

Using an ISTAT survey carried out in 2001 on graduates in 1998, Cutillo and Di Pietro (2006) find that once controlling for endogeneity of overeducation, the wage penalty increases up to between 22 and 39%.

Once controlling for both endogeneity and sample selection bias, the wage penalty of overeducation reaches always about 40%, independent of the sample adopted.

Considering the dramatic geographical differences existing in the country, a potentially relevant issue is whether there is any divide also in the way overeducation manifest itself across regions. In theory, one would expect overeducation to be more common in the South, where the demand for skills is supposedly lower, due to the lower development level. Nonetheless, Franzini and Raitano (2009) find that in the Southern regions overeducation is less frequent and bears a lower wage penalty. They explain this finding in terms of the relatively greater share in Southern regions of workers employed in the state sector, where overeducation is less frequent and bears a lower wage penalty. On the other hand Croce and Ghignoni (2011) find that frictions and barriers increasing the costs of spatial mobility worsen the matching between required and possessed education in the labour market. And, in particular, among the university graduates, movers are less overeducated than stayers and a longer migration distance decreases overeducation risks.

## 2. Methodology and data

### 2.1. Methodology

A first set of estimates will assess the impact of several individual characteristics on the probability that a university graduate experiences overeducation by estimating the following type of probit model by maximum likelihood:

$$Pr(O = 1|X) = \Phi(X'\beta) \quad [1]$$

where  $O$  is a binary variable with outcome 1 in case of overeducation and 0 otherwise;  $X$  is a vector of regressors and  $\beta$  is a vector of parameters;  $Pr$  denotes probability and  $\Phi$  is the cumulative distribution function of the standard normal distribution.

When the dependent variable is the “ineffectiveness” of the university degree, since it is an ordinal type of outcome – categorical and ordered, we estimate the following ordered probit model:

$$Pr(I_j = 1|X) = Pr(k_{i-1} < X_j\beta + u < k_i) = \Phi(k_i - X_j\beta) - \Phi(k_{i-1} - X_j\beta) \quad [2]$$

Where  $I_j$  is the ineffectiveness of the university degree;  $u_j$  are normally distributed residuals;  $k_i$  are cut off points, with  $i=1, \dots, n$  being the number of cut off points, which are 5 in this case, as detailed in the next section. Coefficients and cut off points are estimated simultaneously.

Step two implies the estimate of the usual Mincerian earnings equation, augmented of the overeducation / overskilling term:

$$Lnw_i = \mathbf{X}_i\beta + rO_i + u_i \quad [3]$$

where  $Ln w_i$  is the natural logarithm of the net monthly wage for an individual  $i$ ,  $\mathbf{X}_i$  is a set of variables assumed to affect earnings (see the previous sub-section for a full list of regressors),  $O_i$  is a dummy taking a value of one when the individual is overeducated / overskilled, and  $u_i$  is a disturbance term representing other forces which may not be explicitly measured, assumed independent of  $\mathbf{X}_i$  and  $O_i$ .

Unfortunately, the years of overeducation / overskilling are not available in the AlmaLaurea data. This prevents us from applying the classical ORU specification (Over-, Required, and Under-education), which Duncan and Hoffman (1981) formulated in terms of years of required schooling, overschooling and underschooling. A simplified version of the Verdugo and Verdugo (1989) specification provides hence the empirical framework to estimate the wage penalty of overeducation / overskilling<sup>4</sup>.

In addition, since every individual in the sample is a university graduate, no variable for (potential) years of (attained) schooling is included. Nonetheless, we control for the actual years of schooling indirectly through the number of extra-curricular years spent to attain the degree. Work experience is measured indirectly through the number of months that the individual has employed to find a job. Given the short work horizon of individuals in the sample, no quadratic term is used for work experience.

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<sup>4</sup> According to Leuven and Oosterbeek (2011, section 5), where available the specification in terms of years of schooling should be preferred to the specification in terms of educational qualifications. The latter, in fact, among others reasons, mixes up years of required with years of completed education.

Clearly,  $r$  is the coefficient of interest: it measures the wage effect of being overeducated / overskilled, rather than being adequately educated or undereducated (in the baseline). Dolton and Vignoles (2000), among others, argue that the human capital theory would postulate that  $r = 0$ , because earnings should be affected by human capital, which supposedly is a factor of labour productivity, rather than by the job's educational requirement. Therefore, finding that  $r \neq 0$  would imply a breach to the human capital theory. In particular, if the job's educational requirement affects earnings, then graduates will be paid like their peers with lower educational attainment, rather than with the same educational qualification. This implies a wage penalty for overeducation, namely  $r < 0$ . Conversely, Groot and Maassen van den Brink (2000) argue that the case when  $r < 0$  might indicate a lack of work experience in the overeducated and, therefore, indirect confirmation of the human capital theory: in fact, the human capital is not only made of education, but also of work experience

The above earnings function is a log-linear transformation of an exponential function and can be estimated by OLS. The coefficients have a semi-elasticity interpretation. They measure the ceteris paribus percentage change in the dependent variable for any unit change in any independent variable<sup>5</sup>.

Nonetheless, as explained in detail in the next section, the AlmaLaurea data provide monthly wages in the form of interval data with right-censoring at the threshold of €3,000 per month. OLS is, therefore, estimated after taking the mid-point of the available interval data. This procedure is common in empirical studies, but it implies, in fact, in the case of OLS data interval bias (which is a case of censoring, so-called interval censoring) and truncation bias (Stewart, 1983; Cameron and Trivedi, 2009, 532-535). The entity of the bias is uncertain. In order to control for these sources of specification error, to use Heckman (1979) definition, the same earnings equation has been estimated also by maximum likelihood as an interval regression.

As already noted in previous sections, ignoring the non-employed when estimating the wage effect of overeducation might generate a further source of bias whose direction is, in principle, ambiguous. According to the job competition (and the job assignment<sup>6</sup>) model, unemployment is essentially involuntary in nature and, as a consequence, the most skilled among graduates (also when possessing attributes that are not much on demand in the labour market) are the first to get job offers and accept them as their best alternative. In other words, sample selection bias arises because of the fact that the mismatch of possessed and required skills appears first of all in the form of a lower probability of job finding and only at a later stage takes the form of a wage penalty. Once controlling for the selection bias arising from the presence of non-employment, the wage penalty of those experiencing an educational mismatch might be higher. Because of sample selection bias, OLS estimates of the wage penalty would be downward biased (in absolute terms).

Conversely, according to the search theoretical model, unemployment is a voluntary choice and the most skilled graduates prefer to wait into the non-employment pool until when they get the best job offer they can. Accordingly, because of sample selection bias, OLS estimates of the wage penalty would be upward biased (in absolute terms).

We control for the possible omitted heterogeneity bias arising from measuring overeducation only among the employed by the Heckman (1979) econometric specification – sometimes called Heckit for consonance to the Tobit model – of the earnings equation, where the usual OLS estimates are corrected for the lower / higher employment opportunities of the most skilled and motivated among those whose personal attributes would lead to overeducation if they were employed.

The Heckit model was originally thought to explain the higher returns to education of employed women in terms of their greater motivation with respect to the non-employed women. The basic intuition of the

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<sup>5</sup> When the regressor is a continuous variable, the elasticity at the mean of the covariates, namely the percentage change in the regressand for a percentage change in the regressor, can be computed multiplying the coefficient by the mean of the regressor:  $\beta \bar{X}$ . In the case of independent dummy variables, like levels of education attainment, the semi-elasticity interpretation is flawed and, following Halvorsen and Palmquist (1980), it should be computed as:  $(e^\beta - 1) * 100$ . This formula measures the percentage change in the median wage, which is less affected by outliers. Nonetheless, many authors interpret also the estimated coefficients of dummy variables directly as semi-elasticity. This is acceptable when the estimated coefficient is sufficiently close to zero.

<sup>6</sup> We thank Peter Sloane for pointing out that in fact the basic assumption that we want to test here is not only implicit in the job competition, but also in the job assignment model.

model in the case here under consideration is that the earnings equation is missing some variable able to explain the different degree of participation of the individuals that have attributes not much on demand in the labour market. If one finds the factors affecting the labour market participation of the overeducated, but not their wages, it is possible to estimate a specific equation, the so-called participation (or selection) equation. It has as a dependent variable a dummy taking a value of one if an individual is employed and zero otherwise and, thus, obtain a measure of her probability to participate in the labour market (the inverse Mills ratio). Adding this last variable to the main equation, in this case the earnings equation, would provide a test of the existence of sample selection bias and correct the coefficients in case the added variable proves to be statistically significant. Analytically, model [3] consists now of two equations:

$$Lnw_i = \mathbf{X}_i\boldsymbol{\beta} + rO_i + u_i, \text{ with } E(u|x) = 0 \quad [4]$$

$$S = 1 \text{ if } z\gamma + v \geq 0 \quad [5]$$

The main equation [4] is nothing else but the usual earnings equation and can be estimated by OLS. The selection equation [5] can be estimated by probit. Sample selection arises when there is correlation between  $u$  and  $v$ . In this case, and assuming that  $u$  is independent of  $z$ , the expected value of  $Lnw_i$ , will be:

$$E(Lnw_i|z, v) = \mathbf{X}_i\boldsymbol{\beta} + rO_i + \rho\lambda(z\gamma) \quad [4]$$

where  $\rho$  is the correlation between the error terms of the main and of the participation equation and  $\lambda$  is the inverse Mills ratio evaluated at  $z\gamma$ . This equation shows that when there is sample selection, in order to obtain unbiased estimates of  $r$ , one should include the term  $\lambda(z\gamma)$  as an additional regressor. In fact, if  $\rho=0$ ,  $\lambda(z\gamma)$  does not appear, and OLS will consistently estimate  $r$ . However, if  $\rho$  is different from 0, ignoring the  $\lambda(z\gamma)$  term is equivalent to omitting a statistically significant variable, and all the coefficients, including  $r$ , will be biased. The inverse Mills ratio can be estimated by probit in the first step and the correlation with the dependent variable can be estimated by OLS in the second step. In addition to this two-step procedure, the two equations above can be simultaneously estimated by maximum likelihood, as done in this study.

Following Wooldridge (2003, p. 588), the independent variables in the main equation,  $x$ , should be a strict subset of the independent variables in the selection equation,  $z$ . In other words, the selection equation should include all the variables contained in the main equation – since the explanatory variables in the main equation usually affect also the probability of selection through wages –, plus some additional variables which should be chosen in such a way that they affect participation, but not earnings. This is because otherwise there could be a high correlation between  $\lambda$  and  $x$ , which would lead to multicollinearity in the main equation.

Following the existing literature (see, for instance, Nicaise, 2001; Cuttillo and Di Pietro, 2006, p. 148), we instrument labour market participation by using family commitment variables, namely the civil status and the number of dependent children. Most graduates are just single, but there is also a small share of them who are married, co-habitant or separated, divorced or widowed. Notice that in Table 5 these variables do not affect wages and therefore are suitable instruments. Among adults, in principle, family commitment should affect in a different way the labour market participation of men and women, and specifically increase the former and reduce the latter. To test whether this hypothesis applies also to graduates during their early labour market experiences, each instrumental variable is interacted with a gender dummy in the pooled estimates.

Based on this line of reasoning, we expect that if the coefficient of overeducation / overskilling in the Heckman corrected estimates is lower or equal to the OLS', then the job search model is accepted. Otherwise, we reject the job search model in favor of the job competition and job assignment models. Analytically:

$$H_0: |r_{Heck}^{O_i}| \leq |r_{OLS}^{O_i}| \text{ (Job search model is valid)}$$

$$H_1: |r_{Heck}^{O_i}| > |r_{OLS}^{O_i}| \text{ (Job competition and job assignment models are valid)}$$

Where  $i= 1, 2$ , in case of overeducation or overskilling respectively.

The same Heckman selection model is applied to the earnings equation estimated with interval regression. The standard errors are obtained by bootstrapping.

An additional source of bias that is typically found in the literature is endogeneity bias, which might especially arise in the case when overeducation is self-assessed as it is the case in the AlmaLaurea data. In order to control for this source of bias, we apply a methodology similar to the Heckman selection one, but in this case the variable to instrument is not the employment probability, but the probability to experience (or

declare) to be overeducated / overskilled. Following Cutillo and Di Pietro (2006), among others, we instrument overeducation with the fact of moving from the place where the university is located to elsewhere, since we assume that individuals who move are less likely to experience overeducation / overskilling than those who remain.

## ***2.2. The AlmaLaurea data base***

This paper provides the first available estimates of the impact of overeducation on wages of AlmaLaurea university graduates. AlmaLaurea is a consortium of a large and growing number of Italian universities. With 62 member universities in 2010, it is by far the greatest entity of its kind. All Italian regions are covered, except for the Lombardy region, whose universities have established their own consortium<sup>7</sup>. The large number of observations available make AlmaLaurea by far the largest dataset of university graduates in the country (and elsewhere).

The aim of AlmaLaurea is to deliver an institutional framework for easing the interaction of graduates and firms by collecting information on curricula of graduates and making it available to firms for consultation to fill in their job vacancies. Valuable information on individual characteristics of graduates is requested at the time of graduation, while that on the employment status is asked one, three and five years after graduation. Follow-up interviews are foreseen up to the 10<sup>th</sup> year after graduation.

By collecting detailed statistics on several aspects of university education and the school-to-work transition of graduates, for each of the universities joining the Consortium, AlmaLaurea is a valuable source of information to assess the quality of tertiary education across athenaeums, faculties, provinces, fields of studies and so on.

The sample includes about 27,000 pre-reform university graduates who obtained their degree in 2005 at one of the 36 universities belonging to the Consortium at that time. Individuals in the sample are observed at the time of their graduation and, thereafter, in 2006, in 2008 and in 2010. The focus is on individuals who answer the questionnaire 5 years after graduation, which should allow us catching the determinants of permanent, rather than transitory overeducation<sup>8</sup>. Only 13500 graduates are employed in 2010, confirming the highest degree of youth non-employment and the extremely long school-to-work transition also among university graduates<sup>9</sup>.

A smaller dataset would not allow controlling for a number of factors that affect overeducation. And, therefore, the smallest number of graduates who completed the “3+2” Bologna type of programme in 2005 and, therefore, answered the interview 5 years after graduation prevented us from including this group in the analysis.

## ***2.3. Definition of variables***

Information on characteristics at graduation and employment status, available in separate files and databases, are, in fact, merged into a single data set. The former questionnaire covers educational background, school and university performance, field of study, post-graduate studies and early labour market experience, allowing us investigating the possible impact of the quality of education and of individual ability on overeducation in a way that has never been possible earlier. The questionnaire administered after graduation includes two questions based on different subjective measures of the educational / skill mismatch: they are based in fact on individual’ self-assessment<sup>10</sup>.

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<sup>7</sup> For further details, see the AlmaLaurea’s homepage: <http://www.almalaurea.it/universita/profilo/profilo2007/premessa/info-variabili.shtml>.

<sup>8</sup> This paper focuses on a cross-section dimension, leaving to future research the aim of looking at the longitudinal dimension of the data.

<sup>9</sup> The length of the school-to-work transition is even greater for those who do not succeed in obtaining a university degree. Quintini, Martin and Martin (2007, Table 2) reckon that the expected length of the school-to-work transition in Italy amounted to 62.4 months in 1995, 70.5 months in 2000 and 51.3 months in 2005, after the introduction of temporary work for a large number of young people.

<sup>10</sup> Alternative “objective” measures of overeducation include: a) a job analyst assessment of the educational requirements of jobs; b) “statistical overeducation”, conventionally meant as the case when the individual educational

Question A16 asks: “In your current job, do you use the competences acquired during your university studies?” Three answers are possible: 1) the competencies acquired are used to a great extent; 2) they are little used; 3) they are not used at all. We defined as overeducated all those who choose answer 3. This question closely mirrors what Dolton and Silles (2008) call the “to do” definition of the educational mismatch. In fact, it aims to assess whether the skills acquired at the university are necessary “to do” the job, independent of whether they are required to access the job.

Question A17 asks: “Is your university degree necessary to access your current job?” Four answers are possible: 1) the degree is required by law; 2) it is not required by law, but is in fact needed; 3) it is not required by law, but is in fact useful; 4) it is neither required by law nor useful. We defined as overeducated all those who choose answer 4. This question allows us defining what Dolton and Silles (2008) call the “to get” definition of the educational mismatch. In fact, it aims to assess whether the title acquired at the university is necessary to get the job, independent of whether it actually provides the skills that are necessary to do the job.

As it should be now clear, the AlmaLaurea data does not allow defining undereducation / underskilling. By changing the baseline group to which the overeducated are typically compared, this missing information is likely to cause a slight underestimation of the wage effect of overeducation / overskilling with respect to the weakest segment of graduates. This should be kept in mind when interpreting the results.

In addition, we adopt the definition of “effectiveness” of the university title that AlmaLaurea itself has elaborated by merging information coming from the questions A16 and A17. As summarised in Table 1, there are five degrees of effectiveness the university title. They move from 1 to 5:

- equal to 1, when the university title is “very effective” (VE), namely the degree is required by law or necessary *to get* a job *and* also highly needed *to do* the job;
- equal to 2, when it is “effective” (E), namely useful (but neither required by law nor necessary) to get a job and highly needed to do the job or, alternatively, required by law, but not much useful to do the job;
- equal to 3, when it is “quite effective” (QE), namely necessary or useful (but not required by law) to get the job, and little used to do the job;
- equal to 4, when it is “little effective” (LE), namely neither required nor useful to get the job, but at least a little used to do the job or, in other cases, useful to get, but not to do the job;
- equal to 5, when it is “not effective” (NE), namely when the qualification is neither required nor useful to do the job.

The variable is ordered in decreasing effectiveness of the title and, therefore, the estimated coefficients measure the impact of determinants on the “ineffectiveness” of the title. We also look at the determinants of (in-)effectiveness of the degree. Considering the ordered nature of this variable, the relevant estimates of the determinant of effectiveness of the degree are based on ordered probit models.

**[Table 1 about here]**

Earnings are defined as the natural logarithm of net monthly wages. Question A20 asks the interviewee to declare to which of 13 classes of earnings of €250, up to the “over €3,000” class, (s)he belongs to. For ease of analysis, the natural logarithm is applied to the average value of the relative class. No information on working hours is collected at five years from graduation, which prevents us from using hourly wages.

The independent variables are self-explaining. They have been divided in: a) individual characteristics (gender, civil status, having children, nationality), observed at the time of graduation; b) educational background (grade and type); c) family educational background (parents’ educational level); d) university attendance and performance (final grade, time to get a degree, field of study, localisation of Athenaeum, experience of study abroad, work and study, pre-university work experience); e) graduate studies and professional experiences; f) job characteristics (job search method, migration, hours worked, firms’ ownership, type of contract); g) local unemployment rate defined as the 1994-’99 average unemployment rate at the provincial level (NUTS3).

For individuals working abroad, we use the OECD – Europe average unemployment rate over the same years. For individuals who do not declare their place of residence, we use the average provincial unemployment rate.

The baseline group includes single Italian men with no children, no study abroad experience, that study and work, who graduated in Engineering from a university located in the North-West in the curricular time with magna cum laude, whose parents have both a university degree, who attended the Lyceum focusing on

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level is one standard deviation higher than the mean or mode of the distribution. The latter method allows computing in a similar manner also under-education.

sciences, with no post-graduate education or training, but who did some occasional work while at school, holding a full time, permanent job in the private sector, found thanks to his personal initiative. Table A.2. in the Appendix reports descriptive statistics.

## 3. Results

### 3.1. Size and composition

The AlmaLaurea databank confirms a picture where the share of the overeducated / overskilled is roughly similar to that found in other EU countries. Table 2 shows that one year after graduation, the overskilled and the overeducated amounted to 16.5 and 13.2 per cent respectively, to reduce at a roughly constant pace down to 11.4 and 8.0 per cent respectively at the end of the considered period. It means a reduction down only to 69.1 and 60.6% of the original value. In other words, for a large number of individuals overeducation and overskilling are *not* transitory phenomena<sup>11</sup>.

The correlation coefficient between overeducation and overskilling equals to 0.52, which suggests that they are not the same phenomenon. In fact, only a share as high as ... declare to experience both overeducation and overskilling at the same time, which suggests that the rest identifies with some clarity the type of mismatch they actually experience.

**[Table 2 about here]**

Overeducation and overskilling are not invariant to the field of study attended at the university, just the opposite. Figure 1 shows, in fact, that overeducation (“to get”) fluctuates from virtually zero in the case of Architecture, Chemistry and Pharmacy, Engineering, Sciences to above 10 per cent in the case of Geology and Biology (10.2%), Physical education (12.2%), Languages (13.2%), Political Sciences (14.0%), Arts (17.9%). The ability of the type of qualification achieved to provide access to a liberal profession, which applies to most of the former qualifications, but not to the latter, is likely to be an important factors of these differences. Some fields of study , such as Economics and Statistics, Law, and Education provide some preparation to pass public competitions in the state sector, where the university degree is not only necessary to get a job, but also, at a later stage, to gain higher earnings and a quicker working career.

**[Figure 1 about here]**

Overskilling roughly follows the same pattern, with slightly higher shares for each field of study. Some fields of study experience a relatively greater increase in the share of the overskilled with respect to that of the overeducated. It is the case of Agriculture, Geology and Biology, and Sciences. This is probably because these last fields of study tend to give some form of cushion against overeducation, by providing easier access to a graduate job, but not against overskilling. Young graduates might get access to sectors that require different skills from those acquired at the university or, also in case of a good job worker match, at the beginning, they might be employed in tasks that are inferior in terms of skills requested, probably because of the lack of work experience<sup>12</sup>.

Omitted elaborations show that there are only negligible gender differences in the probability of overeducation by field of study. Women tend to perform slightly better if their degree is in humanities and worse if it is in scientific and technical fields. This finding lines towards what Leuven and Oosterbeek (2011, p. 20) note in their survey with reference to other countries.

**[Figure 2 about here]**

The previous figures provide indirect support for the career mobility theory, in as much as a large share of overeducated / overskilled tend to find the right job for them just within five years. Nonetheless, the support is only partial in as much as the number of overeducated / overskilled remains still high five years after graduations. A fuller test of this theoretical hypothesis will be probably possible only in the future when the AlmaLaurea enquiry about the jobs held by university graduates ten years after graduation will be ready

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<sup>11</sup> There are several small differences from the REFLEX data that are hard to explain in full. A different composition and size of the sample and slightly different formulations of the questions used to measure overeducation / overskilling might explain such differences.

<sup>12</sup> Unreported figures suggest that gender differences are not striking.

for use. In what follows, we focus on the overeducated five years from their university degree because we trust that this will allow us catching the permanent characteristics of the phenomenon under scrutiny.

### **3.2.Determinants**

Table 3 reports PROBIT estimates of the probability to be overeducated (column 1) or overskilled (column 2). Column 3 of the table also provides the estimated coefficients of an ordered PROBIT model of the (in-)effectiveness of the university qualification on a scale from 1 (very effective) to 5 (not effective), as based on the definition provided in Table 1. The last row of column 3 provides the estimated cut off points of the ordered PROBIT model. Overall, the estimates are quite satisfactory for these types of cross-section data, with values of the pseudo- $R^2$  ranging from 0.14 to 0.20.

Overall, the factors associated to overeducation are consistent with the well-known image of a very immobile social structure. The same groups that are at disadvantage in achieving higher education are at disadvantage also in their access to the labour market and tend to experience very often also overeducation and / or overskilling. The common factors of success can be found in the socio-educational background, which affects educational choice and labour market outcomes through school tracking, as now a large literature has proven (see, among others, Checchi, 2003; Cappellari, 2004; Brunello and Checchi, 2007; Bratti, Checchi and de Blasio, 2008; Caroleo and Pastore, 2012). As Caroleo and Pastore (2012) argue, in a study based on AlmaLaurea data, there is a dualism in the youth school-to-work transition. On the one hand, some successful young people, coming from a good socio-educational background, are more likely to choose a lyceum at high school and, after that, to attend a university programme, with a good performance. On the other hand, other more numerous young people choose a professional or technical school and then go to the university without adequate educational background. The latter group experiences dramatic difficulties in completing their university education and also in finding a job.

Such individual characteristics as gender, civil status and having children seem to have little impact on the probability to be overeducated. A possible explanation for civil status and having children is that, as already noted in the previous section, the questions on which this information is based were asked at the time of graduation and therefore might not apply anymore five years later.

The probability of experiencing the educational mismatch is higher among those graduates who experience a longer non-employment spell after graduation, perhaps as a consequence of a reduction in their reservation wage. This finding is partly different from other countries, such as Belgium (see, for instance, Nicaise, 2001), where longer unemployment spells are associated with more careful job search and lower probability of overeducation. The reason is likely to lie in the highest youth unemployment rate in the country, which discourages young people from being demanding when receiving a job offer.

Confirming a finding relative to the USA, UK and Germany (see, for a survey of recent contributions, Leuven and Oosterbek, 2011, section 4.2), several aspects of an individual educational background correlate with the educational mismatch. The higher is the final grade at high secondary school, the lower is the probability to be overeducated. Graduating in technical, professional high schools or in pedagogic, where typically young people with a lowest socio-economic background tend to gather, is associated with a greater chance of being overeducated later in their working life. Notice that coefficients are always higher in the case of overskilling.

Once controlling for the high school background, it should come as no surprise that the educational background of parents does not affect the probability to be overeducated / overskilled, since, as already noted, the family background correlates with the performance at high school and the choice of the type of diploma (so-called school tracking). Although being totally free, the choice of the high school tends to reflect the social class to which the young person belongs to: in fact, people from a poor walk of life tend to choose technical or professional schools and, hence, to experience problems in their educational career later on.

The university background and performance are also factors and, interestingly, they are much more so when looking at overskilling rather than at overeducation: in fact, in the latter case, the tertiary qualification is the only important condition to get a job (the so-called sheepskin effect), independent of the competencies held, which are instead decisive to understand overskilling. In other words, the probability “to get” a job that is inferior than her own qualification is independent of individual ability, whereas the probability “to do” a job that is inferior to her own skills depends also on individual ability, which would tend firms to employ



graduates in simpler tasks. As a consequence, a bad university performance is less likely to affect overeducation than overskilling<sup>13</sup>.

By the same token, also other proxies of the quality of education – the time spent to get a degree, the final grade and the type of degree achieved – are all proxies of the quality of education and tend, therefore, to correlate more positively with the probability of being overskilled, rather than being overeducated. Having got a degree with five years of delay with respect to the curricular time is the exception<sup>14</sup>. It does affect also overeducation, since most probably implies a much lower level of competencies than average.

Even after controlling for a number of individual characteristics, the type of degree remains a very important determinants of overeducation / overskilling. The latter are associated with any other degree but Engineering, and Mathematics and Physics. Particularly strong is the *ceteris paribus* impact of holding a degree in Arts, Languages, Physical education and Education on the chance of being overeducated and / or overskilled.

Also the effectiveness of *laurea*<sup>15</sup> in the labour market is strictly dependent on university background (see Column 3). The shorter the time needed to get a degree and the higher is the grade, the greater is the effectiveness of the degree.

The localisation of the athenaeum matters. In fact, since it takes a long time to get a degree, most graduates tend to seek jobs in the place where they got their degree. Of course, people getting a degree in the North, no matter whether in the West or in the East, have a lower chance of being overeducated or overskilled. Also the Centre has a lower share of overskilling than the South, probably thanks to the larger share of public sector jobs, whose share of overeducation is lower than average.

Studying abroad does not seem to affect the probability of overeducation. Also studying while working does not affect in a statistically significant way the probability to be overeducated or overskilled, but when the graduate is continuing the job that she had already before starting the university programme. The overeducated / overskilled are more frequent among those who started the university after finding employment, since they started most probably their job as high school graduates only and five years are not sufficient to improve their position in the static Italian labour market.

Interestingly, having completed some post-graduate training or advanced master course represents a cushion against the risk of overeducation, confirming the importance of institutions able to increase the job specific competences of graduates, which the educational system and the labour market are unable to satisfy<sup>16</sup>.

The overeducated are more frequent among the graduates who found their job through a network of family and friends and through the request of recommendation by the employer. Interestingly, this search methods increase also the “effectiveness” of the university degree in the labour market. Overall, this finding suggests that finding a job earlier is likely to bring with it an increased probability of overeducation as a trade-off.

Finding a job as a continuation of a *stage* or other on-the-job training programme reduces the chance of finding a job, but also of experiencing overeducation and to a lesser extent overskilling. This suggests that more difficult search methods bring with them also better results in terms of the quality of the job worker match.

Moving is typically associated, also in theoretical models, with a lower chance of overeducation if mobility is due to a rational choice. However, in the case of Italy this does not seem to be the case. The only (negative) statistically significant effect of mobility on the probability of overeducation regards those who

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<sup>13</sup> In a way, “overskilling” can be taken as a case of “underskilling”, in the sense that even when the individual is in a graduate job, she appears to the firm not to possess sufficient skills (work experience perhaps) to be employed in tasks that are up to her competencies.

<sup>14</sup> It is well known that only a minority of university students attain their degree in the curricular years. Abating the problem of *fuoricorsismo*, namely the tendency of university students to overcome the curricular years was one of the main declared aims of the recent university reforms. Nonetheless, this objective has been failed.

<sup>15</sup> This is the Italian name for a university degree.

<sup>16</sup> As Caroleo and Pastore (2007) note, the youth unemployment problem essentially depends on the youth experience gap that the educational system seems unable to overcome. The Italian system follows the sequential, in as much as it foresees that training should come not during (like in the dual system), but after general education.

decide to move to the South and the Islands, where the labour market is less developed, the production structure is more oriented towards traditional manufacturing and also the quality of employment is lower.

Furthermore, there is a strong correlation between the probability of overeducation and overskilling among the graduates who are involved in starter contracts / training and work contract / apprenticeship, temporary contracts, without contract. This might be taken as evidence that those who are in some way weaker in the labour market and therefore need to find a job through some temporary arrangement have also to accept jobs for which they are overeducated / overskilled.

The county level unemployment rate seems to be negatively related to the probability of overeducation, but not to overskilling, although the university degree is less effective in areas with a higher unemployment rate. This finding seems in line with that of Franzini and Raitano (2009) who find that overeducation is lower in high unemployment areas and relate this to the greater share of public sector jobs there.

**[Table 3 about here]**

### *3.3. The wage effect*

What is the wage penalty associated to overeducation / overskilling? Table 4 provides summary measures, including the unconditional estimate, the conditional one (based on Table 5) and that obtained including controls for sample selection bias (based on Table 6). The unconditional wage penalty has been estimated using both an OLS and an ordered probit specification.

Different from what previous studies on Italy found (see, Ferrante, McGuinness and Sloane, 2010), the unconditional wage penalty is relatively high, especially in the case of overskilling (-100%). In fact, *ceteris paribus* being overeducated implies a wage reduction of 33%.

**[Table 4 about here]**

However, the unconditional measure of the wage penalty might catch such factors as the lower than average characteristics of the overeducated / overskilled. In other words, such a high unconditional penalty might disappear once controlling for the lower than average levels and quality of human capital of the overeducated. Such characteristics might be observed or unobserved.

Table 4 reports also a conditional measure of the wage penalty as obtained in simple OLS estimates including all the variables of the AlmaLaurea data base as controls (as in Table 5). Interestingly, once controlling for the level and quality of human capital, the wage gap of the overskilled becomes statistically insignificant, while that of the overeducated goes up by about 10% of the wage of the baseline group, reaching -42.5%.

How to explain this result? In the case of overskilling, the observed quantity and quality of human capital possessed by the overskilled are actually lower than average, which totally explain their lower earnings. In other words, the least skilled are involved in jobs where they are assigned tasks that are lower than what they consider being their supposed skill level. This is not surprising, since overskilling is a variable based on a self-assessment of the actual skill level possessed by the individual to do the job that they actually have. This finding can be taken to mean that young people have actually made the right assessment of their skill level.

In a similar vein, in the case of overeducation, the fact that the conditional wage penalty is slightly higher than the unconditional one might suggest that the skill level of the overeducated, as measured based on observed characteristics, is slightly higher than that required to get a job.

As to the other determinants of earnings they are quite similar to those typically found in the case of young graduates. Interestingly, the gender gap is not statistically significant in the case of young graduates. This has been already noted in previous studies. In fact, the fact itself that female wages are not higher than males is already a case of discrimination, considering the higher level and quality of human capital of young women in the country (and elsewhere). In addition, young women tend to have the same wages as men, simply because they have not experience maternity yet. The wage penalty increases dramatically in the late thirties, when women tend to give birth.

Having waited longer after graduation before finding a job reduces earnings by about 2% per month. Holding a pedagogic diploma increases earnings by over 35%. The final grade does not seem to affect earnings, but when the grade is the lowest: having attained less than 90 out of 110 implies a wage penalty of about 45% five years after graduation. The type of degree does not seem to affect earnings, except for graduates in Mathematics and Physics, who have a wage premium ranging between 38% and 54%. Other relevant regressors include having attended some post-graduate training programme, including the practice

that is necessary to access liberal professions, which increases wages by over 50%. Vice versa, having had a study scholarship or a voluntary civil service brings with it a wage penalty, although it is less sizeable once controlling for overskilling. Again moving does not seem to affect earnings in any positive way, at least five years after graduation. In fact, it brings with it quite a sizeable wage penalty. Also holding a part-time job means losing about 85% of the average wage. Working in the health services sector or in the public administration or the army brings with it a remarkable wage premium. The self-employed and also workers holding other types of atypical work also enjoy sizeable wage premiums.

**[Table 5 about here]**

As a further check, we test whether the impact of overeducation on wages is independent of that of overskilling. In other words, what matters more in terms of wage penalty? Table 6 attempts to answer this question by reporting coefficients of OLS unconditional and conditional earnings equations, where there are three variables for the educational mismatch: overeducation only, overskilling only and overeducation and overskilling. The results suggest that the weakest group is represented by those who are at the meantime overeducated and overskilled. They have an unconditional wage penalty of about 24% and a conditional wage penalty of half that size. Overskilling only is again almost entirely caught by observed characteristics of individuals, such as the performance at school and at the university.

The last row of the table reports also the coefficients of the effectiveness of the university title as defined in the data section. Any point increase in the degree of effectiveness implies an unconditional wage penalty of 3.6% and a conditional wage penalty of about 3%. Moving from a title that is “very effective” to one that is “not effective” means a wage loss of 15% conditional and of 18% unconditional.

**[Table 6 about here]**

### ***3.4. The Heckit estimates***

However, as noted in a previous section, OLS estimates do not control for possible unobserved differences between the overeducated and the non-employed, who might also experience the educational mismatch. In earnings equations, overeducation is observed only among the employed, not the non-employed. As explained in the previous section, the Heckit methodology is used to control for this possible source of bias.

Table 7 reports the results of earnings equations estimated with the Heckman correction. A maximum likelihood simultaneous estimate is preferred to the two step procedure. The main equation is a typical Mincerian earnings equation, while the selection equation is a Probit estimate of the probability to be employed rather than non-employed. We apply the rule that variables in the main and selection equation should be the same, except for some instrumental variables. This implies that the set of regressors used here are only a sub-set of those used in the OLS equation.

The instrumental variables have been chosen according to the criterion that they should affect the probability to participate to the labour market, but not wages. The instrumental variables are those typically used to predict labour force participation in these cases, namely: civil status, having children and the local unemployment rate.

The instrumental variables have the expected sign. Being married reduces the reservation wage and therefore increases the probability to participate to the labour market. The opposite applies to having children. The local unemployment rate reduces the probability to participate to the labour market. The instruments are statistically significant, except for the local unemployment rate.

The arthro is positive and statistically significant, while the log sigma is statistically significant.

We find, in fact, that the wage penalty associated to overeducation has slightly reduced (in absolute terms) with respect to the conditional value, whereas the wage penalty associated to overskilling has dramatically increased (in absolute terms) with respect to the conditional one. In the case of overskilling, the wage penalty also goes back almost up to the unconditional level, suggesting that the unobserved characteristics in terms of human capital of the overskilled are much better than those of the non-employed who experience the educational mismatch. In other words, non-employment is featured by a higher, not lower degree of educational mismatch. Overall, this evidence can be taken to support the job competition and job assignment models in the case of the overskilled, but not of the overeducated.

In the case of the overeducated, the Heckit model is probably catching a sheepskin effect: the qualification itself is important to determine wages, rather than motivation and ability. An alternative

explanation is that, at least in the public sector, where public competitions are necessary to enter the job, the most skilled wait for the best job to come and that they expect to get at the next public competition.

Interestingly, also the gender pay gap emerges in estimates corrected for sample selection bias: from not statistically significant in simple OLS estimates, it becomes now statistically significant and sizeable. This suggests that non-employed women are much less skilled and motivated than the employed ones.

[Table 7 about here]

## Discussion, concluding remarks and policy implications

This paper has attempted to study the main characteristics, determinants and labour market effect of overeducation / overskilling using, for the first time, the AlmaLaurea database. This is the largest and most valuable source of information at an individual level on university graduates available in the country, and also elsewhere. The sample includes all pre-reform university graduates (excluding Medicine) from 36 universities located all over the country. The focus of the survey is on the educational performance and early labour market experience of graduates up to the fifth year after graduation. It allows us, hence, establishing a number of links with overeducation that have never been investigated before with the same detail.

The size of the phenomenon is in the AlmaLaurea slightly lower than in the REFLEX data. Overeducation falls from 13.2% after one year to 8.0% after five years. The comparable figures for overskilling are 16.5% and 11.4%. Like in other countries, overskilling is generally more common than overeducation and mirrors the perceived feeling of inadequacy of young people in the labour market due to the lack of work experience and the tendency of firms to employ them in tasks that do not fully use the competences gained by individuals. This interpretation is based on evidence coming from the analysis of the determinants of overeducation.

The factors that are associated to overeducation are consistent with the well-known image of an immobile social structure, whereas not only the success at school and at the university, but also in the labour market dramatically depends on the socio-educational background of young people. In fact, the probability of being overeducated and, above all, overskilled is higher among those graduates who experience a higher duration of unemployment, a lower final grade at high secondary school; a longer time elapsed to get the university degree; a lower final grade and residing in or moving to the South of the country; having parents with a low educational level; graduating in technical or professional school, where typically young people with a poor walk of life tend to gather.

In addition, the overeducated are more frequent among those who started the university after finding employment, since they started most probably their job as high school graduates only and five years are not sufficient to improve their position in the static Italian labour market. Interestingly, having completed some post-graduate training or advanced master course represents a cushion against the risk of overeducation, confirming the importance of institutions able to increase the job specific competences of graduates, which the educational system and the labour market are unable to satisfy.

The overeducated are more frequent among the graduates who found their job through a network of family and friends and through the request of recommendations' letters by the employer. Interestingly, this search method increases also the "effectiveness" of the university degree in the labour market. Finding a job as a continuation of a *stage* or other on-the-job training programme reduces the chance of overskilling more than that overeducation.

Furthermore, there is a strong correlation between the probability of overeducation and overskilling among the graduates who are involved in starter contracts / training and work contract / apprenticeship, temporary contracts, without contract. This might be taken as evidence that those who are in some way weaker in the labour market and therefore need to find a job through some temporary arrangement have to accept jobs in conditions of overeducation / overskilling.

Finally, the chance of overeducation is strongly associated with any other degree but Engineering and Mathematics and Physics. Particularly strong is the impact of holding a degree in Arts, Languages, Physical education and Education on the chance of being overeducated.

Interestingly, like in Franzini and Raitano (2009), the *ceteris paribus* probability of overeducation (but not overskilling) is higher in low, not in high unemployment regions. This is probably due to the relatively higher share of public sector jobs in the South.

The correlation between overeducation, but even more so overskilling, on the one hand, and weak educational background and poor university performance, on the other hand, suggests that, in fact, overskilling is a signal of low skills. In other words, even when there is the right match between the qualification held by the graduate and that required to get the job, perhaps due to scant work experience, some graduates might be given tasks for which they feel to be overskilled.

The unconditional wage penalty of the educational mismatch is relatively higher for overskilling (-100%) than for overeducation (-33%). This might mirror the lower human capital endowment of the overeducated / overskilled as compared to the individuals with the required level of skills. In fact, when estimating the conditional wage penalty by OLS, we find that it falls down to about 10% of the median wage when we adopt the “to get” definition and to 6.7% when we adopt the “to do” definition of overeducation.

These findings are consistent with a theory where labour demand is less skill biased and, therefore, where the non-employment rate of university graduates is relatively higher than elsewhere. To test this last hypothesis, we move away from traditional OLS estimates, towards modelling strategies able to control for and assess the impact of the (possibly) greater / lower probability of non-employment of the graduates who have a higher degree of educational mismatch as compared to labour demand. In fact, as Nicaise (2001) note, according to the job competition and job assignment model, it is likely that the wage penalty of overeducation is lower than actual when it is estimated only among the employed who are overeducated. The latter represents the smoothest form of educational mismatch: in other words, the personal attributes that dispose individuals to be mismatched might also reduce the probability of finding a job. In other words, the most dramatic penalty of disposing of attributed that are not requested in the labour market is in terms of the reduced probability to find a job. An alternative hypothesis is also in order. According to the search theoretical model, unemployment is a voluntary choice and the most skilled individuals prefer to stay in the unemployment pool waiting for a better job offer to come. In this case, the OLS would return upward biased estimates of the wage effect of overeducation.

We control for the possible sample selection bias arising from measuring overeducation only among the employed by the Heckit econometric specification of the earnings equation, where the usual OLS estimates are corrected for the lower / higher employment opportunities of those experiencing the educational mismatch. When controlling for sample selection bias, we find that the wage penalty associated to overeducation / overskilling goes up to 35 and 74%, respectively. Our findings provide indirect support for the job competition and job assignment models versus the search theoretical model, suggesting that the non-employed would be more likely overeducated, and more so overskilled, if employed. In other words, the sample selection correction confirms that there is positive selection into employment of the most skilled among those whose personal attributes are less on demand on the labour market. This finding is in line with that of Cuttillo and Di Pietro (2006) based on different data.

Overall, the findings of this paper have important policy implications. From the demand side, they suggest that the most important strategy to reduce the share of overeducation and the wage penalty associated to it would be that the country move away from a low towards a high road to development. This is overall the most important strategy to accommodate the increasing supply of human capital of the youngest generation. This would also reduce the share of graduates who possess attributes that are not on demand in the labour market and remain experience a greater difficulty in finding any kind of job.

Related to this point, as Ferrante, McGuinness and Sloane (2010) note, it is important to mention the small average size of Italian firms. Small firms do not manage human resources in such a way to fully exploit and develop them. This is due to their typically informal production structure, the scant propensity to delegate functions to managers, and the lack of on-the-job training programmes.

From the supply side, it is important to: a) increase the quality of tertiary education and of human capital in general; b) reduce the length of studies for the individuals coming from low family background, so to reduce the impact of school tracking on university success; c) provide more guidance for families and students when deciding their field of study at the university; d) provide vocational education and training also at a university level (see, for an interesting proposal, Boeri and Garibaldi, 2011) for individuals with low family background (German solution): this implies adopting the dual principle on a large scale and provide on-the-job training before or soon after the university degree; e) fully implement the Bologna process.

Last, but not least, we find evidence that temporary work arrangements are associated with a higher probability of overeducation / overskilling, which confirms the well known fact that only rarely they involve training programmes. Temporary contracts tend to be used as a substitute for permanent contract, due to the lower labour cost of temporary workers. The cost of temporary work should increase, also foreseeing the obligation to provide on-the-job training to young people.

Future research will exploit the panel dimension of the data to test in a different context the role of ability bias and measurement errors. Panel data analysis should also allow disentangling the wage effect of genuine and of true overeducation detected by looking at the degree of satisfaction for the actual job worker match of graduates.

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## Appendix of Tables and Figures

**Table 1. Definition of effectiveness of the university degree**

Use of university competences	Usefulness of the degree				
	Required by law	Necessary	Useful	Neither required nor useful	Does not answer
High	VE	VE	E	NC	NC
Low	E	QE	QE	LE	NC
None	NC	NC	LE	NE	NC
Does not answer	NC	NC	NC	NC	NC

*Note: VE means very effective; E = effective; QE = quite effective; LE = little effective; NE = not effective; NC = not classifiable.*

*Source: AlmaLaurea.*

**Table 2. Overeducation after 1, 3, 5 years of pre-reform graduates. Large definition**

Definition	1 year	3 year	5 year
Overskilled (“to do” a job)	16.47	12.49	11.44
Overeducated (“to get” a job)	13.16	9.37	7.99
Number of observations	13500	17223	17387

*Source: own elaboration on AlmaLaurea data.*

**Table 3. Determinants of overeducation 5 years after graduation. Pure pre-reform graduate in 2005**

Independent variable	Dependent variable		
	Overeducation (to get)	Overeducation (to do)	Ineffectiveness of the title
	(1)	(2)	(3)
<b>Individual Characteristics</b>			
Gender. Default: Men			
Woman	-0.0308	0.0653	-0.0044
Civil Status. Default: Single			
Married	0.0322	-0.013	-0.0383
Lives together	0.0654	0.0251	0.0219
Separated, divorced, widow	-0.346	-0.3747	-0.1145
Children	-0.071	-0.0571	-0.023
Non Italian	-0.1533	-0.1706	-0.0639
<b>High secondary School</b>			
Months from the degree before finding a job	0.0076***	0.0052***	0.0027**
Final grade at High Secondary school (out of 100)	-0.0036*	-0.0048**	-0.0034***
Type of Secondary high school diploma. Default: Lyceum in sciences			
Classical high school	0.006	0.0717	-0.0216
Specialisation in teacher training	0.2171**	0.2800***	0.1625***
Language high school	0.07	0.0198	0.0199
Art school	0.2694	0.2026	0.1545
Technical school	0.1909***	0.0957*	0.0964***
Professional school	0.2482*	0.3788***	0.1954**
Other high school diploma	0.3573*	0.3599**	0.2208*
<b>Family background</b>			
Parents' level of education. Default: Both parents got a university degree			
No title	0.0325	-0.0082	-0.322
Primary school	0.1018	0.0437	-0.1082*
Low secondary education	0.0916	0.0107	-0.1318***
High secondary education	0.1391	0.0536	-0.0859*
One parent got a university degree	0.1355	0.0775	-0.0794*
<b>University performance</b>			
Final grade at the university. Default: Magna cum laude			
66-90 out of 110	0.1651	0.3653***	0.2706***
91-100 out of 110	0.1779**	0.2685***	0.1999***
101-105 out of 110	0.1018	0.2962***	0.1466***
106-110 out of 110	0.0901	0.2206***	0.1077***
Time to get a degree. Default: Curricular years			
I extra-curricular year late	0.0958	0.1646	0.1847***
II extra-curricular year late	0.1546	0.1646	0.2098***
III extra-curricular year late	0.1461	0.2756**	0.2759***
IV extra-curricular year late	0.1334	0.2263*	0.2564***
V extra-curricular year late	0.2129*	0.2773**	0.3255***
Field of study. Default: Engineering			
Agriculture	0.4890**	0.5845***	0.2675**
Architecture	0.0655	0.2047	0.2161***
Chemistry and pharmacy	-0.4469*	-0.4982***	-0.7332***
Economics and statistics	0.3495***	-0.0764	0.2148***
Physical education	0.9401***	1.0209***	0.7991***
Geology and biology	0.8622***	0.7890***	0.5520***
Law	0.4480***	0.3943***	0.2400***
Education	0.7304***	0.3730***	0.2998***
Arts	1.0483***	0.9820***	0.9230***
Languages	0.8095***	0.6611***	0.5984***
Political and social sciences	0.7963***	0.6007***	0.7327***
Psychology	0.8839***	0.7273***	0.7453***
Mathematics and Physics	0.2232	0.4172**	0.1332
Localisation of the Athenaeum. Default: North West			
North East	-0.0294	-0.0139	0.0075
Centre	0.1306*	0.1310*	0.0742*
South and Islands	0.2035*	0.2529***	0.1172***
Study abroad. Default: No study experience abroad			
Erasmus experience	-0.0333	-0.0834	-0.0078
Other Study experiences abroad	0.0728	0.0013	-0.0158
Missing	0.0857	-0.0848	0.1515
Work and study. Default: Study and work			
Work and study	-0.0675	0.0801	-0.0338
No work experience	-0.1323*	-0.0282	-0.0484
Work experience is missing	0.0009	-0.0437	-0.1313
Relation with pre-university job. Default: (S)he started a job after the degree			
Current job is the same as that before university	0.4858***	0.3218***	0.3998***
Current job is different from that before university	0.0164	0.0416	0.0227

Post-graduate studies			
Post-graduate studies or professional experiences			
Training, apprenticeship aimed at gaining access to a liberal profession	-0.2312***	-0.2387***	-0.2806***
Doctoral studies	-0.2194	-0.031	-0.2097**
Specialisation school	-0.0595	-0.1439*	-0.3004***
Ist level master degree	-0.0494	0.0726	-0.0671
IInd level Master degree	-0.2046**	-0.1047	-0.0888*
Other type of Master degree	-0.0524	-0.0022	-0.0641
Stage / Work grant / Training on-the-job	-0.0836	0.0277	0.034
Public off-the-job training scheme	-0.0096	0.01	0.0506
Study scholarship	-0.1993	-0.2366*	-0.1336*
Voluntary civil service	0.0621	0.0749	0.0985
Job characteristics			
Job-search method. Default: Personal initiative			
Network of family and friends	0.2729***	0.2260***	0.2299***
Continuation of stage / other traineeship	-0.3495***	-0.1656*	-0.1662***
Answering an advertisement	0.1133	0.1282*	0.1287***
Public competition	0.1504	-0.0704	0.1058
Application to teach at school	-0.2821	-0.2175	-0.2778***
Direct call by the employer	0.0959	0.1677*	0.0285
Temporary employment agency	0.1763	0.1477	0.2621***
Request of recommendation by the employer	0.3714***	0.2446*	0.2461***
Other job search channel	0.5230*	0.4831*	0.2406
Job search channel is missing	0.8557*	0.9234*	0.4442
Stay versus moves. Default: Works where (s)he resides			
(S)he works in another region (Nuts2) of the same area of residence (NUTS1)	-0.0799	0.1303	-0.0126
Moved to the North	-0.1426	0.0291	-0.0426
Moved to the Centre	-0.0994	-0.0267	0.0631
Moved to the South or to the Islands	0.5907**	0.1812	0.2925*
Moved abroad	1.8721*	0.5378	-0.0792
Hours worked. Default: Full-time work			
Part-time work	0.3128***	0.2189***	0.2034***
Firm's ownership. Default: Private company			
Public sector job	-0.1225	0.1077	-0.0742
Self-employment and family business			
Type of working contract. Default: Permanent work	0.1051	0.2069**	0.0611
Type of working contract. Default: Permanent work			
Self-employed	-0.1378	-0.3127***	-0.3419***
Starter contract / Training and work contract / Apprenticeship	0.4461***	0.2250*	0.1910**
Temporary contract	0.2484***	0.1323**	0.0459
Freelance / Consulting	0.0909	-0.0643	-0.1249**
Other atypical work	0.2184	0.1471	0.1615
Without contract	0.3312**	-0.0217	-0.0132
Contract is missing	-0.0178	0.7066	0.3956
County level unemployment rate (NUTS3)			
Constant	-3.0744***	-2.6775***	
Cut point 1			0.7119***
Cut point 2			1.4319***
Cut point 3			2.5139***
Cut point 4			3.0198***
N	13621	13621	13297
Pseudo R <sup>2</sup>	0.20	0.16	0.14

Note: Legend: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Coefficients have been omitted for some groups of regressors: Sectors of activity (15);

Source: own elaboration on AlmaLaurea data.

Variable	unco	uncs	uncbo_s	uncboth	uncall	ounco	ouncs	ouncbo_s	ouncboth	ouncall	iunco	iuncs	iuncbo_s	iuncboth
<b>Overskilling</b>	-0.1563***		-0.0859***	-0.0893***		-0.3698***		-0.2154***	-0.2308***		-0.2062***		-0.1336***	-0.1428***
<b>Overeducation</b>		-0.2127***	-0.1609***	-0.1684***			-0.4851***	-0.3560***	-0.3903***			-0.2470***	-0.1662***	-0.1868***
<b>Overeducation only</b>					-0.1684***					-0.3903***				
<b>Overskilling only</b>					-0.0893***					-0.2308***				
<b>Both overeducation and overskilling</b>					-0.2434***					-0.5560***				
<b>N</b>	15544	15544	15544	15544	15544	15544	15544	15544	15544	15544	15544	15544	15544	15544
<b>ll</b>	-1.10E+04	-1.10E+04	-1.10E+04	-1.10E+04	-1.10E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04	-3.30E+04
<b>aic</b>	2.20E+04	2.20E+04	2.20E+04	2.20E+04	2.20E+04	6.60E+04	6.60E+04	6.60E+04	6.60E+04	6.60E+04	6.70E+04	6.70E+04	6.70E+04	6.70E+04

**Table 4. The wage penalty of overeducation and overskilling**

	<i>Overeducation (to get)</i>	<i>Overskilling (to do)</i>
<i>Dependent variable: Natural logarithm of net monthly wages</i>	(1)	(2)
<i>Unconditional estimates</i>		
<i>OLS</i>	<i>-0.3264<sup>***</sup></i>	<i>-0.9608<sup>***</sup></i>
<i>Ordered PROBIT</i>	<i>-0.4682<sup>***</sup></i>	<i>-1.6324<sup>***</sup></i>
<i>Conditional estimates</i>		
<i>OLS</i>	<i>-0.4253<sup>**</sup></i>	<i>-0.1083</i>
<i>Controlling for sample selection</i>		
<i>Heckman model (ML simultaneous)</i>	<i>-0.3513<sup>***</sup></i>	<i>-0.7357<sup>***</sup></i>
<i>Heckman model (two steps)</i>	<i>-0.3533<sup>***</sup></i>	<i>-0.7339<sup>***</sup></i>

*Note: The table reports only the coefficient of the overeducation variable. The OLS conditional estimate is obtained with all the control variables included in Table 5. The Heckit estimate based on Maximum Likelihood simultaneous estimate is obtained with all the control variables included in Table 6. The two step estimate is unreported.*

*Legend: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .*

*Source: own elaboration on AlmaLaurea data.*

**Table 5. OLS earnings equation augmented for overeducation or overskilling**

Dependent Variable:	Log of net monthly wage	
Overeducation (to get)	-0.4253**	
Overskilling (to do)	-0.1083	
<b>Gender. Default: Men</b>		
Donna	-0.0516	-0.0488
<b>Civil Status. Default: Single</b>		
Married	0.1646	0.0546
Lives together	0.545	0.6926*
Separated, divorced, widow	-0.0905	-0.0584
Children	0.4312*	0.4570*
Months from the degree before finding a job	-0.0190***	-0.0183***
Final grade at High Secondary school (out of 100)	0.004	0.0044
<b>Type of Secondary high school diploma. Default: Lyceum in sciences</b>		
Classical high school	0.1374	0.0974
Specialisation in teacher training	0.3636*	0.4425*
Language high school	-0.0046	0.0354
Art school	0.1432	0.0426
Technical school	-0.0555	-0.1024
Professional school	0.0713	0.0677
Other high school diploma	0.258	0.2874
<b>Final grade at the university. Default: Magna cum laude</b>		
66-90 out of 110	-0.4626**	-0.4460*
91-100 out of 110	0.1224	0.154
101-105 out of 110	-0.0008	0.0124
106-110 out of 110	-0.11	-0.0862
<b>Field of study. Default: Engineering</b>		
Agriculture	0.0584	-0.004
Economics and Statistics	0.1938	0.2007
Law	0.0803	0.0958
Education	-0.3022	-0.1835
Arts	-0.094	-0.1079
Languages	-0.109	-0.1538
Political and Social Sciences	-0.1765	-0.1179
Mathematics and Physics	0.5442**	0.3746*
<b>Time to get a degree. Default: Curricular years</b>		
I extra-curricular year late	-0.4799*	-0.5252*
II extra-curricular year late	-0.2329	-0.2516
III extra-curricular year late	-0.2315	-0.2655
IV extra-curricular year late	-0.2801	-0.2965
V extra-curricular year late	-0.1235	-0.1565
<b>Study abroad. Default: No study experience abroad</b>		
Erasmus experience	0.0161	0.0354
Other Study experiences abroad	-0.1662	-0.0119
Work and study	-0.1313	-0.0744
No work experience	-0.1123	-0.1531*
<b>Relation with pre-university job. Default: (S)he started a job after the degree</b>		
Current job is the same as that before university	0.0525	-0.0819
Current job is different from that before university	0.1018	-0.0068
<b>Post-graduate studies or professional experiences</b>		
Training, apprenticeship aimed at gaining access to a liberal profession	0.5660**	0.5535*
Doctoral studies	0.4488	0.5483
Specialisation school	0.0391	0.0435
Ist level master degree	0.1197	0.1575
IInd level Master degree	-0.2696	-0.2424
Other type of Master degree	-0.1659	-0.0243
Stage / Work grant / Training on-the-job	-0.0083	0.034
Public off-the-job training scheme	0.121	0.2242*
Study scholarship	-0.4548**	-0.3366*
Voluntary civil service	-0.5057**	-0.2795
<b>Job-search method. Default: Personal initiative</b>		

<b>Self-employed</b>	-0.471	-0.4565
<b>Network of family and friends</b>	-0.0502	-0.0109
<b>Continuation of stage / other traineeship</b>	0.4024*	0.3290*
<b>Answering an advertisement</b>	-0.3185**	-0.2580*
<b>Public competition</b>	-0.235	-0.1377
<b>Application to teach at school</b>	0.0138	0.0754
<b>Direct call by the employer</b>	-0.2063	-0.2109
<b>Temporary employment agency</b>	0.2915*	0.1697
<b>Request of recommendation by the employer</b>	-0.0935	-0.2727
<b>Other job search channel</b>	-0.1484	-0.2451
<b>Stayer versus movers. Default: Works where (s)he resides</b>		
<b>(S)he works in another region (Nuts2) of the same area of residence (NUTS1)</b>	0.2819**	0.182
<b>Moved to the Centre</b>	-1.2963***	-1.4838***
<b>Moved abroad</b>	0.4219	0.2288
<b>Part-time work</b>	-0.8825***	-0.8335***
<b>Public sector job</b>	-0.1527	-0.1798
<b>Sector of industry. Default: Education and research</b>		
<b>Agriculture</b>	0.4409	0.469
<b>Mechanical industry</b>	0.3133	0.2681
<b>Construction</b>	-0.3031	-0.2226
<b>Chemical and Oil industry</b>	0.5558*	0.4735
<b>Other manufacturing</b>	0.0916	0.2192
<b>Trade</b>	0.0453	0.0487
<b>Credit and insurance</b>	0.2045	0.2635
<b>Mail, Transportation and telecommunications</b>	0.305	0.4264
<b>Legal and Fiscal Services</b>	-0.5071	-0.5304
<b>Informatics</b>	0.0241	0.1848
<b>Other services</b>	-0.1823	0.1411
<b>Public Administration and Army</b>	0.7226**	0.6872*
<b>Health</b>	0.8187**	0.9272**
<b>Other services</b>	-0.215	-0.2504
<b>Type of working contract. Default: Permanent work</b>		
<b>Self-employed</b>	0.4628*	0.5312*
<b>Starter contract / Training and work contract / Apprenticeship</b>	0.0678	-0.0914
<b>Temporary contract</b>	0.1857	0.1465
<b>Freelance / Consulting</b>	0.251	0.1768
<b>Other atypical work</b>	0.8809***	0.6429***
<b>Without contract</b>	-0.2195	-0.7243*
<b>County level unemployment rate (NUTS3)</b>	0.0202	0.0571
<b>Constant</b>	7.0221***	6.8322***
<b>N</b>	11385	11385
<b>LI</b>	2.90E+04	2.80E+04
<b>Aic</b>	-5.80E+04	-5.60E+04

*Note: The estimates regard a cross-section of pure pre-reform students who graduated in 2005, observed in 2010. OLS estimates. Legend: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .*

*Source: own elaboration on AlmaLaurea data.*



**Table 6. Different specifications of the wage penalty**

	OLS unconditional estimates	OLS conditional estimates
<b>Overeducation only (to get)</b>	-0.1629***	-0.0728***
<b>Overskilling only (to do)</b>	-0.0935***	-0.0266*
<b>Overeducation and overskilling</b>	-0.2392***	-0.1227***
<b>In-effectiveness of the university title</b>	-0.0365***	-0.0298***

*Note: The table reports the coefficient of overeducation variables, with a distinction between those who are only overeducated, only overskilled or both overeducated and overskilled. The dependent variable is the natural logarithm of the net monthly wage. The OLS conditional estimates are obtained with all the control variables included in Table 5. The definition of the in-effectiveness of the university title is given in the methodology section.*

*Legend: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .*

*Source: own elaboration on AlmaLaurea data.*

**Table 7. Earnings equations with correction for sample selection**

Main equation		
Dependent variable	Log of net monthly wage	
Overeducation (to get)	-0.3513***	
Overeducation (to do)	-0.7357***	-0.7357***
Woman	-0.8815***	-0.7976***
66-90 out of 110	-0.6495***	-0.6191***
91-100 out of 110	0.0511***	0.1884***
Agriculture	0.0211	-0.0096
Economics and Statistics	-1.4102***	-1.3072***
Education	-0.3226***	-0.2669***
Arts	-0.7288***	-0.4539***
Languages	-0.3904***	-0.4302***
Political and social sciences	-0.0944***	0.0401**
Mathematics and Physics	-0.2	-0.166
IV extra-curricular year late	-0.8457***	-0.6778***
V extra-curricular year late	-0.1622***	-0.0920***
Training, apprenticeship aimed at gaining access to a liberal profession	-0.1995***	-0.2433***
Stage / Work grant / Training on-the-job	-0.9494***	-0.7358***
Constant	8.2009***	7.9823***
Selection equation		
Dependent variable:	Labour market participation	
Woman	4.1238***	3.8294***
66-90 out of 110	0.174	0.2093
91-100 out of 110	8.0756***	7.7758***
Agriculture	-4.7748***	-4.6214***
Economics and Statistics	-4.1127***	-3.9919***
Education	-6.5625***	-6.0043***
Arts	-5.0092***	-4.9830***
Languages	-7.9005***	-7.3861***
Political and social sciences	-8.3520***	-7.6120***
Mathematics and Physics	-2.5102***	-2.6441***
IV extra-curricular year late	0.2579	0.3722
V extra-curricular year late	-2.2605***	-1.7813***
Training, apprenticeship aimed at gaining access to a liberal profession	-8.6088***	-8.0429***
Stage / Work grant / Training on-the-job	-4.5620***	-4.2088***
Married, lives together * woman	6.0161***	5.9789***
Children	-10.5108***	-10.3030***
County level unemployment rate (NUTS3)	-0.1921	-0.1609
Constant	7.4228***	6.7600***
Arthrho	0.9819***	1.1311***
Lnsigma	-0.9857***	-1.0087***
Statistics		
N	20171	20171
LI	-7.90E+03	-7.40E+03
Aic	1.60E+04	1.50E+04

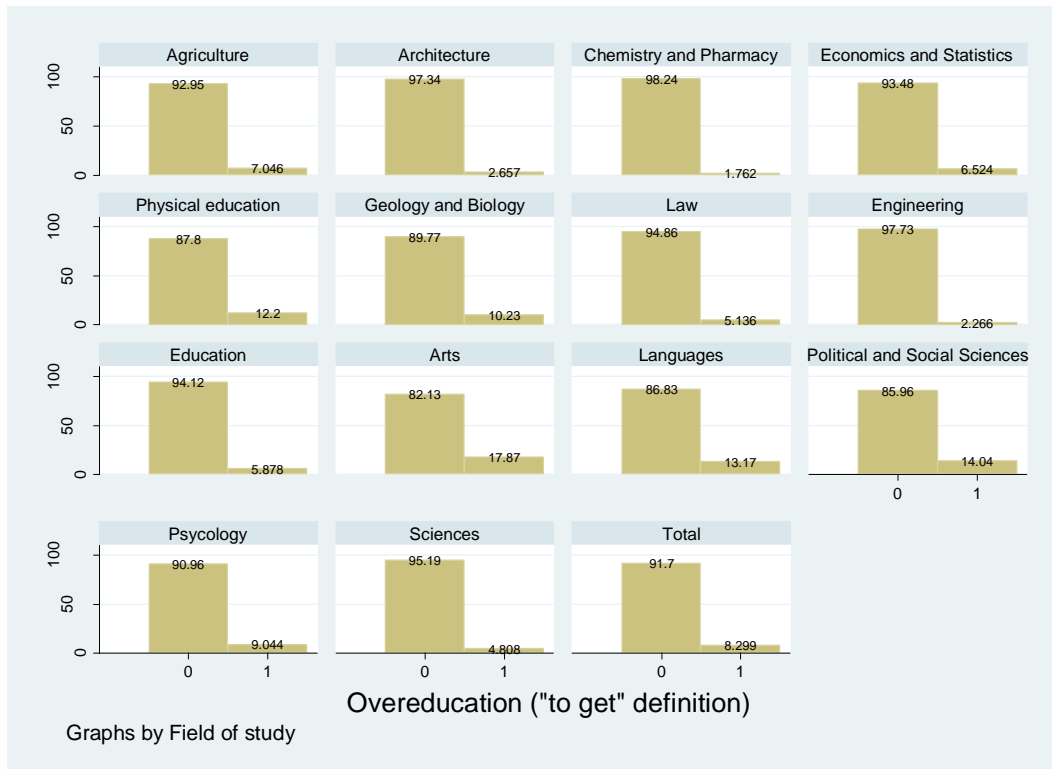
Note: Pure pre-reform graduates in 2005, observed 5 years after graduation. ML simultaneous estimate.

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

Source: own elaboration on AlmaLaurea data.

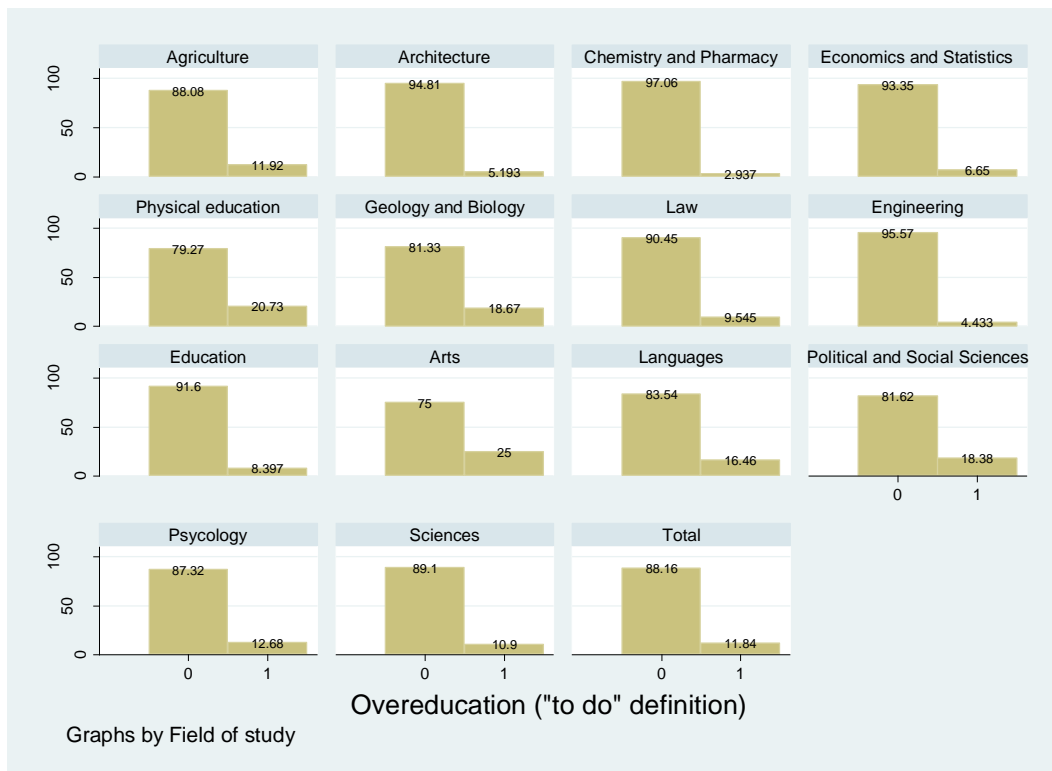
## Appendix of Figures

**Figure 1. Overeducation by field of study**



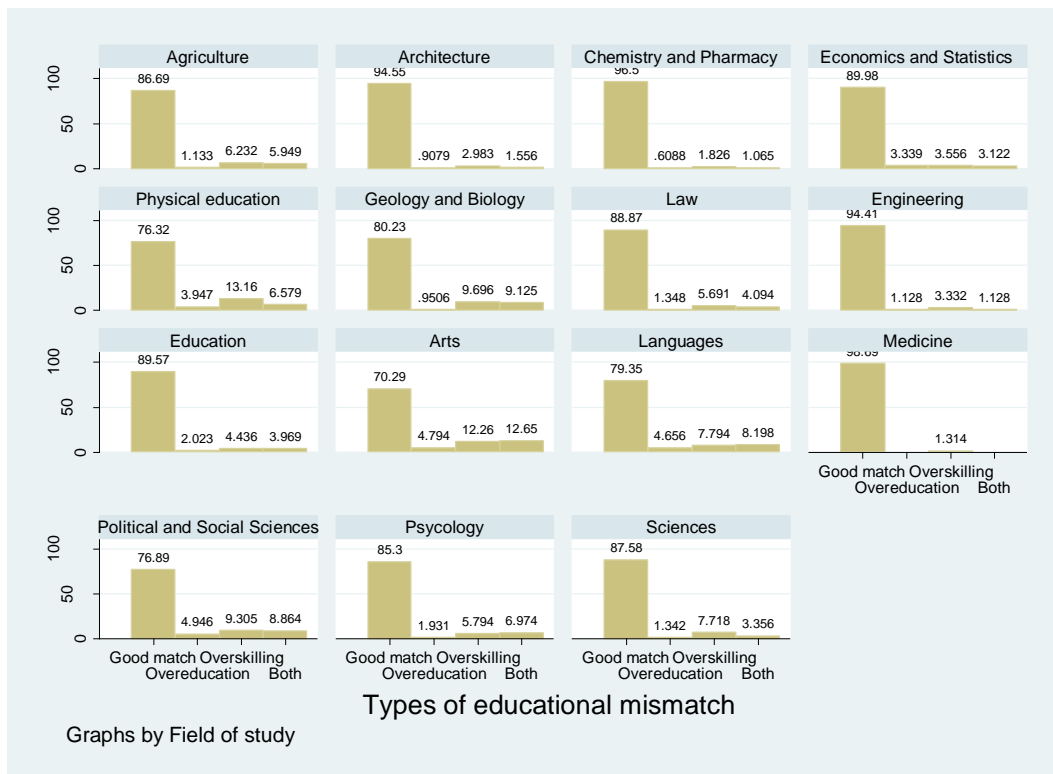
Source: Own elaboration on AlmaLaurea data.

**Figure 2. Overskilling by field of study**

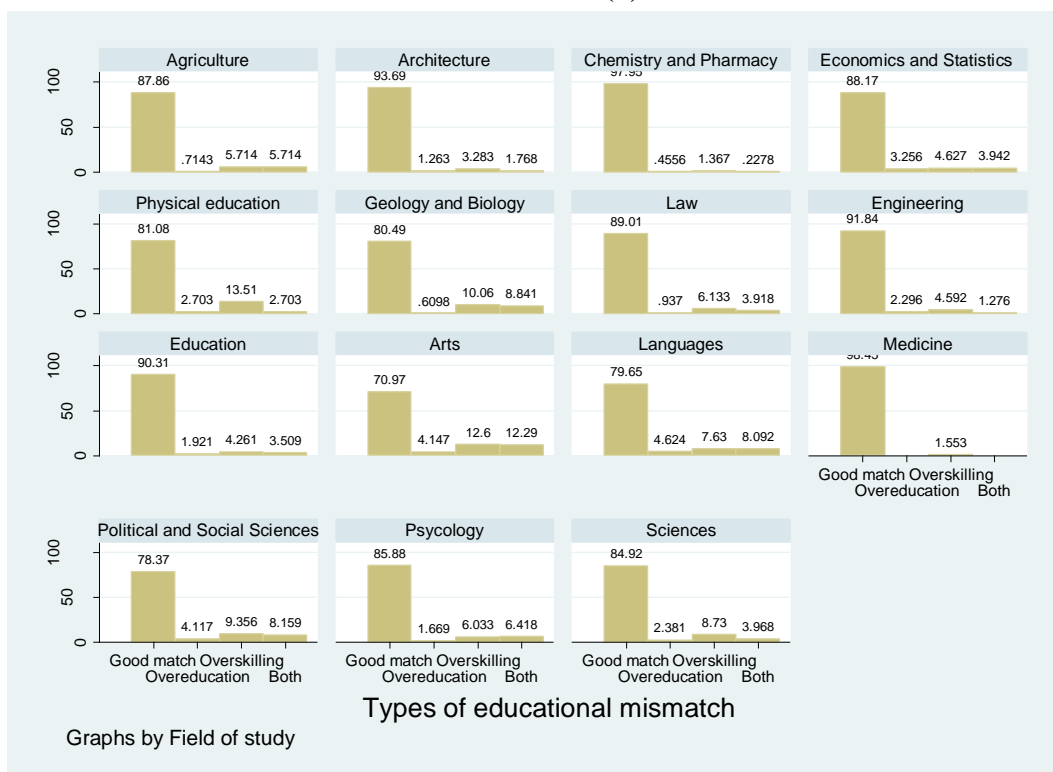


Source: Own elaboration on AlmaLaurea data.

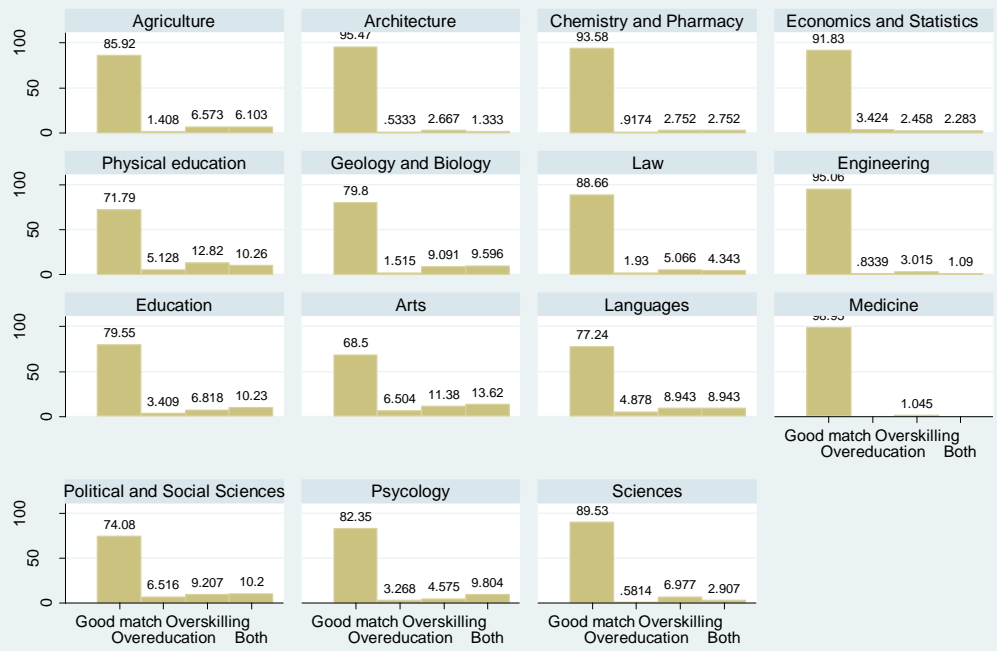
**Figure 3. Educational mismatch by gender and field of study**  
**Panel (a): All**



**Panel (b): Women**



### Panel (c): Men



Graphs by Field of study

Types of educational mismatch

## Annexes

**Table A.1. Survey of the literature**

	Data	Overeducation indicator	results
<b>Quintano, Castellano, D'Agostino 2008</b>	Sample of graduates in Economics of University of Naples Parthenope by graduation year (1999-2002). Date of interview: spring 2005	<b>The authors derive two indicators from the self-declared answers to the questionnaire.</b> a) <b>overskilling or Objective indicator</b> (i.e. the formal necessity of having the university degree in order to apply for the job). b) <b>overeducation or Combined indicator</b> : who respond that university degree is not formally necessary plus all graduates who feel that the substantial need of a university degree is excessive. <b>Earning indicator</b> : dichotomous measure that divides more disadvantaged graduates from the others (+ or - 1100 € per month)	To be overeducated is a strong predictor of the probability of having low earning. (0.39* for the objective Ind.) (0,44* for the combined ind.)
<b>Ferrante, McGuinness, Sloane (2010)</b>	Alam Laurea: Sample (17000) of the graduate population in Italy in 2004 interviewee in 2009.	<b>Indicator of overskilling or effectiveness</b> : if skills acquired during university are utilized in the present job. <b>Indicator of overqualification</b> : if the degree level is necessary or useful to do the job. <b>Indicator of efficacy</b> : combination of effectiveness indicator plus overqualification indicator. <b>Earning indicator</b> : not defined	Results of the mismatch indicators on the probability to be employed are not presented. Descriptive statistics show that 11% of the graduates employed are overskilled and 7% are overqualified five years after the degree.
<b>Ferrante, McGuinness, Sloane (2010)</b>	International data set REFLEX. Graduate in 1999/2000 in 13 European countries interviewee in 2005	<b>Overeducated</b> who feel for a present job more adequate a title lesser than a university degree (vertical mismatch). <b>Overkilled</b> : if skills acquired during university are not utilized in the present job (horizontal mismatch). <b>Earning indicator</b> : <b>wage level (si parla di earning equation e di livelli retributivi)</b>	In Italy the wage penalty of the overeducated is not significant (-0,04). In the other countries the coefficient is high and significant. To be overskilled has a wage penalty significant and in line with the other countries such as France, Netherland and UK (-0,11**)
<b>Franzini Raitano 2009</b>	Data Set Plus. Survey of 2005. Sub-sample of all dependent full time workers	Overeducation or subjective direct indicator (i.e. the formal necessity of having the university degree in order to apply for the job). <b>Earning indicator</b> : ORU (Overeducation Required Undereducation model) Method, based on the surplus years of education i.e. the difference between the mode years of education of the qualification held and of the one required for the job.	To have a university degree augments the probability of higher wages (21,65***). To be not overeducated performs better (22,64***). To be overeducated performs lesser than to be not overeducated (17,02***) but the coefficient is positive. This if we refer to the all dependent full time workers. The overeducated dependent full time workers with university degree have a wage penalty of -5,15***. But this decrease and become not significant when we add indices of individual abilities.
<b>Brynin Longhi 2009</b>	The data derive from the "e-Living project" funded by the EU. The project was based on a household survey of 1750 households in 4 countries—Britain,	Three indicators: the first with the ' <b>certification method</b> ' is best calculated from a direct comparison of qualifications held and required. The second method is a version of the traditional <b>ORU specification</b> : it defines excess education as the difference between actual years of education and the average years associated with the qualification necessary for a job. The third is the ' <b>Combined definition</b> ': the (temporal) overeducation is the difference in years of education between individual i and the majority of people with	The results of the estimation with the <b>certification indicator</b> show in all countries except Germany a matched graduate earns more than an overqualified graduate (in Italy we have the higher coefficients (0,922 vs 0,719). In all countries except Norway (where the difference is slight), someone matched with a higher school leaving qualification earns more than someone overqualified at the

	Germany, Italy, and Norway	the same qualification.	same level. Certification indicator in Italy generates a premium. The results of <b>ORU specification</b> reveal that in all four countries the effect of education required for the job is positive, also greater than that of years of education, The effects of excess education are either positive, but with little statistical significance, or zero. <b>Combined definition:</b> In Italy nor excess qualifications (converted into years of education) nor extra time in education have effect on earnings
<b>Di Pietro Urwin (2006)</b>	The data are taken from a survey carried out by ISTAT (National Statistical Italian Centre) in 1998 on individuals who graduated from all Italian universities in 1995. (17,326 individuals)	Four dummy variables. The first one ( <b>EDMIS</b> ) takes a value of 1 if a university degree was not a formal requirement for the graduate's current job, and 0 otherwise. Similarly, the second dummy variable ( <b>OVERED</b> ) has a value of 1 if the worker considers their level of education to be excessive, relative to the job tasks they have to perform, and 0 otherwise. The third dummy variable ( <b>UNDERED</b> ) takes a value of 1 if a worker feels that their level of education is insufficient, relative to the job tasks. Finally, with respect to skill mismatch, it has been constructed a dummy variable ( <b>SKIMIS</b> ) which takes the value 1 if graduates respond that they have used either "none" or "a little" of the knowledge and skills acquired at university in their current jobs, and 0 otherwise.	The coefficient on over-education (OVERED) is found to be negative and statistically significant, whereas that on under-education (UNDERED) is neither in line with expectations nor statistically significant. The results indicate that over-qualified graduate workers earn, on average, 5.1 per cent less than those with the same qualification level who occupy jobs for which they are adequately qualified. The indicator of skill Underutilization (SKIMIS) has a negative impact on earnings (1,5%). When we combine the employed indicators for education and skills mismatch are combined, we fund that effect of under-utilisation of skills on wages disappears when controlling for educational mismatches, while the value of the coefficient on over-education is largely unchanged. Adding the indicator for educational mismatch constructed (EDMIS), the findings indicate that graduates working in jobs for which a university degree was not formally required, receive lower wages than other graduates who occupy jobs for which a degree was a formal requirement. The wage penalty is of 3.6%.
<b>Di Pietro Cutillo (2006) IJM</b>	The individual-level data are taken from a survey carried out in 2001 by the ISTAT on people who graduated from Italian higher education institutions in 1998	Overeducation is measured through the worker self-assessment method. <b>Overdedicated</b> are graduates who respond not to the question: 'Was a university degree a formal requirement to obtain your current job?'. The estimate effect of overeducation on wage are done by a simple OLS and by IV model to take account for the endogeneity of overeducation. However, it has been demonstrated that, using a single selection framework, the estimate effects is downwrad biased as it don't thake in account the problem of sample selection bias and of endogeneity bias. To go beyond the failure of controlling for this correlation yields the relationship between	The estimated pay penalty associated with overeducation under OLS and when we correct for sample selection bias due to the decision to work is approximately 4.4%. The estimate of the negative effect of overeducation on earnings rises to 39.4 per cent and 5.7 per cent once we take the endogeneity of overeducation into account using the Heckman and the IV estimation techniques respectively. The wage differential between appropriately

<p><b>Etienne Wasmer, Peter Fredriksson, Ana Lamo, Julián Messina, Giovanni Peri 2005</b></p>	<p>The authors use the European Community Household Panel (ECHP) Data set. The analysis is concentrated on the five largest countries of the EU-15; namely, France, Germany, Italy, Spain and the UK, but also summary statistics for all EU-15 countries in an attempt to provide a full picture of the skill mismatch phenomenon are presented</p>	<p>overeducation and wages has been investigated using a double selection approach where two basic individuals' decisions are considered: the decision to work and the choice of occupation. <b>Wage indicator:</b> natural logarithm of the basic hourly wage</p> <p>For indicators are used: Type 1. "Non-over-qualified and well matched" (<b>NOWM</b>), if non-over-qualified and education and training is suited for their job. Type 2. "Non-over-qualified and mismatched" (<b>NOBM</b>), if non-over-qualified but education and training is not suited for their job. Type 3. "Over-qualified but correctly matched" (<b>OWM</b>), if over-qualified but education and training are suited for their job. Type 4. "Over-qualified and mismatched" (<b>OBM</b>), if over-qualified and education and training are not suited for job. <b>Wage equation:</b> standard Mincer regression augmented to include a dummy variable for overqualification and in a second stage authors differentiate between the different types of mismatched workers.</p>	<p>educated and overeducated workers (measured at the all workers mean), using the bivariate selectivity model is of 39,0%.</p> <p>For the pooled countries overqualified workers have a wage penalty with respect to properly matched employees. However, the magnitude of the effect is relatively small (1 % lower wages) Moreover, the pooled results hide important differences across countries, since it is only in Spain where the wage penalty of over-qualified workers is negative and statistically significant. Distinguishing between the three different types of skill mismatch, NOBM,OWM, OBM (and taking NOWM as reference group). NOBM,OWM present a negative return in all countries. In Italy, as well as in the other countries, the effect is large: on average NOBM and OBM workers earn about 10,5 percent less than properly matched individuals. If instead the individual has the skills required for the job (well matched) but is over-qualified (OWM), a wage penalty is found only in the cases of Spain and Italy. It should be noted that even if significant the magnitude of the wage penalty from being OWM is about one third of the wage penalty in case of being badly matched (OBM) in all countries. Thus, the authors conclude that in the five EU countries studied it is to a large extent skill mismatch what drives the wage penalty on wages and not over-qualification</p>
<p><b>Caniarca Sgobbi 2009</b></p>	<p>the data are taken from the OAC-ISFOL survey on employees in industrial and service private sector in 2004</p>	<p><b>The educational mismatch</b> is defined as the correspondence between the education level possessed and the task performed. It has been measured comparing the education level and the self declared answer to the question: «Se qualcuno dovesse fare domanda per occupare la sua posizione, che qualificazione scolastica dovrebbe possedere secondo lei?» (En.Tr.: "If somebody should apply for your job, which kind of qualification would he need to hold?").</p>	<p>In the sample overeducated are the 14,1 % over total employees and undereducated are the 17,1%. The wage penalty is estimated by an ORU specification. As usual the years of undereducation have a negative impact on wages (-1,9) and the years of overeducation have a positive impact (0,9) even if the premium is only a quarter of that of the years of education.</p>
<p><b>Verhaest, van der Velden 2010</b></p>	<p>International data set REFLEX. Graduate in 1999/2000 in 13 European countries interviewee in 2005</p>	<p><b>Overeducated</b> are workers who feel for a present job more adequate a title lesser than a university degree (vertical mismatch). Earning indicator: not defined</p>	<p>The incidence of overeducation six months after graduation in Italy is 38,0% and five years after graduation is 19,3%. On average, in the main OECD countries the incidence of overeducation is about 10% lower in the current job (26,0%) compared to</p>



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			the first job (15,6%). Italy has a high initial incidence of overeducation and, like the other countries in the same situation, has the largest drop after five years. Italy is also characterized by an overall low stability of match positions: this country combines a below average overeducation persistence with a relatively high probability to fall back in overeducation after an initial good match.
<b>Davia, McGuinness, O'Connell 2010</b>	The data come from the 2004, 2005 and 2006 waves of the EU Survey on Income and Living Conditions (EU-SILC)	Individuals are defined as being <b>overeducated</b> if their level of attained schooling is at least one level above the mode of their occupation, measured at the 2 digit ISIC level. Earning indicator: not defined	The average overeducation rate in Italy in 2004 - 2006 is 25,4% for males and 30,6% for females. Compared with the other countries the Italian rate is one of the highest and in particular the country exhibits relatively high levels of regional variation.
<b>Ordine and Rose 2009</b>	The individual-level data are taken from a survey carried out in 2004 by the ISTAT on people who graduated from Italian higher education institutions in 2001	<b>Overeducated</b> is who answer not to the question: «Is your degree a required qualification for your job?». Wage indicator: log of the basic hourly wage	A wage equation is estimated in which the occurrence of overeducation is included as explanatory variable. Wage impact of overeducation is relevant (coefficient of OLS - 0,084) and significant, meaning that mismatched graduates earn consistently less than their matched peers and this may influence the pattern of wage inequality within the group of graduates.

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**Table A.2. Descriptive statistics**

Variable	Nobs	Mean	St. dev.	Min	Max
Overeducation 1 year after the degree (to get)	13500	0.1316	0.3380	0	1
Overeducation 1 year after the degree (to do)	13500	0.1647	0.3709	0	1
Overeducation 3 year after the degree (to get)	17223	0.0937	0.2914	0	1
Overeducation 3 year after the degree (to do)	17223	0.1249	0.3307	0	1
Overeducation 5 year after the degree (to get)	17387	0.0799	0.2711	0	1
Overeducation 5 year after the degree (to do)	17387	0.1144	0.3183	0	1
Effectiveness of the degree in the labour market	16960	2.1273	1.1801	1	5
Earnings, 5 years after the degree	16591	7.0618	0.4997	5.2983	8.0864
Earnings, 3 years after the degree	16462	6.9588	0.4903	5.2983	8.0864
Earnings, 1 year after the degree	12892	6.8026	0.5341	5.2983	8.0864
Overall job satisfaction	17382	7.5698	1.6933	1	10
Overeducation 5 years (to get), based on Chevalier (2003)	17387	0.1206	0.4330	0	2
Overeducation 5 years (to do), based on Chevalier (2003)	17387	0.1787	0.5248	0	2
Woman	28976	0.6163	0.4863	0	1
Married	25196	0.1066	0.3086	0	1
Lives together	25196	0.0182	0.1337	0	1
Separated, divorced, widow	25196	0.0056	0.0746	0	1
Children	25196	0.0586	0.2348	0	1
Foreigners	28976	0.0357	0.1856	0	1
Months from the degree before finding a job	17355	10.8186	13.3111	0	65
Final grade at High Secondary school (out of 100)	28032	81.4413	12.3064	60	100
Erasmus experience	28976	0.0658	0.2479	0	1
Other Study experiences abroad	28976	0.0394	0.1947	0	1
Missing	28976	0.1933	0.3949	0	1
I extra-curricular year late	28976	0.2068	0.4050	0	1
II extra-curricular year late	28976	0.1908	0.3929	0	1
III extra-curricular year late	28976	0.1483	0.3554	0	1
IV extra-curricular year late	28976	0.1025	0.3033	0	1
V extra-curricular year late	28976	0.2755	0.4468	0	1
66-90 out of 110	28976	0.0732	0.2605	0	1
91-100 out of 110	28976	0.2678	0.4428	0	1
101-105 out of 110	28976	0.2135	0.4098	0	1
106-110 out of 110	28976	0.2292	0.4203	0	1
Athenaeum in the North East	28976	0.2674	0.4426	0	1
Athenaeum in the Centre	28976	0.3303	0.4703	0	1
Athenaeum in the South and Islands	28976	0.2833	0.4506	0	1
(S)he works in another region (Nuts2) of the same area of residence (NUTS1)	17387	0.0548	0.2275	0	1
Moved to the North	17387	0.0937	0.2915	0	1
Moved to the Centre	17387	0.0565	0.2309	0	1
Moved to the South or to the Islands	17387	0.0054	0.0733	0	1
Moved abroad	17387	0.0311	0.1735	0	1
No title	23191	0.0049	0.0696	0	1
Primary school	23191	0.0802	0.2716	0	1
Low secondary education	23191	0.2195	0.4139	0	1
High secondary education	23191	0.4168	0.4930	0	1
One parent got a university degree	23191	0.1694	0.3751	0	1
Classical high school	28976	0.2228	0.4161	0	1
Specialisation in teacher training	28976	0.0689	0.2533	0	1
Language high school	28976	0.0547	0.2273	0	1
Art school	28976	0.0167	0.1280	0	1
Technical school	28976	0.2120	0.4088	0	1
Professional school	28976	0.0232	0.1506	0	1
Other high school diploma	28976	0.0141	0.1181	0	1
Training, apprenticeship aimed at gaining access to a liberal profession	21605	0.2859	0.4518	0	1
Doctoral studies	21605	0.0430	0.2030	0	1
Specialisation school	21605	0.1225	0.3278	0	1
Ist level master degree	21605	0.0801	0.2714	0	1
IInd level Master degree	21605	0.0828	0.2756	0	1
Other type of Master degree	21605	0.1019	0.3025	0	1
Stage / Work grant / Training on-the-job	21605	0.1963	0.3972	0	1
Public off-the-job training scheme	21605	0.1234	0.3290	0	1
Study scholarship	21605	0.0357	0.1855	0	1
Voluntary civil service	21605	0.0413	0.1990	0	1
Work and study	23742	0.0707	0.2564	0	1
No work experience	23742	0.2253	0.4178	0	1
Work experience is missing	23742	0.0104	0.1013	0	1
Agriculture	17387	0.0068	0.0824	0	1
Metal and engineering industry	17387	0.0382	0.1918	0	1
Construction	17387	0.0391	0.1939	0	1
Chemical industry and energy	17387	0.0373	0.1894	0	1
Other manufacturing industry	17387	0.0408	0.1979	0	1
Trade and repair	17387	0.0992	0.2989	0	1
Credit and insurance	17387	0.0699	0.2550	0	1

Transportation, advertising and telecommunications	17387	0.0603	0.2381	0	1
Several consulting services	17387	0.1837	0.3873	0	1
Informatics	17387	0.0246	0.1550	0	1
Other services for firms	17387	0.0485	0.2148	0	1
Public administration and army	17387	0.0590	0.2355	0	1
Health	17387	0.0628	0.2426	0	1
Other services	17387	0.0814	0.2735	0	1
Current job is the same as that before university	17387	0.1208	0.3259	0	1
Current job is different from that before university	17387	0.2424	0.4285	0	1
Part-time work	17387	0.1872	0.3901	0	1
Public sector job	17387	0.2057	0.4042	0	1
Network of family and friends	28976	0.0856	0.2797	0	1
Continuation of stage / other traineeship	28976	0.0614	0.2401	0	1
Answering an advertisement	28976	0.0547	0.2274	0	1
Public competition	28976	0.0593	0.2362	0	1
Application to teach at school	28976	0.0295	0.1691	0	1
Direct call by the employer	28976	0.0361	0.1865	0	1
Temporary employment agency	28976	0.0264	0.1604	0	1
Request of recommendation by the employer	28976	0.0190	0.1365	0	1
Other job search channel	28976	0.0160	0.1257	0	1
Job search channel is missing	28976	0.0024	0.0487	0	1
Network of family and friends	28976	0.0008	0.0282	0	1
Self-employed	17387	0.2222	0.4158	0	1
Starter contract / Training and work contract / Apprenticeship	17387	0.0183	0.1342	0	1
Temporary contract	17387	0.1502	0.3572	0	1
Freelance / Consulting	17387	0.1070	0.3091	0	1
Other atypical work	17387	0.0150	0.1214	0	1
Without contract	17387	0.0200	0.1401	0	1
Contract is missing	17387	0.0011	0.0330	0	1
Agriculture	28976	0.0195	0.1384	0	1
Architecture	28976	0.0457	0.2087	0	1
Chemistry and pharmacy	28976	0.0365	0.1875	0	1
Economics and statistics	28976	0.1211	0.3263	0	1
Physical education	28976	0.0043	0.0655	0	1
Geology and biology	28976	0.0378	0.1906	0	1
Law	28976	0.1328	0.3394	0	1
Education	28976	0.0698	0.2548	0	1
Arts	28976	0.1267	0.3326	0	1
Languages	28976	0.0655	0.2474	0	1
Political and social sciences	28976	0.1225	0.3278	0	1
Psychology	28976	0.0496	0.2171	0	1
Mathematics and Physics	28976	0.0197	0.1391	0	1
County level unemployment rate (NUTS3)	17387	6.84	3.47	2.6323	18.1093

Source: own elaboration on AlmaLaurea data.