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Studying «too much»? A comparative and diachronic analysis of overeducation among tertiary graduates.

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Introduction

It is a well-known result that education is positively correlated with the main indicators of economic and social wellbeing: higher educated individuals have better occupational opportunities, earn higher wages, have more stable families, are more healthy, live longer, commit fewer crimes and participate more in civic and political activities (Hout 2012). These are among the reasons why the process of educational expansion that has taken place in all developed countries in last decades has been supported and praised by policy-makers, scholars, and the public opinion: educational expansion brings to society both economic and extra-economic positive effects. However, starting from Freeman's pioneering work *The Overeducated American* (1976), concern has been raised about the unexpected and unattended consequences of a huge increase of (highest) educational levels: educational expansion can have also negative undesired effects if it outpaces the increase in the demand for higher levels of education. If the supply of higher educated workers far outmatched the corresponding demand, the author argued, the risks of graduates being forced to accept traditionally non-graduate jobs and of the wage premium associated with a tertiary degree strongly declining become real.

The publication of Freeman's work has been followed by a growing body of literature on overeducation. This term, roughly speaking, refers to the situation in which the amount of skills acquired in education exceeds the level required by the individual's job. As will be discussed in the following, this concept is much more complex than it could appear at first sight. Indeed, it entails a relation between education and skills which is hard to disentangle: even though commentators often use the terms *education* and *skills* interchangeably, education is far from a perfect measure of individual skills.

So far, the leitmotiv of research on overeducation has been that this phenomenon is not simply the result of a frictional mismatch between labour demand and supply. The most recent research has indeed refuted the hypothesis of overeducation being merely due to an excessive supply of higher educated workforce: not only there is international evidence of skill shortages at the tertiary level, but the wage premium for tertiary education has remained stable or has even

increased over the past decades, while it should have decreased in case of an oversupply of university graduates (OECD, 2011). Rather, overeducation is proven to be a relevant and persistent phenomenon, which deserve policy concern: according to OECD estimates, about one worker out of four is overeducated (OECD, 2011). To a similar conclusion arrive Leuven and Oosterbeek (2011) in a recent meta-analysis: summarising results from the main studies on overeducation they found that, on average, 30% of the working population is overeducated. Moreover, when analysing the evolution over time of the phenomenon, the authors point out that, after a decline in reported overeducation from the 1970s (40%) to the 1990s (24%), in 2000s there appears to be a sharp increase (39%).

What is even more topical, lots of studies have addressed the consequences of overeducation, suggesting the relevant impact that the phenomenon has—not only from an economic point of view—on individuals and on the whole society. Overeducation is usually considered the result of a twofold failure: of education systems—not able to provide students with useful and marketable skills—and of labour markets—inefficient in sorting school leavers into the available jobs. These institutional failures are proven to have detrimental effects on workers, firms and economic systems. Overeducated individuals are found to earn less than individuals with the same educational level who match job requirements (Duncan and Hoffman, 1981; Cohn and Khan, 1995; Hartog, 2000)[1] , to be less productive (Tsang, 1987)[2] and less satisfied with their jobs (Tsang *et al*., 1991; Battu *et al.*, 2000). Overeducation can also be very costly for the economy, not only because it is likely to restrict productivity growth (McGuinness, 2006), but also because, as education is often largely funded by the States, it can represent a waste of

[1] Leuven and Oosterbeek (2011) estimate that on average the return to one year of schooling is around 0.09, while the return to one year of overeducation is about half of that (0.043).

[2] Using data from companies in the US, Tsang (1987) estimates that a one-year reduction in surplus schooling would increase output by more than 8% translating into an additional gain of almost five billion dollars.

resources since it implies unproductive investments on human capital (Maier *et al.*, 2003)[3].

An influential body of research on overeducation has thus addressed the institutional causes of overeducation, in order to both shed light on the mechanisms driving the mismatch and identify possible policy interventions to tackle this widespread and lasting phenomenon. Comparative research has indeed explained cross-country differences in overeducation—and in other indicators of labour market entrance, such as unemployment, occupational status attainment and job-search duration—as a result of different institutional characteristics of education systems and labour markets. On the one side, stratification, standardization and vocational specificity of education are found to affect the goodness of the matching between workers' education and jobs (Di Stasio *et al.*, 2015; Levels *et al.*, 2014; Wolbers, 2003); on the other side, labour market rigidities are shown to roughen labour market entrance of school leavers (Scherer, 2004; Wolbers, 2007).

The most recent research on school-to-work transition—and, in particular, the literature on overeducation—has focused on labour market entrance of university graduates. Following the process of educational expansion that has taken place in all developed countries in last decades, in fact, an in-depth examination of the transition of tertiary graduates to the labour market is essential in order to better understand the processes of social reproduction that are still at work despite the generalized increase in educational levels (Müller and Gangl, 2003; Shavit *et al.*, 2007). The expansion of education and the focus on tertiary graduates evidently posit new questions about a new source of differentiation, namely the horizontal stratification of educational qualifications. It is in fact a well-established result that different returns are associated with the field of study individuals graduated from. The best performing graduates—in terms of wages, occupational opportunities, job prestige, and so on—are those from technical and job-oriented

[3] It could be argued, in this regard, that public investment in education does not respond only to economic reasons, but that it could and should contribute to social progress, by promoting equal opportunities for active citizenship. Extra-economic returns to education are the topic of a wide strand of research (see Campbell 2006 for an exhaustive review of the literature), which is still debating around the causal nature of this association. Despite the relevance of this argument, it goes beyond the scope of this dissertation to assess whether extra-economic factors compensate for the lack of marketability of educational degrees. Moreover, to the best of our knowledge, no study exists that links these two phenomena. Thus, we are not able to assess whether extra-economic consequences of education are the same for overeducated and non-overeducated individuals.

fields (such as Medicine, Engineering, and Law), while the worst results are usually found among graduates from the Humanities and Social Sciences (Kim and Kim, 2003; Reimer *et al.*, 2008). This general pattern is found to be valid also when speaking about overeducation. While overall graduates' overeducation appears to be a not negligible phenomenon in all developed countries (Humburg *et al*., 2012), field of study differentials are also worth noting: the more generally oriented is the study programme, the less likely are graduates to find a good match at the beginning of their job careers (Chevalier, 2003; Ortiz and Kucel, 2008; Verhaest and Van der Velden, 2013).

The aim of this study is to link these two strands of research in order to assess if and how institutional features are likely to shape fields of study differentials in the overeducation risk. This topic has received, in fact, little attention, even if there exists studies suggesting that differences across fields are likely to be influenced by different trends in demand and supply growth (Reimer *et al.*, 2008), and by a set of institutional factors, on both the demand and supply sides of qualified labour (Ortiz, 2006; Ortiz and Kucel, 2008; Verhaest and van der Velden, 2013). Analysing in depth these differentials might serve a twofold function. On the one hand, it could shed light on the mechanisms linking education to labour market returns. On the other hand, by enhancing our understanding of the drivers of field of study differentials, it could suggest instruments to improve the equality of graduates' opportunities in the labour market.

In the following chapters, this issue will be addressed with two different perspectives. First, in Chapter 4, we will comparatively analyse how the differential incidence of overeducation among graduates from different fields of study is affected by labour market institutions. While researchers have often focused on the role of the educational system, less attention has been devoted, in the overeducation literature, to the possible determinants of the phenomenon on the demand side. Even more ignored has been their role in shaping the differentials between fields of study. In the following analyses, three labour market features will be taken into account, whose relevance will be depicted below: the level of labour market regulation, the regulation of the access to liberal professions, and the level of public employment. Because they are known to alter the number and the quality of available job vacancies and to affect the structure of

labour demand, they are likely to impact on both the overall incidence of overeducation and on the differential distribution of the phenomenon among graduates from different fields of study.

Then, in Chapter 5, the effect of the university reform dictated by the guidelines of the Bologna Process on tertiary graduates' risk of overeducation will be evaluated. Italy is selected as a relevant case study for these analyses since, in comparison with other developed countries, it displays both low graduation rates and modest returns to tertiary education. This peculiar combination has been explained with characteristic features of the Italian labour market and economic structure, which above all require less qualified workers to be trained on the job. Graduates' overeducation might have been further enhanced by the introduction in 2001 of the Bologna university reform. By both increasing the number of individuals accessing to HE and enlarging the social base of participation to tertiary education, this reform might have even worsened graduates' risk of mismatch and altered the pattern of fields of study differentials. The evaluation of the impact of the reform is by definition restricted to a single case study; however it sheds new light on the role of HE systems in shaping graduates' opportunities at labour market entrance and suggests the necessity of analogous research on the reform's effect in other countries.

Preliminary to these analyses, after a review of the theoretical literature on overeducation (Chapter 1), Chapters 2 and 3 provide an insight in the aforementioned issue of how to properly define and measure the phenomenon. After a review of the existing literature (Chapter 2), an empirical comparison between different indicators of overeducation is provided in Chapter 3. Findings will show that different indicators of overeducation often lead to different results. Thus, the possibility that different indicators may not exactly measure the same phenomenon will be discussed and the necessity to employ more than one measure will be suggested. Not only these results are propaedeutic to the analyses presented in Chapter 4 and 5, but they also represent a contribution *per se* to the methodological literature on overeducation, since they show how different indicators are likely to measure different features of the phenomenon, namely *educational* and *skill mismatches*.

1. Theoretical framework

1.1 Why does education (sometimes) pay off?

In spite of the huge body of research on overeducation, there is no clear agreement in the literature on how to interpret the occurrence and persistence of the phenomenon. In the next Chapter the longstanding problem of properly defining and adequately measuring overeducation will be addressed. Suffice it now, in order to theoretically frame the phenomenon, to say that overeducation occurs whenever the amount of individuals' educational skills exceeds the level required by their jobs.

Scholars have tried to explain this phenomenon in the light of the various theoretical frameworks usually applied to the analysis of labour market returns to education, which also provide different accounts for the nature, existence, and returns to overeducation. These theories can be grouped into three main categories[4] based on the three different mechanisms they assume connecting education to labour market outcomes (Van de Werfhorst, 2011). The first group includes the approaches based on human capital theory (Becker, 1964; Mincer, 1958) that consider education as an indicator of productive skills. The second comprehends the perspectives that look at education as a positional good (Spence, 1973; Stiglitz, 1975). Finally, in the third group are comprised the theoretical frameworks that suggest that education may serve as a means for social closure (Weber, 1920).

The following paragraphs briefly discuss these theoretical approaches and their contribution to the explanation of the occurrence of overeducation, without pretending to establish the superiority of one mechanism over the others. It is definitely useful to theoretically distinguish the possible mechanisms driving the (mis)match between workers and jobs. However, since they represent ideal types, we do not expect any of them to fully explain the existence of the phenomenon under investigation.

[4] These categories have to be intended as groups of theories, which exhibit a certain degree of internal heterogeneity. However, it goes beyond the scope of this dissertation to present in detail the internal differences of the three approaches.

1.1.1 Education as an indicator of productive skills

According to the standard neo-classical approach, education pays off because it provides individuals with productive skills. The economic tradition of the human capital theory (HCT henceforth) claims that a direct link exists between human capital, productivity and wage: more precisely, individuals' productivity is directly proportional to their level of human capital, and workers are paid proportionally to their marginal productivity. Education, providing marketable skills and abilities relevant to job performance, is the main source[5] of human capital (Becker, 1964).

Rationality and efficiency are the core concepts of HCT. One the one side, individuals rationally decide to invest in education in order to increment their human capital and, consequently, their future job opportunities and salaries. On the other side, employers rationally select applicants on the basis of educational credentials and differently reward schooling levels.

The existence of the phenomenon of overeducation seems to completely contrast with a strict interpretation of HCT: if labour markets were efficient, we would not observe any form of over- or under-education, except those due to short-term disequilibria. It is possible, indeed, to observe a temporary and frictional mismatch, due to the firms' necessity to adjust the production process in response to any changes in the supply of skilled labour. The empirical evidence is, however, inconsistent with this hypothesis, at both the micro and the macro levels. Several studies suggest that overeducation is often a permanent condition in workers' careers (Dolton and Vignoles, 2000; Mavromaras and McGuinness, 2012). Verhaest and Van der Velden (2013), for example, estimate than on average[6] one tertiary graduate out of four is overeducated in the first job. Five years after graduation the incidence of the phenomenon is lower (16%), but the persistence in the condition of overeducation is high (43%). Moreover, if overeducation were the result of a frictional mismatch between labour demand

[5] Human capital corresponds to any stock of knowledge and skills that contribute to the worker's productivity. This broad definition does not include only years of schooling, but also training and work experience. Therefore, HCT recognizes the possibility that workers with the same level of education differ in terms of productivity. We will come back on this issue at the end of this paragraph.

[6] Data from fourteen countries are analysed, namely: Spain, United Kingdom, Italy, Japan, Belgium, the Netherlands, Czech Republic, Austria, Norway, Finland, France, Switzerland, Germany and Portugal (see Tab. 2.1).

and supply—due to transitory economic shocks—over time we should observe picks in the otherwise low and flat distribution of the phenomenon. Empirical results show, on the contrary, that over the last four decades overeducation has always been a high-incidence persistent phenomenon in the advanced economies (Leuven and Oosterbeek, 2011; McGuinness, 2006).

An important contribution which in some way recognizes the limits of classical HCT, but adopting a similar approach, is the *Career Mobility* model proposed by Sicherman and Galor (1990), which seems consistent with the phenomenon of overeducation. In this theoretical frame education is still considered as a fundamental provider of relevant skills, but the authors hypothesize that workers may decide to temporarily work in jobs which provide them with competencies to be used later in higher-level jobs. This way, it might be the optimal choice, for some individuals, to spend a limited amount of time in jobs for which they are overeducated. This hypothesis is supported by data: overeducated workers are found to have a higher probability to move to a higher-level job than workers with the required level of education (Sicherman, 1991).

Alternatively, some authors suggest that persistent overeducation may be consistent with HCT if the heterogeneity of workers' skills is taken into account. In other words, it is possible to observe a long-lasting mismatch between attained and required schooling when individuals' skills are not adequately represented by their levels of education. In particular some studies underline that formal education and on-the-job training (or experience) may be substitutes in the competencies production function. This means that individuals with more schooling may be compensating for a lack of other forms of human capital, such as experience or on-the-job training (Alba-Ramírez and Blázquez, 2003). The lack of data on individuals' skills makes it difficult to test the correspondence between formal education and workers' competencies. Recent empirical research has, however, identified various methods to capture at least part of the unobserved heterogeneity among individuals holding the same level of education. The analysis of longitudinal data (Lindley and McIntosh, 2009), the use of indicators of personal ability such as the IQ (Hartog and Jonker, 1998), and instrumental variable techniques (Dolton and Silles, 2008) go in this direction. For example, Cainarca and Sgobbi (2012) have recently analysed data collected among employees of Italian private firms and have highlighted that only part of their

results can be attributed to differences in individual human capital endowment, thus not justifying an explanation of overeducation merely based on the heterogeneity of workers' competences.

1.1.2 Education as a positional good

The second approach, which considers education as a positional good, moves from a substantial critique to one of the core assumption of HCT, that is, that individuals compete in a free and perfect competitive market, in which there is perfect information on both the demand and supply sides. This second theoretical framework, on the contrary, assumes that employers have to select workers under uncertainty, because they do not know potential employees' level of productivity.

According to the signaling theory (Spence, 1973), during the selection process employers do not possess perfect information on applicants' productive skills and abilities, nor they have any guarantee of obtaining this information in the short run. In other words, when employers decide to hire workers they are making an investment under uncertainty. Since acquiring information on individuals' skills and abilities is costly, employers will make hiring decisions on the basis of inexpensive information, which will allow them to estimate workers' future productivity. Among this information, Spence (1973) distinguishes between indexes—that is to say individuals' innate characteristics, such as sex and race—and signals. The latter are characteristics which may change over time and which can be manipulated by individuals: among these characteristics, the individual level of education plays a crucial role. Modifying this signal is costly, and individuals decide whether to make this kind of investment or not on the basis of the expected returns.

Educational choices are assumed to be directly correlated to individual ability: abler individuals will be more prone to invest in education, since the costs will be repaid by higher returns. Consequently employers will tend to hire more educated individuals, assuming that the educational system is able to screen individuals on the basis of their pre-existing ability (Stiglitz, 1975)[7]. In other words, this approach shares with the previous one the hypotheses that individual

[7] Signaling and screening theories ultimately differ in that the former refers to the supply side, that is, to the behaviour of employees, while the latter refers to the demand side, that is, to the behaviour of employers (Stiglitz and Weiss, 1990).

investment in education is driven by the rational comparison between costs and benefits and that employers aim at maximizing future productivity. But while HCT claims that education actually enhances individuals' productivity, this approach states that schooling does not need to provide workers with a set of skills directly usable on the labour market, but that it primarily signals their unobservable motivation and ability to employers[8]. Job-relevant competences will be indeed learned through on-the job training, and employers select applicants on the basis of their educational qualifications in order to save on training costs. Thence, individuals may decide to make a bigger investment in education, in order to enforce this signal; this would lead to an increase in the educational level of the labour force, above and beyond jobs' requirements (Tsang and Levin, 1985).

Similar to the signaling and screening theories, the *job competition model* formulated by Thurow (1975) also underlines the positional function of education. It suggests that individuals compete in the labour market in order to win the existing job opportunities. According to this approach, individuals invest in education to increment their competitiveness in the labour market, that is to say, to advance on the job queue. Even if school does not provide students with job-specific skills, it enhances individuals' trainability: thus, the more individuals are educated, the lower training costs they signal, and the more they are likely to be selected by employers. Also in this case, thus, the competition for available jobs creates an incentive for job seekers to acquire more and more education in order to stay ahead of the labour queue. Indeed, since education functions as a positional good, it is not its absolute value that matters, but the level of educational attainment *relative* to that of other job seekers.

Overeducation is entirely consistent with the approach of education as a positional good. Both the signaling theory and the job competition model assume the existence of pressures that would induce individuals to acquire more education, possibly leading to processes of credential inflation. When the number of educated individuals in the economy increases, indeed, acquiring more education becomes increasingly necessary to protect one's own place in the job

[8] According to Psacharopoulos (1979) it is possible to distinguish a weak and a strong versions of the screening hypothesis. In the strong version, education is merely a signal, since it does not provide students with productive skills. In the weak version, on the contrary, schooling not only provides a signal but also augments productivity.

queue. Thus, the individual decision to overinvest in education may be rational, since it increases the probability of obtaining vacancies. What is more, according to this theoretical framework, overeducation is likely to be a persistent phenomenon in the labour market, since highly educated individuals are always preferred to workers with lower levels of education, regardless of the level of schooling required by the job.

1.1.3 Education as a means for social closure

The last approach – which considers education as a means for social closure – suggests that differentials in occupational outcomes for differently educated individuals depend on restrictions of the supply side in specific areas and on a regulation of the demand of the corresponding occupations. This approach significantly differs from the previously outlined theoretical frameworks: while the former approaches interpret labour market returns to education as a consequence of workers' actual or potential level of productivity, the present one suggests that they merely are the effect of a process of social exclusion. Moreover, while the theories discussed above set the mechanisms linking education to labour market opportunities at the individual level, social closure theory, on the contrary, suggests that the process of social stratification happens at the level of the social group.

Some important contributions to the social closure approach come from neo-Weberian theorists, such as Parkin (1979) and Collins (1979), who analyse the conditions under which educational credentials and qualifications serve as instruments of exclusion and social stratification, thus strictly regulating the access to specific occupational positions. This idea primarily refers to Weber's analysis of class conflict: social closure occurs when, among groups competing for possession and control of profitable opportunities, some are able to monopolize the advantages deriving from these opportunities. The main way in which these groups implement social closure is by limiting the access to outsiders by binding it to visible characteristics, such as educational credentials. Social groups formed around certain labour market positions build and defend legal, formal, or social boundaries that ensure the maintenance of high standards of

members' remuneration, at the expense of social groups excluded from these positions (Weber, 1920).

The Weberian closure theory has lot in common with the Marxist accounts of exploitation, which can be defined as the process by which one class obtains an economic advantage at the expense of another class. The main source of inequality does not reside in the skills and efforts of the incumbents of social classes, but rather in the relation between classes. Exploitation refers to inequality generated by the ownership of rent-producing assets, which guarantee an advantage to the owner at the expense of non-owners. The labour market is one of the main arenas of reproduction of inequality: employment rents are created when the access to occupational position is closed to outsiders by the collective action of unions, by the requirement of legal certification of professions or by other forms of professional licenses. Thus, educational credentials may create rents for individuals possessing them when they are used as rationing devices for specific jobs (Grusky and Sørensen, 1998; Sørensen, 2000).

This approach has been largely ignored by the economic literature, whilst it has received lot of attention by sociologists interested in the analysis of returns to education (van de Werfhorst, 2011). According to this perspective, educational qualifications serve as formal entry requirements that regulate the access to occupations. In other words, what matters to employers is the match between specific qualifications and specific occupations, rather than individuals' skills. As will be discussed in the following, this approach is particularly useful when the focus is on horizontal differentiation of occupational opportunities, the basic idea being that different fields of study prepare students for more or less regulated professions.

1.2 Why do certain types of education pay off more than others?

The outlined theoretical frameworks have been mainly applied to the analysis of the returns to different levels of education. As previously underlined, however, scholars' attention has recently shifted on returns to different *types* of education. Also the literature on overeducation has followed this strand of research, by analysing the differential diffusion of the phenomenon among tertiary graduates

from different fields of study. Results generally show that graduates from technical and job-oriented fields are less at risk of overeducation than graduates from generalist fields, such as the Humanities and Social Sciences (Barone and Ortiz, 2011; Verhaest and Van der Velden, 2013). This finding can be interpreted recurring to the aforementioned approaches, which provide different account for the differential incidence of overeducation among individuals with the same level, but different types, of education. In each case, however, we need to assume that if a limited number of graduate-jobs is available and that graduates who do not succeed in obtaining these vacancies will prefer to accept non-graduate jobs rather than remaining unemployed. It has to be acknowledged, indeed, that, the phenomenon of overeducation is associated to qualitative or quantitative disequilibria between supply and demand of highly qualified labour, while the different theoretical frameworks predict different mechanisms acting in cases of supply-demand disequilibria.

Applying a human capital approach to the analysis of returns to different types of (tertiary) education requires assuming that different educational tracks provide individuals with different kinds and levels of skills. In particular, some studies have underlined how skills provided by different disciplinary areas may differ in terms of specificity. Van de Werfhorst and Kraaykamp (2001) suggest in this regard that different fields of study provide students with different levels of four types of resources: cultural, economic, communicative, and technical. According to the authors, when individuals choose the disciplinary area of their studies, they differentially invest in these resources, which are more or less marketable and thus have different impacts on labour market outcomes. Also Reimer and colleagues (2008) suggest that graduates from different fields of study possess skills at diverse levels of specificity; in particular, graduates from technical and scientific fields possess more productive and occupation-specific skills than graduates from the Humanities. Assuming that the main employers' aim is to maximize profit, the lower training costs required by more specialized individuals will be a good incentive to hiring applicants with more specific knowledge (Ortiz and Kucel, 2008). According to this approach, we may thus expect graduates from scientific and technical fields to be more protected from the risk of overeducation than graduates from generalist fields of study because of the

different level of specificity—and consequent marketability—of the skills they have acquired through tertiary education.

Horizontal differences in returns to education can be also interpreted in the light of the second theoretical framework, assuming that graduating from some fields of study depends more from pre-existing ability than others. Consequently, the corresponding qualifications are better evaluated, and thus rewarded. In other words, according to this approach, fields of study are more or less selective according to their level of difficulty: more motivated and abler individuals will prefer more challenging disciplinary areas, while the less talented students will choose the less demanding ones. As employers try to assess the distribution of individuals' ability among fields of study, and to estimate their future training costs, they are expected to better remunerate the *harder* ones, that is to say, those in which a successful completion depends more on pre-existing individuals' ability; thus, these fields of study will send more powerful signals to the labour market (Reimer *et al.*, 2008). Also from this approach descends the hypothesis that graduates from technical and scientific disciplines will perform better on the labour market, while the risk of overeducation will be higher among students from the so-called *soft* fields of study. This prediction, though, descends from a different mechanism: while in the perspective of education as an indicator of productive skills, the former are in a better position because of the occupation-related nature of their studies, in this second perspective their advantage derives from the fact that the fields they graduated from are expected to be more selective, thus signaling higher levels of ability and motivation and lower on-the-job training costs.

Finally, according to the social closure approach, graduates from some fields of study—such as medicine, architecture and law, for instance—might perform better in the labour market because the corresponding groups of interest are more able than others to keep the supply of graduates low. For example, social closure may take the form of the imposition of stringent entry requirements or of higher tuition costs. As in the classical economic theory, this restriction on the number of graduates in specific fields origins a price increase—that is to say wages—and, consequently, it enhances the competition for those study places. Those who are most favoured in this competition are those with the greatest resources, tangible or intangible, that is to say those who have greater financial resources or better

personal skills. Such a selection could, therefore, produce an increase in the average level of skills of students from fields of study affected by this process, thus increasing the market value of the acquired qualification.

It is worth noting, at this point, that while there is a substantial overlap between the predictions descending from HCT and signaling frameworks, the same might not be true for the social closure approach. In the former case, in fact, fields of study are more or less exposed to the risk of overeducation according to the job-oriented nature of the fields of study they graduated from. In the latter, instead, graduates' occupational outcomes are functions of the bargaining power of the corresponding social groups.

1.3 How does the institutional setting affect graduates' overeducation?

While a great part of research has directed its efforts to test which of the aforementioned approaches best fits the empirical evidence, recent studies have suggested that returns to education are unlikely to be explained entirely by just one of these three models. Also for what concerns overeducation, it is surely useful to distinguish the various mechanisms which can influence the matching between workers and jobs; it is, however, quite unlikely that this process exactly follows one of those theoretical models. Instead of trying to assess the theoretical superiority of one interpretation over the others, thus, the priority should be to understand under which conditions each mechanism tends to prevail over the others: indeed, not only the strength of the association, but also the mechanism relating education to labour market outcomes are likely to vary significantly across contexts (Bol, 2013; Van de Werfhorst, 2011). In particular, the literature on school-to-work transition suggests that the allocation of job seekers into the labour market is significantly affected by characteristics pertaining both to the supply and the demand sides of the labour force—such as the structure of the educational system, the institutional mechanisms that regulate the match between demand and supply, and labour markets' characteristics. These institutional characteristics are indeed likely to affect the individuals' process of decision making, by altering the set of options they have.

1.3.1 The role of the educational system

On the supply side, especially three dimensions of educational systems have been widely analysed in the literature. These are standardization, stratification and vocational specificity. The first dimension indicates how much schooling systems comply with national standards; the second refers to the extent to which educational systems differentiate school tracks in a more or less early and rigid way; the third regards the degree of occupational orientation of educational curricula (Allmendinger, 1989; Kerckhoff, 2001; Shavit and Müller, 1998). Research suggests that the more stratified, vocationally specific, and standardized is the educational systems, the stronger will be the education payoff (Allmendinger, 1989; Bol and Van de Werfhorst, 2011; Shavit and Müller, 1998): while high levels of stratification and vocational specificity allow employers to select workers with specific vocational qualifications, high levels of standardization make the signals provided by education more reliable. Cross-country differences in the structure of educational systems are also found to be significantly correlated with differences in the incidence of overeducation. Particular emphasis has been put on vocational specificity, which is hypothesized to ease the match between workers and jobs, especially at the very beginning of the work career (Di Stasio *et al.*, 2015). According to Bol (2013), these larger returns to education in vocational systems are more likely to be explained by the role of educational degrees rather than by the level of accumulated human capital: educational credentials are indeed likely to be more effective as occupational closure strategy in countries characterized by a more vocational and highly tracked educational system.

Additionally, several authors underline the connection between educational systems and labour markets, which are particularly likely to affect the pattern of school-to-work transition. One influential discussion on the institutional setting shaping school-to-work transition is that proposed by Maurice and colleagues (1986) who discriminate between «qualificational» and «organizational» spaces. These two ideal types are well represented, according to the author, by Germany and France, respectively. The qualificational space is characterized by high educational differentiation and vocational tracking; the vocationally oriented educational system provides students with occupation-specific skills that are, later

on, evaluated by employers when making hiring decisions. The organizational space, on the contrary, is less standardized, less stratified, and less vocationally-oriented; skills are learnt on-the-job and education acts primarily as a screening device. Similar to this dichotomy is the one that contrasts systems of internal labour markets (ILMs) with systems of occupational labour markets (OLMs) (Marsden, 1986: Eyraud *et al.*, 1990). Also in this case, the main difference lies in the presence of a system of education and training which provides occupationally specific skills: in OLMs, jobs are mainly defined by their contents, and since vocational programs already provide the essential training, skills are easily transferable between jobs within the same occupation. In ILMs, on the contrary, firms—and not jobs—are the central units of the labour market and, since education mainly provides students with general skills, most of the training takes place on-the-job within the firm. The effect of education on labour market outcomes is thus likely to be weaker in ILMs than OLMs, since, as suggested by Gangl (2003, p. 110), «*to the extent that educational credentials do little to reflect job applicants' potential capabilities for a particular job, employers will be more likely to assess individual skills from past work records. In turn, if training systems provide qualifications that are meaningful indicators of skills at particular jobs, employers should be more likely to use this inexpensive signal of individual capabilities*».

The dimensions described so far provide sound explanations for cross-country variability in returns to education: in countries with a high level of tracking and vocational specificity the risk of unemployment is lower (Müller and Gangl, 2003; Breen, 2005), the length of school-to-work transition is shorter (Van der Velden and Wolbers 2003; Wolbers, 2007), the link between education and occupational status is stronger (Andersen and Van de Werfhorst, 2010), job stability increases (Allmendinger, 1989) and the risk of overeducation decreases (Levels *et al.*, 2014). Moreover, qualificational spaces show a tighter link between educational attainment and occupational status than organizational spaces (Shavit and Müller, 1998). However, these institutional features are primarily associated with pre-tertiary education. When research focuses on tertiary graduates additional factors deserve consideration. Van de Werfhorst (2004), in this respect, suggests that it is worth taking into account also the level of stratification of the systems of Higher Education. In particular, some countries have a highly

vocationally oriented tertiary education system in the vocational colleges (e.g. the *Fachhochsculen* in Germany and the *Hoger Beroepsonderwijs* in the Netherlands), which are specifically designed to develop job-oriented skills in specific subjects. Additionally, Müller and Wolbers (2003) distinguish between tertiary education systems characterized by «parallel» segmentation and «sequential» systems, where tertiary education is made up of two or three cycles and where the access to the next-higher cycle is dependent on the successful completion of the preceding one. Different structures of tertiary education systems are stated to influence returns to tertiary education, since they are likely to affect the transparency of the signals provided by educational qualifications in higher education. These factors are also found to have a relevant effect on overeducation: among the most recent studies, Allen and de Weert (2007) show a better education-job match in countries where tertiary education is strongly geared to the labour market, such as Germany and the Netherlands. Similarly, Verhaest and Van der Velden (2013) analyse the determinants of graduates' overeducation in 13 European countries plus Japan, and find that the risk of mismatch is lower in countries with a vocational tertiary education system.

As will be discussed in the next paragraph, in this general framework it acquires particular relevance the investigation of the effect of the recent Bologna Process on tertiary graduates' occupational outcomes. With the aim of making European Higher Education institutions attractive and competitive worldwide, indeed, the Bologna Process has contributed to the development of a European system of comparable academic titles and to the promotion of mobility by European students and scholars. Despite the complexity of the Bologna Process, a lot of attention has been devoted to the changes it has entailed in the degree structure of many European countries. Indeed, while for some countries, such as the UK, the reform merely implied a soft rescheduling of the existing HE structure, in others it involved a major restructuring. In Italy and Portugal, for example, the implementation of the reform required to move from the former unitary structure of HE towards a two-tier system, consisting of a three/four-year Bachelor's degree (BA, hereafter) plus a one/two-year Master's degree (MA). Even though this structure—which is typical of countries as the UK, the US,

Canada and Australia—is known to guarantee a high level performance[9] (Jacobs and van der Ploeg, 2006), its implementation has led to some controversy. On the one hand, such a system is arguably more transparent, reduces the time to labour market entrance, and thus enhances graduates' employability. On the other hand, concern has been raised about both the academic contents of the new curricula and the adequacy of the skills acquired in a shorter period for the labour market, which might undermine the match between individuals' education and jobs.

1.3.2 The role of labour market institutions

Less studied in the overeducation literature is, instead, the correlation between the phenomenon and labour market institutions, notwithstanding the huge body of literature arguing that returns to education are widely influenced by these factors, since they alter the transaction costs employers have to bear, thus shaping their hiring decisions.

The only relevant exception is the level of labour market regulation, usually measured by the level of employment protection legislation (EPL). Wide variation is registered across European countries in the regulation of hiring procedures, in the terms and conditions of work, and in the restrictions to individuals and collective dismissal: through the regulation of labour contracts and the protection of employment relationships, the level of labour market regulation is likely to affect the size of labour demand, in particular of young workers (Breen, 2005; Scherer, 2005; Wolbers, 2007). Mixed results exist, however, on the effect of labour market regulation on labour market opportunities for new entrants. On the one side, it can be argued that, in countries with a stricter labour market regulation, lower workers' mobility is accompanied by stronger difficulties for school-leavers in entering the labour market (Nickell, 1997). Several studies find that in countries with a high level of employment protection, the placement of students in the labour market takes longer (Müller and Gangl, 2003; Müller, 2005; Wolbers, 2007), and the risk of falling into unemployment after formal education is higher (Ryan, 2001; Breen, 2005). In fact, by reducing the number of available

[9] In the list of top 50 universities of the *Times Higher Education* World University Ranking 2015, which judges universities on the basis of teaching, research, knowledge transfer and international outlook, 41 institutions have an Anglo-Saxon system of HE.

job vacancies, job security provisions reduce employment opportunities for the unemployed. Unemployment is thence likely to heap on specific demographic groups, like school leavers entering the labour market for the first time. It has been also argued, however, that EPL has the effect of extending the duration of first job spells (Wolbers, 2007). This, in turn, might have the effect of boosting human capital accumulation, which is likely to improve youngsters' labour market opportunities (Noelke, 2011). The evidence is mixed also for what concerns the specific risk of overeducation. On the one side, a high level of employment protection might reduce firms' ability to adapt to technological change and this would induce overeducation through two different mechanisms. First, *"firing restrictions may discourage firms to immediately upgrade the level of the workforce in response to rapid changes in technologies"* (Di Pietro, 2002, p. 893). Second, *"as a consequence of their inability to fully take advantage of upward changes in skilled workforce availability caused by strict employment protection legislation, firms are unlikely to adopt new technologies"* (*ibidem*). On the other side, recent empirical evidence suggests a high level of employment protection not to be associated with a higher incidence of overeducation (Verhaest and van der Velden, 2013), a possible explanation for this being that, since a high level of EPL leads employers to rely more on internal promotions for new vacancies, this factor is also likely to ease the transition from overeducation into a good match.

Other factors, almost ignored in the literature, are likely to influence school-to-work transition via their impact on the structure of labour demand. Among these, the regulation of access to liberal professions is particularly likely to shape the labour market entrance of tertiary graduates. Italy presents—together with Eastern and Southern European countries—a stringent regulation of professional services; less restrictive is, instead, the regulation in Northern countries, such as Sweden and Denmark (Paterson *et al.*, 2003). Typically, such a regulation takes the form of restrictions to both the access to the professions and to the free competition among incumbents of these occupations. These two kinds of restrictions may have opposite effects on graduates' labour market prospects (Barone and Schindler, 2014). The former (e.g. *numerus clausus* for access to tertiary education or high tuition fees) reduces the number of students from the matching fields, thus lowering the risk of oversupply of graduates and improving their labour market prospects. On the contrary, the latter (e.g. long periods of

postgraduate training, selective entry examinations to the professions) constrains the access to these professions also for graduates from the matching fields, thus possibly lowering the connected occupational rewards. These forms of regulation have been addressed by recent studies that have particularly analysed their impact on economic growth (Paterson *et al.*, 2003; Barone and Cingano, 2010). It has remained almost unexplored, on the contrary, their role in shaping the entrance of new workers in the labour market: to the best of our knowledge, the sole relevant result concerns the role of this regulation on the intergenerational transmission of prestigious occupational positions in the liberal professions (Basso and Labartino, 2011).

Another factor that is likely to affect the structure of labour demand is the role of welfare state as employer. Also in this case, a wide differentiation is registered across European countries. Particularly Scandinavian countries have expanded public employment since the 1960s. While this expansion has been primarily guided by egalitarian concerns—distinctive feature of social democratic regime—, it has surely functioned also as a means for promoting employment (Esping-Andersen 1990). This factor has received little attention in the overeducation literature. However, Barone and Ortiz (2011) suggest that countries like Norway, Finland and the Netherlands display lower incidence of graduates' overeducation, despite the prominent expansion of higher education. According to the authors, a factor that might contribute to the explanation of this empirical evidence is the success of these countries in creating a large share of skilled employment in the public sector (i.e. managerial professions and professional employment).

1.4 Research questions and overview of the next chapters

In this chapter a review of the theoretical literature providing explanations for returns to education has been outlined. Different theoretical frameworks have been presented, which differ for the mechanisms they assume relating education to labour market outcomes, and the role of the institutional context—both on the supply and demand side—has been addressed. Finally, the contribution of these

approaches to the interpretation of the occurrence of overeducation has been discussed.

What in the literature has received less attention is the way in which horizontal differentials in graduates' overeducation can be explained. Though for different reasons, all the theoretical approaches previously presented arrive at the conclusion that graduates from vocational and job-oriented fields of study are more protected from overeducation than graduates from generalist fields, and this conclusion is supported by lots of studies (Barone and Ortiz, 2011; Ortiz and Kucel, 2008; Verhaest and Van der Velden, 2013). However, it has remained almost unexplored the role of institutions in shaping field of study differentials. The main aim of this dissertation is to fill this gap: the micro and the macro levels are linked, both from theoretical and empirical points of view, and the way in which the institutional context shapes the distribution of overeducation risk among graduates from different fields of study is analysed. What we are going to hypothesize is that the institutional context is likely not only to reduce or augment the gap between graduates from different fields, but also to affect the mechanism by which graduates from some fields of study are more protected from the risk of overeducation than others.

In Chapter 4, comparative data on European tertiary graduates will be analysed by means of multilevel modelling to assess the role played by labour market institutions in determining differentials in the overeducation risk for graduates from different fields of study. The three labour market institutions discussed above will be taken into account, namely the level of employment protection, the regulation of the access to liberal professions and the level of public employment. Specific hypotheses on the role of these factors will be presented in that chapter.

In Chapter 5, the analysis will instead focus on the role of the recent restructuring of European tertiary education system established with the Bologna Process. Italy is selected as a case study for both methodological and substantive reasons. On the one side, the peculiar rules settled by the Bologna reform in Italy—which, as will be described, exclude some courses from the implementation of the new "3+2" structure—and the existence of nationally representative repeated cross-section data allow us to convincingly adopt a counterfactual approach in order to estimate the causal impact of the reform on

graduates' risk of overeducation, both overall and across fields of study. On the other side, Italy represents an interesting case of study since, notwithstanding its below-average participation to Higher Education, it is one of the European country with the highest incidence of overeducation.

These two chapters are preceded by an in-depth discussion of the definition of overeducation and the measurement of the phenomenon (Chapter 2). The claim that it is advisable to distinguish between different features of the phenomenon, namely *educational* and *skill mismatches*, is presented and supported by data analysed in Chapter 3. On the basis of these findings, this distinction is adopted in Chapters 4 and 5.

2 On overeducation's definition(s) and measurement(s)

So far, theoretical interpretations for the occurrence, persistence and differential incidence of overeducation have been provided. It remains to be explored a crucial issue, that is the one concerning the definition and measurement of overeducation. In the research process, one should first provide a clear definition of the phenomenon to be analysed, and then indicate how this concept can be measured. As will be suggested, however, the concept of overeducation is so ambiguous and open to various interpretations that it is difficult to find a well-suited indicator of the phenomenon. Moreover, data constraints often force scholars to choose one measurement criterion over the ones proposed in the literature, with limited awareness of the distance between the ideal concept of overeducation and the actual operationalization of the phenomenon.

For these reasons, it seems worth to intertwine conceptual and practical issues, in order to account for the actual pace of research. Thus, after a brief definition of overeducation, we will go through the more utilized measurement criteria and indicators. After having underlined the criticisms of each operationalization, we will discuss how the different indicators actually describe just a part of the phenomenon. This way, we will basically try to define the concept by assessing what the various indicators do or do not point out.

2.1 What is overeducation? How can we measure it?

Despite the growing interest in overeducation, a univocally acknowledged measure of this phenomenon does not exist. Generally speaking, this term indicates a mismatch between individual education and job requirements. As pointed out by Verhaest and Omey (2006a) the lack of a uniform measurement criterion derives from a conceptual confusion around the meaning of this mismatch. On the one side, overeducation can be conceptualized as an overinvestment in education: it refers to a situation in which the returns to education are lower than workers' investment in education. On the other side, this

term can refer to the underutilization of educational skills, that is to say, a situation in which workers have acquired through education more skills than they can employ in their job. While underutilization of skills often entails lower returns to education, it is not necessary the contrary: indeed, lower wages may simply be the consequence of an oversupply of educated workers. Thus, it seems conceptually more adequate to define overeducation as an underutilization of educational skills.

Formally, we can say that an individual i is overeducated (OE_i) if his or her educational skills (e_i) exceed those required by his or her job (r_i):

$$OE_i \equiv \begin{cases} 1 \; if \; e_i > r_i \\ 0 \; if \; e_i \leq r_i \end{cases}$$

This kind of definition clearly raises problems about how to measure acquired and required educational skills. The greatest part of the literature has overcome the first issue by simply using educational levels as proxies for educational skills: be it expressed in terms of years of schooling or in terms of educational qualifications, this information is, in fact, usually collected in the main surveys and is available to the researcher. Several commentators have, however, argued that qualifications are only a poor proxy for skills, since they do not take into account the eventual heterogeneity of individuals' skills within each educational level. In order to take into account the imperfect correspondence between education and skills, several suggestions have been advanced. In one of the former discussion around this topic, Chevalier (2003) introduced a distinction between *genuine* and *apparent* overeducation[10], the basic idea being that graduate workers holding a non-graduate job might be only apparently overeducated, if they are

[10] In order to distinguish between apparent and genuine overeducation, Chevalier combines two indicators. First, JA is used to define graduate jobs. Then, for graduates in non-graduate jobs, a question about their level of (dis)satisfaction with the match between their work and their qualifications is used to disentangle the genuineness of their status of overeducated workers. This way, overeducated workers who are satisfied with the match between their education and their work are defined as apparently overeducated, whereas those who are dissatisfied are considered as genuinely overeducated. A similar strategy is adopted by Verhaest and Omey (2006a) who substitute SAp for JA indicator, and refer to the following question: «Do you have a level of education which is, according to your own opinion, too high, too low, or appropriate for your job?». This distinction is pretty sound and persuasive; however it is clear that, in order to be operationalized, it implies some assumptions on the validity of indicators. In fact, in spite of how the genuineness of overeducation is measured, the distinction between the two groups of overeducated workers is based on the assumption that the employed indicator really captures the concept of overeducation.

provided with a low endowment of skills. When scholars assume homogeneity of workers, indeed, they inevitably end up overestimating the true incidence of overeducation, especially as the expansion of higher education has increased the heterogeneity of the skills of new graduates entering the labour market. Another well-grounded distinction between overeducation-related concepts is the one between *educational* and *skill mismatch* (Allen and van der Velden, 2001). The first term refers to the formal mismatch between educational credentials and job requirements, while the second concerns the actual mismatch between the knowledge acquired through formal education and the skills necessary to perform a job. This distinction is close to the one between *overqualification* and *overskilling* (Green and McIntosh, 2007; Quintini, 2011): in the first case, we are dealing with the formal correspondence between the individual level of education and the qualification required to get a job, while in the second case reference is made to the effective use of skills and abilities in the workplace. These two similar dichotomies present relevant theoretical implications. On the one side (educational mismatch or overqualification), we are mainly dealing with the signaling value of the educational credentials; on the other side (skill mismatch or overskilling), what is under discussion is the possibility, for workers, to fully employ on the job the human capital they have gained through education. It is worth noting that, even though the two phenomena have been shown to be somehow correlated, educational mismatch does not necessarily indicate a lack of demand for individuals' skills *per se*. In fact, increasing demand for advanced competencies may be the result of technological and organisational changes that require more advanced skills for performing a job.

Several strategies have been, instead, adopted to measure the second element of the equation, namely job requirements (r_i). As described in the following paragraphs, a review of the existing literature suggests three feasible ways to measure these requirements and, consequently, overeducation (Chevalier, 2003).

2.1.1 Subjective indicators

The first way to measure overeducation consists in using a subjective indicator, based on workers' self-assessment (SA, hereafter) of (minimal) job requirements (r_i), which are then compared with individuals' skills and/or

qualifications (e_i). Formally, this definition can be exactly expressed by the formula reported above.

Since the exact phrasing of questions varies substantially across studies, various SA of overeducation have been used in the literature. In particular, it is worth distinguishing between indicators that refer to the level of education required to *get* the job (SA_g hereafter), on the one side, and those that refer to the educational level required to *perform* the job (SA_p), on the other side. The former originate from questions such as «What was the minimum formal qualification required for entering this job?» (Dolton and Vignoles, 2000), or «If they were applying today, what qualifications, if any, would someone need to get the type of job you have now?» (Green and Zhu, 2010). The latter derives from questions such as «With respect to your current job, do you feel that having a university degree is excessive, adequate or insufficient?» (Di Pietro and Urwin, 2006). Some studies try to capture more directly the conceptualization of overeducation as underutilization of skills by employing indicators based on workers' self-assessment of their making use on the job of the skills acquired through education (SA_{sk}). In the simplest case, this kind of indicator is based on questions such as «To what extent do you use the knowledge and skills acquired at university in your current job?» (Di Pietro and Urwin, 2006). Alternatively, individuals are required to express their (dis)agreement with statements as «My current job offers me sufficient scope to use my knowledge and skills» or «I would perform better in my current job if I possessed additional knowledge and skills» (Allen and van der Velden, 2001). Sometimes scholars have used detailed information on a set of skills acquired at school and on their usage on the job (Barone and Ortiz, 2011). Allen and de Weert (2007), for example, have constructed a SA_{sk} indicator on the basis of individuals' answers to the following question, which referred to a set of 18 skills: «Please, state the extent to which you had the following competencies at the time of graduation and to what extent they are required in your current job». As it will be discussed in the following (see also Tab. 2.1), these three kinds of SA indicator are not interchangeable, since they are likely to produce very different results.

Finally, the most recent literature—devoted to the analysis of the incidence, the determinants and the returns to overeducation in the tertiary graduates' labour market—has often recurred to SA measures that aim at grasping the horizontal

match (SA_{hm}) between the discipline individuals have graduated from and the job they hold. These indicators derive from questions asking graduates which field of education is most appropriate for their job, the possible answers generally being «Only my own field of education», «My own or a related field», «A completely different field of education», «For this job no specific field is required/exists» (Allen and van der Velden, 2001). In this case the reference to the specific disciplinary skills acquired at university is made clearer; it still remains, however, the possibility—discussed later on—that respondents confuse the formal and the substantive job requirements.

2.1.2 Objective indicators

An alternative way to measure overeducation is to use an objective indicator, based on information provided by job analysts (JA, hereafter) and collected in occupational classifications. This objective approach is based on a systematic study conducted by external job experts: each job is analysed in terms of work performed and worker characteristics, and a classification of jobs according to the required level and type of education is included (Miller *et al.*, 1980). These classifications can then be converted into requested years of schooling (or schooling dummies) which can be compared with individuals' acquired education (Rumberger, 1987).

In order to understand how this classification can be used to measure overeducation, we can consider as examples the two best-known job classifications, which are the *Standard Occupation Classification System*, developed in the UK (Alpin *et al.*, 1998), and the *Dictionary of Occupational Titles* from the US (McGoldrick and Robst, 1996). In the British case, jobs are classified according to the concepts of «skill level» and «skill specialisation», that refer, respectively, to the length of training and to the field of knowledge required to competently and efficiently perform job-related activities. Similarly, in the US dictionary, a level of «general educational development» and a degree of «specific vocational preparation» are attributed to each job: the former refers to the necessary education of a general nature, while the latter makes reference to the occupation-specific training needed for average performance in the job. In both cases, typical entry routes and associated qualifications are identified for each

occupation, on the basis of the information collected in the classification. This datum can be compared with individuals' level of education, and workers can be defined as overeducated if they have attained more schooling than what it is required.

Formally:

$$OE_i \equiv \begin{cases} 1 \; if \; e_i > r_j \\ 0 \; if \; e_i \leq r_j \end{cases}$$

where r_j indicates, for each job, the level of education required to adequately perform job-related activities, as identified by the job classification.

2.1.3 Statistical indicators

The third way of measuring overeducation consists in recurring to an empirical indicator that is constructed using information on realized matches (RM) within occupational categories.

In this case, required education is inferred from the distribution of schooling years within a given occupation, which is then compared with individual education. The criterion most often adopted to define overeducation is to consider an individual as overeducated if his or her amount of attained schooling years is one standard deviation (σ) or more above the mean (RM_{mn}) of all individuals in that occupation (Verdugo and Verdugo, 1989). Formally:

$$OE_i \equiv \begin{cases} 1 \; if \; (e_i - \bar{e}_j) > \sigma \\ 0 \; if \; (e_i - \bar{e}_j) \leq \sigma \end{cases}$$

where $\bar{e}_j$ indicates the average years of education in each job category.

Naturally, the mean cannot be used when individual education is defined by a categorical variable, such as schooling level[11]. This is usually the case when the focus of the analysis is the incidence of overeducation among tertiary graduates. In this case researchers have used the mode (RM_{md}) (Kiker *et al.*, 1997; Alpin *et*

[11] A feasible way to employ the mean as a reference point also when the only available information is the individual education level is to transform this level into the minimal years of schooling that are needed to reach this level (e.g. Verhaest and Omey, 2006a).

al., 1998; Mendes de Oliveira *et al.*, 2000), instead of the mean, or other conventional points of the distribution, such as the median or the 80th percentile (RM_{pct}) (Ortiz and Kucel, 2008; Barone and Ortiz, 2011).

2.2 Critiques to the indicators of overeducation

The pros and cons of the three presented measurement criteria are well established in the literature (McGuinness, 2006; Leuven and Oosterbeek, 2011). Nevertheless, they are often considered as a matter of fact because data constraints do not allow avoiding criticisms deriving from their use. However, a critical discussion of the arguments in favour or against the use of these measures is essential in order to have a clearer insight in their degree of validity and reliability.

The main criticism of SA lies exactly in its subjective nature. Even though respondents possess all relevant information to indicate job requirements, they lack a uniform criterion to assess them (Verhaest and Omey, 2006b), which may affect the reliability of this kind of measure (van der Velden and van Smoorenburg, 1997). Not only the formulation of questions may partially differ over studies (Green *et al.*, 1999), but individuals may also consider different factors when answering them, such as the formal requirement to obtain the job, the level of education necessary to actually perform it, or the typical educational level of similar workers (Dolton and Vignoles, 2000). SA indicators also have to deal with the possible reticence of individuals (Hartog, 2000), and with the fact that workers employed in different contexts may be more or less able to assess the matching between their educational levels and job requirements (McGuinness, 2006): for example, workers of small and scarcely structured firms may find it difficult to identify the reference level to establish which are the requirements in their job place. Moreover some studies have remarked that the level of overeducation is likely to be underestimated when measured through SA, since individuals may be inclined to overestimate the educational requirements or to equate them to their own level of education, thus affecting the validity of the measurement instrument (Hartog and Jonker, 1998). According to some commentators, however, subjectivity has to be praised, since it enables the

researcher to capture nuances of overeducation that objective indicators are unable to grasp (van der Velden and van Smoorenburg, 1997; Leuven and Oosterbeek, 2011). As described in the following, indeed, occupations are often a poor proxy for job requirements (Quintini, 2011), since not all jobs included in a given ISCO code require the same level of education and/or skills.

JA measures are often considered very instructive, since they specifically address the knowledge and skills required to perform job's tasks (Hartog, 2000), thus reflecting the basic idea of overeducation as underutilization of skills. Unfortunately, this kind of measure is only available in a small number of countries, which inevitably reduces the possibility to utilize it. However, two main objections can be raised to this way of measurement (Halaby, 1994; van der Velden and van Smoorenburg, 1997). First, JA ignores, by definition, the variability of job levels within occupational categories. Since variation in educational requirements within a given occupation may be appreciable, the measurement instrument could suffer from a loss of reliability. Second, the allocation of the levels is determined by job analysts on the basis of descriptions of the tasks and of the nature of required knowledge and skills. However, while these are subject to change, dictionaries of occupations are seldom updated and, thus, they are not able to take into account modifications in the value assigned to educational levels in the labour market. It might result in a systematic overestimation or underestimation of the level of certain occupations, which affects the validity of the measurement instrument.

RM is similar to JA in that it does not take into account the variation in educational requirements within a given occupation, with the additional limit given by the arbitrary nature of the cut-off point (σ) by which it is established whether a worker is overeducated or not. What is even more important is that this measurement instrument is very sensitive to changes in labour market conditions, which alter the validity of the indicator. For example, in case of excess of supply, employers will be more likely to hire individuals with a higher level of education than is actually required, and overeducation will be underestimated (Van der Velden and Van Smoorenburg, 1997; Mendes de Oliveira *et al.*, 2000). For these reasons, RM measures are often considered the less adequate to measure overeducation (Hartog and Jonker, 1997).

2.3 Are SA, JA and RM sound indicators of overeducation?

The criticisms previously outlined raise doubts on the capability of the measurement instruments to actually capture the concept to be measured. A brief review of the existing literature shows, in fact, a not negligible divergence between results obtained with different indicators. Significant discrepancies in the estimates of both the incidence of, and the economic returns to overeducation, a weak correlation among these estimates and different patterns of determinants of the phenomenon are found across measures (Groot and Maassen van den Brink, 2000; Rubb, 2003). In order to depict the divergence between indicators, Table 2.1 provides a summary of the most recent studies on graduates' overeducation[12]. Focusing on the analysis of the Italian case, for example, it can be observed that the incidence of overeducation among graduates ranges from 8.9%, estimated by Barone and Ortiz (2011) recurring to a RM indicator, to 38.3%, as reported by Di Pietro and Urwin (2006) on the basis of a SA indicator. Additionally, as reported in the table, the employment of different indicators may lead to the identification of different determinants of, and returns to, overeducation. For example, Alpin and colleagues (1998) register a higher incidence of overeducation among women when using a JA indicator, while they find the phenomenon to be more widespread among men if measured through RMmd. Similarly, Allen and de Weert (2007) analyze the returns to overeducation comparing SAhm and SAsk indicators, and they find the phenomenon to be a good predictor for wage, job satisfaction and job-search only if measured through the former measure.

A limited body of literature, mainly from the UK (Battu et al., 2000), the Netherlands (Van der Meer, 2006; Van der Velden and Van Smoorenburg, 1997) and Belgium (Verhaest and Omey, 2006a; 2006b; 2006c; 2010), has assessed the consistency of the existing measurement instruments by directly testing the degree of validity and reliability of the various indicators.

[12] When the analysis includes many countries, estimates are reported only for some selected cases.

Tab. 2.1 Synopsis of the selected studies

Author and Year	Data, period, countries	Indicator of overeducation	Incidence of overeducation	Individual determinants of overeducation	Returns to overeducation
Allen and de Weert (2007)	Cheers (1998). Graduates of the A.Y. 1994/1995. ES, DE, NL, UK, JA.	SA_{hm}	ES: 6.0%; DE: 10.4%; NL: 11.1%; UK: 18.6%; JP: 24.2%		Negative association with wages and job satisfaction. Positive association with search for other work.
		SA_{sk}	ES: 16.0%; DE: 18.5%; NL: 12.1%; UK: 18.2%; JP: 27.3%		No significant association with wages, job satisfaction, and search for other work.
Allen and van der Velden (2001)	Higher education and Graduate Employment in Europe (1998). Graduates from the A.Y. 1990/1991. Netherlands.	SA_{hm}	56% among higher vocational education graduates; 50% among university graduates		Negative association with wages; no significant association with job satisfaction and on-the-job search.
		SA_{sk}	16% among higher vocational education graduates; 14% among university graduates.		Negative association with wages and job satisfaction; positive association with on-the-job search.
		SA_{sk}	46% among higher vocational education graduates; 53% among university graduates		No significant association with wages; negative association with job satisfaction; positive association with on-the-job search.
Alpin et al. (1998)	Labour Force Survey (1995).Individuals aged 21 to 60.Great Britain.	JA	27%	Gender (higher probability of overeducation for women), ethnicity, age, field of study.	
		RM_{md}	37.70%	Gender (higher probability of overeducation for men), age, field of study.	

(continue)

Author and Year	Data, period, countries	Indicator of overeducation	Incidence of overeducation	Individual determinants of overeducation	Returns to overeducation
Barone and Ortiz (2011)	Reflex (2005). Graduates of the A.Y. 1999/2000. IT, ES, AT, DE, NL, FI, NO, CZ.	SA_p	IT: 12.4%; ES: 17.1%; DE: 12.6%	Gender; social origin; upper secondary graduation mark; type of tertiary degree; field of study	
		SA_{sk}	IT: 11.6%; ES: 19.2%; DE: 9.2%		
		RM_{pct}	IT: 8.9%; ES: 24.8%; DE: 3.8%		
Battu et al. (2000)	Survey organized by the University of Birmingham (1996). Graduates from the A.Y. 1985 and 1990. United Kingdom.	SA_g	40%		Negative association with wages and job satisfaction. The strength of the association varies with the employed indicator.
		SA_p	Around 35-41% or 15-21% depending on the cut-off point.		
		RM_{mn}	Between 15 and 20% for males; between 24 and 28% for women.		
Betti et al. (2011)	AlmaLaurea (2011). Graduates of 2004 from the University of Siena (Italy).	SA_p	74%	Gender, field of study, work experience during higher education, employment sector (public or private), firm size	
		Multidimensional SA	It identifies, for each individual, a 'degree' of overeducation		
Caroleo and Pastore (2013)	AlmaLaurea (2010). Pre-reform graduates of 2005. Italy.	SAsk	16.5% one year after graduation 11.5% five years after graduation	Gender, social origin, field of study, graduation mark, time to degree, geographical area	Negative association with wages. The strength of the association varies with the employed indicator.
		SAg	13.2% one year after graduation 8% five years after graduation		

(continue)

Author and Year	Data, period, countries	Indicator of overeducation	Incidence of overeducation	Individual determinants of overeducation	Returns to overeducation
Cutillo and Di Pietro (2006)	Istat (2001) Graduates' Employment Survey. Graduates of the A.Y. 1998. Italy.	SA_g	32.20%	Gender; field of study; graduation mark; type of contract; firm size	
Di Pietro and Cutillo (2006)	Istat (2001) Graduates' Employment Survey. Graduates of the A.Y. 1998. Italy.	SA_g	M: 31.3% F: 34.0%	Field of study; university quality; type of contract; employment sector (public or private)	
Di Pietro and Urwin (2006)	Istat (2001) Graduates' Employment Survey. Graduates of the A.Y. 1998. Italy.	SA_g SA_p Sa_{hm} SA_{sk}	32.30% 17% 4.60% 38.30%		Negative association with wages and positive association with on-the-job-search. The strength of the association varies with the employed indicator.
Dolton and Vignoles (2000)	National Survey of High school and Tertiary Graduates (1980). Graduates interviewed six years after graduation. United Kingdom.	SA_g	38% in the first job; 30% six years after graduation	Type of degree, graduation mark; further education; field of study; firm size.	Negative association with initial and actual wages.
Ferrante et al. (2010)	AlmaLaurea (2009). Pre-reform graduates of 2004. Italy.	Combination of SA_p and SA_{sk}	11%	Social origin; upper secondary education; field of study; graduation mark; time to degree; further education after HE, length of first job search; type of contract; geographical area.	

(continue)

Author and Year	Data, period, countries	Indicator of overeducation	Incidence of overeducation	Individual determinants of overeducation	Returns to overeducation
Ferrante et al. (2010)	Reflex (2005). Graduates of the A.Y. 1999/2000. AT, BE, CZ, EE, FI, FR, DE, IT, NL, NO, ES, PT, UK.	SA_p	IT: 23% in the first job. 13% five years after graduation.	Prestige of the degree, economic sector, public or private employment, firm size.	
		SA_{sk}	IT: 21% in the first job. 11% five years after graduation.		
Green and Zhu (2010)	Employment in Britain (1992) and Skills Survey (1997, 2001, 2006). Individuals aged 25 to 60. United Kingdom.	SA_g	1992 - M: 21.7%; F: 23.8%; 1997 - M: 23.0%; F: 25.2%; 2001 - M: 27.0%; F: 23.4%; 2006 - M: 33.2%; F: 32.1%		The negative association with wages increases over time for both men and women. Negative association with job satisfaction. The strength of the association varies with the employed indicator.
		SA_{sk}	1992 - M: 15.4%; F: 12.2%; 2001 - M:12.8%; F: 12.0%; 2006 - M:15.4%; F: 12.7%		
Humburg et al. (2012)	Reflex (2005) and Hegesco (2008). Graduates of the A.Y. 2000 and 2003. AT, BE, CZ, EE, FI, FR, DE, HU, IT, LT, NL, NO, PO, ES, SI, CH, UK.	Sa_p	IT: 14.7% ES: 18.5% DE: 5.9%	Gender; social origin; duration of first job search; work experience during higher education; skill level.	
Kler (2005)	Australian Bureau of Statistics (1996) Households Sample File. Graduates aged 20 to 64. Australia.	JA	21% for both men and women.	Gender, age	Returns to overeducation are positive, but lower than returns to required education. The strength of the association varies with the employed indicator.
		RM_{mn}	M: 46%; F: 38%	Gender	

(continue)

Author and Year	Data, period, countries	Indicator of overeducation	Incidence of overeducation	Individual determinants of overeducation	Returns to overeducation
McGuinness and Sloane (2011)	Reflex (2005). Graduates from the A.Y. 1999/2000. United Kingdom.	SA_p	36% in the initial job; 14% in the current job.		Negative association with wages. No significant association with job satisfaction. The strength of the association varies with the employed indicator.
		SA_{sk}	33% in the initial job; 14% in the current job.		
Ordine and Rose (2009)	Istat (2004) Graduates' Employment Survey. Graduates of the A.Y. 2001. Italy.	SA_g		Gender; social origin; age; marital status; upper secondary graduation mark; field of study; university quality; employment sector; type of contract.	
Quintano et al. (2008)	Data collected by the Department of Mathematics and Statistics of the University of Naples 'Parthenope' (2005). Graduates of 1999 and 2002.	Combination of SA_g and SA_{sk}.	46%	Gender; graduation mark; access channel to the job; employment sector; geographical area.	
Terraneo (2010)	Istat (2007). BA or pre-reform graduates of 2004. Italy.	Combination of SA_g and SA_{sk}.	26.7%	Gender; type of degree; field of study	Negative association with wages and with some features of job satisfaction. Positive association with job search.
Verhaest e Van der Velden (2013)	Reflex (2005). Graduates of the A.Y. 1999/2000. IT, ES, AT, DE, NL, FI, NO, CZ, FR, UK, NO, PT, BE, JA, CH.	SA_p	IT: 38% six months after graduation; 19.3% five years after graduation. ES: 45%; 26.7%. DE: 15.1%; 13.8%	Gender; age; field of study; graduation mark.	

In order to identify which measure best indicates the phenomenon, these studies compare the indicators along four axes:

i. Comparison of the incidence of the phenomenon obtained with different indicators;
ii. Analysis of the correspondence and correlation between measures;
iii. Estimation of the determinants of the phenomenon across measures;
iv. Investigation of the predictive value of the measurement instruments for one or more relevant criteria (usually wages, job satisfaction, mobility and training participation).

It is hard to summarize results from these studies, since the analysed data differ with respect to both the country and the year(s) of reference. However, it is possible to outline the main findings and to identify similarities and differences across studies.

The first undeniable result is the measurement sensitivity of the estimated incidence of overeducation. On average, RM indicators are found to deliver the lowest estimates of overeducation, while JA seems to overestimate the phenomenon. SA indicators fall in between, with SA_g generally overcoming SA_p. Even though a gap across measures is always found, its magnitude varies across studies. One main element seems to contribute to the variability of results, namely the sample selection. We can distinguish between studies that refer to the whole labour force (usually one cohort of school leavers is selected, regardless of the individual level of education) and studies that refer to a specific subset of the working population, that is, the one of tertiary graduates. It is within the former group that the hugest differences are found across measures. For example, in one of the most systematic studies on this topic, Verhaest and Omey (2006a) use the 2001 cohort of the Flemish SONAR survey about school-to-work transition to estimate the incidence of overeducation among school-leavers on the basis of six indicators of the phenomenon (three SA, two RM and one JA). The authors find a substantial divergence among the estimates of the incidence of overeducation, which, on average, ranges from 7.9% on the basis of RM_{mn} to 50.6% on the basis of JA. When it comes to the estimation of the incidence of overeducation across levels of education, the authors find the largest gap among individuals with lower secondary education: from 0% according to the two RM indicators to 82% on the basis of SA_g. Definitely smaller is the divergence across measures when

overeducation is estimated among tertiary graduates: from 22% on the basis of SA_g (with the other two SA delivering similar results) to 54% on the basis of JA, passing from the 49% estimated through RM_{md}. The magnitude of this gap is similar to the one found by Battu and colleagues (2000), who analyse the phenomenon among British tertiary graduates comparing two SA and one RM indicators. Nevertheless, the direction of the difference is opposed to the previous one: in the UK, the incidence of overeducation is found to be lower with RM_{md} (about 20%) than with SA_g (around 40%).

The second relevant finding is that, despite these huge differences, when the authors analyse the determinants of overeducation they only find small—and often not relevant—differences across measures. As reported in Table 2.1, overeducation is mainly found to be associated with some variables related to the educational curriculum (such as type of secondary degree, field of study, graduation mark and time to degree) and with job-related variables (such as firm size, type of contract and occupational sector). When the risk of overeducation is estimated through regression models, the coefficients for these variables have the same sign and almost the same magnitude across measures. The only relevant variable for which the compared measures deliver statistically different results is sex. Some studies find the risk of overeducation to be higher among men when using SA indicators, but among women when using RM measures (Battu *et al.*, 2000; Verhaest and Omey, 2006a). In other cases, JA delivers a higher risk of overeducation for women, compared to RM which indicates men to be more exposed to this phenomenon (Alpin *et al.*, 1998; Verhaest and Omey, 2010). A closer inspection of these results, however, reveals that, in spite of statistical significance, the substantive relevance of such differences is questionable. The gender gap is in fact usually found to be around 3 or 4 percentage points with a relevant uncertainty around the estimates.

Finally, turning to the examination of the criterion validity of the measurement instruments, overeducated workers are generally found to earn less than their adequately allocated counterparts (Battu *et al.*, 2000; van der Velden and van Smoorenburg, 1997), to be less satisfied with their jobs (Battu *et al.*, 2000), to be more likely to look for a new job and to participate more often in on-the-job training activities (Verhaest and Omey, 2006c). These results usually hold regardless of the employed measure. This means that, in the regression models

estimating the aforementioned dependent variables, the sign of the coefficient for overeducation is robust over different measures. However, we cannot pretend the same for the magnitude. In fact, some authors find statistically significant differences between measures. For example, Van der Velden and van Smoorenburg (1997) compare SA_g and JA indicators and find the effect on wages to be larger in the second case. Similarly, Battu and colleagues (2000) use two SA and one RM indicators and find a bigger effect on earnings with the last measure. Verhaest and Omey (2006b) find a bigger effect of overeducation on mobility when using a RM indicator rather than SA or JA. Also in this case, however, we should be very careful in discussing these results: statistical significance does not always entail substantive relevance, since the delineated differences are often small in size.

The results presented so far have been interpreted in different ways, leading to dissimilar conclusions about the validity of the overeducation measures. In some cases, the authors recognize that different indicators may produce different estimates of the incidence (and sometimes determinants) of overeducation. However, since they yield similar results about the effects of overeducation on the analysed relevant outcomes, scholars only suggest caution when using these measures (Battu *et al.*, 2000; Verhaest and Omey, 2006b). Van der Velden and van Smoorenburg (1997) hypothesize that the reason behind these different results is that the various indicators measure essentially the same concept but differ with regards to the points on the scale at which there is overeducation. In particular, they compare SA_g and JA methods and point out that the former is likely to provide more accurate estimates, while the latter seems to systematically overestimate the level of overeducation. Definitely more severe is the conclusion of Verhaest and Omey (2006c; 2010) who claim that the various measures do not capture equally well overeducation, but are likely to be indicators for related concepts. In particular, the authors suggest that RM is likely to capture only the non-structural part of overeducation within occupations, while SA_g does not take into account that (at least part of) overeducation might result from the inflation of hiring requirements. Thus, the authors conclude, if overeducation is defined as the mismatch between the attained level of education and that required to do the job, measures based on JA or SA_p are probably the most adequate to capture this concept. Still, the authors suggest a careful interpretation of results, since in the

case of JA a certain degree of measurement error is unavoidable, while in the case of SA_p individuals are likely to take their expectations into account when they assess the quality of their match.

As discussed at the very beginning of this Chapter, however, the lack of consensus around the correct way to measure overeducation is not at all just a methodological question, but it is, instead, also a substantive issue. A possible explanation for the inconsistency found between measurements is that, even if with the criticisms previously outlines, the indicators adopted in the literature actually capture different forms of mismatch.

In particular, it should be quite clear that the indicators previously presented contribute in different ways to the definition of educational and skill mismatches (or overqualification and overskilling). Indicators based on RM consider the educational credentials held by workers, whilst they test neither the correspondence between formal qualifications and skills, nor their actual utilization in the job routine. Since it considers only the formal requirements of jobs, this kind of indicator seems to indicate which levels of education are the more profitable ones, given a certain distribution of qualifications in the labour market. What RM is surely able to point out, if available data cover a long period of time, is the phenomenon of inflation of educational credentials. JA, on the contrary, seems to provide information concerning the match between individuals' skills and those required in the job place. Dictionaries of occupations are based on the assessment of job contents and characteristics, and on the evaluation of their correspondence with skills and competencies gained by individuals through different educational curricula. Thus, although with the previously outlined limitations, they seem to indicate the correspondence between individuals' skills and those necessary to perform the job they hold. Finally, indicators based on SA may measure both educational and skill mismatch according to the way questions are formulated, that is to say according to the importance they attribute to the formal or substantial match between attained and required levels of education.

In the following Chapter the hypothesis that different measures actually indicate different forms of mismatch is tested recurring to Italian data on tertiary graduates: results of that chapter will inform the rest of this dissertation, since they will guide and support the choice of indicators to be used in the subsequent analyses.

3 Methodological issues. Are SA, RM and JA valid measurement instruments for graduates' overeducation?

3.1 Introduction

As discussed in Chapter 2 the empirical literature devoted to the validation of the indicators of overeducation has mainly employed data from the UK and the Netherlands. Notwithstanding the similarity of the employed data, results are not always consistent across studies. In the Italian literature, to the best of our knowledge, no effort has been made in this direction, and scholars have usually recurred to SA indicators, since JA measures are not available. Thus, this chapter aims at filling these two gaps: a new indicator of overeducation is developed that resembles the JA measure, and its validity is tested in comparison to other four indicators (three SA and one RM).

These five indicators are compared following the procedure usually employed in the literature and described in the previous chapter. First of all, descriptive results are compared, by analysing the different estimates of the incidence of overeducation and the correspondence and correlation between the various measures. The second step consists in estimating the determinants of overeducation and assessing whether the results are sensitive to the employed measurement instruments. Finally, the criterion validity is investigated by connecting overeducation—variously defined—with three relevant outcomes, namely wage, job satisfaction and search for a new job.

As already discussed, the choice of these three variables as relevant outcomes is supported by both theoretical reasons and existing empirical evidence. The greatest attention in the literature has certainly been paid to the relation between overeducation and earnings: a widely acknowledged finding is that returns to overeducation (i.e. to exceeding years of schooling) are positive, but lower than returns to required education. In other words, overeducated workers are generally found to earn more than their colleagues with the required level of education, but less than equally educated workers whose level of schooling matches job requirements.

The relation between job match and satisfaction—first addressed in the psychological literature (Vroom, 1964)—is also found to be a relevant result in the overeducation literature (Verhaest and Omey, 2006b). As suggested by Battu and colleagues (2000), we can hypothesize that the higher the individual level of education, the more individuals will develop expectations about their jobs. Thus, the eventual mismatch between actual and required education might mean the ruin of these expectations and could generate workers' dissatisfaction.

Finally, the association between overeducation and job satisfaction may also indirectly affect the mobility behaviour of workers, by making them more prone to look for a new job. But this relationship could also be the result of other mechanisms. For example, according to the Career Mobility theory (Sicherman and Galor, 1990), already discussed in Chapter 1, overeducation may be a good investment if the acquired experience results in higher promotion opportunities inside and/or outside the firm.

3.2 Data

The data used for the analyses come from a large-scale survey on Italian tertiary graduates' employment (*Indagine sull'inserimento professionale dei laureati*), conducted about every third year by the Italian National Institute of Statistics (ISTAT). In particular we use data from the 2011 wave, which provide information on the education and labour market careers of a representative sample of 62,000 individuals who got a tertiary degree in 2007 (31,088 BA graduates and 30,912 MA graduates). BA graduates who, after graduation in 2007, continued studying in order to obtain a MA degree are excluded from the analytical sample. These individuals are not comparable with the other BA graduates because of a different educational history (three vs. five years of tertiary education), nor with the MA graduates of 2007 because of a different amount of work experience. Also graduates who had a continuative employment during tertiary education and whose actual job started before the attainment of the 2007 degree have been excluded, since they clearly differ from other graduates in terms of tenure, job experience and, presumably, amount of skills learnt on-the-job.

Tab. 3.1 Sample composition for the main socio-demographic and education-related variables

	Bachelor	Master	Total
Sex (Ref: Male)			
Female	57.4	50.4	52.9
Age (mean)	29.9	31.2	30.8
Geographical area (Ref: North)			
Centre	23.6	23.2	23.3
South and Islands	23.5	28.3	26.6
Parents' Education (Ref: Primary or Less)			
Lower secondary	29.0	20.2	23.3
Upper secondary	45.9	43.5	44.4
Tertiary	16.8	29.5	25.0
NA	0.6	0.3	0.4
Social origin (Ref: Entrepreneurs)			
Professionals	6.4	9.7	8.5
Managers	3. 6	6.2	5.2
Clerks	30.3	38.2	35.4
Self-employed	15.5	13.4	14.1
Executive workers	16.1	11.8	13.4
Manual workers	21. 7	14.2	16.8
NA	1.1	0.9	1.0
Secondary graduation mark (mean)	80.2	84.4	82.9
Matriculation Year (Ref: 1999-2000 or later)			
1998-1999 or before	10.3	26.0	20.4
Field of study (Ref: Mathematics)			
ICT and Engineering	9.5	21.9	17.4
Natural Sciences	3.7	5.6	4.9
Pharmacy, Veterinary	1.3	2.2	1. 9
Medicine	-	4.6	3.0
Medical Professions	43.3	1. 6	16.4
Architecture	2.6	8.2	6.2
Business, Administration, Statistics	12.6	14.8	14.1
Social sciences	8.2	9.3	8.9
Law	5.0	8.9	7.5
Arts and Humanities	6.1	9.3	8.2
Education, Psychology	6.2	7.5	7.0
Graduation mark (Ref: 66-90)			
91-100	34.6	20.0	25.2
101-105	19.4	17.3	18.1
106-110	18.3	24.7	22.4
110 cum laude	13.1	31.6	25.0
N	9,217	16,594	25,811

This way, we end up with a homogenous sample of graduates, in terms of a) educational experience, and b) work experience. This choice helps in reducing the portion of overeducation that is more likely due to the heterogeneity of individual skills. In other words, even though we cannot control for graduates' unobserved ability, this way we reduce the possibility that individuals in the sample have different endowments of skills, due for example to different work experience.

Additionally, since overeducation is conditional on employment, unemployed graduates and individuals who are still studying at the time of the survey have been excluded from the analyses. Summing up, the final sample includes 9,217

BA and 16,594 MA graduates. The composition of the selected sample for the main socio-demographic and education-related variables is reported in Table 3.1.

3.3 Overeducation measures

The data described above provide the opportunity to compare five indicators of overeducation: three of them are subjective, one is based on realized matches, and the fifth resembles the job analysis method.

3.3.1 Subjective indicators

The first subjective indicator is based on individuals' self-assessment of the necessity of a tertiary degree to *get* their actual job (SA_g). It refers to graduates' answers to the question: «Was a tertiary degree a formal requirement to access your current job?». Being the possible answers «Yes» or «No», individuals are considered overeducated if they chose the second option. Formally:

$$SA_{g_i} \equiv \begin{cases} 1 \; if \; «No» \\ 0 \; if \; «Yes» \end{cases}$$

The second indicator (SA_{hm}) is similar to the first, but a little more restrictive, since it takes into account the *horizontal* match between individual education and job requirements. It is built by combining answers to the previous question with responses to «Was it necessary whichever tertiary degree, a degree in a specific disciplinary area, or exclusively your own degree?». According to this second criterion, individuals are considered as overeducated not only if they declared a tertiary degree not necessary for their job (as according to SA_g), but also if they evaluate that whichever tertiary degree is necessary. Formally:

$$SA_{hm_i} \equiv \begin{cases} 1 \; if \; SA_{g_i} = 1 \\ 1 \; if \; SA_{g_i} = 0 \;\; \cap \;\; «Whichever \; tertiary \; degree \; is \; necessary» \\ 0 \; otherwise \end{cases}$$

The third indicator is based on individual self-assessment of the necessity of the tertiary degree to *perform* the job (SA_p). It is based on graduates' answers to the question: «And to do your current job, according to your opinion, is a tertiary degree effectively necessary?»[13]. As in the first case, the possible answers were «Yes» or «No», and individuals who choose the second option are considered as overeducated. Formally:

$$SA_{p_i} \equiv \begin{cases} 1 \; if \; «No» \\ 0 \; if \; «Yes» \end{cases}$$

3.3.2 Realized Matches Indicator

The fourth indicator employed in this study is based on the comparison between individual level of education and the modal level within his/her occupational category[14] (RM_{md}). As discussed in the previous chapter, the mode is preferred to the mean since we are dealing with educational levels rather than years of schooling.

The modal educational level is derived from the 2011 Labour Force Survey (ISTAT). This survey is conducted every third months on a representative sample of the Italian working population. The four 2011 quarterly waves have been merged into a unitary dataset, containing 657,569 individuals. The analyses have been conducted only on the subsample of employed individuals aged from 25 to 40 for which the ISCO code was available (N=77,826). The modal educational level has been computed for each 3-digit occupational category, which is the finest information available in the Graduates' Survey. Due to data constraints, it has not been possible to distinguish between BA and MA degree. Thus, graduates are considered as overeducated if the modal educational level within their 3-digit occupational category is lower than a tertiary degree. Formally:

[13] The original formulation of the three questions in Italian was «Per accedere al suo attuale lavoro possedere una laurea è stato un requisito necessario?»; «Era necessaria una laurea qualsiasi, una laurea di una specifica area disciplinare o esclusivamente il suo tipo di laurea?»; «E per svolgere il suo lavoro, secondo lei, possedere una laurea è effettivamente necessario?».

[14] The employed occupational classification is CP2011, developed by ISTAT, which resembles the ISCO08 classification. The correspondence table of the two classifications can be found at the link http://www.istat.it/it/archivio/18132.

$$RM_{md_i} \equiv \begin{cases} 1 \; if \; mode_j < tertiary \; degree \\ 0 \; if \; mode_j \geq tertiary \; degree \end{cases}$$

3.3.3 Job Analysis indicator

As previously discussed, indicators based on JA are not available in Italy. In order to fill this gap, we exploit the unique opportunity to develop this kind of indicator using the information jointly collected in 2007 by ISTAT and ISFOL (Institute for the Development of Vocational Training for Workers).

Tab. 3.2 Set of competences included in the Survey on Professions

Sub-Area	Descriptors
Business Management and Accounting	Business management Desk work Economics and Accounting Marketing and Sales Customer service Human Resources Administration
Production Process	Production and Process Food production
Engineering and Technology	Computers and Electronics Engineering and Technology Technical Design Building and Construction Mechanics
Mathematics and Science	Mathematics Physics Chemistry Biology Psychology Sociology and Anthropology Geography
Health and Personal Services	Medicine and Dentistry Psychological Therapy and Counselling
Education and Training	Education and Training
Human and Social Sciences	Italian Language Foreign Language Arts History and Archaeology Philosophy and Theology
Legislation and Public Security	Civil Protection and Public Security Legislation and Institutions
Transport and Communications	Telecommunications Communication and Media Transports

During the Survey on Professions (*Indagine campionaria sulle professioni*), about 20 employees per occupational category (defined by the 5-digit coding) have been interviewed. The collected data cover a wide set of topic: from the formal characteristics of the job, to the tasks performed by workers, to the skills and knowledge required to do the job. It is especially the last information that has been used to develop a JA indicator of overeducation. Workers were asked to evaluate a) the importance of a set of 33 competences for the job performance on a scale of 1-5, and b) the level of complexity at which these competences are employed on the job on a scale of 1-7. Table 3.2 summarizes the set of competences, which were organized in 9 subareas, while the complete questionnaire is reported in the Appendix.

The available data are not individual, but aggregated at the occupation level. In other words, for each competence, the average levels of importance and complexity reported by interviewees within the occupational categories are provided, rescaled to a 0-100 range. In order to compare this information with data from the Survey on Graduates, we further averaged these values to the 3-digit occupational categories.

This wide set of information has been used to identify graduate and non-graduate jobs—and, consequently, overeducated and non-overeducated workers—following the procedure described above:

1. The set of 33 competences has been submitted to a little group of experts, who have been asked to evaluate at which level of complexity each competence can be considered as a «graduate competence». This question has been asked using the same formulation of the original questionnaire, as reported in the Appendix.
2. The information collected among experts has been compared with workers' evaluation, through the following steps:
    i. For each occupational category, the core competencies have been identified. These are the three most important competences, according to workers' evaluation, provided that they score at least 50 (theoretical mean) on the importance scale. The main assumption is that these competences are those necessary to perform the core business of the occupation.

ii. The average level of complexity, as evaluated by workers, is identified for the competences selected in the previous step.
iii. The level of complexity assessed by workers is compared with the evaluation of job experts. Graduate jobs are defined by having at least one core competence employed at a level of complexity which, according to the experts, is definable as standing at a «graduate's level».

3. This information is merged with data on tertiary graduates. An individual is considered as overeducated if his/her job is not classified as a graduate job. Formally:

$$JA_i \equiv \begin{cases} 1 \; if \; occupation \; with \; at \; least \; one \; graduate's \; competence \\ 0 \; otherwise \end{cases}$$

3.4 Empirical strategy

In the following sections the validity of the five indicators of overeducation is assessed. Following the literature reviewed in the previous chapter, we estimate a) the measurement sensitivity of the determinants of the phenomenon and b) the predictive value of indicators on three relevant outcomes, namely wage, job satisfaction and job search.

The determinants of overeducation (§ 3.6) are estimated by means of logit regression models, specified as follows:

$$\text{logit}(\hat{p}_i) = \alpha + \beta X_i + \varepsilon_i$$

where the dependent variable is a dummy for overeducation, measured through the five indicators described above, and X_i represents a vector of attributes for individual *i* that, according to the literature, are likely to affect individuals' risk to be overeducated. These are both socio-demographic and educational curriculum-related variables. Among the former, gender, age, geographical area, and parents' education and social class are included. The last two variables are constructed by taking the maximum value recorded between parents. Among the latter, two variables refer to individuals' upper secondary education, namely the type of

attended secondary school and the secondary graduation mark. Moreover, tertiary education related variables are included: matriculation year, field of study, graduation mark, years of graduation delay and type of tertiary degree. Finally, two dummies are included for having attained other formative activities after graduation and for having started the current job before or after graduation.

The effect of overeducation on the selected outcomes (§ 3.7) is estimated through regression models (OLS for earnings and job satisfaction, logistic for job search) that take the following general form:

$$\widehat{y_i} = \alpha + \beta x_{oe_i} + \beta X_i + \varepsilon_i$$

where y represents the dependent variables, namely earnings, job satisfaction and job search, x_{oe} is a dummy variable for overeducation (each time measured by one of the five indicators) and X_i is a vector of individual characteristics, which includes all the variables controlled for in the model for the determinants of overeducation, plus two variables for job characteristics. These are a dummy variable for full vs. part-time and one for stable vs. unstable job (where the unstable category includes fixed-term and atypical jobs).

Turning to the operationalization of the dependent variables, earnings are measured through the self-reported net monthly income, which is then transformed into its logarithmic form. The variable for job satisfaction is an index derived from a factor analysis applied to individuals' answers to the question: «How much are you satisfied with your current job with respect to...?». Graduates were asked to answer by referring to the following items: tasks, stability, autonomy, use of competences, wage, and career opportunities[15]. The possible answers go from 1 (not at all) to 4 (to a very high extent). The factor analysis reveals the existence of a unique underlying factor with an eigenvalue of 2.6. Finally, job search is a dummy variable which takes value 1 if the individual declares to be looking for a new job, 0 otherwise.

The distribution of these variables within the selected sample is reported in the following table.

[15] The original Italian question was «Lei quanto è soddisfatto del suo lavoro rispetto a…? Le mansioni che svolge; la stabilità o la sicurezza del posto di lavoro; il grado di autonomia sul lavoro; l'utilizzo delle conoscenze acquisite all'università; il trattamento economico; le possibilità di carriera».

Tab. 3.3 Distribution of monthly net wage, job satisfaction and job search

	Mean	Std. Dev.	Min	Max	Obs.
Wage	1,374	526.4	333	5,000	21,168
Job Satisfaction	0	1	-3.8	1.8	25,592
Job search	0.2	0.4	0	1	25,811

3.5 Descriptive results

3.5.1 The incidence of overeducation

The incidence of overeducation is reported in Table 3.4, which shows that this estimate is sensitive to the applied measurement method. Overeducation ranges from 29% on the basis of SA_g to 43% on the basis of RM_{md}, with the other SA and JA indicators similarly delivering mid-way estimates closer to the former.

Tab. 3.4 The incidence of overeducation by the main socio-demographic and education-related variables on the basis of different measures (N=25,811)

	SA_g	SA_{hm}	SA_p	RM_{md}	JA
Total	**28.9**	**32.9**	**31.4**	**43.4**	**31.0**
Sex					
Males	30.0	33. 9	32.1	44.1	29.4
Females	28.0	31.9	30.8	42.7	32.4
Geographic Area					
North	28.5	32.8	31.9	45.1	32.4
Centre	29.9	33.4	32.4	43.1	31.2
South and Islands	29.0	32.5	29.8	40.3	28.1
Type of degree					
Bachelor	33.2	36.4	31.4	44.6	33.4
Master	26.6	30.9	31.5	42.7	29.7
Field of study					
Mathematics	16.6	19.7	23.7	33.5	17.5
ICT and Engineering	21.5	24.1	29.8	37.2	16.9
Natural Sciences	38.9	43.7	39.3	59.0	41.4
Pharmacy, Veterinary	13.1	14.7	17.0	19.3	14.6
Medicine	2.9	3.7	6.1	1.4	0.8
Medical Professions	8.2	8.9	9.4	6.0	4.7
Architecture	23.7	25.4	25.8	29.9	17.3
Business and Administration, Statistics	39.5	45.4	45.1	72.4	65.9
Social sciences	51.7	60.8	52.0	67.9	58.4
Law	30. 9	35.9	30.3	46.0	40.6
Arts and Humanities	54.6	61.4	51.5	65.5	54.5

These figures are only partially in line with earlier findings in the literature. In particular, two differences are worth noting. First of all, while previous findings usually show that RM indicators deliver the lowest estimates (Groot and Maassen van den Brink, 2000; Verhaest and Omey 2006a), according to our results RM_{md} seems to overestimate the incidence of the phenomenon. This finding reflects the distribution of educational levels within occupations and might

be the combined result of two peculiar characteristics of the Italian case. On the one side, the expansion of tertiary education has been slower than in other countries, so that tertiary graduates are still likely to be a minority in many occupational categories. On the other side, it is widely acknowledged in the Italian literature that some high-level occupational categories are often held by non-graduates: this is, in particular, the case of small and medium entrepreneurs, which constitutes a big portion of the Italian service class (Barone and Assirelli, 2014).

The second important difference is that, although the various indicators—as expected—deliver significantly different estimates of the incidence of overeducation, these divergence is not as huge as the one often found in the literature. One reason for this difference might be the homogeneity of our sample, which is constituted by individuals belonging to the same graduation cohort, which have entered the labour market more or less in the same period, that are just at the beginning of their work careers, and that have acquired approximately the same amount of on-the-job experience. Our results are, in fact, more similar to those found by Battu *et al*. (2000), who analyzed British data only from tertiary graduates.

The other results do not always go in the expected direction. First of all, results concerning the distribution of overeducation across genders and geographical areas are ambiguous. On the one side, every indicator, with the only exception of JA, suggests that males are overeducated more frequently than females. This little difference, which is contrary to the empirical evidence on the disadvantaged role of women in the Italian labour market, can be explained by the analysed individuals being a selected sample of the population: it can be argued that individuals who succeed in attaining a tertiary degree are more motivated and able than those who do not. The same way of reasoning can be applied to the unexpected result found among individuals from different geographical areas: Northern graduates are, indeed, found to be more often overeducated than their Southern counterparts. These counterintuitive figures might also be the result of a compositional effect, due for example to the different distribution across fields of study of men and women and of individuals from different geographical areas. We will come back on this issue in the following paragraphs.

For what concerns the distribution of overeducation with respect to the main variables related to Higher Education, we observe a higher incidence of overeducation among BA graduates irrespectively of the applied measure, the only exception being the estimates delivered by SA_p that show no significant difference between BA and MA graduates. Moreover, as we expected, fields of study can be easily ranked according to the risk of overeducation suffered by their graduates. Medicine, Medical Professions, Pharmacy and Veterinary present the lowest incidence of overeducation, the Humanities and Social Sciences report the highest risks, and the other fields fall somewhere in between. Again, this result seems to hold true irrespectively of the employed measure, the only difference lying in the punctual estimates produced by different indicators and not in the general pattern of results.

3.5.2 Correspondence and correlation between different measures of overeducation

Table 3.5 reports, for each combination of two measures, the percentage of graduates that are equally classified as overeducated. It ranges from approximately 50% to 100%. Not surprisingly, RM_{md} has the lowest correspondence figure with the other measures: only half of the individuals classified as overeducated according to RM_{md} are overeducated also on the basis of the various SA measures. RM_{md} has a relatively high correspondence only with the JA measure.

Tab. 3.5 Correspondence percentages between different measures of overeducation

	SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g	100.0	100.0	69.0	75.7	58.1
SA_{hm}	88.1	100.0	66.2	74.6	58.0
SA_p	63.0	68.6	100.0	70.1	55.4
RM_{md}	50.5	56.5	50.9	100.0	71.5
JA	53.8	61.0	56.2	100.0	100.0

On the one side, 71.5% of graduates who are overeducated according to RM_{md} are overeducated also on the basis of JA; on the other side, all graduates classified as overeducated by the JA measure are overeducated on the basis of $RM_{md.}$ This high mutual correspondence does not surprise, since both RM_{md} and JA are occupation-based indicators, while the three SA measures are, by

definition, worker-based. It also comes with no surprise the high correspondence between SA_g and SA_{hm}, since the former, as previously described, is a sub-group of the latter.

For the same reasons, results reported in Table 3.6, which shows the correlation between different measures, go in the expected direction: RM_{md} and JA—that are the two occupation-based measures—register a high correlation, such as SA_g and SA_{hm}.

Tab. 3.6 Pearson's correlation between different measures of overeducation

	SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g	1.00				
SA_{hm}	0.91	1.00			
SA_p	0.51	0.52	1.00		
RM_{md}	0.42	0.44	0.37	1.00	
JA	0.37	0.40	0.36	0.77	1.00

Also the correlation between the other indicators—which is never lower than 0.3—is, however, higher than the one usually reported in the literature.

In order to provide a clearer insight on the level of accordance between the five measures, Table 3.7 reports the number of measures for which graduates in our sample are classified as being overeducated.

Tab. 3.7 Percentage of graduates classified as overeducated on the basis of* n *indicators

N of indicators	Total Sample	Bachelor	Master
0 (not overeducated)	43.2	41.9	45.5
1	11. 6	14.0	7.3
2	14.0	14.9	12.5
3	10.2	10.8	9.1
4	8.1	7.4	9.3
5	12.9	11.0	16.3
N	25,811	16,594	9,217

More than a half of the whole sample is equally classified on the basis of all five measures: 43.2% of graduates are adequately educated and 12.9% are overeducated on the basis of each and every measure. This result confirms that, as shown in the previous tables, the correspondence between the five measures is not so low. At the same time, it supports the claim that overeducation is not a negligible phenomenon: it is surely relevant—both from a methodological and substantive point of view—that more than one graduated out of ten is overeducated on the basis of *every* measure and that almost six graduates out of ten are overeducated on the basis of *at least one* indicator.

Tab. 3.8 Overeducation by occupational category on the basis of different measures of overeducation

Occupation	SA_a	SA_{hm}	SA_p	RM_{md}	JA	N
1.1.1	0.57	0.57	0.14	0	0	7
1.1.2	0.21	0.28	0.16	0	0	86
1.1.3	0.00	0.00	0.00	0	0	1
1.1.4	0.63	0.79	0.40	0	0	20
1.2.1	0.73	0.77	0.48	1	0	93
1.2.2	0.48	0.54	0.47	1	0	83
1.2.3	0.27	0.35	0.31	0	0	49
1.3.1	0.73	0.75	0.60	1	0	243
2.1.1	0.25	0.27	0.31	0	0	1,174
2.2.1	0.09	0.10	0.18	0	0	1,981
2.2.2	0.10	0.11	0.15	0	0	820
2.3.1	0.07	0.07	0.11	0	0	723
2.4.1	0.02	0.02	0.06	0	0	734
2.5.1	0.24	0.31	0.33	0	0	1,461
2.5.2	0.04	0.05	0.06	0	0	857
2.5.3	0.13	0.17	0.22	0	0	270
2.5.4	0.45	0.52	0.39	0	0	327
2.5.5	0.61	0.64	0.63	1	1	179
2.5.6	0.00	0.00	0.00	0	0	2
2.6.1	0.09	0.09	0.00	0	0	12
2.6.2	0.02	0.03	0.07	0	0	215
2.6.3	0.10	0.13	0.11	0	0	673
2.6.4	0.31	0.33	0.23	1	0	632
2.6.5	0.23	0.32	0.25	0	0	480
3.1.1	0.23	0.23	0.28	1	0	156
3.1.2	0.43	0.47	0.44	1	0	609
3.1.3	0.33	0.34	0.31	1	0	482
3.1.4	0.25	0.29	0.34	1	0	64
3.1.5	0.35	0.39	0.37	1	0	252
3.1.6	0.47	0.53	0.55	1	0	49
3.1.7	0.76	0.80	0.70	1	0	79
3.1.8	0.26	0.35	0.27	1	1	225
3.2.1	0.07	0.08	0.09	0	0	4,430
3.2.2	0.31	0.34	0.28	1	1	159
3.3.1	0.43	0.50	0.44	1	1	1,030
3.3.2	0.41	0.49	0.46	1	1	1,040
3.3.3	0.32	0.42	0.42	1	1	706
3.3.4	0.63	0.71	0.60	1	1	408
3.4.1	0.56	0.62	0.57	1	1	211
3.4.2	0.46	0.50	0.36	1	0	403
3.4.3	0.67	0.74	0.70	1	1	27
3.4.4	0.57	0.60	0.61	1	1	94
3.4.5	0.29	0.33	0.30	0	0	298
3.4.6	0.50	0.50	0.40	1	0	42
4.1.1	0.54	0.63	0.59	1	1	1,221
4.1.2	0.58	0.65	0.75	1	1	48
4.2.1	0.54	0.65	0.59	1	1	500
4.2.2	0.77	0.86	0.81	1	1	340
4.3.1	0.60	0.68	0.63	1	1	250
4.3.2	0.52	0.60	0.58	1	1	173
4.4.1	0.63	0.67	0.57	1	1	90
4.4.2	0.40	0.60	0.46	1	1	35
5.1.1	0.86	0.88	0.81	1	1	188
5.1.2	0.87	0.90	0.84	1	1	300
5.1.3	0.64	0.75	0.74	1	1	57
5.2.1	0.86	0.86	0.86	1	1	7
5.2.2	0.97	0.98	0.94	1	1	124
5.2.3	0.77	0.83	0.56	1	1	36
5.3.1	0.58	0.63	0.42	1	1	19
5.4.1	0.88	0.88	0.88	1	1	8
5.4.2	0.64	0.64	0.45	1	1	22
5.4.3	0.75	0.75	0.56	1	1	16

(continue)

Occupation	SA_a	SA_{hm}	SA_p	RM_{md}	JA	N
5.4.4	0.60	0.63	0.51	1	1	73
5.4.5	0.50	0.50	1.00	1	1	2
5.4.6	0.71	0.71	0.57	1	1	7
5.4.8	0.88	0.89	0.76	1	1	80
6.1.1	1.00	1.00	1.00	1	1	1
6.1.2	1.00	1.00	1.00	1	1	3
6.1.3	1.00	1.00	1.00	1	1	7
6.1.4	1.00	1.00	1.00	1	1	2
6.1.5	1.00	1.00	1.00	1	1	3
6.2.1	0.75	0.75	1.00	1	1	4
6.2.3	1.00	1.00	1.00	1	1	8
6.2.4	0.80	0.80	0.90	1	1	10
6.3.1	0.90	0.90	0.90	1	1	10
6.3.2	0.75	0.75	0.75	1	1	4
6.3.3	0.75	0.75	0.75	1	1	4
6.3.4	0.50	0.50	0.50	1	1	2
6.4.1	0.91	0.96	0.83	1	1	23
6.4.2	1.00	1.00	0.50	1	1	2
6.4.3	0.67	0.67	1.00	1	1	6
6.5.1	0.88	0.94	0.94	1	1	17
6.5.2	1.00	1.00	1.00	1	1	5
6.5.3	1.00	1.00	0.86	1	1	7
6.5.4	1.00	1.00	1.00	1	1	2
6.5.5	1.00	1.00	1.00	1	1	2
7.1.1	1.00	1.00	1.00	1	1	1
7.1.2	1.00	1.00	1.00	1	1	1
7.1.3	0.00	0.00	0.00	1	1	1
7.1.5	1.00	1.00	0.80	1	1	5
7.1.6	1.00	1.00	1.00	1	1	1
7.1.7	1.00	1.00	1.00	1	1	1
7.2.2	1.00	1.00	1.00	1	1	1
7.2.3	1.00	1.00	0.50	1	1	2
7.2.5	1.00	1.00	1.00	1	1	1
7.2.6	1.00	1.00	1.00	1	1	3
7.2.7	0.00	0.00	0.00	1	1	2
7.3.2	0.80	0.80	1.00	1	1	5
7.4.1	1.00	1.00	1.00	1	1	4
7.4.2	0.94	0.94	0.88	1	1	17
7.4.3	1.00	1.00	1.00	1	1	1
7.4.4	0.50	1.00	0.50	1	1	2
8.1.2	0.50	0.50	1.00	1	1	2
8.1.3	1.00	1.00	1.00	1	1	12
8.1.4	0.89	0.89	0.89	1	1	9
8.1.5	0.86	0.86	0.86	1	1	7
8.1.6	0.93	0.93	0.86	1	1	14
8.2.1	1.00	1.00	1.00	1	1	2
8.2.2	1.00	1.00	1.00	1	1	4
8.3.1	0.86	0.86	0.86	1	1	7
8.4.2	1.00	1.00	1.00	1	1	2
8.4.3	1.00	1.00	1.00	1	1	7
9.1.1	0.11	0.15	0.14	1	1	65
9.2.1	0.79	0.86	0.57	1	1	14
9.3.1	0.50	0.50	0.36	1	1	14

Results from previous tables indicate how much indicators agree in defining *individuals* as overeducated. Table 3.8, instead, shows the level of accordance between different indicators in classifying an *occupational category* as adequate or not for graduates. The columns referring to RM_{md} and JA only present the values 0 and 1, where 1 indicates overeducation. On the contrary, columns

referring to the three SA indicators report values between 0 and 1, which represent, for each occupational category, the proportion of overeducated workers. The number of graduates in our sample per occupational category is reported in the last column.

It is immediately clear that the five indicators completely agree in identifying as non-graduate jobs those belonging to the groups 4 (Clerical workers), 5 (Service and Sales Workers), 6 (Craft, skilled manual workers and agricultural, forestry and fishery workers), 7 (Plant and machine operators) and 8 (Other elementary workers)[16]. The five measures generally agree also in considering the occupational categories included in Group 2 (Professionals) as adequate for graduates. The higher disagreement can be found in correspondence of the occupations belonging to the Groups 1 (Managers and Legislators) and 3 (Technicians and Associate Professionals). It is interesting to note that, while in the former case SA indicators are the most pessimistic, in the latter case occupations are more often defined as not adequate for graduates on the basis of RM_{md}. JA sometimes resembles RM_{md}, while in some other cases offers results more similar to that of the various SA indicators. This finding suggest that SA indicators better capture the utilization of skills on-the-job, while statistical indicators merely represent the distribution of educational levels within occupational categories. In the group of technicians, in fact, we found jobs that, until recent years, were held by non-graduate workers. On the contrary, in the Group 1, we find managerial professions traditionally held by tertiary graduates.

3.6 The determinants of overeducation

In this paragraph the determinants of overeducation are investigated across indicators and the sensitivity of these estimates to the employed measure is assessed. In order to have comparable results across different measures, Table 3.9[17] reports average marginal effects instead of logit coefficients.

16 In these cases, the disagreement is generally attributable to the little number of graduates employed in the occupational category (see, for example, the occupational category 7.1.3)

17 The same analyses have been conducted separately for BA and MA graduates (results reported in the Appendix). However, the general pattern of results does not change.

We start our discussion with results that are consistent across measures. Some factors are clearly not relevant for the explanation of overeducation, regardless of the employed measure: these are, in particular, the matriculation year and the level of parents' education. Both results are not surprising: on the one side, the eventual association between the year of matriculation and overeducation is likely to be hidden by the included variable for the number of years of graduation delay (which is, indeed, significantly associated with the dependent variables); on the other side, the effect of parents' education is likely to be mediated by the effect of social origin (also in this case the coefficients are indeed statistically significant).

Tab. 3.9 The determinants of overeducation. Logit models, average marginal effects

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.01	0.01	0.020***	0.017**	0.044***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Age		0.005***	0.006***	-0.001	-0.005***	-0.005***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.005	-0.003	0.000	-0.005	-0.007
		(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
	Upper secondary	-0.01	-0.003	0.006	0.005	0.003
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	Tertiary	-0.027*	-0.024	-0.002	-0.008	-0.013
		(0.013)	(0.014)	(0.014)	(0.014)	(0.013)
	NA	-0.018	-0.006	-0.049	-0.033	-0.007
		(0.042)	(0.043)	(0.043)	(0.045)	(0.042)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.054***	-0.050***	-0.024	-0.078***	-0.029*
		(0.014)	(0.015)	(0.015)	(0.015)	(0.013)
	Managers	-0.066***	-0.049**	-0.02	-0.057***	-0.002
		(0.016)	(0.016)	(0.016)	(0.016)	(0.015)
	Clerks	-0.034**	-0.031**	0.001	-0.045***	0.009
		(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
	Self-Employed	-0.027*	-0.024	0.008	-0.038**	0.008
		(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
	Executive workers	-0.036**	-0.035**	-0.002	-0.034*	0.012
		(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
	Manual workers	-0.041**	-0.039**	0.007	-0.033*	0.011
		(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
	NA	-0.025	-0.018	0.016	-0.029	0.006
		(0.029)	(0.03)	(0.032)	(0.031)	(0.029)
Area of Athenaeum	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.017*	0.009	0.017*	-0.002	0.001
		(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
	South and Islands	0.013*	0.008	0.002	-0.026***	-0.011
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Type of secondary degree	Scientific lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical lyceum	-0.011	-0.005	-0.008	-0.030***	-0.020*
		(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
	Other lyceum	-0.005	-0.005	-0.007	0.039***	-0.015
		(0.009)	(0.009)	(0.01)	(0.01)	(0.009)
	Technical school	0.013*	0.016*	0.016*	0.020**	0.004
		(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
	Vocational school	0.018	0.019	0.014	0.041**	0.033*
		(0.013)	(0.013)	(0.014)	(0.014)	(0.013)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Secondary graduation mark		-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.016	0.006	0.000	-0.003	0.000
		(0.008)	(0.009)	(0.009)	(0.009)	(0.008)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.007	-0.002	0.029	0.001	-0.029*
		(0.015)	(0.015)	(0.015)	(0.016)	(0.014)
	Natural Sciences	0.172***	0.184***	0.121***	0.192***	0.215***
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	Pharmacy, Veterinary	-0.083***	-0.100***	-0.089***	-0.219***	-0.061***
		(0.021)	(0.022)	(0.023)	(0.023)	(0.021)
	Medicine	-0.177***	-0.200***	-0.178***	-0.394***	-0.204***
		(0.017)	(0.018)	(0.019)	(0.016)	(0.014)
	Medical Professions	-0.169***	-0.200***	-0.198***	-0.385***	-0.188***
		(0.014)	(0.015)	(0.015)	(0.015)	(0.013)
	Architecture	0.041*	0.023	0.004	-0.078***	-0.013
		(0.017)	(0.018)	(0.018)	(0.018)	(0.017)
	Business, Administration, Statistics	0.166***	0.188***	0.161***	0.300***	0.430***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.015)
	Social sciences	0.300***	0.353***	0.236***	0.264***	0.364***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
	Law	0.095***	0.102***	0.033	0.078***	0.213***
		(0.017)	(0.018)	(0.017)	(0.018)	(0.017)
	Arts and Humanities	0.338***	0.365***	0.247***	0.252***	0.347***
		(0.017)	(0.017)	(0.018)	(0.018)	(0.017)
	Education, Psychology	0.109***	0.113***	0.023	0.158***	-0.055***
		(0.018)	(0.018)	(0.018)	(0.019)	(0.016)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.015	-0.023	-0.005	-0.007	-0.001
		(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
	101-105	-0.027*	-0.030**	-0.008	-0.017	-0.016
		(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
	106-110	-0.046***	-0.053***	-0.029*	-0.031**	-0.021
		(0.011)	(0.012)	(0.012)	(0.012)	(0.011)
	110 cum laude	-0.070***	-0.074***	-0.064***	-0.047***	-0.048***
		(0.012)	(0.012)	(0.013)	(0.012)	(0.012)
Type of degree	Pre-reform	Ref.	Ref.	Ref.	Ref.	Ref.
	Master	0.014	0.024**	0.073***	-0.029**	0.036***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	Bachelor	0.161***	0.168***	0.113***	0.152***	0.140***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Graduation delay		0.017***	0.021***	0.022***	0.004	0.013***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.064***	-0.065***	-0.055***	-0.068***	-0.053***
		(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.189***	-0.174***	-0.101***	-0.058***	-0.003
		(0.011)	(0.011)	(0.011)	(0.01)	(0.009)
Pseudo R2		0.165	0.177	0.106	0.234	0.239
N		25,518	25,518	25,811	25,811	25,811

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Some factors are instead found to be consistently relevant for the explanation of overeducation, meaning that both the direction and the magnitude of the association are similar across measures. These are mainly education-related variables. Secondary and tertiary graduation marks are found to be negatively associated with the risk of overeducation, which is also found to be higher among BA graduates. As expected, one of the main relevant variables is field of study. Results reported in Table 3.9 resemble the bivariate findings shown in Table 3.1: overeducation measures deliver almost the same ranking of fields of study on the basis of the corresponding risk of overeducation. On the one side, we have fields that yield the lowest risk of overeducation: these are Medicine, Medical Professions, Pharmacy and Veterinary. On the other side, the Humanities, Social Sciences, Education, Psychology, Natural Sciences, Economics and Statistics present the highest risk of overeducation. The third group, which stays in the middle, includes Mathematics, Architecture and Engineering. For what concerns the other factors, outcomes are sensitive to the employed measure. In particular, the compared indicators disagree in correspondence of the main socio-demographic variables. First of all, the coefficient for women is positive and statistically significant on the basis of SA_p, RM_{md} and JA, while is not significant on the basis of SA_g and SA_{hm}. Again, age is found to be positively correlated with overeducation measured by SA_g and SA_{hm}, not statistically correlated with overeducation measured by SA_p, and negatively correlated with overeducation measured by RM_{md} and JA. Also the evidence concerning the incidence of overeducation across Italian regions—which does not confirm at all the bivariate results reported in Table 3.3—provides inconsistent results. According to SA_g, overeducation is more widespread in the Centre and in the South of Italy, while RM_{md} delivers opposed results. The last interesting result concerns the association between social origin and overeducation, which is statistically significant according to SA_g, SA_{hm} and RM_{md}, but not according to SA_p and JA.

As suggested by van der Velden and van Smoorenburg (1997), the differences between indicators might be partially driven by objective indicators, such as RM_{md} and JA, being occupation-based, while the three SA indicators being, by definition, subjective. For this reason, Table 3.10 reports the estimates of the determinants of overeducation, measured with three new indicators: these are simple averages, by occupational category, of the three SA indicators. In other

words, each occupational category is considered not adequate for graduates if the majority of individuals belonging to that category are overeducated according to the original SA indicators (see Tab. 3.8). The general pattern of results does not significantly change, but, as expected, the differences between objective and subjective indicators slightly decrease. In particular, the coefficients for gender and age are now found to be more similar to the one delivered by RM_{md} and JA: women and younger individuals present a higher risk of overeducation.

Tab. 3.10 The determinants of overeducation with dummy indicators. Logit models, average marginal effects

		SA_{g_job}	SA_{hm_job}	SA_{p_job}
Sex	Male	Ref.	Ref.	Ref.
	Female	0.026***	0.012**	0.029***
		(0.005)	(0.005)	(0.005)
Age		-0.003***	-0.002**	-0.003***
		(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.
	Lower secondary	0.008	0.010	0.005
		(0.010)	(0.010)	(0.010)
	Upper secondary	0.015	0.022**	0.012
		(0.010)	(0.011)	(0.010)
	Tertiary	0.007	0.017	0.001
		(0.012)	(0.012)	(0.012)
	NA	-0.003	-0.001	-0.010
		(0.036)	(0.038)	(0.036)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.
	Professionals	-0.057***	-0.067***	-0.040***
		(0.012)	(0.013)	(0.012)
	Managers	-0.062***	-0.073***	-0.043***
		(0.014)	(0.014)	(0.013)
	Clerks	-0.045***	-0.059***	-0.026**
		(0.010)	(0.011)	(0.010)
	Self-Employed	-0.028**	-0.036***	-0.011
		(0.011)	(0.012)	(0.011)
	Executive workers	-0.044***	-0.054***	-0.027**
		(0.011)	(0.012)	(0.011)
	Manual workers	-0.033***	-0.045***	-0.015
		(0.011)	(0.012)	(0.011)
	NA	-0.028	-0.039	-0.010
		(0.026)	(0.027)	(0.026)
Area of residence	North	Ref.	Ref.	Ref.
	Centre	0.014**	0.016***	0.016***
		(0.006)	(0.006)	(0.006)
	South and Islands	0.012**	0.012**	0.015**
		(0.006)	(0.006)	(0.006)
Type of secondary degree	Scientific lyceum	Ref.	Ref.	Ref.
	Classical lyceum	-0.007	-0.004	-0.008
		(0.007)	(0.008)	(0.007)
	Other lyceum	-0.004	-0.023***	-0.003
		(0.008)	(0.008)	(0.008)
	Technical school	0.001	0.000	0.001
		(0.006)	(0.006)	(0.006)
	Vocational school	0.027**	0.033**	0.027**
		(0.012)	(0.013)	(0.012)
Secondary graduation mark		-0.001***	-0.001***	-0,001***
		(0.000)	(0.000)	(0.000)

(continue)

		SA_{g_job}	SA_{hm_job}	SA_{p_job}
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.
	1998-1999 or before	-0.006	-0.005	-0.005
		(0.007)	(0.008)	(0.007)
Field of study	Mathematics	Ref.	Ref.	Ref.
	ICT and Engineering	-0.032***	-0.039***	-0.025**
		(0.012)	(0.012)	(0.012)
	Natural Sciences	0.158***	0.160***	0.159***
		(0.017)	(0.017)	(0.017)
	Pharmacy, Veterinary	-0.010	-0.007	-0.005
		(0.018)	(0.020)	(0.018)
	Medicine	-0.113***	-0.123***	-0.107***
		(0.013)	(0.014)	(0.013)
	Medical Professions	-0.109***	-0.124***	-0.105***
		(0.011)	(0.012)	(0.011)
	Architecture	0.047***	0.038**	0.051***
		(0.015)	(0.015)	(0.015)
	Business and Administration, Statistics	0.202***	0.196***	0.198***
		(0.014)	(0.014)	(0.013)
	Social sciences	0.298***	0.356***	0.291***
		(0.015)	(0.016)	(0.015)
	Law	0.123***	0.124***	0.128***
		(0.015)	(0.015)	(0.015)
	Arts and Humanities	0.340***	0.428***	0.337***
		(0.016)	(0.016)	(0.016)
	Education, Psychology	0.019	0.162***	0.009
		(0.014)	(0.016)	(0.014)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.
	91-100	0.000	0.000	0.000
		(0.010)	(0.010)	(0.010)
	101-105	-0.020**	-0.020**	-0.010
		(0.010)	(0.010)	(0.010)
	106-110	-0.020**	-0.030***	-0.020**
		(0.010)	(0.010)	(0.010)
	110 cum laude	-0.050***	-0.050***	-0.050***
		(0.010)	(0.010)	(0.010)
Type of tertiary degree	Pre-reform	Ref.	Ref.	Ref.
	Master	0.016**	0.029***	0.019**
		(0.008)	(0.008)	(0.008)
	Bachelor	0.116***	0.128***	0.116***
		(0.007)	(0.007)	(0.007)
Years of graduation delay		0.014***	0.016***	0.015***
		(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.
	Yes	-0.046***	-0.044***	-0.044***
		(0.005)	(0.005)	(0.005)
Current job started	Before graduation	Ref.	Ref.	Ref.
	After graduation	-0.033***	-0.072***	-0.031***
		(0.009)	(0.009)	(0.009)
Pseudo R2		0.183	0.198	0.180
N		25,811	25,811	25,811

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

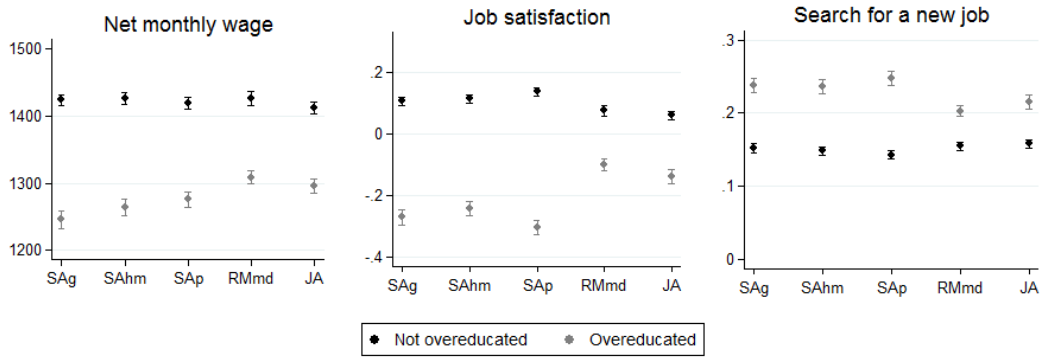
3.7 The effects of overeducation

So far, we have seen that results are sensitive to the employed measurement instrument. The incidence of overeducation varies across indicators, whose correlation and correspondence are, however, a little bit higher than expected.

Moreover, our results suggest the pattern of determinants to be similar across measures, with the only relevant exception concerning the influence of socio-demographic variables. We have shown, though, that a huge part of this difference derives from the different nature of the compared indicators: RM_{md} and JA are fixed within occupations, while the three SA vary individually.

In the following, the criterion validity of the five instruments is examined, by investigating their predictive value for three relevant criteria: earnings, job satisfaction and job search. A first look at descriptive results (Fig. 3.1) confirms that these variables are significantly associated with overeducation: overeducated workers earn lower wages, are less satisfied with their jobs and look more frequently for a new occupation. These findings are robust over measures. However, SA indicators generally deliver a wider gap between overeducated and correctly allocated individuals.

Fig. 3.1 Net monthly wage, job satisfaction, and job search by overeducation status



3.7.1 Overeducation and earnings

Table 3.11 illustrates the results of OLS models for the logarithm of net monthly income. In addition to the dummy indicator of overeducation, control variables are included as described in the Empirical strategy section.

All the included covariates go in the expected direction. For what concerns the main socio-demographic variables, we observe, for example, that women earn significantly less (nearly 10%) than men and that wages tend to increase with age. Additionally, as expected, earnings are significantly higher in Northern than

Southern Italian regions, and are significantly associated with graduates' social origin. Also the variables for graduates' educational curriculum—that might be considered as proxy of ability and motivation—affect wages as predicted by the literature: on the one side, the higher the secondary and tertiary graduation marks, the higher wages graduates will earn; on the other side, a lower income is observed for graduates coming from vocational and technical upper secondary education, and for individuals who have delayed graduation. Finally, wages strongly differ across fields of study—with a net advantage of scientific and technical fields—and on the basis of job characteristics: unstable contracts and part time work guarantee lower earnings.

Turning to the indicators of interest, we observe that, as expected, overeducated individuals earn less than adequately educated counterparts. However, this negative effect is found to be statistically significantly only when overeducation measured by subjective indicators: overeducated workers earn around 5% less than adequately matched graduates. On the contrary, the coefficients for RM_{md} and JA are found not to be statistically significant, although they present the expected negative sign.

This unexpected result might somehow depend on the different nature of the analysed indicators. The absence of results for the occupation-based indicator—RM_{md} and JA—may be partly due to the combination of two circumstances: the risk of overeducation is not equally distributed among BA and MA graduates and, at the same time, the former are likely to hold lower-level occupational positions and to earn lower wages then the latter. In other words, these not significant findings may be the result of a compositional effect, which depends from a different distribution of BA and MA graduates in graduate and non-graduate jobs, and in high- or low-wage profile jobs.

In order to test this hypothesis, the same models have been conducted separately on BA and MA graduates. As expected, results significantly change (see Tab. C.1 and C.2 in the Appendix). Among BA graduates we observe that overeducated workers earn significantly less—from about 6% to more than 9%—than their adequately matched counterparts. Not surprisingly, the higher coefficient is that for SA_p, which also produce a larger increase in the explanatory power of the model. Oddish results are instead found among MA graduates.

Tab. 3.11 The effect of overeducation on earnings. OLS models.

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.059***				
		(0.005)				
SA_{hm}			-0.046***			
			(0.005)			
SA_p				-0.052***		
				(0.005)		
RM_{md}					-0.006	
					(0.005)	
JA						-0.006
						(0.005)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.091***	-0.091***	-0.090***	-0.091***	-0.091***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age		0.007***	0.007***	0.007***	0.007***	0.007***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.001	-0.001	-0.002	-0.002	-0.002
		(0.010)	(0.010)	(0.009)	(0.010)	(0.010)
	Upper secondary	0.000	0.001	0.000	0.000	0.000
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	Tertiary	0.010	0.010	0.010	0.010	0.010
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	NA	0.006	0.007	0.002	0.002	0.002
		(0.043)	(0.044)	(0.044)	(0.044)	(0.044)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.032*	-0.031*	-0.031*	-0.030*	-0.030*
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	Managers	0.024	0.025	0.026	0.026	0.027*
		(0.014)	(0.014)	(0.013)	(0.013)	(0.013)
	Clerks	-0.036**	-0.036**	-0.033**	-0.033**	-0.033**
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	Self-Employed	-0.033**	-0.032**	-0.029**	-0.030**	-0.030**
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Executive workers	-0.050***	-0.050***	-0.048***	-0.048***	-0.048***
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Manual workers	-0.046***	-0.045***	-0.043***	-0.043***	-0.043***
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	NA	-0.029	-0.028	-0.016	-0.019	-0.019
		(0.025)	(0.025)	(0.025)	(0.025)	(0.025)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Area of residence	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.048***	-0.049***	-0.048***	-0.048***	-0.048***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	South and Islands	-0.097***	-0.097***	-0.097***	-0.098***	-0.098***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Type of secondary degree	Scientific lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical lyceum	-0.011	-0.008	-0.008	-0.008	-0.008
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
	Other lyceum	0.010	0.010	0.010	0.011	0.011
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Technical school	-0.012*	-0.012*	-0.011*	-0.012*	-0.012*
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	Vocational school	-0.027*	-0.027*	-0.025*	-0.025*	-0.025*
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Secondary graduation mark		0.001***	0.001***	0.001***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.010	-0.011	-0.010	-0.011	-0.011
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.046***	0.046***	0.045***	0.043***	0.043***
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Natural Sciences	-0.100***	-0.101***	-0.102***	-0.107***	-0.107***
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Pharmacy, Veterinary	-0.034	-0.032	-0.036	-0.033	-0.032
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	Medicine	0.229***	0.230***	0.230***	0.234***	0.235***
		(0.018)	(0.018)	(0.017)	(0.018)	(0.017)
	Medical Professions	0.056***	0.058***	0.058***	0.066***	0.067***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Architecture	-0.131***	-0.132***	-0.133***	-0.135***	-0.134***
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Business and Administration, Statistics	0.011	0.010	0.009	0.002	0.003
		(0.011)	(0.012)	(0.011)	(0.012)	(0.012)
	Social sciences	-0.056***	-0.056***	-0.060***	-0.070***	-0.069***
		(0.012)	(0.013)	(0.012)	(0.012)	(0.013)
	Law	-0.113***	-0.114***	-0.118***	-0.121***	-0.120***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Arts and Humanities	-0.109***	-0.111***	-0.117***	-0.128***	-0.127***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Education, Psychology	-0.081***	-0.081***	-0.083***	-0.082***	-0.083***
		(0.013)	(0.014)	(0.013)	(0.013)	(0.013)

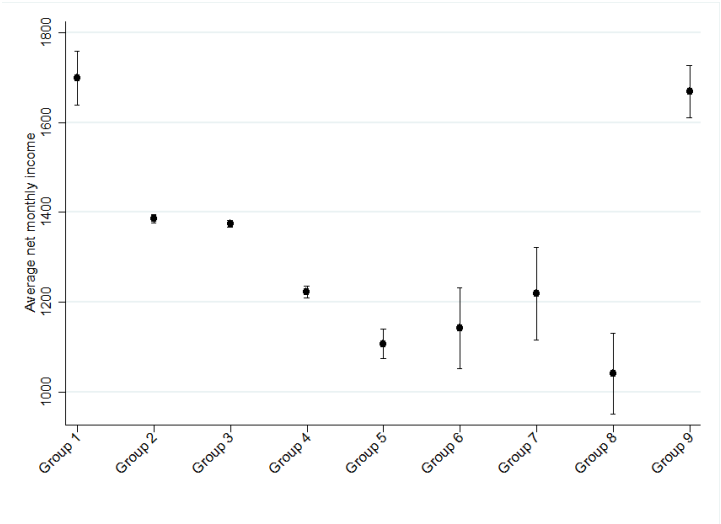
(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	0.007	0.007	0.008	0.008	0.008
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	101-105	0.010	0.010	0.011	0.012	0.012
		(0.010)	(0.010)	(0.011)	(0.012)	(0.012)
	106-110	0.012	0.013	0.014	0.015	0.015
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	110 cum laude	0.033**	0.033***	0.032**	0.035***	0.035***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Type of tertiary degree	Pre-reform	Ref.	Ref.	Ref.	Ref.	Ref.
	Master	0.015	0.016*	0.018*	0.014	0.014
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Bachelor	-0.004	-0.006	-0.011	-0.016	-0.016*
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Years of graduation delay		-0.017***	-0.017***	-0.017***	-0.018***	-0.018***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.017**	-0.016**	-0.016**	-0.013**	-0.013**
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.004	0.000	0.001	0.006	0.007
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.077***	-0.077***	-0.076***	-0.077***	-0.077***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.464***	-0.466***	-0.469***	-0.471***	-0.471***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Constant		7.107***	7.102***	7.111***	7.093***	7.091***
		0.036	0.036	0.036	0.036	0.036
R2		0.326	0.324	0.326	0.322	0.322
N		20,197	20,197	21,168	21,168	21,168

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Coefficients for SA_g, SA_{hm} and SA_p slightly decrease, but they still remain statistically significant; the coefficient for JA changes sign, though still being not significant; finally, the coefficient for RM_{md} even become positive and statistically significant, meaning that overeducated individuals, according to this measure, earn more than adequately educated workers. This result is quite surprising, if compared with the main findings in the literature, but is perfectly in line with the figures depicted in Tab. 3.8. According to the RM criterion we can indeed observe a prevalence of overeducation among individuals employed as Technicians and Associate Professionals (Group 3) and Armed Forces (Group 9): not only these workers are often considered as adequately educated by the other indicators but, as reported in Figure 3.2, they are also likely to earn relatively high wages.

Fig. 3.2 Average net monthly income by 1-digit occupational category



3.7.2 Overeducation and job satisfaction

Table 3.12 reports the estimation results for the analysis of job satisfaction. Also in this case, the coefficients for the included covariates go in the expected direction: job satisfaction seems to be directly associated with the factors that, according to the literature, help graduates in obtaining a better job position (in terms of prestige of the occupation, wages, contract stability, working time, etc.). We can observe, indeed, that females are significantly less satisfied than males,

Tab. 3.12 The effect of overeducation on job satisfaction. OLS models

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.296***				
		(0.014)				
SA_{hm}			-0.279***			
			(0.014)			
SA_p				-0.387***		
				(0.013)		
RM_{md}					-0.112***	
					(0.014)	
JA						-0.178***
						(0.015)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.122***	-0.121***	-0.115***	-0.12***	-0.114***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Age		-0.004*	-0.004*	-0.005**	-0.005**	-0.005**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.016	-0.015	-0.015	-0.017	-0.017
		(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
	Upper secondary	0.018	0.02	0.022	0.019	0.02
		(0.027)	(0.027)	(0.026)	(0.027)	(0.027)
	Tertiary	-0.004	-0.002	0.003	0.001	0
		(0.031)	(0.031)	(0.03)	(0.031)	(0.03)
	NA	0.044	0.048	0.032	0.044	0.046
		(0.097)	(0.097)	(0.096)	(0.098)	(0.097)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.057	-0.055	-0.046	-0.046	-0.042
		(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
	Managers	-0.026	-0.02	-0.019	-0.018	-0.011
		(0.037)	(0.037)	(0.036)	(0.037)	(0.037)
	Clerks	-0.122***	-0.12***	-0.111***	-0.115***	-0.108***
		(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
	Self-employed	-0.114***	-0.112***	-0.103***	-0.11***	-0.104***
		(0.03)	(0.03)	(0.029)	(0.03)	(0.03)
	Executive workers	-0.179***	-0.177***	-0.167***	-0.17***	-0.164***
		(0.03)	(0.03)	(0.029)	(0.03)	(0.03)
	Manual workers	-0.129***	-0.127***	-0.112***	-0.117***	-0.112***
		(0.03)	(0.03)	(0.029)	(0.03)	(0.03)
	NA	-0.086	-0.083	-0.089	-0.098	-0.093
		(0.067)	(0.067)	(0.065)	(0.066)	(0. 066)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Area of residence	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.113***	-0.116***	-0.115***	-0.121***	-0.12***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	South and Islands	-0.164***	-0.166***	-0.172***	-0.173***	-0.172***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.021	-0.019	-0.019	-0.019	-0.02
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	Other Lyceum	0.06**	0.06**	0.058**	0.065**	0.059**
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
	Technical school	0.001	0.001	0.002	-0.002	-0.003
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Vocational school	0.002	0.002	-0.002	-0.002	-0.001
		(0.029)	(0.029)	(0.028)	(0.029)	(0.028)
Secondary graduation mark		0.003***	0.003***	0.003***	0.003***	0.003***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.023	-0.026	-0.025	-0.025	-0.025
		(0.02)	(0.02)	(0.019)	(0.019)	(0.019)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	-0.006	-0.007	0.005	-0.007	-0.013
		(0.032)	(0.032)	(0.031)	(0.032)	(0.032)
	Natural Sciences	-0.01	-0.007	-0.007	-0.029	-0.015
		(0.039)	(0.039)	(0.038)	(0.039)	(0.039)
	Pharmacy, Veterinary	0.065	0.064	0.061	0.07	0.082
		(0.053)	(0.052)	(0.051)	(0.052)	(0.052)
	Medicine	0.45***	0.448***	0.437***	0.45***	0.463***
		(0.046)	(0.046)	(0.045)	(0.046)	(0.046)
	Medical Professions	0.1**	0.099**	0.085*	0.122***	0.126***
		(0.035)	(0.035)	(0.035)	(0.036)	(0.035)
	Architecture	-0.207***	-0.21***	-0.211***	-0.221***	-0.215***
		(0.037)	(0.037)	(0.036)	(0.037)	(0.037)
	Business and Administration, Statistics	0.144***	0.149***	0.163***	0.135***	0.176***
		(0.032)	(0.032)	(0.032)	(0.033)	(0.033)
	Social sciences	-0.077	0.006	0.001	-0.057	-0.024
		(0.035)	(0.035)	(0.034)	(0.035)	(0.035)
	Law	0.062	0.065	0.051	0.046	0.074*
		(0.036)	(0.036)	(0.035)	(0.036)	(0.036)
	Arts and Humanities	0.011	0.016	0.013	-0.046	-0.016
		(0.036)	(0.036)	(0.035)	(0.036)	(0.036)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Education, Psychology	0.122***	0.124***	0.105**	0.121***	0.091*
		(0.037)	(0.037)	(0.036)	(0.037)	(0.037)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	0.029	0.026	0.03	0.031	0.032
		(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
	101-105	0.018	0.017	0.025	0.026	0.025
		(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	106-110	0.031	0.029	0.035	0.042	0.042
		(0.026)	(0.026)	(0.025)	(0.026)	(0.026)
	110 cum laude	0.066*	0.065*	0.063*	0.081**	0.078*
		(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Type of tertiary degree	Pre-reform	Ref.	Ref.	Ref.	Ref.	Ref.
	Master	0.02	0.023	0.048*	0.0116	0.026
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
	Bachelor	0.071***	0.069***	0.068***	0.038	0.048*
		(0.02)	(0.02)	(0.019)	(0.02)	(0.02)
Years of graduation delay		-0.039***	-0.038***	-0.038***	-0.045***	-0.044***
		(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.03*	-0.029*	-0.032**	-0.017	-0.019
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.048*	-0.039	-0.025	0.01	0.017
		(0.024)	(0.024)	(0.023)	(0.023)	(0.03)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.401***	-0.400***	-0.395***	-0.401***	-0.401***
		(0.015)	(0.015)	(0.014)	(0.015)	(0.015)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.324***	-0.328***	-0.325***	-0.344***	-0.343***
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	NA	-0.240***	-0.243***	-0.239***	-0.251***	-0.256***
		(0.025)	(0.025)	(0.024)	(0.025)	(0.025)
Constant		0.360	0.0352	0.406	0.301	0.286
		(0.097)	(0.097)	(0.095)	(0.097)	(0.096)
R2		0.136	0.135	0.150	0.124	0.126
N		25,301	25,301	25,592	25,592	25,592

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

that job satisfaction decreases as we move from Northern to Southern Italy, and that social origins play a relevant role, with sons of lower classes less satisfied than individuals from the Service Class. Interestingly, we find that job satisfaction is slightly affected by graduates' educational achievement: only the coefficients for secondary graduation mark and years of graduation delay are found to be significantly associated with, respectively, higher and lower level of job satisfaction. Also field of study seems not to play a relevant role in determining the level of satisfaction. However, we can observe some important exceptions: graduates from Medicine, Medical Professions, Business and Administration, Education and Psychology are much more satisfied with their jobs. Finally, as expected, job satisfaction is significantly associated with job characteristics: part-timers and unstable workers are found to be less satisfied then, respectively, full-time and stable workers.

In line with earlier findings (Allen and Van der Velden, 2001; Verhaest and Omey, 2006c), all the coefficients for the overeducation dummies are negative and statistically significant, meaning that overeducated workers are less satisfied with their job than adequately matched individuals, regardless of the measurement instruments. The difference between indicators in terms of magnitude is, however, appreciable. In particular, as expected (Battu *et al.*, 2000), SA_p yields the biggest coefficient, while the lowest association with job satisfaction is recorded by overeducation measured through RM_{md}. The other indicators fall in-between, with SA_g and SA_{hm} indicators overcoming JA.

3.7.3 Overeducation and job search

We have seen that overeducation has important effects on both wages and job satisfaction. The following analyses try to shed light on the possibility that it also translates in behavioural consequences for workers. In other words, we are trying to understand if workers who are classified (or perceive themselves) as overeducated are more prone to quitting their job in favour of another one. Thus, in this section the effect of overeducation on the propensity of graduates of looking for a new job is analyzed.

Tab. 3.13 The effect of overeducation on job search. Logit models, average marginal effects.

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		0.059***				
		(0.005)				
SA_{hm}			0.061***			
			(0.005)			
SA_p				0.073***		
				(0.005)		
RM_{md}					0.023***	
					(0.005)	
JA						0.039***
						(0.005)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.027***	0.027***	0.025***	0.025***	0.024***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age		-0.002*	-0.002*	-0.002*	-0.002**	-0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.003	0.003	0.003	0.003	0.003
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Upper secondary	-0.012	-0.012	-0.013	-0.013	-0.013
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Tertiary	-0.019	-0.018	-0.02	-0.02	-0.02
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	NA	-0.053	-0.055	-0.053	-0.056	-0.056
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	0.023	0.023	0.021	0.021	0.02
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	Managers	0.055***	0.054***	0.053***	0.052***	0.052***
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Clerks	0.043***	0.043***	0.041***	0.042***	0.041***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	Self-Employed	0.026*	0.026*	0.024*	0.025*	0.024*
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Executive workers	0.035**	0.035**	0.033**	0.033**	0.033**
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Manual workers	0.027*	0.027*	0.024*	0.025*	0.024*
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	NA	0.011	0.011	0.011	0.016	0.011
		(0.025)	(0.025)	(0.025)	(0. 025)	(0.025)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Area of residence	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.021***	0.021***	0.020***	0.021***	0.021***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	South and Islands	0.048***	0.049***	0.048***	0.048***	0.048***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Type of secondary degree	Scientific lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical lyceum	0.005	0.005	0.004	0.004	0.004
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Other lyceum	-0.019*	-0.019*	-0.019*	-0.020**	-0.019*
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Technical school	0.000	0.000	0.000	0.001	0.002
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	Vocational school	-0.003	-0.003	-0.003	-0.002	-0.002
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Secondary graduation mark		-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.008	0.008	0.008	0.008	0.008
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.024	0.024	0.020	0.024	0.025
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Natural Sciences	0.010	0.009	0.011	0.015	0.011
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Pharmacy, Veterinary	-0.075***	-0.075***	-0.075***	-0.076***	-0.079***
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	Medicine	-0.103***	-0.103***	-0.099***	-0.101***	-0.103***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Medical Professions	-0.093***	-0.092***	-0.092***	-0.097***	-0.098***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Architecture	-0.006	-0.006	-0.004	-0.002	-0.003
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Business and Administration, Statistics	-0.038**	-0.040**	-0.042**	-0.035**	-0.045**
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Social sciences	-0.008	-0.013	-0.010	0.003	-0.005
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Law	-0.053***	-0.055***	-0.051***	-0.050***	-0.056***
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Arts and Humanities	-0.008	-0.011	-0.009	0.003	-0.005
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Education, Psychology	-0.070***	-0.071***	-0.072***	-0.075***	-0.070***

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
		(0.014)	(0.014)	(0.013)	(0.013)	(0.014)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.005	-0.004	-0.006	[illegible]	[illegible]
		(0.010)	(0.010)	(0.010)	([illegible])	([illegible])
	101-105	-0.013	-0.012	-0.014	-0.014	-0.014
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	106-110	-0.016	-0.015	-0.016	-0.018	-0.018
		(0.011)	(0.011)	(0.010)	(0.011)	(0.011)
	110 cum laude	-0.033***	-0.032***	-0.032***	-0.036***	-0.035***
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Type of tertiary degree	Pre-reform	Ref.	Ref.	Ref.	Ref.	Ref.
	Master	0.025**	0.024**	0.021*	0.028***	0.026**
		(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
	Bachelor	-0.023**	-0.024**	-0.021**	-0.016*	-0.018**
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Years of graduation delay		0.002	0.002	0.003	0.004	0.004
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	0.044***	0.044***	0.044***	0.042***	0.042***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	0.015	0.014	0.011	0.005	0.004
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	0.110***	0.110***	0.107***	0.190***	0.109***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	0.107***	0.108***	0.110***	0.115***	0.114***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	NA	0.096***	0.097***	0.097***	0.101***	0.102***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Pseudo R2		0.093	0.093	0.097	0.089	0.090
N		25,518	25,518	25,811	25,811	25,811

(continue)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results on job search (Tab. 3.13) are consistent with those regarding job satisfaction. Individuals who possess characteristics that are negatively associated with job satisfaction—women, graduates from Southern regions, individuals from lower social origins, atypical and part-time workers—are more likely to be looking for a new job. The reverse is also true: those who have been previously found to be more satisfied workers—principal reference here is made to the coefficients for fields of study—are now found to be less likely to look for new job opportunities.

Also in this case, the coefficients for the indicators of overeducation go in the expected direction: overeducated workers are more likely to be looking for a new job. Again, the strongest association between job search and overeducation is found when the phenomenon is measured through SA_p, while the lowest association is found in correspondence of RM_{md}. The other SA indicators and JA fall in between[18].

3.8 Concluding remarks

In this chapter we have tested the validity of five indicators of overeducation, by comparing the estimates of the incidence and determinants of the phenomenon, by analysing the correspondence and correlation between measures, and by assessing their predictive power on three relevant outcomes, namely wage, job satisfaction and job search.

First of all, we have observed that the estimates for the incidence of overeducation are more similar across indicators than is usually found in the literature: according to SA and JA indicators, about one graduate out of three is overeducated. Only the RM indicator delivers a higher estimate of the phenomenon. Also the correlation and correspondence between different indicators are higher than what expected on the basis of the existing empirical evidence. We have seen, indeed, that the five indicators agree in classifying as over- or adequately educated more than a half of students in our sample. The main differences concern individuals who are employed as managers and legislators

[18] Results do not change if the analyses are separately conducted on BA and MA graduates (results from these models are reported in the Appendix).

(Group 1) or as technicians and associate professionals (Group 3). In particular, the former are generally classified as overeducated by SA_g and SA_{hm}, while are considered as adequately educated by SA_p and JA. On the contrary, the latter are classified as overeducated mainly by RM.

Some important differences are found across indicators when the determinants of overeducation are estimated. In particular we have seen the effect of socio-demographic variables to differ across measures. According to the two occupation-based indicators and SA_p, the risk of overeducation is higher among women, while no significant difference between male and female graduates is found by the other two subjective indicators. Moreover, SA_g and SA_{hm} differ from the other indicators in that they found the phenomenon of interest to be significantly associated with age and social origin.

Finally, also the analysis of the association between overeducation and the three selected outcome variables shows interesting differences between the various indicators. First, the expected negative association between overeducation and earnings is found only with subjective indicators, with the coefficients for SA_g overcoming those for SA_{hm} and SA_p. Second, the negative association between overeducation and job satisfaction is found to be robust across measures. However, the magnitude of the coefficients for overeducation differs. The coefficient for SA_p is higher than those for SA_g and SA_{hm}, while JA and RM_{md} show the lowest values. A similar result is found for job search: overeducated workers are found to be more prone to look for a new job, but this association is stronger when the phenomenon is measured by SA_p, followed by the other two subjective indicators.

These results help in drawing some main conclusions about the validity of the five compared indicators. First of all, RM seems not to be a well-suited measure of overeducation. It tends to overestimate the phenomenon, probably because it identifies as non-graduate jobs some occupational positions (namely those in Group 3) that, on the contrary, are considered as graduate jobs by the other measures. Moreover, it often differs from the other indicators in both the significance and the magnitude of the association between overeducation and its determinants and effects. These results suggest that this indicator is capable, more than others, to represent the distribution of educational levels within job categories, rather than the mismatch between individuals' educational skills and

the knowledge and competences required to adequately carry out job tasks. This finding comes with no surprise and confirms the existing evidence described in the previous chapters.

Results for JA are less clear. Sometimes they resemble findings for SA_p, suggesting that this measure approaches the concept of overeducation as mismatch between individual education and that required to perform the job. In other cases JA behaves like RM_{md}. The similarity between these two indicators probably lies in their occupation-based nature, that is to say, in the fact that they do not recognize the eventual heterogeneity within job categories. Thus, this indicator seems to be a good alternative to SA_p when the subjective indicator is not available in the data. However, our results suggest that—whenever it is possible—it is recommendable to employ subjective indicators of overeducation, which are the most informative ones, since they are able to catch within-occupation variability.

Finally, when it turns to subjective indicators, a demarcation is found between SA_g and SA_{hm}, on the one side, and SA_p, on the other. No relevant difference is found between SA_g and Sa_{hm}; thus, the following discussion will focus on the comparison between SA_g and SA_p. Even though these indicators deliver almost the same estimates of the incidence of overeducation and are pretty highly correlated, some relevant differences have been found. More precisely, we have seen that the effect of socio-demographic variables on overeducation differs—both in terms of sign and magnitude—across measures. Moreover, we have observed that SA_g delivers the strongest association between overeducation and wage, while SA_p contributes more to the explanation of job satisfaction and job search. These results are similar to the one found by Allen and van der Velden (2001) and by Green and McIntosh (2007). As discussed in the previous chapter these authors suggest to distinguishing between two closely related couples of concepts: educational and skill mismatches (Allen and van der Velden 2001) or overqualification and overskilling (Green and McIntosh 2007). In one case (educational mismatch/overqualification) we refer to the formal education-job mismatch, while in the other (skill mismatch/overskilling) we are dealing with the actual mismatch between acquired and required skill. The author operationalize these concepts in a similar way: Allen and van der Velden (2001) measure educational mismatch through employees' self-rating of the level of

education most appropriate for their current job, while Green and McIntosh measure overqualification on the basis of interviewees' self-assessment of the level of education that would be required to someone wishing to get their current job. The variables for skill mismatch and overskilling are, instead based upon respondents' level of agreement with statements as «My current job offers me sufficient scope to use my knowledge and skills» (Allen and van der Velden 2001) and «In my current job I have enough opportunity to use the knowledge and skills that I have» (Green and McIntosh 2007). Both the quoted studies conclude that educational mismatch/overqualification more strongly affect wages, while skill mismatch/overskilling is a better predictor of job satisfaction and on-the-job search.

In order to explain the differences observed between overqualified and overskilled workers, Green and McIntosh (2007) suggest that individuals within educational levels might be heterogeneous in terms of human capital. Therefore, they would only appear to be overqualified because some features of their human capital remain unobserved. Moreover, Allen and van der Velden (2001) underline that screening theory offers a sound explanation for the differential effects of educational mismatch/overqualification and skill mismatch/overskilling on wages. As discussed in Chapter 1, according to this approach, individuals are sorted in the labour market (and rewarded) not on the basis of their productivity, but rather on the basis of easily observable indicators of productivity, such as education, gender, and social background. If the other indicators are differently distributed within levels of education, a relevant portion of workers will end up in jobs which do not match their education and will earn less than those working at their own level, irrespective of their actual amount of knowledge and skills. Allen and van der Velden (2001) also emphasize the relevance of results relating to job satisfaction and on-the-job search: skill mismatch/overskilling is found to be an important cause of job dissatisfaction, which encourages workers to look for other work. This finding suggests that adjustments in the labour market are driven by the relation between job content and individual skills, rather than by the material rewards provided by work.

All these results suggest being very careful when measuring overeducation with different indicators. The best choice seems to be, whenever it is possible to employ more than one measure of the phenomenon, being aware of the fact that

they are likely to indicate different but closely related concepts. For these reasons, in the following chapters we accept the suggestion of the aforementioned studies, supported by our results, of distinguishing between educational and skill mismatches. Both in the comparative and in the diachronic analyses that will follow we will employ SA indicators. They are the most suitable for an analysis that aims to compare the incidence of overeducation across countries and over time since, by definition, they are not affected by the differential distribution of educational levels in the labour market. Moreover, they also have been proven to be more valid than the other occupation-based indicators since they take into consideration variability within occupational categories.

4 Educational and skill mismatches among tertiary graduates: The effect of labour market institutions on fields of study differentials in 18 countries

4.1 Introduction

As discussed in the Introduction, following the overall increment in educational attainment in developed countries the most recent literature on overeducation has paid particular attention to the analysis of the relationship between the horizontal stratification of higher education and the incidence of the phenomenon. Scholars generally agree in finding a smaller risk of overeducation among tertiary graduates from technical and scientific fields and a substantially higher incidence of the phenomenon among graduates from the Humanities and Social Sciences (Barone and Ortiz 2011).

However, despite the growing interest for the phenomenon, in the overeducation literature some questions still remain unanswered. In particular, while the existing literature has widely documented the effect of the educational system on horizontal and vertical mismatches between individuals' educations and jobs (Levels *et al.*, 2014; Ortiz 2006), less is known about the effect of particular labour market features. What has been seldom investigated, in particular, is whether these factors affect not only the overall incidence of the phenomenon among tertiary graduates, but also its distribution among different fields of study.

The main purpose of this chapter is to fill this gap by analysing the influence of labour market institutions on the differential risk of overeducation among graduates from different fields of study. In particular, data from two comparative surveys—REFLEX and HEGESCO—are employed to assess the impact of three elements that, as discussed in Chapter 1, are likely to affect not only the incidence but especially the distribution of overeducation among graduates: the level of employment protection, the regulation of access to the so-called liberal professions, and the propensity of welfare states to hire skilled workers.

Moreover, on the basis of the literature reviewed in Chapter 2 and on the results presented in Chapter 3, in the following analyses a distinction is drawn

between educational and skill mismatches. As previously discussed, this distinction has important theoretical and methodological implications, and the empirical results that will be presented in the following confirm its heuristic value.

4.2 Research questions and hypotheses

It has been widely documented that field of study matters in determining graduates' occupational opportunities (Kim and Kim 2003; Reimer *et al.* 2008), and the incidence of overeducation is consistent with this assessment. Graduates from more generalist fields of study are exposed to the highest risks of mismatch, whereas overeducation is less likely in vocationally oriented technical and scientific fields (Wolbers, 2003; Ortiz and Kucel, 2008). As discussed in Chapter 1, these variations in the incidence of overeducation have been interpreted in light of theoretical approaches that differ with respect to the mechanisms connecting education to labour market opportunities (van de Werfhorst, 2011).

First, in a human capital framework, education is considered as an indicator of productive skills (Becker, 1964). If we assume that a worker's productivity is a function of both the amount and type of skills acquired through education and that graduates from occupation-specific fields are generally more productive, we can expect that overeducation is less widespread in technical and scientific fields than in the generalist fields of the Humanities and Social Sciences (Reimer *et al*. 2008).

Second, education may be considered as a positional good, i.e., a signal of motivation and ability used by employers to predict the productivity of potential workers in contexts of imperfect information (Spence 1973; Stiglitz 1975). According to this approach, employers prefer graduates from technical and scientific fields because these fields are perceived as more selective.

Third, education may function as a means for social closure. Educational qualifications may serve as instruments of exclusion, as they strictly regulate the access to specific occupations (Collins 1979; Parkin 1979). As discussed above, this framework is particularly useful to interpret horizontal differentiation in occupational opportunities, since graduates from several fields—such as

Medicine, Architecture, Engineering and Law—are intended to prepare for specific highly regulated professions.

Although most literature on overeducation has assessed which approach best fits the empirical evidence, recent studies have suggested that overeducation is unlikely to be entirely explained by only one of these three models. Instead, scholars tend to focus on the macro conditions under which one mechanism tends to prevail over the others. The institutional context is likely to affect not only the *strength* of the educational effect on labour market opportunities for job seekers, but also the *mechanism* through which individual education affects occupational outcomes (van de Werfhorst 2011).

This chapter focuses on three labour market features that are likely to affect both the overall incidence of educational and skill mismatches among graduates and the patterns of differences between fields of study: the level of employment protection, the extent to which access to some professions is regulated by the requirements of specific credentials, and the role of the welfare state as an employer. These factors may affect the occupational opportunities of graduates, by influencing both the number and the quality of job vacancies and the job screening process.

Scholars have mainly focused on the influence of employment protection on unemployment rates, with ambiguous findings. The stricter the employment protection, the more difficult it is for employers to dismiss workers, but also the lower is employers' willingness to hire workers (Breen 2005). Whether the strictness of employment protection also affects the incidence of overeducation remains unclear. Although some studies indicate a positive association (Di Pietro 2002), others do not find any significant effect (Verhaest and Van der Velden 2013). It may be expected that employment protection affects educational mismatches among graduates from different fields of study, but not the distribution of skill mismatches (*Hypothesis 1*). The stricter the employment protection, the more fields of study do affect the risk of educational mismatch. Since dismissing workers in these contexts implies higher costs, employers have a greater incentive to select graduates from fields of study that send more powerful signals of applicants' abilities and motivations, i.e., scientific and technical fields. In other words, employment protection is likely to enhance the signaling value of technical education rather than its skill content.

The second institutional factor taken into account is the regulation of liberal professions, usually promoted by professional orders. This kind of regulation takes the form of restrictions to the access both to fields of study and, in a subsequent stage, to the corresponding professions. These two kinds of restrictions may have opposite effects on graduates' labour market prospects (Barone and Schindler, 2014). The former (e.g. *numerus clausus* for access to tertiary education or very high tuition fees) reduces the number of students from the matching fields, thus lowering the risk of oversupply of graduates. Since overeducation, in terms of both educational and skill mismatches, is primarily due to a gap between demand and supply of graduates, reducing the number of graduates could improve their labour market prospects, in terms of both the analysed phenomena. On the contrary, the latter type of regulation (e.g. long periods of postgraduate training or additional selective entry examinations to the professions) constrains the access to these professions also for graduates from the matching fields, thus possibly lowering the connected occupational rewards. Graduates who do not succeed in accessing the corresponding professions (e.g. graduates in Law that do not succeed in becoming lawyers) are likely to end up in jobs that do not require nor their tertiary degree nor the skills they have acquired at university. Summing up, we can expect the regulation of liberal professions to affect the risk of both educational and skill mismatches for graduates from the corresponding fields of study (*Hypothesis 2*). However, the direction of these associations strongly depends on the prevalence of one of the two aforementioned types of restrictions. Indeed, if access to professions is regulated more strongly than access to the corresponding education, this can easily result in a oversupply of graduates that could end up being overeducated.

Finally, the existing literature suggests that the match between workers and jobs may be affected by the capacity of the welfare state to employ skilled workers. As some studies suggest, the risk of overeducation is lower in the public than in the private sector (Wolbers 2003). In developed countries, substantial shares of graduates are employed in the public sector, particularly in services (i.e., Medicine, Social Services, and Education) and public administration, which means that the public sector can absorb graduates who are at greater risk for overeducation, such as those from the Humanities and social sciences. Therefore, the higher the capacity of the public sector to absorb graduates, the smaller the

differentials between fields of study will be in terms of both educational and skill mismatches (*Hypothesis 3*). Because a higher level of education is formally required for several managerial positions in public bureaucracies, we expect that the larger the public sector, the more graduates from generalist fields—such as the Humanities and Social Sciences—will improve their labour market prospects. The public sector generally comprises professions requiring specific competencies, such as education, social and Health services. Therefore, we hypothesise that graduates from these fields of study will be at less risk of skill mismatch in countries with a higher rate of public employment.

4.3 Data and empirical strategy

4.3.1 REFLEX and HEGESCO Data

The analyses are based on data from two comparative surveys conducted on representative samples of graduates from ISCED 5A (Bachelors and Masters or equivalent) that report detailed comparable information on individuals' educational careers, occupational status, job experience before and after the conclusion of tertiary education, and family background. These are the REFLEX (Research into Employment and Professional Flexibility) and HEGESCO (Higher Education as a Generator of Strategic Competencies) survey.

The first dataset (REFLEX) includes 34,347 individuals from thirteen European countries (Italy, Spain, France, Austria, Germany, the Netherlands, the United Kingdom, Finland, Norway, the Czech Republic, Portugal, Belgium and Estonia) and Japan who graduated between 2000 and 2001 and were interviewed in 2005. The second study, (HEGESCO), is based on the methodology developed in the REFLEX study and was conducted approximately three years later. It includes 8,742 graduates of the 2002/2003 academic year from Slovenia, Turkey, Lithuania, Poland, and Hungary.

The size of the national samples varied according to the anticipated response rate and the targeted number of respondents in each country. To increase the efficiency of the sample, stratified sampling was used. The strata used were

dependent on the national context, but usually comprised type and field of higher education, and in some countries also region and gender[19].

The following table contains an overview of the number of available respondents and the response percentage per country.

Tab. 4.1 Number of respondents and response percentage per country

Country	Number of respondents			Response %
	First level	Second level	Total	
REFLEX Countries				
Norway	1,397	804	2,201	50
Finland	1,187	1,489	2,676	45
The United Kingdom	1,470	108	1,578	23
Germany	544	1,142	1,686	36
Austria	122	1,699	1,821	38
Switzerland	1,578	3,304	4,882	60
The Netherlands	2,291	1,134	3,425	35
Belgium-Flanders	403	871	1,274	22
France	1,053	599	1,652	32
Italy	255	2,884	3,139	30
Spain	1,566	2,346	3,912	22
Portugal	167	477	644	12
The Czech Republic	1,177	5,586	6,763	27
Estonia	820	139	959	18
Total REFLEX	14,030	22,582	36,612	*31*
HEGESCO countries				
Slovenia	2,681	238	2,919	49
Turkey	1,852	310	2,162	36
Lithuania	680	310	1,199	16
Poland	393	806	1,199	20
Hungary	886	586	1,472	30
Total HEGESCO	6,492	2,250	8,742	30
Total REFLEX + HEGESCO	**20,522**	**24,832**	**45,354**	**31**

Source: Allen J. and van der Velden R. (2009)

Only data from Lithuania are excluded from this analysis because not all aggregate indicators that are used in this study (see next section) are available for it. Consequently, this study reports findings for 17 European countries plus Japan. The analysis is restricted to individuals who were employed at the time of the interview. Thus, the analytical sample includes 34,955 individuals.

4.3.2 Variables

In this study both educational and skill mismatches are defined on the basis of a SA of the match between workers' education and jobs held five years after graduation. The indicator of educational mismatch is based on responses to the

[19] More detailed reports on the research design and data collection can be downloaded from the projects websites (www.reflexproject.org; www.hegesco.org).

question «What type of education do you feel is most appropriate for this work?». The possible responses are: a) PhD; b) Other postgraduate qualification; c) Master; d) Bachelor; e) Lower than higher education. Educational mismatch occurs when individuals feel that a level lower than higher education is most appropriate for their work.

The indicator of skill mismatch is based on graduates' responses to the question: «To what extent are your knowledge and skills utilized in your current work?». The possible answers range from 1 (not at all) to 5 (to a very high extent). Skill mismatch occurs when the response is 2 or below. It is worth underlying that, when answering, individuals might refer to skills not acquired through education. However, because the respondents are new entrants in the labour market, their job experience is assumed to play a less relevant role than the competencies acquired during university studies.

The main independent variable, at the individual level, is field of study, classified as follows: Education; Art and Humanities; Social Sciences; Business and Administration; Law; Natural and Applied Sciences; Mathematics and Statistics; Engineering and Architecture; and Medicine. Each model – specified as described in the next section – also includes all the antecedent variables relevant for the outcomes of interest, which are known to affect both the choice of field of study and the labour market chances. These are gender, age, country of birth, parents' level of education, type of upper secondary education completed, final examination mark at the end of secondary education, type of tertiary study programme completed (whether it provides direct access to doctoral programmes), involvement in further education after graduation, and work experience before and during higher education. The distribution of these individual-level variables is summarized in Table 4.2.

At the country level, three main variables are taken into account, whose distribution is reported in Table 4.3. The first variable is the OECD index *Overall Strictness of Employment Protection*, which is constructed by combining 21 items in three main categories: i) protection of regular workers against dismissal, ii) regulation of temporary employment, and iii) specific requirements for collective dismissals (see Venn, 2009 for further details). The possible values range from 0 (least stringent) to 6 (most restrictive). The second variable is the OECD index *Professional Services Regulation*, which indicates the extent to which access to

some professions is regulated by particular credential requirements; the scale ranges from 0 to 6 (from least to most restrictive).

Tab. 4.2 Descriptive statistics of individual level covariates

Variable	%
Gender (Ref: Male)	
Female	57.70
Age (Ref: <30)	
31-40	31.62
>40	6.12
Birth country (Ref: Home country)	
Other country	2.78
No answer	9.21
Parents' Level of Education (Ref: High)	
Medium	37.65
Low	20.17
No answer	2.68
Type of upper secondary education completed (Ref: General)	
Vocational	24.13
Other	3.84
Upper secondary graduation mark (Ref: High)	
Medium	43.58
Low	24.66
No answer	4.17
Field of Study (Ref: Education)	
Art and Humanities	9.81
Social Sciences	14.86
Business and Administration	16.70
Law	5.22
Natural and Applied Sciences	9.37
Mathematics and Statistics	3.71
Engineering and Architecture	18.71
Medicine	9.91
Tertiary programme (Ref: Providing direct access to PhD)	
Not providing direct access to PhD	48.10
No answer	0.52
Further education after graduation (Ref: No)	
Yes	37.53
Work experience before and during higher education (Ref: No)	
Experience not study related	31.49
Experience study related	49.46
No answer	1.02
N	34,955

This indicator measures regulatory conditions in professional services, covering entry and conduct regulation in the legal, accounting, engineering, and architectural professions (see Conway and Nicoletti, 2006 for information about its composition and its advantages and disadvantages)[20]. The reference year for both indexes is the year in which the survey was conducted in each country. Finally, the third variable is employment in general government as a percentage of the labour force, provided by OECD and referring to 2008. Moreover, some

20 Unfortunately, we can use only a general indicator of professional services regulation, which does not distinguish among different professional sectors. Further research could use more detailed, field-specific indicators.

country level covariates are added to control for both the economic structure and cycle, namely GDP per capita and unemployment rates (World Bank). Finally, we control for tertiary graduation rates (UNESCO).

Tab. 4.3 Distribution of country-level covariates.

	Overall Strictness of Employment Protection[a]	Professional Services Regulation[a]	Rate of Public Employment[a]	GDP per Capita[b]	Unemployment Rate[b]	Tertiary Graduation Rate[c]
IT	1.82	3.74	14.3	30,479	7.7	22
ES	2.98	2.36	12.3	26,056	9.2	33
FR	3.05	1.90	21.9	33,819	8.9	37
AT	1.93	3.14	11.4	37,076	5.2	16
DE	2.12	3.01	9.6	33,543	11.1	18
NL	2.12	1.60	12.0	39,122	4.7	37
UK	0.75	1.05	17.4	38,122	4.6	39
FI	2.02	0.95	22.9	37,319	8.4	43
NO	2.56	1.14	29.3	65,767	4.6	40
CZ	2.09	2.83	12.8	12,706	7.9	14
JA	1.43	1.99	6.7	35,781	4.4	33
PT	3.46	2.71	12.1	18,186	7.6	35
BE	2.18	2.30	17.1	36,011	8.4	18
EE	2.10	2.11	18.7	10,330	7.9	10
SL	2.51	3.33	14.7	27,015	4.4	19
TU	3.72	3.39	11.0	10,298	11.0	13
PL	1.90	2.66	9.7	13,886	7.1	44
HU	1.65	3.14	19.5	15,365	7.8	32

Source: [a]OECD, [b]World Bank, [c]UNESCO

To account for the structure of the educational system, we first included different indicators of the level of stratification (e.g., the age of first selection into educational tracks) as control variables in the models. However, the inclusion of this variable did not affect the pattern of results concerning labour market institutions, nor were its coefficients statistically significant. The role of educational institutions is not a major focus of this study, particularly because several previous studies have documented it extensively. The finding that age of tracking does not matter does not contradict these studies once we consider that the models presented here control for graduation rates. In other words, this effect is explained by this variable, suggesting that early tracking affects overeducation mainly by restricting the supply of graduates. Thus, we decided not to include this control variable in the final models to preserve more degrees of freedom.

4.3.3 Analytical strategy

To analyse the determinants of educational and skill mismatches, a sequence of multilevel logit models is estimated that reflects the nested structure of the data

and assesses how much of the overall variance in educational and skill mismatches is attributable to country differences. A two-level structure is employed, in which individuals *i* are nested in countries *c*. The models have the following general form:

$$y_{ic} = \beta_0 + \beta_1 X_{ic} + \beta_2 C_c + U_{ic} + V_c$$

where y is the dependent variable of interest, X is a vector of characteristics of individual *i*, C is a vector of characteristics of country *c*, and U and V are random error terms. Markov Chain Monte Carlo (MCMC) methods are used to compute estimation (Browne and Draper 2006), that provide more accurate results than those derived by classical likelihood-based frequentist methods[21].

The baseline model (Model 1) consists solely of an intercept and additional random effects at the country level. In Model 2, the covariates measured at the individual level are added, while Model 3 also includes the variables measured at the country level. Finally, Model 4 includes interaction terms between country level variables and field of study to test whether different institutional settings affect the distribution of educational and skill mismatches among graduates from different fields[22].

Before presenting multivariate results, the following section describes the descriptive evidence on the distribution of educational and skill mismatches across countries and fields of study and on the association between the phenomena and the above described labour market characteristics.

21 Frequentist methods find maximum likelihood point estimates for the parameters of interest in the model by iterating between two deterministic steps until two consecutive estimates for each parameter are sufficiently close together, thus achieving convergence. Conversely, MCMC methods are simulation-based procedures, which are run for many iterations, each of which produces an estimate for each unknown parameter. These estimates are not independent because, for each iteration, the estimate for the last iteration is used to produce the next estimate. Thus, these methods produce accurate interval estimates, from which it is possible to calculate the posterior mean and standard deviation (Browne 2003).

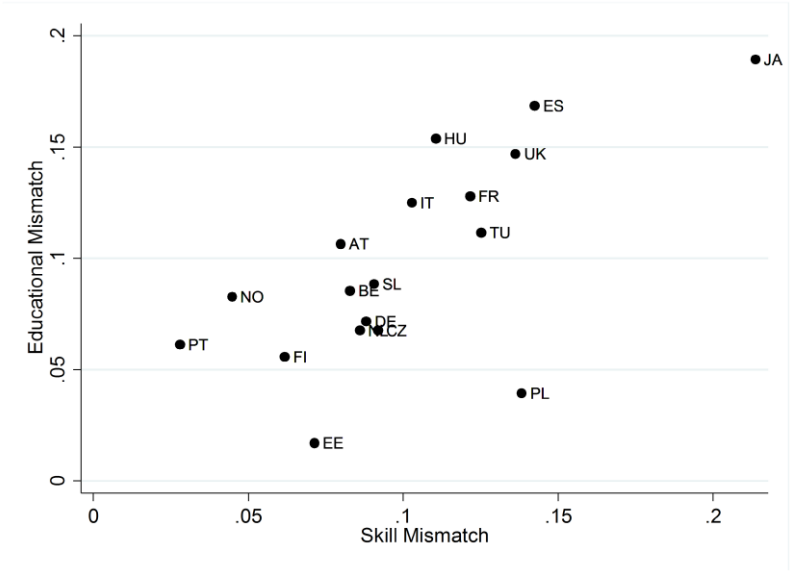
22 Some robustness checks have been conducted by excluding the country-level control variables and adding the interaction terms one by one. The results do not substantively change.

4.4 Results

4.4.1 Educational and skill mismatches across countries and fields of study

The incidence of educational and skill mismatches by country is reported in Figure 4.1.

Fig. 4.1 The incidence of educational and skill mismatches by country



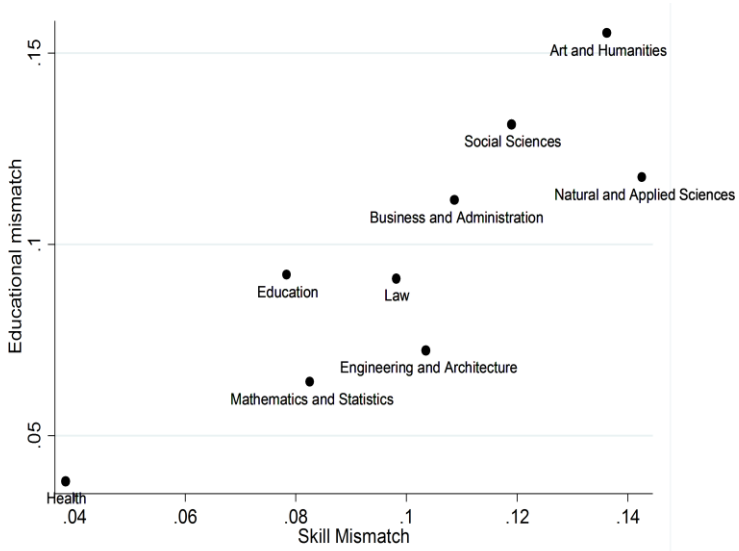
The average incidence of both educational and skill mismatches five years after graduation across the 18 countries studied is approximately 10 per cent. However, Figure 1 indicates that significant differences exist in the incidence of the phenomena among countries and that the correlation among the two is far from perfect. The highest incidence of educational mismatch is observed in Japan (18.9), followed by Spain (16.8), Hungary (15.4) and the United Kingdom (14.7); the lowest incidences are recorded in Finland (5.6), Poland (3.9) and Estonia (1.7). The diffusion of skill mismatch also differs by country to a significant extent. The highest value is again observed in Japan (21.4), but Poland and Estonia score higher than before (13.8 and 7.1, respectively); the lowest incidence of skill mismatch is observed in Norway (4.5) and Portugal (2.8). The correlation between the two measures at the country level is 0.69. However, their average correlation at the individual level is only 0.36, with great variability among countries, spanning from 0.07 in Estonia to 0.50 in Japan (Tab. 4.4).

Tab. 4.4 Correspondence and correlation between educational and skill mismatches by country

	Only Educational Mismatch	Only Skill Mismatch	Educational and Skill Mismatch	Correct Allocation	Correlation
IT	8.4	6.2	4.1	81.3	0.28
ES	7.8	5.3	9.0	77.9	0.50
FR	6.9	6.2	5.9	81.0	0.40
AT	6.5	3.8	4.2	85.5	0.40
DE	4.1	5.7	3.1	87.1	0.33
NL	3.2	5.0	3.6	88.2	0.42
UK	6.9	5.8	7.8	79.5	0.48
FI	3.2	3.8	2.4	90.6	0.37
NO	6.4	2.7	1.8	89.1	0.26
CZ	4.0	6.5	2.7	86.8	0.29
JA	11.0	13.5	7.9	67.6	0.24
PR	4.0	0.7	2.1	93.2	0.49
BE	5.6	5.4	2.9	86.1	0.29
EE	1.3	6.8	0.4	91.5	0.07
SL	5.1	5.4	3.7	85.8	0.36
TU	5.7	7.1	5.4	81.8	0.39
PL	1.2	11.0	2.8	85.0	0.33
HU	9.7	5.3	5.7	79.3	0.35
Total	5.7	6.0	4.3	84.0	0.36

The aggregate distribution of educational and skill mismatches among graduates from different fields is reported in Figure 4.2.

Fig. 4.2 The incidence of educational and skill mismatch by field of study



Significant differences are observed among fields of study in the incidence of both educational and skill mismatches. A substantial risk of educational mismatch is faced by graduates from Art and Humanities (15.51) and Social Sciences (13.13). The incidence of this phenomenon is lower among graduates from technical and scientific fields, such as Engineering and Architecture (7.23),

Mathematics and Statistics (6.4), and Medicine (3.81). The distribution of skill mismatches is partially different. The highest values are observed among graduates from Natural and Applied Sciences (14.25), followed by graduates from Art and Humanities (13.62). The lowest incidence of skill mismatches is found among graduates from Medicine (3.84). Additionally, when considering different fields of study separately, the correlation between educational and skill mismatches is far from perfect (Table 4.5).

These descriptive results provide *prima facie* evidence that educational and skill mismatches do refer to different situations: not only their distribution across countries and fields of study substantially differ, but also their correlation is rather weak. Thus, these findings preliminarily support the (substantive before than methodological) choice to distinguish between the two phenomena.

Tab. 4.5 Correspondence and correlation between educational and skill mismatches by field of study.

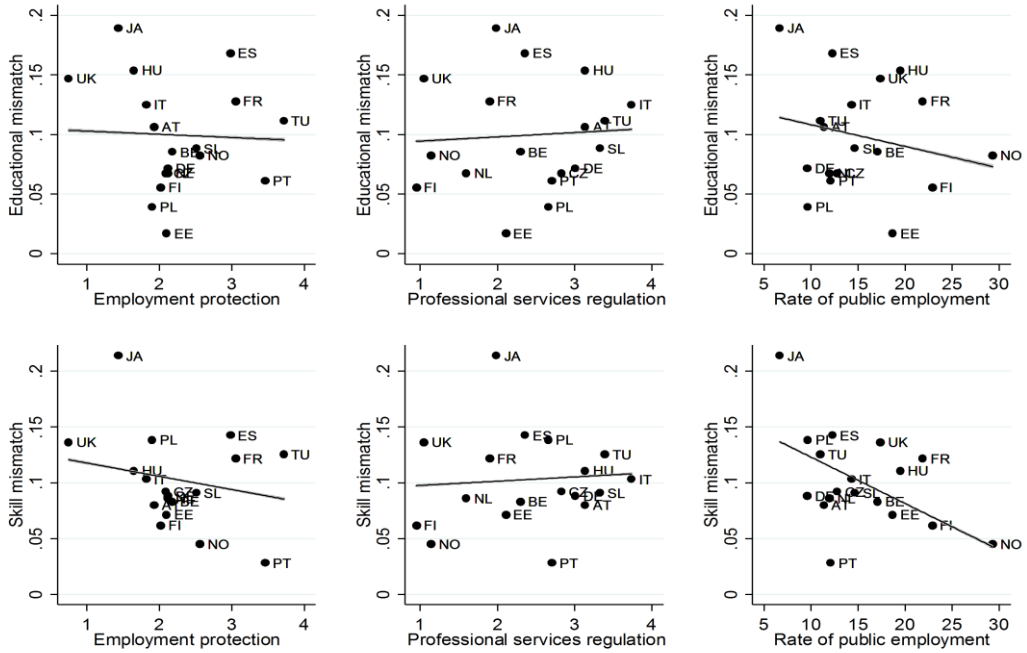
	Only Educational Mismatch	Only Skill Mismatch	Educational and Skill Mismatch	Correct Allocation	Correlation
Education	5.35	3.98	3.86	86.82	0.40
Art and Humanities	7.87	5.98	7.64	78.51	0.44
Social Sciences	7.70	6.47	5.43	80.40	0.35
Business and Administration	6.19	5.89	4.97	82.95	0.38
Law	4.94	5.65	4.17	85.24	0.38
Natural and Applied Sciences	6.10	8.61	5.65	79.65	0.35
Mathematics and Statistics	4.32	6.17	2.08	87.42	0.23
Engineering and Architecture	4.37	7.49	2.86	85.28	0.27
Medicine	2.74	2.77	1.07	93.42	0.25
Total	5.66	6.00	4.30	84.04	0.36

4.4.2 The association between educational and skill mismatches and labour market features

Before presenting the main findings of the multivariate analyses, Figure 4.3 represents the association between educational and skill mismatches and the three labour market characteristics previously described.

The only variable which seems to be significantly associated with both educational and skill mismatches is the rate of public employment: the incidence of the two phenomena in fact decreases as the amount of individuals employed in the public sector increases. On the contrary, nor the level of employment protection nor the regulation of professional services seem to be significantly associated with educational and skill mismatches.

Fig. 4.3 Educational and skill mismatches by country-level variables



The main aim of this chapter is, however, not to establish whether these institutional features affect the overall incidence of educational and skill mismatches, but to assess whether these labour market characteristics somehow shape the distribution of educational and skill mismatches among graduates from different fields of study. Thus, the next paragraph presents the results of the multilevel analyses.

4.4.3 Do labour market institutions affect the distribution of educational and skill mismatches across fields of study?

The results on the risk of educational and skill mismatches five years after graduation are reported in Tables 4.6 and 4.7, respectively.

These results are obtained by controlling for the main socio-demographic variables and for some indicators of educational and working experience of graduates, as previously indicated. The coefficients of these covariates are statistically significant and consistent with results of previous studies, but they will not be discussed here.

Tab. 4.6 The risk of educational mismatch. Multilevel logit estimates

		Model 1	Model 2	Model 3	Model 4
Intercept		-2.377	-3.263	-3.384	-3.239
		(0.092)	(0.185)	(0.146)	(0.251)
Individual Level					
Sex	Male		Ref.	Ref.	Ref.
	Female		0.235***	0.232***	0.233***
			(0.042)	(0.039)	(0.043)
Age	<30		Ref.	Ref.	Ref.
	31-40		0.049	0.045	0.058
			(0.049)	(0.048)	(0.046)
	>40		-0.080	-0.082	-0.086
			(0.087)	(0.087)	(0.084)
Birth Country	Home Country		Ref.	Ref.	Ref.
	Other Country		0.128	0.133	0.125
			(0.112)	(0.112)	(0.106)
	No answer		-0.391**	-0.334	-0.390**
			(0.191)	(0.209)	(0.188)
Parental Education	High		Ref.	Ref.	Ref.
	Medium		0.178***	0.177***	0.163***
			(0.047)	(0.047)	(0.045)
	Low		0.289***	0.285***	0.272***
			(0.052)	(0.053)	(0.054)
	No answer		0.452***	0.434***	0.434***
			(0.108)	(0.112)	(0.112)
Type of secondary school	Generalist		Ref.	Ref.	Ref.
	Vocational		0.492***	0.492***	0.484***
			(0.051)	(0.051)	(0.053)
	Other		-0.136	-0.139	-0.105
			(0.106)	(0.111)	(0.116)
Grade (secondary school)	High		Ref.	Ref.	Ref.
	Medium		0.274***	0.278***	0.267***
			(0.053)	(0.050)	(0.050)
	Low		0.569***	0.575***	0.553***
			(0.055)	(0.053)	(0.053)
	No Answer		0.498***	0.501***	0.482***
			(0.097)	(0.098)	(0.097)
Type of tertiary degree	Direct Access to Phd		Ref.	Ref.	Ref.
	No Direct Access to Phd		0.671***	0.675***	0.693***
			(0.049)	(0.045)	(0.051)

(continue)

		Model 1	Model 2	Model 3	Model 4
	No answer		0.848***	0.847***	0.877***
			(0.225)	(0.225)	(0.222)
Further Education	No		Ref.	Ref.	Ref.
	Yes		-0.308***	-0.309***	-0.309***
			(0.040)	(0.041)	(0.040)
Work experience before/during study	No		Ref.	Ref.	Ref.
	Experience not study related		0.117**	0.117**	0.113**
			(0.053)	(0.055)	(0.049)
	Experience study related		-0.348***	-0.347***	-0.363***
			(0.055)	(0.056)	(0.052)
	No answer		0.005	0.020	0.050
			(0.171)	(0.168)	(0.169)
Field of Study	Education		Ref.	Ref.	Ref.
	Art and Humanities		0.700***	0.694***	0.721***
			(0.072)	(0.073)	(0.081)
	Social Sciences		0.430***	0.420***	0.431***
			(0.068)	(0.071)	(0.074)
	Business and Administration		0.279***	0.271***	0.293***
			(0.065)	(0.071)	(0.078)
	Law		0.032	0.019	-0.067
			(0.099)	(0.096)	(0.116)
	Natural and Applied Sciences		0.387***	0.382***	0.422***
			(0.078)	(0.079)	(0.081)
	Mathematics and Statistics		-0.252*	-0.265**	-0.272**
			(0.130)	(0.128)	(0.137)
	Engineering and Architecture		-0.164**	-0.174**	-0.157*
			(0.074)	(0.077)	(0.081)
	Medicine		-0.863***	-0.871***	-1.048***
			(0.098)	(0.105)	(0.124)
Country Level					
Strictness of Employment Protection				-0.210	0.041
				(0.224)	(0.234)
Professional Services Regulation				0.349	0.674***
				(0.290)	(0.188)
Rate of Public Employment				-0.003	-0.038
				(0.028)	(0.038)
GDP per Capita				0.000	0.000
				(0.000)	(0.000)
Unemployment Rate				0.046	0.138**
				(0.076)	(0.058)

(continue)

		Model 1	Model 2	Model 3	Model 4
Graduation Rate				0.017	0.022
				(0.013)	(0.015)
Cross-Level Interaction					
Strictness of Employment protection *	Education				Ref.
	Art and Humanities				-0.076
					(0.121)
	Social Sciences				-0.101
					(0.113)
	Business and Administration				0.007
					(0.115)
	Law				-0.225
					(0.168)
	Natural and Applied Sciences				-0.159
					(0.127)
	Mathematics and Statistics				-0.564***
					(0.190)
	Engineeringand Architecture				-0.543***
					(0.134)
	Medicine				-0.538***
					(0.187)
Professional Services Regulation *	Education				Ref.
	Art and Humanities				-0.303***
					(0.113)
	Social Sciences				-0.299***
					(0.104)
	Business and Administration				-0.225**
					(0.103)
	Law				-0.102
					(0.147)
	Natural and Applied Sciences				-0.175
					(0.120)
	Mathematics and Statistics				-0.227
					(0.186)
	Engineeringand Architecture				0.127
					(0.106)
	Medicine				-0.325**
					(0.154)

(continue)

		Model 1	Model 2	Model 3	Model 4
Rate of Public Employment *	Education				Ref.
	Art and Humanities				-0.009
					(0.016)
	Social Sciences				-0.015
					(0.014)
	Business and Administration				0.021
					(0.017)
	Law				-0.052**
					(0.025)
	Natural and Applied Sciences				0.037**
					(0.016)
	Mathematics and Statistics				0.014
					(0.029)
	Engineeringand Architecture				0.077***
					(0.015)
	Medicine				0.071***
					(0.022)
Random Part					
Level: Country					
Cons.		0.388	0.450	0.410	0.471
		(0.160)	(0.189)	(0.188)	(0.230)
Level: Individual					
Cons.		1.000	1.000	1.000	1.000
		(0.000)	(0.000)	(0.000)	(0.000)
-2*loglikelihood:					
DIC:		21963.91	20800.07	20800.12	20701.23
pD:		17.44	44.41	44.63	68.20
Units: paese		18	18	18	18
Units: case		34,955	34,955	34,955	34,955

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Consistent with the previous descriptive analyses, results demonstrate that field of study matters. Model 2 suggests that Humanities graduates are the worst performers, whereas those from technical and scientific fields enjoy much better labour market prospects. Interestingly, comparing the results for educational and skill mismatches reveals that the relative position of different fields changes. Educational mismatches seem to be distributed according to the distinction between more-or-less specific and vocationally oriented fields of study (Tab. 4.6). However, the distribution of skill mismatches presents some interesting exceptions to this rule (Tab. 4.7). For instance, graduates from Engineering and Architecture and from Mathematics and Statistics are among those at least risk of educational mismatch, but they do not perform as well in terms of skill mismatches. These findings may somehow account for the actual demand for specific skills in the labour market. If comparable repeated cross-sectional data were available, it would be of real interest to assess how educational and skill mismatches do react to changes in graduation rates from different fields of study.

Model 3 includes country-level covariates. Consistent with the descriptive results reported above, the coefficients for the level of employment protection and for the rate of public employment are negative, while the one for the regulation of professional services is positive. However none of these covariates appear to be statistically associated with the overall risks of both educational and skill mismatches. Moreover, the inclusion of country level variables does not change the significance or the magnitude of the individual level coefficients. Because we were interested in assessing whether these country-level variables affect field of study differentials in overeducation, in Model 4 we add interaction terms between these variables and field of study.

Our first hypothesis concerning the effects of employment protection is confirmed. Model 4 in Table 4.6 suggests that fields of study can be divided into three groups, according to graduates' risk of educational mismatch. On the one side, we have technical and scientific fields, which are associated with a lower risk of mismatch: these are Medicine, Engineering and Architecture, Mathematics and Statistics. On the other side, we find fields with a higher risk of educational mismatch: Arts and Humanities, Social Sciences, Business and Administration and Natural Sciences. Education, which is the reference category, and Law stay in

Tab. 4.7 The risk of skill mismatch. Multilevel logit estimates

		Model 1	Model 2	Model 3	Model 4
Intercept		-2.250	-2.740	-2.752	-2.741
		(0.109)	(0.143)	(0.167)	(0.173)
Individual Level					
Sex	Male		Ref.	Ref.	Ref.
	Female		0.060	0.062	0.063
			(0.041)	(0.042)	(0.041)
Age	<30		Ref.	Ref.	Ref.
	31-40		-0.038	-0.032	-0.035
			(0.047)	(0.045)	(0.049)
	>40		-0.208**	-0.202**	-0.206**
			(0.089)	(0.087)	(0.09)
Birth Country	Home Country		Ref.	Ref.	Ref.
	Other Country		0.210*	0.210**	0.202*
			(0.108)	(0.106)	(0.107)
	No answer		0.056	-0.031	0.010
			(0.172)	(0.175)	(0.187)
Parental Education	High		Ref.	Ref.	Ref.
	Medium		0.188***	0.188***	0.180***
			(0.043)	(0.042)	(0.042)
	Low		0.166***	0.164***	0.156***
			(0.055)	(0.055)	(0.054)
	No answer		0.154	0.169	0.150
			(0.119)	(0.12)	(0.115)
Type of secondary school	Generalist		Ref.	Ref.	Ref.
	Vocational		0.079	0.079	0.085*
			(0.050)	(0.051)	(0.050)
	Other		0.129	0.122	0.110
			(0.094)	(0.091)	(0.095)
Grade (secondary school)	High		Ref.	Ref.	Ref.
	Medium		0.055	0.059	0.056
			(0.046)	(0.047)	(0.048)
	Low		0.225***	0.225***	0.224***
			(0.051)	(0.051)	(0.051)
	No Answer		0.285***	0.288***	0.288***
			(0.098)	(0.099)	(0.098)
Type of tertiary degree	Direct Access to Phd		Ref.	Ref.	Ref.
	No Direct Access to Phd		0.183***	0.195***	0.201***
			(0.048)	(0.048)	(0.048)

(continue)

		Model 1	Model 2	Model 3	Model 4
	No answer		-0.784**	-0.785**	-0.773**
			(0.351)	(0.364)	(0.360)
Further Education	No		Ref.	Ref.	Ref.
	Yes		-0.187***	-0.184***	-0.188***
			(0.038)	(0.039)	(0.040)
Work experience before/during study	No		Ref.	Ref.	Ref.
	Experience not study related		0.161***	0.175***	0.161***
			(0.051)	(0.052)	(0.055)
	Experience study related		-0.405***	-0.391***	-0.404***
			(0.052)	(0.053)	(0.056)
	No answer		0.056	0.074	0.063
			(0.159)	(0.163)	(0.168)
Field of Study	Education		Ref.	Ref.	Ref.
	Art and Humanities		0.580***	0.578***	0.623***
			(0.084)	(0.087)	(0.083)
	Social Sciences		0.400***	0.401***	0.456***
			(0.078)	(0.084)	(0.076)
	Business and Administration		0.347***	0.352***	0.411***
			(0.08)	(0.086)	(0.076)
	Law		0.162	0.164	0.179*
			(0.105)	(0.110)	(0.109)
	Natural and Applied Sciences		0.595***	0.596***	0.672***
			(0.082)	(0.093)	(0.081)
	Mathematics and Statistics		0.078	0.076	0.103
			(0.123)	(0.128)	(0.120)
	Engineering and Architecture		0.257***	0.262***	0.314***
			(0.081)	(0.087)	(0.078)
	Medicine		-0.652***	-0.64***	-0.603***
			(0.11)	(0.118)	(0.107)
Country Level					
Strictness of Employment Protection				-0.168	-0.153
				(0.185)	(0.198)
Professional Services Regulation				0.188	0.414**
				(0.204)	(0.199)
Rate of Public Employment				-0.029	-0.049*
				(0.026)	(0.026)
GDP per Capita				0.000	0.000
				(0.000)	(0.000)
Unemployment Rate				0.011	0.071
				(0.095)	(0.068)

(continue)

		Model 1	Model 2	Model 3	Model 4
Graduation Rate				0.011	0.007
				(0.013)	(0.012)
Cross-Level Interaction					
Strictness of Employment protection *	Education				Ref.
	Art and Humanities				-0.163
					(0.156)
	Social Sciences				-0.123
					(0.145)
	Business and Administration				-0.074
					(0.150)
	Law				-0.168
					(0.194)
	Natural and Applied Sciences				-0.120
					(0.148)
	Mathematics and Statistics				-0.127
					(0.196)
	Engineeringand Architecture				-0.254*
					(0.149)
	Medicine				-0.154
					(0.209)
Professional Services Regulation *	Education				Ref.
	Art and Humanities				-0.336***
					(0.114)
	Social Sciences				-0.233**
					(0.108)
	Business and Administration				-0.273**
					(0.110)
	Law				-0.279**
					(0.140)
	Natural and Applied Sciences				-0.207*
					(0.113)
	Mathematics and Statistics				-0.577***
					(0.182)
	Engineeringand Architecture				-0.272**
					(0.110)
	Medicine				-0.233
					(0.151)

(continue)

		Model 1	Model 2	Model 3	Model 4
Rate of Public Employment *	Education				Ref.
	Art and Humanities				0.022
					(0.020)
	Social Sciences				0.020
					(0.019)
	Business and Administration				0.031
					(0.021)
	Law				-0.008
					(0.024)
	Natural and Applied Sciences				0.040**
					(0.020)
	Mathematics and Statistics				-0.001
					(0.029)
	Engineeringand Architecture				0.025
					(0.019)
	Medicine				0.029
					(0.026)
Random Part					
Level: Country					
Cons.		0.254	0.176	0.253	0.215
		(0.102)	0.082)	(0.177)	(0.143)
Level: Individual					
Cons.		1.000	1.000	1.000	1.000
		(0.000)	(0.000)	(0.000)	(0.000)
-2*loglikelihood:					
DIC:		22695.66	22168.86	22168.88	22182.41
pD:		17.52	44.22	44.75	68.77
Units: paese		18	18	18	18
Units: case		34,955	34,955	34,955	34,955

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

between the two categories. The level of employment protection seems not to be statistically associated with the overall risk of educational mismatch, but it influences the distribution of this risk across fields of study. A stricter employment protection, indeed, seems to further reduce the already low risk of educational mismatches for graduates from fields of study that prepare students for specific professions, such as Engineering and Architecture and Medicine, and from scientific fields, particularly Mathematics and Statistics. In other words, technical fields seem to provide a clearer signal, which is likely to guarantee better occupational opportunities to graduates especially in context where EPL is high. At the same time, it leaves unaltered the risk for graduates from the other fields of study. In short, the stricter the employment protection, the greater the gap between graduates in terms of the risk of educational mismatch. Conversely, consistent with our hypothesis, we find that strictness of employment protection does not significantly affect the overall risk of skill mismatch, nor its distribution among graduates from different fields (Table 4.7).

The empirical evidence partially supports also the second hypothesis, concerning the regulation of professional services. Model 4 in Table 4.6 suggests that a higher level of regulation is associated with an overall higher risk of educational mismatch. Moreover, the interaction terms indicate that in contexts with a stricter professional regulation we find a lower risk of educational mismatch for graduates who do not have to comply with these additional requirements to access the profession, such as graduates from the Humanities or Social Sciences. At the same time, we find no alteration of the risk of educational mismatch for graduates who are subjected to this kind of regulation, such as graduates from Engineering, Architectures and Law. Thus, we end up with a reduction of the comparative advantage for graduates from such fields of study. The only relevant difference is the one of graduates from Business and Administration, whose risk of educational mismatch is found to be lower in countries with a stricter regulation of professional services. On the other side, results reported in Table 4.7 suggest that the regulation of professional services does not influence the distribution of the risk of skill mismatch among graduates: the main effect is positive and statistically significant, but it is counterbalanced by the interaction terms, which all appear negative and significant.

The findings on the role of the public sector as an employer partially support our hypothesis. As expected, the higher the rate of public employment, the smaller the gap between more and less job-oriented fields of study with respect to educational mismatches. The results reported in Table 4.6 suggest, indeed, that a higher rate of public employment reduces the relative advantage of more occupationally oriented fields, such as Engineering, Architecture and Medicine. We find, however, public employment not to significantly affect the risk of skill mismatch (Tab. 4.7). Even though the main effect of the rate of public employment is negative and statistically significant, the interaction terms are not significant, suggesting that this factor is not capable of affecting the differential risk of graduates from different fields of study.

4.5 Concluding remarks

In this chapter, we have deepened the existing knowledge around the association between some labour market institutions and the diffusion of overeducation among tertiary graduates, by distinguishing between two forms of sub-optimal allocation of workers in the labour market: educational and skill mismatches. In a context of widespread educational expansion, the distinction is not of minor importance: individuals may possess formal qualifications higher than those required by their jobs, but actually perform jobs for which their skills are well suited. Consistent with previous findings, we have found important differences in the overall incidence of the two phenomena and a weak correlation between them at the individual level. Also the distribution of educational and skill mismatches among graduates from different fields have been shown to differ to a significant extent, even though both phenomena seem to be more widespread among graduates from generalist fields, such as the Humanities and Social Sciences.

The analyses presented in this chapter have mainly focused on the variation across countries of fields of study differentials in terms of both educational and skill mismatches. While the literature has mainly explained differences across countries as the result of different educational systems, we have investigated the role of labour market and welfare institutions. In particular we have analysed

three institutional factors that are likely to affect the number and the quality of the available vacancies: the strictness of employment protection, the level of professional services regulation, and the capacity of the welfare state to hire skilled workers.

The first result is that these institutional factors do not affect educational and skill mismatches similarly: they have been shown to mainly affect the match between individual educational credentials and job, rather than the actual utilization of skills on the workplace. This finding, together with the descriptive evidence that they happen to be weakly correlated at the individual level and across fields, further supports the claim that we need to trace a distinction between the two phenomena.

The way in which these institutional factors affect fields of study differential is far from homogenous. The level of employment protection is found to augment the differential in terms of educational mismatch, by further reducing the already low risk for graduates from more vocationally oriented fields of study. Employment protection, on the contrary, seems not to affect the match between individual skills and those required on-the-job. In other words, this factor seems to enhance the marketability of some credentials—the «stronger» ones, in fact—without altering the capacity of employers to fully recognize and use graduates' competencies.

The second analysed factor—the regulation of professional services—is found to create rigidities to the individual-job match. Graduates who have to comply with these additional requirements, such as those from Architecture, Engineering, Law or Medicine, seem in fact not to be advantaged at all by this form of closure: on the contrary, in contexts with a stricter regulation of professional services, it appears to be harder for graduates from the matching fields to access these professions.

Finally, the level of public employment seems to play a beneficial effect on the gap between fields of study, at least in terms of educational mismatch. In contexts with a higher rate of public employment, indeed, we have found a reduction of the differential between generalist fields of study and those more vocationally oriented, probably due to the welfare state being able to employ graduates with less marketable credentials, such as those from the Humanities or Social Sciences.

5 Is short better? The impact of the Bologna university reform on graduates' risks of educational and skill mismatch in Italy.

5.1 Introduction

This last chapter aims at evaluating the impact of the recent Bologna Process on tertiary graduates' employability by providing an estimate of the effect of the reform on the risk of overeducation, both overall and across fields of study. Indeed, while a huge body of literature has addressed the role of educational systems in shaping occupational opportunities for tertiary graduates entering the labour market, as described in the previous Chapters, to the best of our knowledge no study has addressed so far the effect of the Bologna university reform. However, the existing empirical evidence and several theoretical reasons that are going to be discussed suggest that the risk of mismatch might have increased as a result of the university reform. Also in this chapter we theoretically and analytically distinguish between educational and skill mismatches: results presented so far suggest that the two phenomena—even though correlated—represent two different features of the more general concept of overeducation, and theoretical considerations that are going to be discussed indicate that they are likely to have been differently affected by the reform.

The following paragraph describes the main features of the reform and presents the hypotheses guiding our analyses. Then, the selected case-study—Italy—is presented: this country is chosen for the analyses for both methodological and substantive reasons. On the one side, the peculiar way in which the reform has been implemented in this country and the existence of large nationally representative datasets on tertiary graduates allow us to adopt a counterfactual approach to evaluate the effect of the reform on graduates' risks of educational and skill mismatch. On the other side, Italy represents an interesting case study *per se*, since it combines comparatively low graduation rates with a high incidence of overeducation. Section 5.4 presents the analysed data and the counterfactual approach adopted to estimate the effect of the reform. Section 5.5 presents the main findings and 5.6 concludes.

5.2 The Bologna reform: main features and expected effects

The 1999 Bologna Agreement has paved the way for the creation of an integrated European Higher Education Area, with the aim of making European HE institutions attractive and competitive worldwide. The main instrument through which this goal has been pursued is the development of a European system of comparable academic titles: the structure of university programmes has been harmonised throughout European countries and a credit system that should facilitate mutual recognition of degrees has been introduced. Despite the complexity of the Bologna Process, a lot of attention has been devoted to the changes it has entailed in the degree structure of many European countries. Indeed, with the signature of the Bologna Agreement many member states of the EU agreed to reform their unitary structure of HE towards the Anglo-Saxon system, consisting of a three/four-year Bachelor's degree (BA) plus a one/two-year Master's degree (MA). Even though this structure—which is typical of countries as the UK, the US, Canada and Australia—is known to guarantee a high level performance[23] (Jacobs and van der Ploeg, 2006), its implementation has led to some controversy. On the one hand, such a system reduces the length of studies and the number of exams required to get a first cycle degree. Since both these elements can, in principle, reduce the cost of investing in tertiary education, the reform may have impacted on human capital investment. Moreover, the wider menu of available degree and the possibility to prolong education in order to obtain a second cycle degree might also have increased the expected returns to tertiary education, by allowing a better match between demand and supply of HE. On the other hand, however, concern has been raised about both the academic contents of the new curricula and the adequacy of the skills acquired in a shorter period for the labour market.

Soon after the implementation of the reform, a huge body of research started addressing the question of the effects of the Bologna Process on participation to HE. Evidence from these studies is mixed, as it indicates that these effects vary across countries. On the one side, for example, Hortschräer and Sprietsma (2015)

[23] In the list of top 50 universities of the *Times Higher Education* World University Ranking 2015, which judges universities on the basis of teaching, research, knowledge transfer and international outlook, 41 institutions have an Anglo-Saxon system of HE.

estimate the short-term impact of the reform in Germany and do not find significant effects on college enrolment and drop-out rates. On the other side, a positive impact of the reform on enrolment rates has been found both in Portugal (Cardoso *et al.*, 2008; Portela *et al.*, 2009) and in Italy (Cappellari and Lucifora, 2009; Di Pietro, 2012; Trivellato and Triventi, 2011), even though this effect is arguably declining in the long run (Schizzerotto and Vergolini, 2015). Additional evidence from Italy suggests that the reform has succeeded in reducing the number of dropouts (Di Pietro and Cutillo, 2008; Cappellari and Lucifora, 2009), in incrementing the number of graduates at the same time reducing age at graduation (Cammelli, 2010), and in favouring participation to HE of students from low social origins and from non-academic tracks, such as vocational and technical institutes (Argentin e Triventi, 2011; Trivellato and Triventi, 2011).

These results suggest the relevance of an in-depth analysis of the impact of the reform on graduates' employability. If the supply of qualified labour force has increased and the composition of the population of tertiary graduates has changed in terms of age, education, and length of studies, it becomes relevant to understand how these new graduates respond to the needs of specific skills and competencies expressed by the labour market. These aspects of the reform have been in fact widely debated. On the one side, supporters of the reform interpreted the shortening of the first cycle as a means to increase enrolment, reduce drop-out rates, improve equality of opportunities for access to university and, finally, to allow a faster entry into the labour market. On the other side, criticisms have been raised about both the academic content and the actual market value of the new shorter cycle. Indeed, even though the basic idea of the reform was that BA degree could be fully considered a tertiary degree and that BA graduates should have a background and a profile tailored to the needs of economic growth and innovation, some studies suggest that this is not the case. Bratti and colleagues (2010), for instance, analyse the effect of the reform on Italian students' performance comparing pre-reform and BA courses and outline three main results, namely a reduction of course workload, a certain degree of grade inflation and an increase in the probability of passing exams. Thus, the authors conclude that obtaining a degree has become easier, which might devaluate tertiary degrees and hence worsen graduates' occupational outcomes. The few studies directly addressing the effect of the reform on graduates' occupational outcomes confirm

this hypothesis. Even though BA graduates are found to have higher probabilities of employment with respect to pre-reform graduates, they are more likely to end up in temporary jobs (Bosio and Leonardi, 2011) and in clerical occupations (De Paoli, 2010), and to earn lower wages (Bosio and Leonardi, 2011; Bratti and Cappellari, 2012). These could be counted among the reasons why a big portion of BA graduates, especially those from high social origins, is found to continue studying in order to obtain a MA degree (Bratti and Cappellari, 2012).

To the best of our knowledge no study has assessed so far the effect of the reform on the match between graduates' jobs and education. However, if the reform has enhanced the already increasing number of graduates, while the corresponding demand has not followed this trend, we can reasonably expect to observe an overall increment in overeducation rates. Following the growth in the number of graduates, the competition for the available vacancies may have increased overall worsening graduates' occupational chances. Thus, graduates would more often be forced to accept non-graduate jobs, which require neither their qualifications nor the skills they have acquired at university. Therefore we could expect that the risks of both educational and skill mismatches have overall increased after the implementation of the reform, as a result of the gap between demand and supply of qualified labour force.

The new two-tier system created by the university reform requires, however, a more detailed analysis. BA and MA graduates differ with respect to several observable and unobservable characteristics—attained credential and amount of education above all. Thus, when comparing pre- and post-reform graduates, we cannot simply ignore the existence of two levels of tertiary education. Rather, from both theoretical and policy-oriented points of view, it becomes relevant to investigate the conceivably twofold effect of the reform. For these reasons, we are going to elaborate different and separate hypotheses on the effect of the reform for BA and MA graduates.

Taking the move from the former, various elements suggest that BA graduates are more exposed to the risk of both educational and skill mismatches with respect to pre-reform graduates. These disadvantages, however, are likely to descend from different mechanisms. As we have discussed in the previous chapters, theories looking at education as a positional good predict that an increment in the number of graduates will challenge the validity of the educational

credential as a screening device. According to this view, employers may decide to rely on other signals of job applicants' unobserved productivity, thus increasing graduates' risk of educational mismatch. This scenario is even more plausible since, after the reform, the social base of participation to tertiary education has expanded. If the heterogeneity of graduates (in terms of skills, motivation, and productivity) has consequently increased, it could result in a further devaluation of the educational credential. Thus, we can hypothesise (*Hypothesis 1*) that BA are more exposed to the risk of educational mismatch than pre-reform graduates, since their educational degree has lost part of its signaling value, due to a) an increase in the number of individuals holding this degree, and b) an increase in graduates' heterogeneity.

At the same time, other elements suggest that the risk of skill mismatch has also increased for new BA graduates. In particular, according to the existing literature, these graduates do not seem to have been provided with skills and competencies actually required in the labour market. The reform does not seem to have reached the goal of making graduates more competitive in the labour market and prepared to meet the needs of innovation expressed by the economic systems. The possibility of developing three-year vocational courses has not been fully exploited; on the contrary, some scholars highlight that, while the reform has reduced the number of years necessary to gain a tertiary degree, universities have mainly continued to provide a generalist training (Trombetti and Stanchi, 2006). Additionally, results discussed above (Bratti *et al.*, 2010) highlight a simplification of educational contents and a reduction of students' workload. Adopting a Human Capital approach, we can expect these elements—BA graduates having lower, inadequate and not marketable skills—to have negative consequences on employers' hiring decision. Thus, we hypothesise (*Hypothesis 2*) that BA are more exposed to the risk of skill mismatch than pre-reform graduates, since tertiary education does not appear to have been reformed according to the needs expressed by labour market.

On the contrary, there is no reason—neither theoretical nor empirical—to expect MA graduates to differ, in terms of educational and skill mismatches, from pre-reform graduates. Indeed, we can expect the new MA degree to maintain the same value of the pre-reform degree, not only in terms of skills transmitted to students, but also in terms of signaling value of the educational credential. The

creation of two levels might have even enhanced the value of the MA degree, as employers do no longer compare it with upper secondary degrees, but rather with another tertiary degree of a lower level. Thus, we hypothesize (*Hypothesis 3*) that MA graduates differ neither in terms of educational mismatch nor in terms of skills mismatches from pre-reform graduates. Their risk of educational mismatch could even be lower, if the signaling value of the MA degree is higher than the one of the pre-reform tertiary degree.

It is especially in terms of fields of study differentials that we expect the reform to have differently impacted on educational and skill mismatches. According to the social closure theory, discussed in previous chapters, graduates from fields of study that are intended to prepare for highly regulated professions (e.g. Engineering, Architecture, Law, etc.) can be more protected than others from the risks of educational and skill mismatches, if the regulation of the access to these professions helps in maintaining the competition for job vacancies low. In these cases, professions require very specific educational credentials and skills that only the corresponding fields of study can provide. For example, in order to become an architect, a student has to obtain a tertiary degree in Architecture. The reverse is also true: graduates in Architecture often become architects. This tight link might have been damaged by the reform. The question we should answer is what kind of job will be held by a BA graduate in Architecture. It might be useful to stress that we are not wondering whether a BA, a MA and a pre-reform graduate will do *the same* job, but rather, whether their educational credential and their skills will be equally required in the labour market. This is exactly the convenience of using subjective indicators: we do not have to impose that two graduates have the same job in order to test if they are at risk of educational and skill mismatches. Thus, the point is to understand whether graduates have—both at the BA and MA levels—credentials and skills required in the labour market. This issue seems particularly relevant when we deal with the above-mentioned fields of study that prepare for specific and regulated professions, by providing students with very specific skills that cannot be substituted by on-the-job training. The problem is to understand whether these new BA graduates are actually required in the labour market. Thus, we hypothesised (*Hypothesis 4*) that the reform has especially affected the risk of educational mismatch of BA graduates from fields that are intended to prepare for specific highly regulated professions.

Whether this effect is positive or negative remains to be established, since it probably depends on the capacity of the corresponding professional groups to adapt their regulation to the introduction of the new BA level.

In terms of skill mismatch, instead, we do not expect that these fields of study have been affected more than others by the reform. As we have seen, educational mismatch does not necessarily imply skill mismatch and there are no reasons to believe that these graduates will have more difficulties in employing the skills they have acquired at university. Thus, we hypothesise (*Hypothesis 5*) that the reform has not differentially impacted on BA graduates' risk of skill mismatch.

Finally, neither theoretical nor empirical reasons indicate that the reform might have enhanced or reduced fields of study differentials among MA graduates, in terms of both educational and skill mismatches.

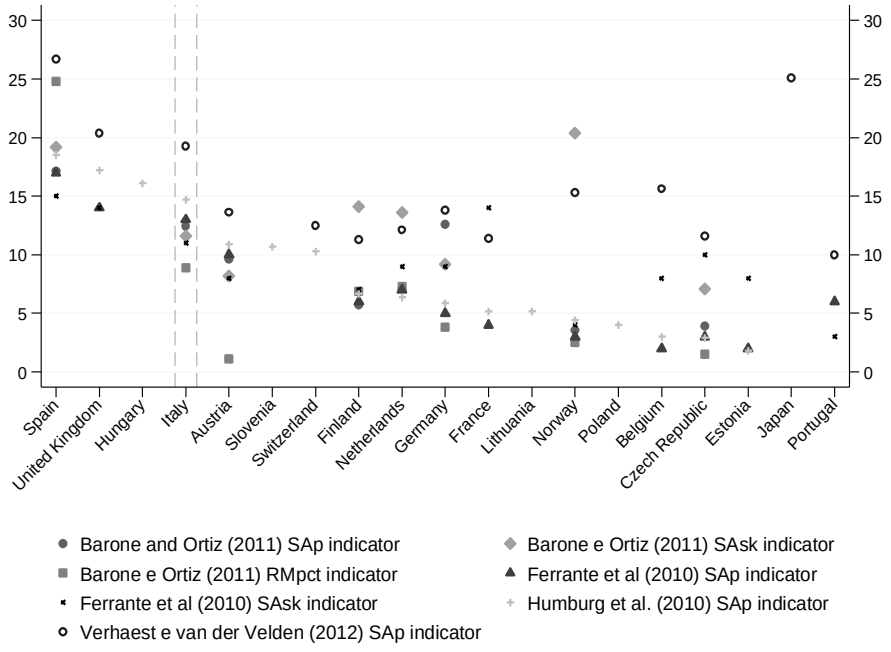
5.3 Italy: too few or too many graduates?

In the following sections the effect of the reform on Italian graduates' risks of educational and skill mismatch is estimated. Low graduation rates combined with below-average returns to tertiary education make the Italian case particularly interesting. Recent estimates by OECD (2012) show a delay of Italy with respect to other industrialized countries. Within each age group, the portion of graduates is found to be lower than the average of OECD countries. Only 20% of the Italian population aged between 25 and 34 achieved a tertiary qualification, which is well below the figures found, for example, in Spain (27%), France (26%), and Great Britain (38%) (OECD 2012). We could expect that fewer graduates compete for job vacancies, the better their employment prospects. Yet, it does not seem to be the case. In Italy, the unemployment rate recorded among tertiary graduates three years after graduation has increased from 10.4% in 2001 to 17.5% in 2011, following a trend of continuous growth (Istat 2012)[24]. Moreover, a decrease in the economic return to education has been recorded, both over time and in the

[24] Istat (2012) reports that the unemployment rate of tertiary graduates three years after graduation has increased from 10.4% in 2001, to 12.6% in 2004, to 15.6% in 2007, to 17.5% in 2011. The worsening labour market opportunities for tertiary graduates seem, thus, not to be fully due to the explosion of the economic crisis (even though it surely has had a negative impact). It rather seems to be a negative trend consolidated in the last decade.

international comparison. Almalaurea (2012) observed a significant reduction of tertiary graduates' wages between 2007 and 2010: -11% for BA graduates, -13% for MA graduates[25]. Additionally, the wage premium for tertiary graduates with respect to individuals with upper secondary education is lower in Italy (+50%) than in other OECD countries (on average: +65%), such as US (+84%), Germany (+81%), the UK (+78%) and France (+65%) (OECD 2012)[26]. Finally, the most interesting datum for this dissertation is that Italy is one of the European countries with the highest incidence of overeducation among tertiary graduates (Barone and Ortiz, 2011; Cainarca and Sgobbi, 2009; Verhaest and van der Velden, 2013). Figure 5.1 reports the main findings from the most recent comparative analyses, which have all been conducted on REFLEX and HEGESCO data (Barone and Ortiz, 2011; Ferrante *et al.* 2010; Humburg *et al.* 2012; Verhaest and van der Velden 2013).

Fig. 5.1 The incidence of overeducation among European graduates, existing evidence



[25] As for the unemployment rate, also wages have started to reduce before the 2008 economic crisis (AlmaLaurea 2012).

[26] Worth to say that this lower premium is not due to individuals with secondary education earning higher wages in Italy than in the other mentioned countries (OECD 2012).

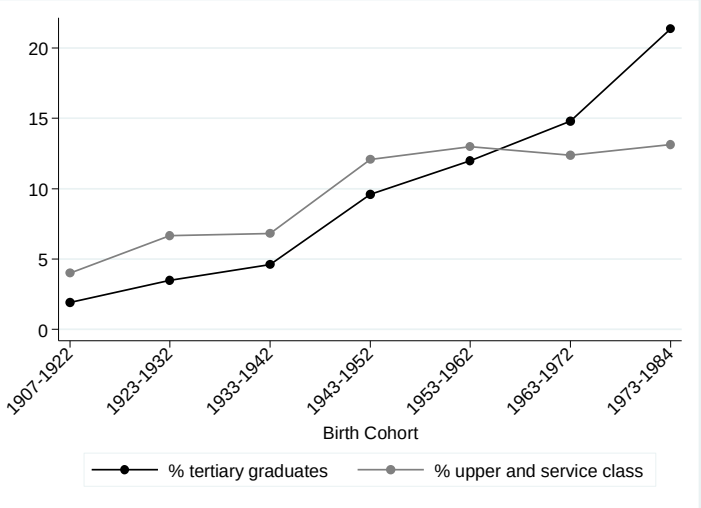
Despite the differences among the estimates reported in the graph, results highlight that Italy ranks among the countries with the highest incidence of overeducated graduates, along with Spain, Hungary and the United Kingdom. Five years after graduation the rate of overeducation among Italian tertiary graduates lies between 11% and 19%. Thus, the overeducation risk is found to be high not only soon after graduation (23% six months after graduation according to Ferrante *et al.* [2010], 38% according to Verhaest and van der Velden [2013]), but also in the long run. It is especially this long-term figure that raises concern: a temporary experience of overeducation can be considered as physiological at the very beginning of the job career, but the phenomenon acquires more relevance if it lasts over time (Groot and Maassen van den Brink 2000). Also the most recent Italian literature has highlighted a major mismatch between demand and supply of skilled labour, resulting in a high incidence of overeducation. In one of the most recent studies, Terraneo (2010) analyses data on graduates of 2004 interviewed in 2007 and finds that about one graduate out of four is overeducated. Among graduates of the same cohort, but interviewed five years after graduation, Ferrante and colleagues (2010) estimate that the rate of overeducation is around 11%. Caroleo and Pastore (2013), using data from graduates of 2005, estimate the incidence of the phenomenon to rank between 13.2% and 16.5% one year after graduation, and between 8% and 11.5% at five years.

These two apparently conflicting results—the low share of tertiary graduates and the high incidence of overeducation—can be reconciled if we take into account not the absolute number of graduates, but rather the ability of the economic system to take advantage of this highly skilled workforce. We have to consider, indeed, that the demand for qualified labour force in Italy is traditionally hampered by a rigid labour market, lack of innovation, low investments in research and development, and the prevalence of a traditional economy which above all requires low-skilled workers (Di Pietro, 2002). In order to compare the evolution over time of demand and supply of qualified labour, Figure 5.2 depicts the trend in graduation rates and in the diffusion of highly skilled jobs[27]. Although the definition of the latter might be debated, for the sake of simplicity we consider

[27] The datum refers to individuals' first job, which is the only information comparable across cohorts.

them to coincide with the first two categories of the scheme proposed by Erikson and Goldthorpe (1992), including the upper and service class (Barone, 2012b).

Fig. 5.2 Percentage of tertiary graduates and of service class by birth cohort



Source: ISTAT, Indagine Statistica Multiscopo sulle Famiglie (2009)

As shown in the figure, a major part of the twentieth century has been characterized by a significant gap between demand and supply of skilled labour. This trend has started to reverse when workers born in the '40s entered the labour market, while the number of skilled jobs stopped increasing[28]. At the same time, figure 5.2 suggests that graduation rates have inexorably continued to grow. This huge increase has followed the more general trend of growing educational

[28] Looking at Figure 5.2, it could be argued that we are not observing a substantial stability of the ratio of qualified jobs over time. On the contrary, it might be hypothesized that, due to technological innovation, the category of highly qualified jobs has expanded, up to include, nowadays, not only the upper classes depicted in the graph, but also, for example, the one immediately below, namely that of qualified employees (Büchel *et al.*, 2003). However, scholars who addressed the distinction between overeducation and upgrading of skills have outlined that, in Italy, the first phenomenon seems to prevail over the second one (Naticchioni *et al.*, 2010). Among the determinants, the peculiarity of the Italian productive structure—characterized by the prevalence of SMEs specialized in traditional low-technology sectors (Trombetti and Stanchi, 2006)—, the labour market rigidity (Di Pietro and Urwin 2006) and the low investment in R&D are counted. The same reasons are also advanced to explain the large incidence of undereducation in Italy, that is to say, of individuals holding a lower level of education than the one required by their jobs. Cainarca and Sgobbi (2009) suggest that this evidence supports the hypothesis that in Italy workers tend to learn occupation-specific skills on the job rather than at school. Consequently, in their hiring decisions, employers would reward job applicants' professional experience more than their educational credentials. This hypothesis has been also confirmed in a recent study, which has outlined that Italian firms tend to hire workers with less skill than those required to do the job, in order to be able to train them on the job (Centro Studi Unioncamere 2010).

attainment: CNVSU data show that the number of upper secondary degree holders has increased in the last three decades, both in absolute terms and as a percentage of individuals aged 19 (which is the typical age at diploma). Along with this phenomenon, we also observe an increase in the number of students enrolled at, and graduated from, university, notwithstanding the well-known high level of drop-out that characterizes the Italian Higher Education system.

According to the literature this pre-existing trend has been further stimulated and accelerated by the introduction of the so-called «3+2» reform of Higher Education Starting from the Academic Year 2000/2001[29], indeed, Italy complied with the European guidelines of the Bologna Process and replaced the former unitary system—in which student could enrol into either four- or five-years degrees[30]—with a two-tier system made of a three-year degree (BA) and an additional two-year degree (MA)[31]. Only students from Medicine and Veterinary have not been systematically affected by the reform, since for these courses no BA degree exists.

The Italian government particularly stressed the remedial role of the Bologna Process to some long-standing problems of tertiary education: the comparatively low participation (especially of students from low social origins), the high level of graduation delay and the high drop-out rate. With the new two-tier system, a reduction of time required to obtain a (first) tertiary degree and the consequent decrease of the direct and indirect costs of education were intended to contribute to the achievement of relevant social goals, such as the expansion of the participation to tertiary education, the reduction of the drop-out rate, the decline in the average age at graduation and the increase of graduation rates. As previously discussed, a huge body of research has investigated the effects of the Bologna Process on enrolment and students' academic performance, indeed finding that the reform has promoted an increase in the number of graduates, mainly by expanding the social base of participation in HE. However, its impact on labour market

[29] D.M. 509/1999.

[30] In the pre-reform system, students could also choose to enrol into another kind of short course, with a two- or three-years duration, called «diploma universitario». This option was, however, scarcely diffused. Moreover, data on students from these courses are not available, so that they cannot be compared with graduates pre- or post-reform.

[31] Other innovations include the introduction of the system of credits (ECTS), intended as a measure of the commitment required to achieve the degree, and the expansion of university in terms of numbers of faculty, courses and teachers.

entrance of graduates still needs to be examined in depth: the few studies addressing this issue, indeed, indicate that post-reform graduates have higher probabilities of employment with respect to pre-reform graduates, but more often hold temporary jobs and earn lower wages (Bosio and Leonardi, 2011; Bratti and Cappellari, 2012).

5.4 Empirical strategy

5.4.1 Data

The analyses are conducted on the six waves of the Istat survey on work careers of tertiary graduates *«Inserimento professionale dei laureati»*. Starting from 1995 the survey has been conducted every third year, interviewing graduates three years after graduation. The only exception is the last wave (2011), in which data have been collected four years after graduation. A total of 186,987 graduates have been included in the six waves of the survey. Some individuals have been excluded from the analyses, in particular:

- 10,133 BA graduates from 2004 who have obtained (or have continued studying in order to obtain) a MA degree. As already discussed in Chapter 3, these individuals are not comparable with other graduates from the same cohort: neither with BA graduates, because of a different educational history (three vs. five years of tertiary education), nor with MA graduates, because of a (presumably) different amount of work experience.
- 16,158 BA graduates from 2007 who have obtained (or have continued studying in order to obtain) a MA degree (for the same reason discussed above).

Moreover, since our outcome variables are conditional on employment, unemployed graduates are excluded from the analysis.

The final sample includes 119.272 observations, as described in the following table.

Tab. 5.1 Sample size by graduation cohort and year of the survey

Year of the survey	Graduation cohort	N
1995	1992	9,251
1998	1995	12,638
2001	1998	15,782
2005	2001	18,517
2007	2004	28,186
2011	2007	34,898
Total		119,272

5.4.2 Variables

Following the discussion of previous chapters on the validity of various indicators of overeducation, also in the following analyses we distinguish between educational and skill mismatches. The former is measured by a SA_g indicator, based on individuals' self-assessment of the necessity of a tertiary degree as an entry requirement for their job: «Was a tertiary degree necessary to get your current job?» [32]. EM occurs when individuals answer «No».

SM is measured through a SA_p indicator which refers to the effective necessity of the tertiary degree to do the job. The wording of this question has slightly changed throughout the six waves. The construction of the indicator is summarized in Table 5.2.

Tab. 5.2 Construction of the SA_p indicator of skill mismatch

Year of the survey	Question	Possible answers	Definition of SM
1995	How much do you make use of your university education to perform your current job?[33]	A lot; quite a lot; scarcely; not at all.	SM occurs if individuals answer 'Scarcely' or 'Not at all'.
1998 2001	With respect to your current job do you think that having a tertiary degree is...?[34]	Too much, necessary, inadequate	SM occurs when individuals answer 'Too much'
2004 2007 2011	And to do your current job, do you think that having a tertiary degree is effectively necessary?[35]	Yes; No	SM occurs if individuals answer 'No'

[32] The original Italian question is «Per accedere al suo attuale lavoro, possedere una laurea era un requisito necessario?». The wording of the question is partially different only in the 1995 wave: «La laurea è un titolo di studio necessario per l'attività lavorativa attuale?».

[33] 'Utilizza la formazione universitaria? a) in maniera importante; b) in maniera soddisfacente; c) in maniera ridotta; d) per niente'.

[34] 'Rispetto al lavoro che svolge, ritiene che avere una laurea sia…? a) eccessivo; b) necessario; c) insufficiente'

[35] 'E per svolgere il suo lavoro, secondo lei, possedere una laurea è effettivamente necessario?'

The following table describes the distribution of the two dependent variables in the six waves of the survey.

Tab. 5.3 Incidence of educational and skill mismatches by graduation cohort

Graduation cohort	Educational mismatch	Skill mismatch	N
1992	0.26	0.35	9,251
1995	0.33	0.26	12,638
1998	0.31	0.18	15,782
2001	0.32	0.31	18,517
2004	0.31	0.30	28,186
2007	0.36	0.33	34,898

The following analyses investigate the evolution over time of the phenomenon, before and after the implementation of the reform, among graduates from different fields of study, by controlling for a number of relevant individual characteristics. The main independent and control variables that will be used in the subsequent analyses are described in Table 5.4.

5.4.3 Methods

The main aim of this chapter is to evaluate the impact of the «3+2» reform on graduates' risks of educational and skill mismatches, both overall and across fields of study. Several elements have been emphasized in the literature, showing how problematic it is to accurately evaluate the effects of the reform (Fondazione Giovanni Agnelli 2012). First of all, the existence of a huge population of graduates who enrolled before the implementation of the reform but who have then shifted to a new three-year course (the so-called *hybrid* graduates) makes it difficult to clearly identify the *pre*- and the *post*-reform populations. Moreover, the near introduction of other reforms, designed to enhance the contractual flexibility in the labour market (such as the so-called «pacchetto Treu»[36] and «Biagi law»[37]), and the emergence of the economic crisis might conceal the eventual effect of the university reform.

36 Law 196/1997.
37 Law 30/2003.

Tab. 5.4 Description of the main independent and control variables

Variable	Description	Categories
Sex	Sex of respondent	Male Female
Geographic Area	It refers to the location of the Athenaeum	North Centre South and Islands
Age	Age at graduation	Less than 30 30 or more
Parents' Education	Level of education of parents (dominance criterion: the highest one is selected)	Primary or less Lower secondary Upper secondary Tertiary
Parents' occupation	Occupational class of parents (dominance criterion: the highest one is selected)	Managers and Professionals Entrepreneurs Non manual employees Self-employed Manual workers Unemployed
Upper secondary education	Type of upper secondary education	Classical lyceum Scientific lyceum Other lyceum Technical school Vocational school
Matriculation year	Year of first matriculation (available only in the 2007 and 2011 surveys)	1998/99 or before 1999/2000 or after
Field of study	Field of study individuals graduated from	Scientific Medicine Engineer Agriculture Economics Social and political sciences Law Humanities Medical professions
Tertiary graduation mark	Tertiary graduation mark	66-90 91-100 101-105 106-110 110 cum laude
Graduation delay	Years of graduation delay	No delay One year Two years Three years Four years or more
Type of tertiary degree	Type of tertiary degree obtained	Pre-reform (or post-reform single-tier courses) Bachelor Master
Graduation cohort	Graduation cohort (defined by Istat sampling procedures)	1992 1995 1998 2001 2004 2007 2011
Further education	Further education after graduation	No Yes
Work experience during HE	Work experience while enrolled at university	No experience Temporary experience Permanently employed during university

Finally, since the *new* graduates are just at the very beginning of their job careers, any detectable effect will be, by definition, only a short-run effect and it will not provide a satisfactory answer to questions relating to long-term returns to education.

In the next section, fundamentals of counterfactual approach are briefly described and techniques adopted so far in the literature to evaluate the causal effect of the university reform are critically presented. Then, the methods employed for the analyses, namely propensity score matching and Difference-in-Differences will be introduced.

5.4.3.1 General problem of assessing the causal effect

We define the outcome of interest as Y_i, namely educational and skill mismatches. We want to estimate the causal effect on this outcome of the treatment D_i, namely graduating under the new regime (D_i=1) instead of under the older one (D_i=0). The causal effect of an intervention for an individual *i* can be defined as the difference between the two potential outcomes that the individual would experience being exposed to the treatment or excluded from it:

$$\tau_i = Y_i^1 - Y_i^0$$

where Y_i^1 represents the outcome of individual *i* when receiving the treatment (D_i=1, post-reform graduates) and Y_i^0 represents the outcome of individual *i* when he does not receive it (D_i=0, pre-reform graduates).

The problem is that we can observe graduate *i* and his outcome only in one of the two possible regimes, while we cannot observe the other outcome (i.e. the counterfactual outcome).

A feasible approach to overcome this «fundamental problem of causal inference» (Holland, 1986, p. 947) is to focus on the identification of causal parameters, that is to say, of specific features of the distribution of the causal effect $Y^1 - Y^0$ for (a subset of) the reference population. Typically, an interesting causal parameter is a mean.

We focus our attention on the average treatment effect on the treated (*ATT*) which is defined as follows:

$$ATT = E[Y^1 - Y^0|D = 1] = E[Y^1|D = 1] - E[Y^0|D = 1]$$

The last term in the equation is a counterfactual, unobservable by definition, since the outcome Y^0 is never observed on individuals exposed to the treatment. We can observe the mean value of Y^0 only among non-treated individuals, that is $E[Y^0|D = 0]$. If we contrast it with the outcome experienced by the treated group we obtain:

$$E[Y^1|D = 1] - E[Y^0|D = 0]$$
$$= \{E[Y^1|D = 1] - E[Y^0|D = 1]\} + \{E[Y^0|D = 1] - E[Y^0|D = 0]\}$$

The term $E[Y^1|D = 1] - E[Y^0|D = 1]$ is the *ATT*, which consists of the difference between the factual outcome for the treated after the treatment and their counterfactual outcome, i.e. the outcome we would observe for the treated, did they have not been exposed to the treatment.

The term $E[Y^0|D = 1] - E[Y^0|D = 0]$ represents the selection bias term, that is to say, the difference we would observe between participants and non-participants if the programme were not implemented. This bias depends on pre-existing differences between the two groups; in other words, it captures any eventual differences between treated and non-treated that cannot be attributed to the programme.

Finally, the term $E[Y^1|D = 1] - E[Y^0|D = 0]$ is the observed mean difference between treated and non-treated. Giving this term causal interpretation requires having no selection bias. The magnitude of selection bias, in turn, depends on the selection process, that is to say, to the set of rules according to which some members of the population are exposed to the intervention while some others are not.

Thus, the possibility to estimate the causal effect of the intervention rests on our capacity to disentangle the selection bias term and to nullify it, by making the treated group equal to the non-treated group, with the only exception of being exposed to or excluded from the treatment. Formally, we need to characterize $D(X, U, Z)$, where D is the binary treatment state, X is a set of observable characteristics not affected by the intervention and possibly correlated to the outcome Y^0, U is a set of unobservable characteristics not affected by the

intervention and possibly correlated to the outcome Y^0, and Z is the binary result of a random draw, that is by definition independent of the potential outcomes.

Various strategies have been adopted by scholars aiming at identifying the impact of the reform on graduates' occupational outcomes. The simplest strategy adopted in the literature is a before-after comparison. This is what can be found in Argentin and Triventi (2011) and in De Paoli (2010). The former analyse the same data that are being used for the following analyses, with the only—but relevant—exception of the 2011 wave. Pre-reform graduates are those who graduated in 2001 or before, while 2004 is the post-reform graduation cohort. Let's notice that this cohort includes, by definition, only BA graduates: thus, it is not possible for the authors to assess any eventual effect of the reform on MA graduates. De Paoli (2010), instead, investigates changes in graduates' occupational opportunities by recurring to Excelsior data on Italian firms. In this survey employers are asked about the characteristics of future employees. Data from 2001 to 2003 (pre-reform) and from 2007 to 2009 (post-reform) are analysed in order to assess whether employers' preferences for hiring graduates or non-graduates job applicants have changed with the introduction of the reform. The major drawback of the before-after approach is that it relies on the assumption that there are not time-varying unobservable factors affecting both the treatment and the outcome. It is particularly unlikely that this assumption holds in our case, since we are observing also the 2007 cohort. These are graduates that entered the labour market just before the economic crisis, which under no doubt has affected their occupational outcomes.

In order to tackle this problem Bratti and Cappellari (2012) restrict the analyses to graduates of the 2004 cohort only. In 2004, in fact, graduates from both the old and the new regime obtained a degree. The former are the last cohort of students enrolled before the introduction of the reform, while the latter are the former enrolled after the reform. In order to compare similar individuals, the authors dropped older graduates and those who graduated with delay. This way, the authors argue, they are able to observe similar individuals, who are not exposed to different business cycles, which is a typical problem with before-after comparisons. In this case, the identification strategy rests upon the assumption that no unobservable factor plays a relevant role in enrolling decisions and thus that, conditioning on a set of observable *Xs*, the students of the two groups will

differ only with respect to the type of degree. Even if we assume that this assumption holds, we have to bear in mind that the argument of the authors is restricted, by definition, to the very beginning of the new university regime.

An alternative strategy is adopted by Bosio and Leonardi (2011), which is based on variation in the timing of the reform. The reform was first introduced in 1999 and, as discussed above, reached its full implementation in 2001. Thanks to its autonomy, each university could decide when to introduce the new degrees. Thus, the first 3+2 graduates appeared in 2002. Using data from the Italian Labour Force Survey 1998-2007, the authors have been able to use this variation between universities in the introduction of the reform, in order to identify changes in the supply of college graduates and to investigate its effect on employment probability and on wages. Unfortunately, this identification strategy does not allow to measure the effect of the full implementation of the reform, since, by definition, no control group does exist anymore starting from 2001, when each and every university has been compelled to adapt to the new rules.

Thus, the following analyses are based on identification strategies different from those employed so far in the literature. In the following paragraphs, two alternative strategies are discussed that allow us to assess the impact of the 3+2 reform on graduates' risks of educational and skill mismatches, namely propensity score matching and Difference-in-Differences.

5.4.3.2 Propensity score matching

In the first part of the analysis, we assume that the probability to participate in the intervention—that is to say, the probability to obtain a degree under the new regime—depends on a set of observable characteristics plus unobservable characteristics that are independent of the potential outcomes. Formally:

$$D(X, U, Z) = D(X, U)$$

In the case of selection on observables, the enforcement of the *ceteris paribus* condition only requires conditioning on X, in order to make the composition of the two groups equivalent with respect to X. In other words, if we assume that all differences between treated and non-treated individuals relevant for the outcome of interest are captured by the observable variables X, controlling for these

variables in the analysis is sufficient to eliminate the selection bias. This is formally called *Conditional Independence Assumption* (CIA):

$$Y_0 \perp D \mid X \; for \; X \in S$$

A further condition that must be fulfilled is that we observe both participants and non-participants with the same characteristics. This *common support* condition can be expressed by:

$$0 < P(D = 1|X) < 1 \; for \; X \in S$$

If we accept these assumptions, we can use the observed mean outcome of the non-treated to estimate the mean counterfactual outcome the treated would have experienced had they not been treated.

A very popular method to analyse the causal effect of an intervention under the assumptions described above is that of propensity score matching (PSM, hereafter), which allows to highlights eventual problems of common support and to reduce the curse of dimensionality, that is the problem that arises when the list of variables is too large to allow a match on each treated unit separately.

The propensity score is expressed by:

$$p(X) = P\{D = 1|X\}$$

that is, the probability of being exposed to the treatment (D=1) conditioning on a set of observable characteristics *X*.

Adopting this approach, our treatment variable D can be constructed by combining information on a) graduation cohort and b) type of obtained degree, as described in the Table 5.5.

Tab. 5.5 Construction of the treatment variable

	1992	**1995**	**1998**	**2001**	**2004**	**2007**
Pre-reform or post-reform single-tier	D=0	D=0	D=0	D=0	D=0	D=0
Post-reform, Bachelor					D=1	D=1
Post-reform, Master						D=1

Then the propensity score[38] is computed for a set of observable characteristics. These are all relevant variables preceding the treatment status: sex, age, geographical area, parents' education and occupation, type of upper secondary education, and field of study. We have some fields of study that univocally predict the treatment status: graduates from Medicine are non-treated by definition, since the reform has not impacted on this course. Graduates from Medical Profession are, instead, always treated, since degrees in this field did not exist before the reform. For these reasons, graduates from these two fields are excluded from this set of analyses.

Finally, the effect of the reform on graduates' risks of educational and skill mismatch is estimated. In order to have an insight on differential effects for BA and MA graduates, we start from a baseline specification, in which the effect is estimated on all treated graduates, as reported in the table above. Then, we restrict the analysis to the comparisons a) between Pre-reform and BA graduates, and b) between Pre-reform and MA graduates. Moreover, as robustness checks, we alternatively specify in a more or less restrictive way the groups of treated and controls. For what concerns the former, we estimate the effect of the reform a) on all post-reform graduates; b) on post-reform graduates of the 2004 cohort; c) on post-reform graduates of the 2007 cohort[39]. With respect to the latter, instead, we alternatively specify the models a) including, or b) excluding non-treated graduates of 2004 and 2007 (highlighted in grey in the table above) since, due to data constraints we are not able to distinguish graduates of non-reformed courses from students that simply have delayed the attainment of a pre-reform degree.

5.4.3.3 Difference-in-differences

The previous approach relies on the assumption that the groups of treated and controls graduates remain comparable over time. If it were not the case, changes due to factors occurred contemporaneously with the implementation of the 3+2 reform and affecting graduates' occupational outcomes would be wrongly attributed to the reform. To account for this problem, we adopt a DiD method.

[38] The employed methods is caliper matching: units are randomly sorted and then treated *i* is matched to the closest non-treated *j* in terms of the propensity score, but only if the control's propensity score is within a certain radius, that we setted at 0.01.

[39] Obviously, this distinction is meaningful only when we compare pre-reform with BA graduates.

This method can be used when the selection to the treatment status is a function of unobservable characteristics, which are associated with the potential outcome under non-treatment Y^0, but are independent with the variation of Y^0 over time.

The DiD method consists in comparing the changes in outcomes over time between the treatment group and the control group. In other words, it combines two before-after, one for the treated group and one for the control group. The difference in the before-after outcomes for the treated group controls for factors that are constant over time in that group. The second difference, which is computed for the control group, not affected by the program but exposed to the same set of environmental conditions, allows to capture time-varying factors. If we subtract this second difference to the former, we eliminate the main source of bias that we have to face with simple before-after comparison.

The causal parameter of interest is, again, the average treatment effect on the treated, that is:

$$ATT = \{E(Y_{t+1}^1|D=1) - E(Y_t^0|D=1)\} - \{E(Y_{t+1}^0|D=0) - E(Y_t^0|D=0)\}$$

It is important to stress that the treatment and control groups do not necessarily need to have the same pre-intervention conditions. But for DiD to be valid, the control group must accurately represent the change in outcomes that the treatment group would have experienced in the absence of the treatment.

Our intuition is that, since the 2001 reform has not affected, by design, the group of graduates in Medicine, these individuals can be used as the control group, while graduates from other fields of study are included in the treatment group[40]. The main assumption underlying our analysis is that, while the former group has not been exposed to the reform, occupational outcomes of both the treatment and control groups have been similarly influenced by other time-varying factors. Hence, to estimate the effect of the «3+2» reform on graduates' risk of educational and skill mismatches, our strategy is to track occupational outcomes

[40] It could be argued in this respect that, even though the structure of courses in Medicine and Veterinary has remained the same, the reform may have indirectly affected graduates from this field of study, for example by altering the composition of this group. Data at our disposal reassure us about this eventuality. Selection into these courses was, and still is, very tight, given the traditionally low number of available places. Perhaps for this reason the composition of graduates from this field is far more stable over time than in reformed fields, as depicted in the figures reported in the Appendix.

for graduates in Medicine before and after the reform, and then compare these changes with the corresponding changes for graduates from other fields of study, exposed to the reform.

The DiD estimate can be therefore computed with a standard logit regression model specified as follows:

$$\text{logit}(\hat{p}_i) = \alpha + \beta_1 P_i + \beta_2 D_i + \delta P_i D_i + \varepsilon_i$$

where P is a dummy variable for the individuals graduating pre- or post-reform; D is a dummy for the treatment status which assumes value 0 for graduates in Medicine and value 1 for graduates from all the other fields; and the DiD coefficient δ provides an estimate of the effect of the reform. In the following, average marginal effects computed from the logit models are presented. In the following analyses, this approach is employed to assess the impact of the reform on graduates' risk of overeducation both overall and across fields of study. In order to evaluate the heterogeneity of the effect, separate models are estimated by field of graduation.

It is worth noting that, in the DiD framework the control group is specified in a different fashion: it does not include anymore all pre-reform graduates, but only graduates in Medicine. Thus, treatment and control groups, before and after the reform are defined as described in the following table.

Tab. 5.6 Definition of the treatment (D=1) and control (D=0) groups, before (t) and after (t+1) the reform

	Medicine	**Other fields**	**Medical Professions**
1992			
Pre-reform	D=0, t	D=1, t	-
1995			
Pre-reform	D=0, t	D=1, t	-
1998			
Pre-reform	D=0, t	D=1, t	-
2001			
Pre-reform	D=0, t	D=1, t	-
2004			
Pre-reform or single-tier	D=0, t+1	Excluded	-
Bachelor	-	D=1, t+1	Excluded
2007			
Pre-reform or single-tier	D=0, t+1	Excluded	-
Bachelor	-	D=1, t+1	Excluded
Master	-	D=1, t+1	Excluded

As described in the table, graduates in Medical Professions are excluded from the analysis, since degrees in this field did not exist before the reform. Again, we exclude from the analyses the group of pre-reform or single-tier graduates of 2004 and 2007 since, due to data constraints we are not able to distinguish graduates of non-reformed courses from students that simply have delayed the attainment of a pre-reform degree.

Since we have data on four cohorts of graduates before the implementation of the reform (from 1992 to 2001), pre-programme tests can be used to test the plausibility of the assumption of parallelism on which our DiD approach relies (Heckman and Hotz 1989). Hence, the following equation is estimated using only pooled data on the 1992, 1995, 1998 and 2001 cohorts:

$$\text{logit}(\hat{p}_i) = \alpha + \beta_1 95_i + \beta_2 98_i + \beta_3 01_i + \beta_4 D_i + \delta_1 95_i D_i + \delta_2 98_i D_i + \delta_3 01_i D_i + \varepsilon_i$$

In this equation the three dummies for graduation cohort (1992 is the reference category) are entered as long as a dummy for the treatment status. The δ coefficients for the interaction terms between cohort and treatment status measure the differential time trend for treated and control graduates in the absence of the reform. If these coefficients turned out not to be statistically different from zero, this would imply that the time trend in the risk of educational and skill mismatches is similar for graduates in Medicine and in other fields in the pre-reform period.

5.5 Results

5.5.1 The evolution over time of overeducation

The following table describes the distribution of overeducation among graduates from the six analysed cohorts by the main socio-demographic and education-related variables, namely sex, geographical area, age, parental education, field of study and type of tertiary degree. Overall, the estimates reported in the table do not suggest the existence of a clear trend of increasing or decreasing incidence of educational and skill mismatches.

Tab. 5.7 Rates of educational and skill mismatches by graduation cohort and main socio-demographic and education-related variables

	Educational mismatch						Skill mismatch					
	1992	**1995**	**1998**	**2001**	**2004**	**2007**	**1992**	**1995**	**1998**	**2001**	**2004**	**2007**
Gender												
Male	0.23	0.25	0.29	0.28	0.29	0.39	0.33	0.22	0.15	0.30	0.29	0.34
Female	0.31	0.40	0.33	0.35	0.32	0.34	0.38	0.30	0.20	0.33	0.31	0.31
Geographic Area												
North	0.28	0.34	0.33	0.33	0.31	0.34	0.35	0.27	0.16	0.33	0.33	0.33
Centre	0.26	0.33	0.31	0.33	0.32	0.38	0.37	0.25	0.19	0.33	0.30	0.32
South and Islands	0.22	0.31	0.27	0.29	0.30	0.39	0.35	0.24	0.20	0.26	0.26	0.32
Age												
Less than 30	0.26	0.33	0.31	0.32	0.31	0.30	0.36	0.26	0.17	0.32	0.31	0.32
30 or more	0.27	0.31	0.32	0.37	0.35	0.55	0.34	0.26	0.20	0.31	0.29	0.33
Parents' Education												
Primary or less	0.25	0.38	0.34	0.36	0.34	0.50	0.34	0.31	0.21	0.34	0.31	0.33
Lower secondary	0.29	0.35	0.33	0.35	0.34	0.40	0.36	0.28	0.19	0.33	0.31	0.33
Upper secondary	0.29	0.33	0.32	0.32	0.32	0.35	0.36	0.26	0.17	0.33	0.32	0.33
Tertiary	0.23	0.27	0.26	0.27	0.26	0.29	0.34	0.20	0.16	0.26	0.27	0.30
Field of study												
Scientific	0.17	0.23	0.21	0.18	0.20	0.29	0.35	0.23	0.14	0.24	0.24	0.31
Medicine	0.01	0.02	0.02	0.01	0.03	0.03	0.16	0.03	0.05	0.03	0.03	0.06
Engineer	0.14	0.16	0.19	0.19	0.21	0.22	0.33	0.19	0.13	0.23	0.24	0.28
Agriculture	0.17	0.38	0.31	0.29	0.31	0.41	0.28	0.33	0.19	0.30	0.31	0.37
Economics	0.35	0.38	0.38	0.38	0.39	0.48	0.37	0.29	0.19	0.41	0.41	0.45
Social and political Sciences	0.59	0.57	0.52	0.54	0.53	0.58	0.61	0.37	0.24	0.48	0.49	0.50
Law	0.25	0.27	0.27	0.28	0.29	0.38	0.30	0.20	0.17	0.25	0.27	0.31
Humanities	0.42	0.58	0.41	0.46	0.42	0.50	0.42	0.36	0.22	0.38	0.35	0.41
Medical professions	-	-	-	-	0.06	0.23	-	-	-	-	0.07	0.13
Type of tertiary degree												
Pre-reform o single cycle	0.26	0.33	0.31	0.32	0.31	0.35	0.35	0.26	0.18	0.32	0.31	0.31
Bachelor					0.31	0.44					0.29	0.33
Master						0.29						0.34
Total	*0.26*	*0.33*	*0.31*	*0.32*	*0.31*	*0.36*	*0.35*	*0.26*	*0.18*	*0.31*	*0.30*	*0.33*

However, what is more interesting for the aim of this study is that while we observe a stable incidence of skill mismatch in the last three cohorts (namely, the one immediately before the implementation of the «3+2» reform and the subsequent two), an increase of educational mismatch is found among graduates of the last cohort.

Results reported in Table 5.7 inform us also on the distribution of educational and skill mismatches by the main socio-demographic and education-related variables. Even though the magnitude of the gender gap is generally small, both kinds of mismatch seem to have been more widespread among women at least until 2007: among graduates of the last cohort the rates of educational and skill mismatches among males overcome that of females. Also results concerning the distribution of the phenomenon across geographical areas do not seem to follow a univocal pattern. Differences between Northern and Southern regions are found to be generally modest in size, and they do not seem to significantly increase or decrease over time. Only in 2007 we observe a relevant increase of educational

mismatch in the Centre and in the South of Italy. A similar result is found for age: no relevant difference is found between younger and older graduates, with the only exception of the last cohort, where we observe a 25 percentage points difference in the risk of educational mismatch. Finally, parents' education is found to be associated mainly with the risk of educational mismatch. The greatest difference is generally found between the two extreme categories: individuals with tertiary educated parents are less at risk of educational mismatch. This difference is found to increase over time: it is almost null in the first cohort, it then ranges around 10 percentage points from the 1995 to the 2004 cohort, and it finally reaches the level of 20 percentage points among 2007 graduates.

When it comes to the distribution of educational and skill mismatches among graduates from different fields of study, three results are worth noting. The former is that field of study seems to be a crucial determinant of the risks of both educational and skill mismatches. Similar to what we found in the previous chapters, we observe that fields of study can be ranked according to their corresponding levels of mismatch, even though the gaps in terms of skill mismatch are generally a little bit smaller. Graduates from Medicine and Medical Professions are the best performing ones, followed, first, by the group of Scientific fields and Engineering, second, by graduates of Economics and Law, and finally, by graduates from the Humanities and Social Sciences. The second relevant result is that, for each and every field of study, we observe that the rates of educational and skill mismatches are more or less stable across cohorts, with the only relevant exception of the last one. Among graduates of 2007, indeed, we observe an overall increment in the risks of both educational and skill mismatches. However—and this is the third interesting results—while the increase of skill mismatch is homogenous across fields of study (meaning that field differentials remain more or less constant), some fields present a larger increase of educational mismatch than others. Actually, it results in a reduction of fields differentials, since fields that register the hugest increase are those who started from lower level of educational mismatch.

Finally, descriptive results suggest that skill mismatch is not relevantly affected by the type of attained degree. On the contrary, we observe that BA graduates are more exposed to the risk of educational mismatch, in comparison

with both pre-reform and MA graduates. Again, we observe a substantial worsening of BA conditions in 2007.

Two main issues emerge from these descriptive results. First, it is confirmed that, as already discussed in the previous chapters, educational and skill mismatches are two distinct phenomena: evidence is provided for diverging incidence and pattern of determinants, which are also shown to differently evolve over time. Second, the hugest variations in the overall incidence of educational and skill mismatches and in their differential occurrence across groups are registered in the last analysed cohort.[41].

The aim of the next paragraph is to assess whether these huge variations can be ascribed to the implementation of the «3+2» reform. It could be argued, in this respect, that any eventual effect of the reform should be detected already in the 2004 cohort. However, we have to consider that BA graduates of 2004 are the former who graduated *without delay* under the new regime. Thus, we can expect them to be a highly selected group of more motivated (and maybe able) individuals. Hence, it comes with no surprise that descriptive analyses do not record any relevant difference between pre-reform graduates and BA of the 2004 cohort. We will try to assess, however, if the impact of the reform can be evaluated by recurring to appropriate methods. Of course the huge variations that have been observed within the last cohort might be also due to the occurrence of the 2008 economic crisis. It is for this reason that the analyses that will be presented in the next paragraph have also been conducted separately on each post-reform graduation cohort.

5.5.2 The impact of the reform on the risks of educational and skill mismatches

We have seen, so far, that the incidence of educational and skill mismatches is far from stable across graduation cohorts, and that also the influence of the various identified determinants of the phenomena varies over time.

The aim of the following analyses is to assess whether this modifications can be somehow attributed to the implementation of the 3+2 reform. In particular, in

[41] The same results are found with a multivariate analysis. In order to assess whether the determinants of educational and skill mismatches have changed over time, a series of logit regression models controlling for the variables described above have been computed separately by graduation cohort.Findings from these models are reported in the Appendix.

this section we investigate whether the reform has impacted on both the overall incidence of educational and skill mismatches, while, in the next one, we analyse its effect on the differential risks for graduates from different fields of study.

Table 5.8 reports the PSM estimates of the effect of the reform. ATT estimates are presented in the table as the mean difference between treated and control individuals. Results are reported for several model specifications. On the one side, the impact of the reform is estimated, first, on average and, then, separately for BA and MA graduates. On the other side, in order to have more robust result we gradually restrict the observation window, by excluding part of the treated and control groups. Let's notice that, for each model specification, these estimates of the effects of the reform have been calculated using almost the entire set of available observations: the proportion of cases off-support closely approaches zero in all the models presented, indicating that the results are highly generalizable.

Tab. 5.8 Propensity score matching results

	Educational Mismatch			Skill Mismatch		
	ATT (Treated – Controls)	Off Support	On support	ATT (Treated – Controls)	Off Support	On support
Pre vs Post						
D=0 all cohorts	0.073***	0	82,917	0.092***	1	86,335
D=0 until 2001	0.083***	1	60,720	0.125***	1	63,969
Pre vs BA						
D=0 all cohorts	0.190***	1	72,963	0.155***	1	76,213
D=1 only 2004	0.131***	2	57,139	0.146***	2	60,121
D=1 only 2007	0.215***	1	57,039	0.170***	1	60,293
D=0 until 2001	0.200***	5	50,763	0.186***	4	53,844
D=1 only 2004	0.130***	3	43,986	0.171***	2	46,972
D=1 only 2007	0.231***	1	47,995	0.189***	2	51,075
Pre vs MA						
D=0 all cohorts	-0.048***	0	73,366	0.033***	0	76,691
D=0 until 2001	-0.035***	0	51,170	0.064***	0	54,325

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

If we overall compare pre- and post-reform graduates we observe that the latter are more exposed to both the risks of educational and skill mismatches. However, if we split post-reform graduates in the two groups of BA and MA graduates, results dramatically change. On the one side, we observe that BA graduates have a higher probability of educational mismatch then pre-reform graduates, with a difference of about 20 percentage points. However, the same does not hold for MA graduates, who are found to have a small advantage (around 4 percentage points) with respect to pre-reform graduates. On the other side, we

observe that the reform has increased the risk of skill mismatches for both BA and MA graduates: the difference with the group of pre-reform graduates is around 15 percentage points in the former case, between 3 and 6 in the latter.

It is worth noting, however, that results slightly change when we observe the effect of the reform on Bachelor graduates: the impact is smaller if we solely observe BA of the 2004 cohort. This result is probably due to these graduates being a highly selected group, whose characteristics are not being fully captured by observable predictors used in the matching algorithm: they are in fact the former students who graduated, without delay, under the new regime.

Results do not substantially change when we estimate the impact of the reform with a DiD estimator. Table 5.9 reports the DiD estimates for the impact of the reform on educational and skill mismatches for various model specifications.

Tab. 5.9 Difference-in-differences estimates

	Educational Mismatch		**Skill Mismatch**	
	DiD estimates	N	DiD estimates	N
		Without control variables		
Pre vs Post	-0.001	69,544	0.162***	73,276
Pre vs BA	0.117***	59,591	0.210***	63,154
D=1 only 2004	0.129***	51,196	0.302***	54,626
D=1 only 2007	0.083**	54,862	0.138***	58,426
Pre vs MA	-0.123***	59,901	0.101***	63,539
		With control variables		
Pre vs Post	-0.020	67,453	0.159***	70,833
Pre vs BA	0.086**	57,500	0.206***	60,711
D=1 only 2004	0.102**	49,105	0.304***	52,183
D=1 only 2007	0.042	52,879	0.133***	56,091
Pre vs MA	-0.125***	57,902	0.102***	61,188
		With propensity score		
Pre vs Post	-0.021	67,443	0.159***	70,823
Pre vs BA	0.093**	57,484	0.204***	60,695
D=1 only 2004	0.119**	49,095	0.306***	52,173
D=1 only 2007	0.050	52,861	0.129***	56,070
Pre vs MA	-0.137***	57,892	0.101***	61,178
		With propensity score and control variables		
Pre vs Post	-0.020	67,443	0.159***	70,823
Pre vs BA	0.086**	57,484	0.206***	60,695
D=1 only 2004	0.102**	49,095	0.304***	52,173
D=1 only 2007	0.042	52,861	0.133***	56,070
Pre vs MA	-0.125***	57,892	0.101***	61,178

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

As we did before, we first account for the overall difference between the treated and control groups, and we then split the post-reform graduates in the two groups of BA and MA graduates. Again, we gradually restrict the group of treated individuals, first to the sole 2004 cohort, and second to the sole 2007 cohort. Also in this case, DiD estimates are to be read as differences in probabilities.

As additional robustness checks, we run models with and without control variables. These are sex, age, geographic area, parents' education and occupation, and type of secondary degree. Finally, we combine the DiD with the matching method. First, we compute a propensity score for the probability to be treated (namely, to graduate in a field different from Medicine), and then we introduce the propensity score as a regressor in the DiD model. In the last set of analyses, we include as control variables both the propensity score and the list of variables that are used to compute the propensity score itself.

Results are found to be robust over different model specifications, and confirm what has been outlined in the previous analyses. First of all, we find that, on average, the reform has not significantly impacted on treated graduates' risk of educational mismatch. However, results vary when we separately observe BA and MA. Among the former, we find an increase of about 10 percentage points in the risk of educational mismatch. Among the latter, instead, this risk has significantly decreased (of approximately 13 percentage points). This finding might be the result of an increased competition among BA graduates: as long as the reform has enhanced graduation rates at the first level, a higher number of job seekers with a BA degree compete for job vacancies, thus lowering the individual probability of obtaining a graduate job. However, this could also be an expression of the competition having moved to the higher level: employers might prefer to hire MA graduates to cover graduate-job vacancies rather than BA graduates. This could also explain why the effect of the reform is found to be positive (i.e. higher risk of educational mismatch) for BA and negative (i.e. lower risk of mismatch) for MA.

Our results suggest, however, that formal (mis)match does not necessarily imply a proper utilisation of skills. Results on the risk of skill mismatch are, indeed, definitely different. The probability of incurring in this phenomenon has increased for both BA (of approximately 20 percentage points) and MA (of 10 percentage points) graduates. The pre-programme tests employed to challenge the assumption of parallel trends, however, suggest caution when interpreting these results. This condition is, in fact, found to hold for educational mismatch, but not for skill mismatch. Results from these tests are reported in the Appendix.

5.5.3 Heterogeneity of the effect across fields of study

So far, we have analysed the overall effect of the 3+2 reform. In this paragraph results are presented separately by field of study. The aim of these analyses is to assess whether the reform has heterogeneously impacted on graduates' risks of educational and skill mismatches. First, PSM estimates are reported, which are obtained by computing separately the propensity score on each field. In other words, graduates are matched *within* field according to their probability of being pre- or post-reform graduates. The set of covariates used for the estimation of the propensity score is the same as before, with the only obvious exception of field of study. Then, the effect of the reform is estimated on matched graduates. As we did before, we start from a baseline specification in which the impact of the reform is estimated by roughly comparing pre- and post-reform graduates. Then, the analyses are refined, and BA and MA graduates are separately observed. Table 5.10 reports the estimation results[42].

In the previous analyses, we found that, overall, post-reform graduates are more exposed to both the risks of educational and skill mismatches. This result holds also when the impact is estimated separately on graduates from each field of study. However, we have a first clue of the heterogeneity of the reform's effect: among graduates from social and political sciences and from the Humanities we do not find, indeed, a statistically significant difference between pre- and post-reform graduates in terms of educational mismatch. Another effect of the reform seems to have been the increment in the risk of skill mismatch: this increase is observed among graduates from *all* fields of study. Once again, graduates from the Humanities and Social Sciences are, however, found to be the less disadvantaged from the reform, meaning that the effect—even if positive and significant—is smaller than the one we detect among graduates from other fields.

When we separately estimate the impact of the reform on BA and MA graduates, two main results catch our attention. The former is that, even if BA graduates are always found to be more at risk of educational mismatch, the smallest differences (between 5 and 10 percentage points) with pre-reform

42 Since results presented in the previous section have been found to be robust over different model specifications, here we use the simplest one, in which all pre-reform graduates are compared to all post-reform graduates (that is to say, all cohorts are employed without any exception).

graduates are found among graduates of *weaker* fields, that is to say, Social and Political Sciences and the Humanities.

Tab. 5.10 PSM estimation of the effect of the 3+2 reform by field of study

	Educational Mismatch			Skill Mismatch		
	ATT (Treated – Controls)	Off Support	On support	ATT (Treated – Controls)	Off Support	On support
Scientific						
Pre vs Post	0.127***	1	13,424	0.105***	1	13,750
Pre vs BA	0.265***	2	12,243	0.185***	3	12,536
Pre vs MA	-0.008	1	12,170	0.026	1	12,483
Engineer						
Pre vs Post	0.081***	1	19,981	0.095***	1	20,372
Pre vs BA	0.275***	2	17,294	0.186***	1	17,662
Pre vs MA	-0.018	0	18,568	0.046**	0	18,953
Agriculture						
Pre vs Post	0.150***	0	2,563	0.111***	1	2,619
Pre vs BA	0.218***	0	2,341	0.304***	0	2,395
Pre vs MA	0.058	1	2,230	0.053	1	2,286
Economics						
Pre vs Post	0.055***	3	15,449	0.105***	2	15,945
Pre vs BA	0.197***	0	13,606	0.159***	0	14,083
Pre vs MA	-0.088***	1	13,546	0.052***	1	14,032
Soc. and Pol. sciences						
Pre vs Post	-0.006	2	7,323	0.056***	4	7,845
Pre vs BA	0.054***	1	5,911	0.097***	1	6,397
Pre vs MA	-0.073***	2	5,748	0.025	3	6,251
Law						
Pre vs Post	0.155***	1	7,494	0.111***	1	7,818
Pre vs BA	0.342***	1	6,865	0.206***	0	7,184
Pre vs MA	-0.104***	0	6,641	-0.043***	0	6,953
Humanities						
Pre vs Post	0.019	0	16,675	0.064***	2	17,975
Pre vs BA	0.097***	1	14,697	0.114***	1	15,951
Pre vs MA	-0.073***	2	14,456	0.006	2	15,725

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

On the contrary, among graduates from other fields we observe differences that range between 20 and 30 percentage points. We observe the same pattern of results looking at skill mismatch, even if, in this case, we do not observe such striking differences among fields. BA graduates in Social sciences and Humanities have, in fact, a probability of skill mismatch of 10 percentage points higher than the corresponding pre-reform graduates. The difference between BA and pre-reform graduates from other fields of study, instead, lays around 20 percentage points (with the only exception of Agriculture). The other relevant result is that MA graduates seem not to run a higher risk of educational mismatch than pre-reform graduates. The difference is not statistically significant for graduates from Scientific fields and Engineering, while it is even negative and significant for graduates in Economics, Law, Social and Political Sciences and the Humanities. The picture is not so optimistic when it comes to results on skill

mismatch. The difference between MA and pre-reform graduates is found to be negative only among graduates in Law; it is statistically not significant among graduates from scientific fields, Social and Political Sciences and the Humanities; finally, it is positive (even though not huge) among graduates in Engineering and Economics.

PSM results are confirmed by DiD estimation[43] (Table 5.11). Looking at its impact on BA graduates, we find, again, that the reform as not altered the risk of educational mismatch for graduates from soft fields, such as Social Sciences and the Humanities, nor from Economics and Agriculture. However, it has significantly increased the probability of mismatch for graduates from Scientific fields, Engineering and Law.

Tab. 5.11 DiD estimation of the effect of the 3+2 reform by field of study

	Educational Mismatch		Skill Mismatch	
	DiD estimate	N	DiD estimate	N
Scientific				
Pre vs Post	0.014	16,545	0.103***	16,948
Pre vs BA	0.074***	15,365	0.142***	15,736
Pre vs MA	-0.063***	15,291	0.048***	15,681
Engineer				
Pre vs Post	-0.001	20,665	0.106***	21,133
Pre vs BA	0.091***	17,979	0.147***	18,423
Pre vs MA	-0.071***	19,251	0.069***	19,713
Agriculture				
Pre vs Post	0.007	8,434	0.068***	8,579
Pre vs BA	0.023	8,213	0.079***	8,355
Pre vs MA	-0.017	8,102	0.041***	8,246
Economics				
Pre vs Post	-0.05	18,178	0.137***	18,760
Pre vs BA	0.037	16,332	0.157***	16,896
Pre vs MA	-0.133***	16,273	0.101***	16,846
Social and Political Sciences				
Pre vs Post	-0.067***	11,859	0.103***	12,462
Pre vs BA	-0.028	10,446	0.109***	11,011
Pre vs MA	-0.084***	10,284	0.072***	10,867
Law				
Pre vs Post	0.011	11,555	0.088***	11,959
Pre vs BA	0.092***	10,926	0.138***	11,324
Pre vs MA	-0.099***	10,701	0.004	11,093
Humanities				
Pre vs Post	-0.073**	18,510	0.103***	19,783
Pre vs BA	-0.020	16,533	0.128***	17,758
Pre vs MA	-0.122***	16,293	0.062***	17,533

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

On the contrary, the risk of skill mismatch is found to have increased among graduates from each and every field of study. Again, the smallest increase is

43 Since the DiD estimates have been previously found to be robust over different model specifications, here we only employ the specification which includes control variables.

found among graduates from the Humanities and Social Sciences, but fields of study differentials are small in size.

Similarly to PSM, Did estimates indicate that the reform has also impacted on MA graduates' risk of both educational and skill mismatches: the former has reduced after the reform, while the latter has increased. These results are found to be valid for all graduates, with modest field of study differentials.

Summing up, both PSM and DiD estimates lead to the same conclusion, namely that graduates who have been traditionally more protected from the risk of overeducation—such as graduates in scientific fields and engineering—are those who have been more negatively affected by the reform, both in terms of educational and skill mismatch[44], especially at the BA level. Interestingly, these are the fields that provide graduates with more specific and job-oriented skills, preparing them for very specific and highly regulated professions. It is worth mentioning that, after the university reform, in these professional areas (for instance, Engineer, Architecture and Natural Sciences) new professional orders of a lower level (level «B») have been created, that can be accessed by BA graduates after having passed a national examination[45]. Our results suggest, however, that so far labour market has not well-absorbed these new professional figures. Furthermore, these findings are in line with data publicized by professional orders, which indicate that very few BA graduates access these professional orders of «B» level. For example, the professional register of engineers has signalled that in 2007 about 70% of MA graduates passed the national examination and obtained the license to access the profession. On the contrary, only 8% of BA graduates achieved the same result.

5.6 Concluding remarks

In this chapter the phenomena of educational and skill mismatches among Italian graduates have been analysed. Italy is an interesting case-study since, compared with other developed countries, it displays both low graduation rates

44 Pre-programme tests suggest, however, caution when interpreting results on skill mismatch, since the trends before the implementation of the reform are found not be parallel. Results are reported in the appendix.

45 DPR 328/2001.

and a high incidence of overeducation. A huge body of literature has suggested that the reasons of this contradiction should be searched for in peculiar traits of the Italian economic system: the rigid labour market, the scarce economic dynamism, the prevalence of traditional sectors requiring low-skilled work, and the poor investment in research and development can be counted among the determinants of the inability to absorb an increasing highly qualified labour force.

This issue may have acquired more relevance as the Italian university system has been recently reformed, following the guidelines of the Bologna Process. The so-called «3+2» reform has stimulated the already increasing trend of graduation rates, also by opening the doors to Higher Education for strata of the population traditionally excluded from university, such as students from lower social origin and vocational secondary education. The existing literature suggests that both the signaling value of the educational degree and graduates' level of human capital might have worsened due to the reform. Of course, these arguments apply to BA graduates, while it has remained almost unexplored the effect of the reform on MA graduates, mostly because of data unavailability.

Hence, in this chapter we have assessed whether the university reform has impacted—both overall and across fields of study—on graduates' risks of educational and skill mismatches. A first descriptive result suggests that the risks of both educational and skill mismatches have increased for graduates of the last cohort: by means of PSM and DiD techniques, this chapter aimed at isolating the specific contribution of the reform from other contingent factors.

Our findings, that are robust across different model specifications and various identification strategies, suggest some tentative conclusions on the impact of the «3+2» reform on graduates' risks of educational and skill mismatches, which also confirms that the two phenomena are loosely correlated. The first interesting result—which is consistent with our expectations—is that BA graduates are more exposed to the risks of educational and skill mismatches than pre-reform graduates. In terms of educational mismatch BA seem to be outclassed by MA graduates, which indeed perform better than pre-reform graduates. However, the oddish result that we did not expect is that the same does not hold true for skill mismatch: also among MA we detected a higher incidence of the phenomenon than among pre-reform graduates. This finding would surely deserve being further explored. It remains, indeed, unknown the mechanism underlying this result. A

possible explanation deals with MA graduates having higher expectations than pre-reform graduates maybe due to the introduction of a new lower level that makes MA graduates comparing themselves with BA graduates rather than with individuals with secondary education. Alternatively, employers might rely in their credentials but not assigning them with tasks that are up to the skills they brought from their education. If this were the case, it would remain to be established whether this is an effect of the university reform or the result of other cyclical or structural factors. As will be stresses below, indeed, our DiD approach is not free from shortcomings, and the adopted overidentification strategies suggest carefulness in the interpretation of results on skill mismatch.

Moreover, we have found that, while the increase in the risk of skill mismatch is more or less homogenous across fields of study both at the BA and MA levels, the reform has differently impacted on the risk of educational mismatch of BA graduates from different fields of study. Indeed, we observed that the risk of educational mismatch has remained substantially unvaried among BA from soft fields. On the contrary, the risk has increased for graduates from Scientific and job-oriented fields which, as discussed above, are intended to prepare for specific professions. Various concurring mechanisms are likely to produce this effect, and they would need to be tested. For instance, it seems reasonable to hypothesise, in this respect, that BA graduates from soft fields are more versatile in terms of other occupations not strictly fitting the training they received than graduates from more technical and job-oriented fields. Thus, employers might prefer hiring the former since they coult be retrained less expensively than the latter.

The analyses presented have limitations and shortcomings, which suggest caution when interpreting results as the impact of the reform. The adopted DiD approach should allow us to disentangle the effect of the reform from the effect of time-varying factors that exerted a similar influence on graduates' labour market opportunities. However, data being collected every third year inevitably produce gaps in the trend that cannot be detected. Thus, in our analyses we may partially confound the effect of the reform with the effect of other factors, for example the labour market reforms which, starting from the late 1990s, has increased employment flexibility. In other words, our DiD results could be biased by unobserved factors having differently impacted on our treated and control groups. The implemented pre-programme tests should reassure us about this eventuality—

and they actually did it with respect to the trend of educational mismatch—but we cannot ignore that they only capture eventual differences every third year. Thus, we cannot be completely sure that trends continued to be parallel between 2001 and 2004. Particular caution must be employed when interpreting results on skill mismatch, since the overidentification strategies adopted to test the parallelism assumption underlying the DiD approach suggest that the detected differences between treated and controls could be anterior to the implementation of the reform.

Notwithstanding these limitations, we are pretty confident in arguing that the reform has been, if not *the* cause, at least *one* determinant of a devaluation of tertiary degrees. While graduates who decide to continue studying to obtain a MA degree are still protected from the risk of overeducation, at least in terms of educational mismatch, BA are definitely disadvantaged with respect to pre-reform graduates. If we consider that one aim of the reform was to give the possibility to students of accessing labour market in a shorter time but with a profile tailored to the needs expressed by the economic system, we can argue that this has been a failure of the reform itself. Another robust result is that, after the reform, we observe a process of equalization of graduates' occupational outcomes. However, what makes this finding discouraging is that the alignment in graduates' risk of educational mismatch, rather than being the result of an improvement of the job match for graduates from soft fields—that are those who generally present the highest incidence of overeducation—, derives from a down-leveling of the occupational condition of graduates typically more protected from the risk of mismatch, namely those from scientific, technical or highly job-oriented fields of study.

The results presented in this Chapter shed new light on the relevance of the Bologna reform in shaping tertiary graduates' occupational opportunities at labour market entrance. However, the mechanism(s) through which the university reform affects labour market opportunities remain to be explored. Further research employing up-to-date data would probably strengthen our knowledge. For example, a possible explanation for the result of MA having benefitted from the reform in terms of educational mismatch could deal with supply-demand disequilibria, if the number of MA graduates is smaller than the number of pre-reform graduates. If this were the case, this could be only a temporary effect of

the reform, and its long-term impact would remain to be assessed. Moreover, external validity of our results, that is to say the extent to which we can apply these conclusions to different times and contexts, is by definition limited to the first decade of the 21st century in Italy. Differentiation of European countries along several institutional axes, macroeconomic conditions, and historical configurations makes it hazardous to apply these conclusions even to the other Mediterranean countries, such as Spain and Portugal, which are by far the most similar to Italy. Thence, before drawing comparatively valid lessons from this case-study, other evaluations of the reform should be conducted elsewhere. Results from other countries would be relevant *per se* to evaluate how the reform has affected labour market chances for tertiary graduates. Moreover, in a comparative fashion, they would provide additional evidence on the structuring effect of interconnections between educational systems and labour market configurations on occupational opportunities for new entrants.

Conclusions

In this dissertation we have analysed the phenomenon of overeducation, which is widely considered as a possible drawback of an uncontrolled process of educational expansion taking place especially at the higher levels. «Studying too much?» is of course intended to be a provocative title: it is not our aim to question the positive economic and extra-economic effects of education, nor the legitimacy of educational choices guided by expressive—and not merely instrumental—motivations. However, a huge body of literature has demonstrated that, if the supply of qualified labour force outpaces the corresponding demand, overeducation becomes a real risk, which in turn has negative consequences on individuals, firms and economic systems.

Following the most recent strand of literature on this topic, we have focussed on the incidence of the phenomenon among tertiary graduates and separately analysed educational and skill mismatches. The existing literature (Ch. 2) and original analyses here provided (Ch. 3) suggest, indeed, that they are distinct features of the more general concept of overeducation. The former refers to the formal (mis)match between acquired and required education, while the second deals with the effective use on the job of skills and knowledge acquired at school.

The main aim of this work has been to investigate the heterogeneity of the risks of educational and skill mismatches by assessing how (much) field of study affects occupational opportunities for graduates entering the labour market. It is widely acknowledged that occupational outcomes vary depending on the field of graduation: the Humanities and Social and Political Sciences lead to the worst results, whilst scientific, technical and job-oriented fields guarantee better occupational chances. However, we argue that the magnitude of these differentials is not stable, neither over time nor across countries, since it is inevitably shaped by structural and cyclical factors referring both to the demand and supply sides of qualified labour force.

Variations in fields of study differentials have been investigated with two different perspectives. First, in Chapter 4, we have comparatively assessed whether they vary according to some labour market institutions that are known to affect both the quantity and the quality of job vacancies. In particular, the role of

employment protection, of regulation of the access to liberal professions and of the capacity of welfare state to hire skilled workers have been taken into account as possible factors affecting the gap in educational and skill mismatches between fields of study. Chapter 5 has then investigated the evolution of the phenomena over six cohorts of Italian graduates, covering the last two decades, with the aim of estimating the effect of the recent reform of the university system—which has promoted the increase in graduation rates mainly by weakening the association between social origins and educational background with participation to higher education—on the occupational destinations of graduates from different fields. Even though the conclusions drawn from the analyses presented in Chapter 5 are by definition restricted to the Italian case, assessing the impact of the university reform on graduates' risk of overeducation can be of real interest also in a comparative perspective, since all European countries have been involved in the Bologna Process.

The analyses presented in the previous chapters confirm that neither educational nor skill mismatch are negligible phenomena: even though with important variations across countries and over time, they affect a big portion of the population of tertiary graduates. Also the detected differences between fields of study cannot be disregarded. It comes with no surprise that graduates from generalist fields of study are more exposed to both risks of mismatch. It is worth noting that the two phenomena, even though correlated, are not completely overlapping, and that skill mismatch is found to be a relevant phenomenon also among graduates from scientific fields, which are traditionally considered more remunerative. However, there is evidence enough, so far, to argue that individuals who have studied «too much» are mainly those who graduated from the so-called «soft» fields—the Humanities and the Social and Political Sciences *in primis*. They are indeed more often found to work in jobs which require neither their educational credentials nor their knowledge and skills.

These results depict a twofold evaluation of tertiary degrees in the labour market, that contrasts «stronger» fields—that ensure a smoother entrance in the labour market—with the «weaker» ones—that often compel graduates to work in non-matching jobs. The striking stability of this dualism across time and contexts needs a structural response able to reduce, if not nullify, the gap. The question which is definitely more challenging than the one we asked in the title is, thus,

«What can we do about it?». Are these graduates doomed to renounce to see their educational investment repaid at least in terms of a good match? It is worth stressing, however trivial, that it is not equalisation *per se* that should be pursued, but the improvement of job opportunities for graduates that actually suffer from a devaluation of their credentials and competences. In fact, our findings suggest that equalisation can appear as the result of an increase in educational and skill mismatches among graduates from fields that usually register lower incidence of the phenomena. This is, for example, what we found in Italy after the implementation of the university reform: fields of study differentials—especially in terms of educational mismatch—have reduced, since the incidence of the phenomenon has remained stable among graduates from Social Sciences and the Humanities, but has increased among graduates from scientific and job-oriented fields.

It is surely not an easy task—and goes beyond the scope of this dissertation—to identify policy instruments able to reach this goal. However some reflections can be made in order to identify possible areas of research and intervention, both on the demand and supply sides of qualified labour force.

Results presented in previous chapters indicate that, even though the ranking of fields of study in terms of educational and skill mismatches remains unvaried, the magnitude of fields of study differentials is, as expected, not stable. Indeed, the gap is found to be positively correlated with the level of labour market regulation and negatively associated with the share of public employment. These findings suggest that labour market institutions can play a relevant role in shaping the pattern of horizontal inequality. Results from our comparative analyses also confirm that flexible labour markets requiring a highly skilled workforce are a prerequisite for a reduction of overeducation and for a decrease of fields of study differentials. These findings also support the idea that low dynamism, entrepreneurial dwarfism and underdevelopment of innovative sectors requiring highly skilled workers are among the reasons of the pervasive diffusion of overeducation among Italian graduates.

Labour market rigidities represent, thus, relevant macro level factors affecting employers' hiring decisions. By altering the transaction costs employers have to bear, the variables we have considered in the previous chapters are likely to affect the pattern of horizontal inequalities between graduates, since they play a relevant

role in determining the marketability of credentials acquired in different disciplinary areas. However, also the supply side cannot be disregarded and several considerations can be made on the drivers of students' choice of field of study. The distribution of students across fields is directly linked to both the number of graduates and the level of heterogeneity within each field, that are factors proven to affect the individual risk of mismatch. A huge body of recent research indeed suggests that students make educational choices—especially that of field of study—under great uncertainty, on the basis of partial and imperfect information on costs and returns connected to their investments (Avery and Kane, 2004; Barone, 2012a; Ikenberry and Hartle, 2004). In Italy, for example this is in part due to guidance activities being often left to universities and faculties, which obviously have good reasons to promote their courses even by promising illusory occupational chances to prospective students. This is, by definition, a problem that especially concerns fields that are weaker in the labour market. Letting students know real labour market prospects guaranteed by the field of study they are going to choose does not mean at all to foment choices merely guided by instrumental motivations. However, informed choices would probably result—and there exists experimental evidence pointing in this direction (Argentin *et al.*, 2015b)—in a redistribution of graduates among fields, due to a self-selection of motivated students within these fields and a self-exclusion of unmotivated students, who are those more at risk of bad performances in the labour market.

Finally, university study programme would also deserve more attention. A deep knowledge of which skills and credentials are required by employers, and an adjustment of educational curricula to these labour market needs could be a feasible strategy to tackle graduates' overeducation, especially for those coming from *soft* fields. For example, in a recent study of occupational destinations of Italian graduates from Sociology (Argentin *et al.*, 2015a)—which are among those who register the highest incidence of educational and skill mismatches—it has been found that they often work in high level clerical jobs that, at the state of the art, do not match their credentials and their knowledge, since they require skills actually not provided by any field of study. Thus, the authors suggest, it would be a good investment for the discipline and for its graduates to enlarge its operating area in order to embrace these occupational opportunities. In other words, future research and educational policies aiming at maximising graduates' labour market

opportunities, could contemplate the idea that not only labour markets should be reformed to employ graduates, but also graduates should be instructed to meet the needs expressed by the labour market.

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Appendix A - Questionnaire from the Survey on Professions, Section B Information on the necessary skills to perform job's tasks.

1. Impresa e gestione di impresa

Conoscenza dei principi e dei metodi che regolano l'impresa e la sua gestione relativi alla pianificazione strategica, all'allocazione delle risorse umane, finanziarie e materiali, alle tecniche di comando, ai metodi di produzione e al coordinamento delle persone e delle risorse

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Firmare un mandato di pagamento
[3]
[4] Controllare l'andamento di un progetto per assicurare la sua realizzazione nei tempi previsti
[5]
[6] Gestire un'azienda con un fatturato da 10 milioni di euro
[7]

2. Lavoro d'ufficio.

Conoscenza delle procedure amministrative e d'ufficio, dei programmi di elaborazione di testi, delle tecniche di gestione di archivi e di basi di dati oppure della stenografia e delle regole di trascrizione o di altre procedure e linguaggi previsti dal lavoro di ufficio.

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Archiviare lettere in ordine alfabetico
[3] Battere sulla tastiera alla velocità di 30 parole al minuto
[4]
[5] Organizzare un archivio sistematico di tutti i documenti di un'impresa
[6]
[7]

3. Economia e contabilità

Conoscenza dei principi e delle pratiche di economia e contabilità, dei mercati finanziari, bancari e delle tecniche di analisi e di presentazione di dati finanziari.

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Fornire informazioni sul conto ad un cliente in possesso di carta di credito
[3]
[4] Definire programmi individualizzati di investimenti finanziari per i clienti
[5]
[6] Tenere la contabilità di una Multinazionale
[7]

4. Commercializzazione e vendita

Conoscenza dei principi e dei metodi per presentare, promuovere, vendere e valutare gli andamenti delle vendite di prodotti o servizi

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Vendere dolci in una festa di beneficenza
[3]
[4] Telefonare ad un elenco di clienti per presentare loro una nuova linea di prodotti
[5]
[6] Mettere a punto un piano commerciale nazionale per una società telefonica
[7]

5. Servizi ai clienti e alle persone

Conoscenza dei principi e delle procedure per fornire servizi ai clienti e alle persone, valutarne i bisogni e la soddisfazione e definire standard di qualità

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Smacchiare a secco l'abito di un cliente
[3]
[4] Occuparsi per l'intera giornata di 10 bambini nello stesso tempo
[5]
[6] Rispondere alle richieste di aiuto dei cittadini dopo un evento catastrofico
[7]

6. Gestione del personale e delle risorse umane

Conoscenza dei principi e delle procedure per il reclutamento, la selezione, la formazione, la retribuzione del personale per le relazioni e le negoziazioni sindacali e per la gestione di sistemi informativi del personale.

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Compilare un modulo di denuncia di incidente sul lavoro
[3] Intervistare candidati ad un posto di segretario
[4]
[5]
[6] Elaborare un nuovo sistema di selezione e di avanzamento di carriera del personale militare
[7]

7. Produzione e processo

Conoscenza delle materie prime, dei processi di produzione, delle tecniche per il controllo di qualità, per il controllo dei costi e di quanto sia necessario per massimizzare la produzione e la distribuzione di beni e servizi

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Imballare un Computer
[3]
[4] Supervisionare una linea di assemblaggio automatizzata
[5]
[6] Dirigere un centro internazionale di una società di distribuzione merci
[7]

8. Produzione alimentare

Conoscenza delle tecniche e delle attrezzature necessarie alla semina, alla coltivazione e alla raccolta di prodotti alimentari (vegetali ed animali) destinati al consumo, comprese quelle relative alla conservazione/stoccaggio

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Conservare delle spezie in cucina
[3]
[4]
[5] Comandare un peschereccio
[6] Condurre una azienda agricola di 10.000 ettari
[7]

9. Informatica ed elettronica

Conoscenza dei circuiti elettronici, dei processori, dei chips delle attrezzature elettroniche, dell'hardware e dei software dei computer, compresa la conoscenza dei pacchetti applicativi e dei linguaggi di programmazione

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Far funzionare un DVD o CD
[3] Usare un Wordprocessor
[4]
[5]
[6] Realizzare un programma per verificare la presenza di virus sul disco
[7]

10. Ingegneria e tecnologia

Conoscenza delle applicazioni pratiche delle scienze ingegneristiche e della tecnologia. Comprende l'applicazione di principi, di tecniche, di procedure e l'uso di strumenti per progettare e produrre diversi beni o servizi

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Montare una serratura su una porta
[3]
[4] Disegnare un carrello per la spesa più stabile
[5]
[6] Determinare l'impatto degli agenti atmosferici nella progettazione di un ponte
[7]

11. Progettazione tecnica

Conoscenza delle tecniche di progettazione, degli strumenti e dei principi utilizzati nella esecuzione di progetti tecnici di precisione, di progetti di dettaglio, di disegni e di modelli

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Tracciare una linea retta di 1,8 cm
[3]
[4] Disegnare schizzi per ristrutturare una cucina
[5]
[6] Realizzare la progettazione tecnica di dettaglio di un grattacielo per uffici
[7]

12. Edilizia e costruzioni

Conoscenza dei materiali, dei metodi e degli strumenti usati nella costruzione e nella riparazione di case, edifici o altre strutture come autostrade e strade

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Scegliere il legno adatto per aggiungere una trave in una casa
[3]
[4] Sistemare una perdita dal soffitto dell'impianto idraulico
[5]
[6] Costruire un grattacielo per uffici
[7]

13. Meccanica

Conoscenza delle macchine e delle attrezzature, compresa la loro progettazione, il loro uso, la loro riparazione e manutenzione

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Sostituire i filtri di una fornace
[3]
[4] Sostituire una valvola di una conduttura di vapore
[5]
[6]
[7] Revisionare un motore jet di un aeromobile

14. Matematica

Conoscenza dell'aritmetica, dell'algebra, della geometria, del calcolo, della statistica e delle loro applicazioni.

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Sommare due Numeri
[2]
[3]
[4] Analizzare dei dati per individuare le aree con maggiori vendite
[5]
[6] Derivare una equazione matematica complessa
[7]

15. Fisica

Conoscenza dei principi e delle leggi della fisica, delle loro interrelazioni e delle loro applicazioni per capire la dinamica dei fluidi, dei materiali e dell'atmosfera e le strutture e i processi meccanici, elettrici, atomici e subatomici

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Usare una leva per forzare una cassa
[2]
[3]
[4] Calcolare la pressione dell'acqua in una condotta
[5]
[6] Progettare un motore a gasolio meno inquinante
[7]

16. Chimica

Conoscenza della composizione, della struttura e delle proprietà delle sostanze, dei processi e delle trasformazioni chimiche sottostanti; ciò comprende l'uso dei prodotti chimici, la conoscenza delle loro interazioni, dei segnali di pericolo, delle tecniche di produzione dei prodotti chimici e dei metodi di bonifica

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Usare un comune insetticida domestico
[3]
[4] Usare la giusta dose di cloro per purificare dell'acqua
[5]
[6] Realizzare un detergente commerciale sicuro
[7]

17. Biologia

Conoscenza degli organismi animali e vegetali, dei loro tessuti, delle cellule, delle loro funzioni, interdipendenze e delle loro interazioni con l'ambiente

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Dar da mangiare ad un animale domestico
[2]
[3]
[4]
[5] Studiare gli effetti dell'inquinamento sulla flora e sulla fauna marina
[6]
[7] Isolare ed identificare un nuovo virus

18. Psicologia

Conoscenza del comportamento e delle prestazioni umane, delle differenze individuali nelle attitudini, nella personalità e negli interessi, dei meccanismi di apprendimento e di motivazione, dei metodi della ricerca psicologica e della valutazione e del trattamento dei disordini comportamentali ed affettivi

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Badare a diversi bambini su un campo da gioco
[3]
[4] Comprendere gli effetti dell'alcool sulle reazioni umane
[5]
[6] Curare una persona con una grave malattia mentale
[7]

19. Sociologia e antropologia

Conoscenza del comportamento e delle dinamiche di gruppo, delle influenze e tendenze sociali, delle migrazioni umane, dell'etnicità, delle culture e della loro storia e origine

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Individuare due diverse culture in un racconto
[3]
[4]
[5] Scrivere un pamphlet sulle differenze culturali
[6]
[7] Elaborare una nuova teoria sulla evoluzione della civilizzazione

20. Geografia

Conoscenza dei principi e dei metodi per descrivere e rappresentare la terra, il mare e le masse d'aria, comprese le loro caratteristiche fisiche, le collocazioni, le interrelazioni e la distribuzione di piante, animali e gli insediamenti umani

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Conoscere la Capitale d'Italia
[3]
[4] Individuare la Turchia su una carta geografica del mondo
[5]
[6] Elaborare una carta geografica del mondo mostrando montagne, deserti e fiumi
[7]

21. Medicina e odontoiatria

Conoscenza delle informazioni e delle tecniche necessarie a diagnosticare e a curare ferite, malattie e deformità del corpo umano, compresa la conoscenza dei sintomi, delle cure alternative, delle proprietà e delle interazioni dei farmaci e delle cure preventive

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Usare un cerotto
[2]
[3]
[4]
[5] Riempire la cavità di un dente
[6]
[7] Effettuare un'operazione chirurgica a cuore aperto

22. Terapia e consulenza psicologica

Conoscenza dei principi, dei metodi e delle procedure per la diagnosi, il trattamento e la riabilitazione delle disfunzioni mentali e fisiche e per la consulenza e la guida nelle carriere

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Consolare un bambino che è caduto
[3]
[4] Dare una consulenza per la ricerca del lavoro ad un disoccupato
[5]
[6] Seguire un bambino che ha subito abusi sessuali
[7]

23. Istruzione e formazione

Conoscenza dei principi e dei metodi per la progettazione formativa e curricolare, per l'insegnamento e l'addestramento collettivo ed individuale, per la misurazione degli effetti della formazione

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Mostrare a qualcuno come giocare a bocce
[3]
[4] Tenere un seminario sul miglioramento della qualità
[5]
[6] Progettare un programma di formazione per neoassunti
[7]

24. Lingua italiana

Conoscenza della struttura e dei contenuti della lingua italiana oppure del significato e della pronuncia delle parole, delle regole di composizione e della grammatica

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Scrivere un biglietto di Ringraziamento
[3]
[4] Pubblicare un articolo su un quotidiano locale
[5]
[6] Insegnare Italiano in un Liceo
[7]

25. Lingua straniera

Conoscenza della struttura e dei contenuti di una lingua straniera oppure del significato e della pronuncia delle parole, delle regole di composizione e della grammatica

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Saper dire "prego" e "grazie" in una lingua straniera
[2]
[3] Chiedere indicazioni su una strada in una città straniera
[4]
[5] Scrivere in italiano una recensione di un libro scritto in una lingua straniera
[6]
[7]

26. Arte

Conoscenza della teoria e delle tecniche necessarie a comporre, produrre e realizzare musica, danza, arti visuali, drammi e sculture

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Assistere ad un concerto di musica pop
[2]
[3] Recitare una parte secondaria in una rappresentazione di una filodrammatica locale
[4]
[5] Disegnare la scenografia di una grande manifestazione fieristica
[6]
[7]

27. Storia e archeologia

Conoscenza degli eventi storici e delle loro cause, degli indicatori e degli effetti sulle civilizzazioni e sulle culture

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2]
[3] Frequentare un corso di storia italiana
[4] Insegnare storia locale in una scuola elementare
[5]
[6] Determinare l'età di reperti ossei per collocarli nella storia fossile
[7]

28. Filosofia e teologia

Conoscenza dei diversi sistemi filosofici e delle diverse religioni, dei principi di base, dei valori, dell'etica, dei modi di pensare, dei costumi, delle pratiche e del loro impatto sulla cultura

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Guardare una trasmissione televisiva sui valori familiari
[3]
[4] Capire le pratiche religiose di un'altra cultura
[5]
[6] Comparare gli insegnamenti dei maggiori filosofi
[7]

29. Protezione civile e sicurezza pubblica

Conoscenza delle più importanti attrezzature, delle politiche, delle procedure e delle strategie per promuovere effettive operazioni di sicurezza locale e nazionale per la protezione delle persone, delle informazioni, della proprietà e delle istituzioni

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Usare una cintura di Sicurezza
[2]
[3]
[4] Ispezionare un edificio per accertare violazioni delle norme di sicurezza
[5]
[6] Comandare una operazione militare
[7]

30. Legislazione e istituzioni

Conoscenza delle leggi, delle procedure legali, dei regolamenti, delle sentenze esecutive, del ruolo delle istituzioni e delle procedure politiche di una democrazia

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Chiedere un certificato elettorale sostitutivo per una elezione politica
[3]
[4] Preparare documenti e atti di proprietà per l'acquisto di una nuova casa
[5]
[6] Fare il giudice in un Tribunale
[7]

31. Telecomunicazioni

Conoscenza delle trasmissioni, della radiodiffusione e delle modalità di connessione e controllo dei sistemi di telecomunicazioni

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1] Fare una telefonata
[2] Installare una antenna satellitare
[3]
[4]
[5]
[6]
[7] Progettare una nuova rete mondiale di telecomunicazioni

32. Comunicazione e media

Conoscenza della produzione dei mezzi di comunicazione, delle tecniche e dei metodi per diffondere informazioni, dei mezzi alternativi per informare e intrattenere in modo scritto, orale e visivo

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Scrivere una lettera di ringraziamento
[3]
[4] Fare il disk jokey in una radio
[5] Scrivere un racconto
[6]
[7]

33. Trasporti

Conoscenza dei principi e dei metodi per trasportare persone o beni con mezzi aerei, ferroviari, navali o stradali; comprende le conoscenze necessarie per calcolare i costi e i benefici dei mezzi di trasporto

A. Quanto è importante quest'area di conoscenza nello svolgimento della sua attuale professione?

[1] Non importante → passare all'area di conoscenza successiva
[2] Appena importante
[3] Importante
[4] Molto importante
[5] Di assoluta importanza

B. A quale livello, fra quelli indicati, sono necessarie queste conoscenze per lo svolgimento della sua attuale professione?

[1]
[2] Prendere un treno per andare al lavoro
[3]
[4]
[5] Guidare una nave da carico in un porto affollato
[6] Controllare il traffico aereo di un aeroporto affollato
[7]

Appendix B - The determinants of overeducation, additional analyses

Tab. B.1 The determinants of overeducation among BA graduates. Logit models, average marginal effects

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.005	0.005	0.020*	0.006	0.048***
		(0.010)	(0.009)	(0.010)	(0.008)	(0.009)
Age		0.004***	0.004***	-0.001	-0.005***	-0.005***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.000	-0.001	-0.02	0.014	-0.001
		(0.018)	(0.018)	(0.019)	(0.016)	(0.017)
	Upper secondary	-0.016	-0.007	-0.017	0.031	0.016
		(0.019)	(0.019)	(0.019)	-0.017	(0.017)
	Tertiary	-0.02	-0.011	-0.03	0.017	-0.012
		(0.022)	(0.022)	(0.023)	(0.020)	(0.020)
	NA	-0.06	-0.071	-0.069	-0.092	-0.08
		(0.058)	(0.057)	(0.059)	(0.055)	(0.052)
Social Origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.008	-0.004	0.024	-0.043*	0.08
		(0.024)	(0.024)	(0.024)	(0.021)	(0.021)
	Managers	-0.060*	-0.03	-0.016	-0.089***	-0.017
		(0.027)	(0.027)	(0.028)	(0.025)	(0.024)
	Clerks	-0.003	-0.002	0.003	-0.052**	0.019
		(0.019)	(0.019)	(0.019)	(0.017)	(0.017)
	Self-Employed	-0.01	0.001	0.004	-0.037*	0.014
		(0.020)	(0.020)	(0.021)	(0.018)	(0.018)
	Executive workers	-0.032	-0.032	-0.005	-0.05**	0.009
		(0.020)	(0.020)	(0.020)	(0.018)	(0.018)
	Manual workers	-0.03	-0.024	-0.002	-0.051**	0.008
		(0.020)	(0.020)	(0.020)	(0.018)	(0.017)
	NA	-0.03	-0.015	-0.048	-0.027	0.033
		(0.047)	(0.047)	(0.048)	(0.041)	(0.044)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.019	0.012	0.026*	0.028**	0.025**
		(0.011)	(0.011)	(0.011)	(0.009)	(0.010)
	South and Islands	0.038***	0.036***	0.021	0.025**	0.027**

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.006	-0.009	-0.026	-0.02	-0.006
		(0.017)	(0.017)	(0.018)	(0.016)	(0.016)
	Other Lyceum	0.006	0.009	-0.01	0.009	-0.014
		(0.014)	(0.014)	(0.015)	(0.013)	(0.013)
	Technical school	0.013	0.013	0.005	0.026**	0.007
		(0.011)	(0.010)	(0.011)	(0.009)	(0.009)
	Vocational school	0.011	0.007	-0.015	0.034*	0.033*
		(0.018)	(0.018)	(0.018)	(0.015)	(0.016)
Secondary graduation mark		0.000	0.000	0.000	-0.001	0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.02	0.017	-0.016	-0.017	-0.013
		(0.017)	(0.016)	(0.017)	(0.014)	(0.015)
Field of study	Mathemantics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	-0.163***	-0.197***	-0.133**	-0.085	-0.163***
		(0.047)	(0.047)	(0.047)	(0.046)	(0.046)
	Natural Sciences	0.022	0.014	-0.009	0.205***	0.244***
		(0.052)	(0.051)	(0.052)	(0.047)	(0.050)
	Pharmacy, Veterinary	-0.203***	-0.215***	-0.148*	-0.056	0.066
		(0.061)	(0.061)	(0.062)	(0.061)	(0.062)
	Medical Professions	-0.476***	-0.523***	-0.410***	-0.569***	-0.336***
		(0.045)	(0.044)	(0.045)	(0.043)	(0.044)
	Architecture	-0.002	-0.029	-0.05	0.110*	0.083
		(0.054)	(0.054)	(0.055)	(0.051)	(0.054)
	Business, Administration, Statistics	-0.051	-0.055	-0.02	0.195***	0.363***
		(0.046)	(0.046)	(0.047)	(0.044)	(0.045)
	Social sciences	0.01	0.035	0.033	0.109*	0.262***
		(0.048)	(0.047)	(0.048)	(0.045)	(0.047)
	Law	0.026	0.05	0.012	0.209***	0.386***
		(0.050)	(0.049)	(0.050)	(0.046)	(0.047)
	Arts and Humanities	0.137***	0.141**	0.124*	0.215***	0.357***
		(0.047)	(0.048)	(0.049)	(0.045)	(0.047)
	Education, Psychology	-0.105	-0.121*	-0.133**	-0.012	-0.124**
		(0.049)	(0.048)	(0.049)	(0.047)	(0.047)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.022	-0.028*	-0.006	-0.006	0.001
		(0.013)	(0.013)	(0.013)	(0.011)	(0.011)
	101-105	-0.050**	-0.051***	-0.006	-0.01	-0.016
		(0.015)	(0.015)	(0.016)	(0.013)	(0.014)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	106-110	-0.023	-0.03	-0.023	-0.013	-0.003
		(0.017)	(0.017)	(0.017)	(0.015)	(0.015)
	110 cum laude	-0.070***	-0.074***	-0.073***	-0.048**	-0.044*
		(0.020)	(0.020)	(0.020)	(0.017)	(0.018)
Years of graduation delay		0.003	0.006	0.011*	0.001	0.000
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.049***	-0.046***	-0.042***	-0.038***	-0.029***
		(0.009)	(0.009)	(0.009)	(0.007)	(0.008)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.211***	-0.201***	-0.110***	-0.038**	0.000
		(0.017)	(0.017)	(0.017)	(0.014)	(0.014)
Pseudo R2		0.245	0.272	0.187	0.425	0.364
N		9,144	9,144	9,217	9,217	9,217

Standard errors in parentheses

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

Tab. B.2 The determinants of overeducation among MA graduates, average marginal effects

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.002	0.000	0.018*	0.023**	0.040***
		(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
Age		0.003**	0.004**	-0.055***	-0.005***	-0.006***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.005	-0.001	0.014	-0.01	-0.008
		(0.014)	(0.015)	(0.016)	(0.016)	(0.015)
	Upper secondary	-0.003	0.001	0.022	-0.006	-0.003
		(0.015)	(0.015)	(0.016)	(0.016)	(0.015)
	Tertiary	-0.02	-0.02	0.02	-0.015	-0.01
		(0.017)	(0.017)	(0.018)	(0.018)	(0.017)
	NA	0.037	0.072	-0.026	0.055	0.081
		(0.062)	(0.065)	(0.062)	(0.067)	(0.063)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.077***	-0.074***	-0.045*	-0.096***	-0.045**
		(0.018)	(0.018)	(0.019)	(0.019)	(0.017)
	Managers	-0.076***	-0.065**	-0.024	-0.051*	-0.001
		(0.019)	(0.020)	(0.020)	(0.021)	(0.019)
	Clerks	-0.053***	-0.050**	-0.001	-0.046**	0.003
		(0.015)	(0.015)	(0.016)	(0.016)	(0.014)
	Self-Employed	-0.035*	-0.037*	0.014	-0.043*	0.005
		(0.017)	(0.017)	(0.018)	(0.018)	(0.016)
	Executive workers	-0.034*	-0.032	0.004	-0.025	0.017
		(0.017)	(0.017)	(0.018)	(0.018)	(0.016)
	Manual workers	-0.047**	-0.047**	0.015	-0.025	0.011
		(0.016)	(0.017)	(0.018)	(0.018)	(0.016)
	NA	-0.021	-0.018	0.064	-0.032	-0.005
		(0.037)	(0.039)	(0.042)	(0.041)	(0.037)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.012	0.004	0.005	-0.020*	-0.017*
		(0.008)	(0.008)	(0.009)	(0.009)	(0.008)
	South and Islands	-0.001	-0.011	-0.019*	-0.048***	-0.036***
		(0.008)	(0.008)	(0.009)	(0.009)	(0.008)
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.014	-0.004	0.000	-0.032**	-0.021*
		(0.010)	(0.010)	(0.011)	(0.011)	(0.010)
	Other Lyceum	-0.016	-0.019	-0.009	0.052***	-0.017

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Technical school	0.011	0.015	0.021*	0.010	0.003
		(0.008)	(0.009)	(0.009)	(0.009)	(0.008)
	Vocational school	0.024	0.028	0.039	0.041*	0.032
		(0.018)	(0.019)	(0.020)	(0.021)	(0.019)
Secondary graduation mark		-0.001***	-0.002***	-0.002***	-0.002***	-0.002***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.014	0.002	0.009	0.002	-0.005
		(0.010)	(0.010)	(0.011)	(0.011)	(0.010)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.027*	0.024	0.060***	0.01	0.006
		(0.013)	(0.014)	(0.015)	(0.017)	(0.013)
	Natural Sciences	0.172***	0.191***	0.131***	0.184***	0.189***
		(0.019)	(0.020)	(0.021)	(0.022)	(0.019)
	Pharmacy, Veterinary	-0.083***	-0.106***	-0.119***	-0.262***	-0.120***
		(0.016)	(0.018)	(0.020)	(0.019)	(0.015)
	Medicine	-0.106***	-0.128***	-0.149***	-0.303***	-0.146***
		(0.013)	(0.015)	(0.016)	(0.016)	(0.012)
	Medical Professions	0.068*	0.061*	0.036	-0.228***	-0.079***
		(0.029)	(0.031)	(0.034)	(0.025)	(0.023)
	Architecture	0.033*	0.017	-0.004	-0.105***	-0.036*
		(0.015)	(0.016)	(0.017)	(0.018)	(0.014)
	Business and Administration, Statistics	0.192***	0.222***	0.196***	0.338***	0.443***
		(0.015)	(0.016)	(0.017)	(0.018)	(0.015)
	Social sciences	0.367***	0.432***	0.289***	0.326***	0.398***
		(0.017)	(0.018)	(0.019)	(0.019)	(0.017)
	Law	0.073***	0.075***	0.011	0.025	0.139***
		(0.016)	(0.017)	(0.017)	(0.020)	(0.017)
	Arts and Humanities	0.356***	0.395***	0.255***	0.261***	0.323***
		(0.018)	(0.018)	(0.019)	(0.020)	(0.018)
	Education, Psychology	0.138***	0.147***	0.034	0.233***	-0.041**
		(0.018)	(0.018)	(0.019)	(0.021)	(0.015)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.01	-0.021	-0.01	-0.018	-0.023
		(0.015)	(0.016)	(0.017)	(0.017)	(0.015)
	101-105	-0.017	-0.022	-0.016	-0.041*	-0.044**
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
	106-110	-0.056***	-0.064***	-0.029	-0.061***	-0.050**
		(0.016)	(0.017)	(0.017)	(0.017)	(0.016)
	110 cum laude	-0.072***	-0.077***	-0.058**	-0.077***	-0.068***
		(0.016)	(0.017)	(0.018)	(0.018)	(0.016)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
Years of graduation delay		0.022***	0.025***	0.009*	0.015***	0.010**
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.071***	-0.075***	-0.061***	-0.079***	-0.062***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.161***	-0.144***	-0.091***	-0.064***	-0.005
		(0.014)	(0.014)	(0.014)	(0.014)	(0.012)
Pseudo R2		0.131	0.14	0.072	0.147	0.183
N		16,374	16,374	16,594	16,594	16,594

Standard errors in parentheses

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

Appendix C - The effects of overeducation, additional analyses

Tab. C.1 The effect of overeducation on earnings among BA graduates. OLS models

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.075***				
		(0.008)				
SA_{hm}			-0.072***			
			(0.008)			
SA_p				-0.093***		
				(0.007)		
RM_{md}					-0.072***	
					(0.009)	
JA						-0.056***
						(0.009)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.087***	-0.087***	-0.086***	-0.088***	-0.086***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Age		0.005***	0.005***	0.004***	0.004***	0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.007	0.007	0.006	0.007	0.007
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	Upper secondary	-0.005	-0.004	-0.004	-0.001	-0.002
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Tertiary	0.006	0.006	0.003	0.005	0.004
		(0.016)	(0.016)	(0.016)	(0.016)	(0.015)
	NA	0.018	0.016	0.023	0.015	0.019
		(0.049)	(0.048)	(0.049)	(0.049)	(0.048)
Social Origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.005	-0.005	-0.007	-0.013	-0.011
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	Managers	0.034	0.037	0.039	0.031	0.035
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
	Clerks	-0.042**	-0.042**	-0.041**	-0.047**	-0.043**
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Self-Employed	-0.050**	-0.049**	-0.050**	-0.054***	-0.052***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Executive workers	-0.042**	-0.042**	-0.041**	-0.046**	-0.043**
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Manual workers	-0.055***	-0.054***	-0.053***	-0.058***	-0.055***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	NA	-0.058	-0.057	-0.062	-0.059	-0.057
		(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.045***	-0.045***	-0.045***	-0.044***	-0.044***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	South and Islands	-0.085***	-0.085***	-0.086***	-0.085***	-0.085***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Type of Secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	0.017	0.017	0.019	0.022	0.022
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Other Lyceum	0.001	0.001	0.001	0.003	0.001
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	Technical school	-0.006	-0.006	-0.005	-0.004	-0.005
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Vocationalschool	-0.018	-0.018	-0.019	-0.014	-0.015
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Secondary graduation mark		0.000	0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.015	-0.015	-0.017	-0.017	-0.018
		(0.010)	(0.011)	(0.013)	(0.011)	(0.012)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.069*	0.066*	0.065*	0.069*	0.066*
		(0.028)	(0.028)	(0.027)	(0.028)	(0.028)
	Natural Sciences	-0.001	-0.001	0.001	0.016	0.016
		(0.031)	(0.031)	(0.030)	(0.031)	(0.031)
	Pharmacy, Veterinary	0.004	0.005	0.003	0.009	0.017
		(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
	Medical Professions	0.117***	0.115***	0.114***	0.108***	0.130***
		(0.027)	(0.027)	(0.026)	(0.027)	(0.027)
	Architecture	-0.058	-0.06	-0.064	-0.053	-0.057
		(0.033)	(0.033)	(0.033)	(0.033)	(0.033)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Business and Administration, Statistics	0.059*	0.059*	0.060*	0.075**	0.082**
		(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
	Social sciences	0.002	0.004	0.003	0.008	0.015
		(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
	Law	0.028	0.03	0.026	0.038	0.045
		(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
	Arts and Humanities	-0.015	-0.014	-0.012	-0.009	-0.003
		(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
	Education, Psychology	-0.010	-0.011	-0.015	-0.005	-0.009
		(0.007)	(0.008)	(0.008)	(0.003)	(0.005)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.002	-0.003	-0.001	-0.002	-0.002
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	101-105	-0.003	-0.003	-0.001	0.000	-0.001
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	106-110	-0.005	-0.006	-0.007	-0.005	-0.005
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	110 cum laude	-0.005	-0.006	-0.007	-0.005	-0.005
		(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Years of graduation delay		-0.010**	-0.010**	-0.009**	-0.010**	-0.010**
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.007	-0.006	-0.006	-0.005	-0.004
		(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	0.013	0.015	0.021	0.029*	0.032*
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.083***	-0.083***	-0.081***	-0.082***	-0.084***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.478***	-0.479***	-0.480***	-0.484***	-0.484***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Constant		7.138	7.138	7.153	7.157	7.123
		(0.050)	(0.050)	(0.049)	(0.050)	(0.050)
R2		0.379	0.378	0.384	0.376	0.374
N		7,669	7,669	7,731	7,731	7,731

Standard errors in parentheses

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

Tab. C.2 The effect of overeducation on earnings among MA graduates. OLS models

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.052***				
		(0.007)				
SA_{hm}			-0.035***			
			(0.007)			
SA_p				-0.034***		
				(0.006)		
RM_{md}					0.013*	
					(0.006)	
JA						0.01
						(0.007)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.095***	-0.095***	-0.094***	-0.095***	-0.095***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age		0.011***	0.011***	0.011***	0.011***	0.011***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.007	-0.007	-0.008	-0.008	-0.009
		(0.014)	(0.014)	(0.014)	(0.013)	(0.013)
	Upper secondary	0.005	0.005	0.004	0.003	0.003
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Tertiary	0.015	0.016	0.015	0.014	0.014
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	NA	-0.011	-0.01	-0.023	-0.025	-0.026
		(0.073)	(0.073)	(0.073)	(0.073)	(0.073)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.039*	-0.037*	-0.035*	-0.033*	-0.034*
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Managers	0.02	0.021	0.021	0.023	0.022
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
	Clerks	-0.034*	-0.032*	-0.029*	-0.028*	-0.029*
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Self-Employed	-0.021	-0.021	-0.017	-0.017	-0.017
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Executive workers	-0.058***	-0.057***	-0.055***	-0.055***	-0.055***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Manual workers	-0.039*	-0.038*	-0.036*	-0.036*	-0.036*
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	NA	-0.009	-0.008	0.011	0.007	0.007
		(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Geographic area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.051***	-0.051***	-0.050***	-0.050***	-0.050***
		(0.008)	(0.008)	(0.007)	(0.007)	(0.007)
	South and Islands	-0.103***	-0.104***	-0.104***	-0.103***	-0.103***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.015	-0.014	-0.013	-0.012	-0.013
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	Other Lyceum	0.02	0.02	0.02	0.02	0.021
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Technical school	-0.015*	-0.015*	-0.015*	-0.016*	-0.016*
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Vocational school	-0.037*	-0.037*	-0.034*	-0.036*	-0.036*
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Secondary graduation mark		0.001**	0.001**	0.001**	0.001***	0.001**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.007	-0.008	-0.006	-0.006	-0.006
		(0.010)	(0.009)	(0.009)	(0.010)	(0.009)
Field of Study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.050***	0.050***	0.049***	0.047***	0.047***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Natural Sciences	-0.121***	-0.123***	-0.125***	-0.131***	-0.131***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
	Pharmacy, Veterinary	-0.032	-0.03	-0.033	-0.024	-0.026
		(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
	Medicine	0.212***	0.213***	0.212***	0.220***	0.218***
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	Medical Professions	0.054	0.054	0.05	0.052	0.049
		(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
	Architecture	-0.143***	-0.144***	-0.144***	-0.143***	-0.144***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Business and Administration, Statistics	0.013	0.011	0.009	-0.002	-0.002
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Social sciences	-0.061***	-0.064***	-0.069***	-0.083***	-0.082***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Law	-0.150***	-0.151***	-0.154***	-0.158***	-0.158***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Arts and Humanities	-0.133***	-0.136***	-0.144***	-0.156***	-0.156***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Education, Psychology	-0.100***	-0.101***	-0.101***	-0.104***	-0.101***
		(0.017)	(0.017)	(0.016)	(0.016)	(0.016)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	0.021	0.021	0.023	0.024	0.024
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	101-105	0.028	0.028	0.030*	0.031*	0.031*
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	106-110	0.035*	0.035*	0.038**	0.040**	0.040**
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	110 cum laude	0.059***	0.060***	0.061***	0.064***	0.063***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Years of graduation delay		-0.025***	-0.025***	-0.026***	-0.027***	-0.027***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.021***	-0.020***	-0.019**	-0.016**	-0.017**
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.014	-0.01	-0.011	-0.007	-0.008
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.073***	-0.073***	-0.072***	-0.072***	-0.072***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.452***	-0.454***	-0.459***	-0.460***	-0.460***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Constant		7.001	6.995	6.993	6.96	6.965
		(0.054)	(0.054)	(0.053)	(0.053)	(0.053)
R2		0.311	0.31	0.311	0.31	0.31
N		13,248	13,248	13,437	13,437	13,437

Standard errors in parentheses

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

Tab. C.3 The effect of overeducation on job satisfaction among BA graduates. OLS models

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.294***				
		(0.024)				
SA_{hm}			-0.288***			
			(0.024)			
SA_p				-0.418***		
				(0.023)		
RM_{md}					-0.152***	
					(0.027)	
JA						-0.223***
						(0.026)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.076***	-0.076***	-0.070***	-0.076***	-0.066***
		(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Age		-0.009***	-0.009***	-0.010***	-0.010***	-0.011***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.010	0.010	0.004	0.014	0.012
		(0.040)	(0.040)	(0.039)	(0.040)	(0.040)
	Upper secondary	0.034	0.037	0.035	0.046	0.045
		(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
	Tertiary	0.032	0.034	0.029	0.045	0.039
		(0.050)	(0.050)	(0.049)	(0.049)	(0.049)
	NA	0.188	0.115	0.115	0.130	0.127
		(0.131)	(0.131)	(0.130)	(0.132)	(0.132)
Social Origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.107	-0.105	-0.093	-0.113*	-0.103
		(0.057)	(0.057)	(0.056)	(0.057)	(0.057)
	Managers	-0.056	-0.045	-0.052	-0.060	-0.049
		(0.067)	(0.067)	(0.066)	(0.067)	(0.067)
	Clerks	-0.166***	-0.165***	-0.167***	-0.177***	-0.164***
		(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
	Self-Employed	-0.136**	-0.132**	-0.135**	-0.143**	-0.134**
		(0.048)	(0.048)	(0.047)	(0.048)	(0.048)
	Executive workers	-0.184***	-0.184***	-0.181***	-0.189***	-0.179***
		(0.048)	(0.048)	(0.047)	(0.048)	(0.048)
	Manual workers	-0.147**	-0.144**	-0.141**	-0.149**	-0.139**
		(0.047)	(0.047)	(0.046)	(0.047)	(0.047)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	NA	-0.141	-0.137	-0.171	-0.159	-0.147
		(0.102)	(0.102)	(0.100)	(0.102)	(0.101)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.122***	-0.124***	-0.121***	-0.125***	-0.124***
		(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
	South and Islands	-0.150***	-0.150***	-0.154***	-0.156***	-0.153***
		(0.025)	(0.025)	(0.024)	(0.025)	(0.025)
Type of Secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.026	-0.027	-0.031	-0.024	-0.022
		(0.040)	(0.040)	(0.039)	(0.040)	(0.039)
	Other Lyceum	0.063*	0.064*	0.053	0.060	0.056
		(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
	Technical school	0.030	0.030	0.027	0.029	0.026
		(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
	Vocational school	0.011	0.010	0.001	0.012	0.014
		(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
Secondary graduation mark		0.002*	0.002*	0.002*	0.002*	0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.001	-0.002	-0.007	-0.005	-0.006
		(0.038)	(0.038)	(0.036)	(0.037)	(0.037)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	-0.035	-0.043	-0.044	-0.006	-0.031
		(0.088)	(0.088)	(0.086)	(0.088)	(0.087)
	Natural Sciences	-0.029	-0.031	-0.040	-0.008	0.014
		(0.096)	(0.096)	(0.094)	(0.096)	(0.096)
	Pharmacy, Veterinary	0.109	0.107	0.106	0.157	0.181
		(0.116)	(0.116)	(0.114)	(0.116)	(0.116)
	Medical Professions	0.075	0.064	0.042	0.118	0.129
		(0.085)	(0.085)	(0.083)	(0.085)	(0.084)
	Architecture	-0.108	-0.115	-0.132	-0.096	-0.094
		(0.100)	(0.100)	(0.099)	(0.101)	(0.100)
	Business and Administration, Statistics	0.097	0.095	0.103	0.135	0.187*
		(0.086)	(0.086)	(0.084)	(0.086)	(0.086)
	Social sciences	-0.108	-0.101	-0.106	-0.104	-0.061
		(0.088)	(0.088)	(0.087)	(0.088)	(0.088)
	Law	0.100	0.106	0.095	0.116	0.170
		(0.092)	(0.092)	(0.091)	(0.092)	(0.093)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Arts and Humanities	-0.005	-0.004	0.008	-0.006	0.041
		(0.091)	(0.091)	(0.089)	(0.091)	(0.091)
	Education, Psychology	0.025	0.022	-0.001	0.057	0.031
		(0.091)	(0.091)	(0.089)	(0.090)	(0.090)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	0.025	0.023	0.028	0.031	0.033
		(0.031)	(0.031)	(0.030)	(0.031)	(0.031)
	101-105	0.009	0.009	0.021	0.023	0.022
		(0.036)	(0.036)	(0.035)	(0.036)	(0.036)
	106-110	0.057	0.056	0.054	0.063	0.065
		(0.038)	(0.038)	(0.037)	(0.038)	(0.038)
	110 cum laude	0.071	0.070	0.071	0.092*	0.091*
		(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
Years of graduation delay		-0.009	-0.008	-0.007	-0.012	-0.012
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.009	-0.007	-0.013	0.000	-0.000
		(0.020)	(0.020)	(0.019)	(0.020)	(0.019)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	0.026	0.031	0.053	0.098*	0.103**
		(0.039)	(0.039)	(0.038)	(0.039)	(0.038)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.409***	-0.409***	-0.397***	-0.409***	-0.407***
		(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.303***	-0.306***	-0.302***	-0.320***	-0.321***
		(0.032)	(0.032)	(0.031)	(0.032)	(0.031)
	NA	-0.267***	-0.272***	-0.253***	-0.283***	-0.293***
		(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
Constant		0.529	0.531	0.600	0.446	0.421
		(0.156)	(0.156)	(0.152)	(0.156)	(0.154)
R2		0.126	0.126	0,143	0.114	0.118
N		9,077	9,077	9,149	9,149	9,149

Standard errors in parentheses

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

Tab. C.4 The effect of overeducation on job satisfaction among MA graduates. OLS models

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		-0.304***				
		(0.018)				
SA_{hm}			-0.283***			
			(0.018)			
SA_p				-0.377***		
				(0.016)		
RM_{md}					-0.107***	
					(0.017)	
JA						-0.168***
						(0.018)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	-0.146***	-0.145***	-0.140***	-0.143***	-0.139***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Age		0.003	0.003	0.001	0.003	0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Parents' education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.034	-0.031	-0.029	-0.036	-0.036
		(0.035)	(0.035)	(0.034)	(0.034)	(0.034)
	Upper secondary	0.010	0.010	0.016	0.006	0.006
		(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
	Tertiary	-0.021	-0.021	-0.009	-0.021	-0.021
		(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
	NA	-0.002	-0.002	-0.031	-0.022	-0.016
		(0.144)	(0.144)	(0.141)	(0.143)	(0.143)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	-0.032	-0.029	-0.018	-0.011	-0.008
		(0.041)	(0.041)	(0.040)	(0.041)	(0.041)
	Managers	-0.014	-0.009	-0.003	0.001	0.006
		(0.045)	(0.045)	(0.044)	(0.045)	(0.045)
	Clerks	-0.101**	-0.099**	-0.083*	-0.086*	-0.080*
		(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
	Self-Employed	-0.104**	-0.104**	-0.087*	-0.096*	-0.091*
		(0.038)	(0.038)	(0.037)	(0.038)	(0.038)
	Executive workers	-0.181***	-0.179***	-0.163***	-0.166***	-0.160***
		(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
	Manual workers	-0.125**	-0.124**	-0.100**	-0.108**	-0.103**
		(0.038)	(0.038)	(0.038)	(0.038)	(0.038)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	NA	-0.065	-0.063	-0.050	-0.076	-0.072
		(0.088)	(0.088)	(0.085)	(0.086)	(0.086)
Geographic area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.112***	-0.114***	-0.117***	-0.121***	-0.121***
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	South and Islands	-0.169***	-0.171***	-0.181***	-0.178***	-0.178***
		(0.019)	(0.019)	(0.018)	(0.019)	(0.019)
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.018	-0.015	-0.013	-0.016	-0.016
		(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
	Other Lyceum	0.051	0.050	0.054	0.063*	0.054
		(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
	Technical school	-0.018	-0.017	-0.013	-0.020	-0.021
		(0.020)	(0.020)	(0.019)	(0.020)	(0.020)
	Vocational school	0.002	0.002	0.002	-0.008	-0.007
		(0.043)	(0.043)	(0.042)	(0.042)	(0.042)
Secondary graduation mark		0.004***	0.004***	0.004***	0.004***	0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	-0.024	-0.028	-0.024	-0.027	-0.028
		(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Field of Study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	-0.006	-0.006	-0.012	-0.010	-0.011
		(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
	Natural Sciences	-0.008	-0.004	-0.003	-0.030	-0.019
		(0.044)	(0.044)	(0.043)	(0.044)	(0.044)
	Pharmacy, Veterinary	0.034	0.032	0.019	0.039	0.045
		(0.060)	(0.060)	(0.059)	(0.060)	(0.060)
	Medicine	0.426***	0.423***	0.400***	0.422***	0.430***
		(0.047)	(0.047)	(0.046)	(0.047)	(0.046)
	Medical Professions	0.079	0.079	0.071	0.034	0.048
		(0.075)	(0.075)	(0.073)	(0.074)	(0.074)
	Architecture	-0.230***	-0.234***	-0.235***	-0.244***	-0.239***
		(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
	Business and Administration, Statistics	0.158***	0.164***	0.179***	0.141***	0.179***
		(0.036)	(0.036)	(0.036)	(0.037)	(0.037)
	Social sciences	0.031	0.044	0.037	-0.035	-0.004
		(0.040)	(0.040)	(0.039)	(0.040)	(0.040)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Law	0.044	0.045	0.029	0.028	0.048
		(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
	Arts and Humanities	0.011	0.017	0.005	-0.058	-0.032
		(0.040)	(0.040)	(0.039)	(0.040)	(0.040)
	Education, Psychology	0.156***	0.158***	0.127**	0.146***	0.113***
		(0.043)	(0.043)	(0.042)	(0.042)	(0.042)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	0.041	0.038	0.039	0.040	0.038
		(0.035)	(0.035)	(0.034)	(0.035)	(0.035)
	101-105	0.033	0.032	0.035	0.036	0.033
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
	106-110	0.025	0.024	0.034	0.038	0.036
		(0.036)	(0.037)	(0.036)	(0.036)	(0.036)
	110 cum laude	0.062	0.062	0.063	0.075*	0.072
		(0.038)	(0.038)	(0.037)	(0.038)	(0.038)
Years of graduation delay		-0.063***	-0.062***	-0.067***	-0.069***	-0.069***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.039*	-0.038*	-0.039*	-0.024	-0.025
		(0.016)	(0.016)	(0.015)	(0.016)	(0.016)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	-0.085**	-0.075*	-0.064*	-0.034	-0.028
		(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	-0.398***	-0.396***	-0.394***	-0.397***	-0.398***
		(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	-0.329***	-0.335***	-0.330***	-0.352***	-0.349***
		(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
	NA	-0.223***	-0.225***	-0.225***	-0.232***	-0.235***
		(0.030)	(0.030)	(0.029)	(0.030)	(0.030)
Constant		0.173	0.165	0.249	0.081	0.085
		(0.136)	(0.136)	(0.133)	(0.135)	(0.134)
R2		0.142	0.141	0.155	0.130	0.132
N		16,224	16,224	16,443	16,443	16,443

Standard errors in parentheses

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

Tab. C.5 The effect of overeducation on job search among BA graduates. Logit model, average marginal effects

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		0.047***				
		(0.008)				
SA_{hm}			0.051***			
			(0.008)			
SA_p				0.047***		
				(0.008)		
RM_{md}					0.024**	
					(0.009)	
JA						0.034***
						(0.009)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.012	0.011	0.011	0.011	0.009
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age		-0.002*	-0.002*	-0.002*	-0.002*	-0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' Education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.007	0.007	0.008	0.007	0.007
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Upper secondary	-0.004	-0.005	-0.003	-0.006	-0.005
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Tertiary	-0.008	-0.008	-0.006	-0.009	-0.008
		(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
	NA	-0.082*	-0.082*	-0.080*	-0.081*	-0.081*
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Social Origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	0.037*	0.037*	0.034	0.037*	0.036
		(0.019)	(0.019)	(0.018)	(0.018)	(0.018)
	Managers	0.068**	0.066**	0.065**	0.068**	0.067**
		(0.024)	(0.024)	(0.023)	(0.023)	(0.024)
	Clerks	0.047**	0.047**	0.045**	0.048***	0.046**
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Self-Employed	0.042**	0.041**	0.041**	0.042**	0.041**
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Executive workers	0.053***	0.053***	0.052***	0.053***	0.052***
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Manual workers	0.038**	0.037*	0.037*	0.039**	0.038**
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	NA	0.053	0.051	0.053	0.054	0.053
		(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.016	0.016	0.017*	0.017*	0.017*
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	South and Islands	0.060***	0.060***	0.060***	0.061***	0.060***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Type of Secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	-0.023	-0.023	-0.022	-0.022	-0.022
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Other Lyceum	0.006	0.006	0.009	0.008	0.009
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	Technical school	-0.003	-0.003	0.002	-0.003	-0.002
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	Vocational school	-0.002	-0.002	-0.001	-0.002	-0.002
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Secondary graduation mark		-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.023	0.023	0.022	0.022	0.022
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.004	0.007	0.005	-0.003	0.004
		(0.035)	(0.035)	(0.035)	(0.035)	(0.037)
	Natural Sciences	-0.041	-0.04	-0.04	-0.049	-0.053
		(0.037)	(0.037)	(0.037)	(0.038)	(0.038)
	Pharmacy, Veterinary	-0.044	-0.042	-0.044	-0.054	-0.058
		(0.044)	(0.044)	(0.044)	(0.044)	(0.045)
	Medical Professions	-0.099**	-0.095**	-0.100**	-0.109***	-0.111**
		(0.034)	(0.033)	(0.033)	(0.034)	(0.034)
	Architecture	0.005	0.007	0.011	0.003	0.003
		(0.040)	(0.040)	(0.040)	(0.041)	(0.041)
	Business and Administration, Statistics	-0.066	-0.064	-0.065	-0.073*	-0.081*
		(0.034)	(0.034)	(0.034)	(0.034)	(0.035)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Social sciences	-0.031	-0.031	-0.028	-0.032	-0.039
		(0.035)	(0.034)	(0.034)	(0.035)	(0.036)
	Law	-0.06	-0.06	-0.056	-0.064	-0.072
		(0.036)	(0.035)	(0.036)	(0.036)	(0.037)
	Arts and Humanities	-0.005	-0.005	-0.003	-0.004	-0.012
		(0.036)	(0.035)	(0.035)	(0.036)	(0.036)
	Education, Psychology	-0.055	-0.054	-0.05	-0.062	-0.056
		(0.035)	(0.035)	(0.035)	(0.035)	(0.036)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.004	-0.004	-0.006	-0.007	-0.007
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	101-105	-0.001	0.000	-0.004	-0.004	-0.004
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	106-110	0.000	0.000	-0.001	-0.002	-0.002
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	110 cum laude	0.000	0.000	-0.003	-0.006	-0.005
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Years of graduation delay		0.000	0.000	0.000	0.001	0.001
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	0.029***	0.029***	0.030***	0.028***	0.028***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	0.002	0.003	-0.004	-0.008	-0.009
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	0.110***	0.110***	0.107***	0.109***	0.109***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	0.097***	0.097***	0.096***	0.099***	0.100***
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	NA	0.086***	0.087***	0.087***	0.092***	0.094***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
R2		0.119	0.119	0.119	0.115	0.116
N		9,144	9,144	9,217	9,217	9,217

Standard errors in parentheses

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

Tab. C.6 The effect of overeducation on job search among MA graduates. Logit models, average marginal effects

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
SA_g		0.064***				
		(0.007)				
SA_{hm}			0.065***			
			(0.007)			
SA_p				0.086***		
				(0.006)		
RM_{md}					0.022***	
					(0.006)	
JA						0.040***
						(0.007)
Sex	Male	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.035***	0.035***	0.032***	0.033***	0.032***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age		-0.002	-0.002	-0.002	-0.002	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Parents' education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.000	0.000	-0.003	-0.001	-0.001
		(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	Upper secondary	-0.017	-0.018	-0.02	-0.019	-0.019
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Tertiary	-0.025	-0.025	-0.029	-0.027	-0.027
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	NA	-0.023	-0.026	-0.023	-0.03	-0.031
		(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
Social origin	Entrepreneurs	Ref.	Ref.	Ref.	Ref.	Ref.
	Professionals	0.014	0.013	0.013	0.01	0.01
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Managers	0.045*	0.045*	0.044*	0.042*	0.042*
		(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
	Clerks	0.039**	0.039**	0.037**	0.037**	0.036**
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	Self-Employed	0.016	0.017	0.014	0.015	0.014
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Executive workers	0.022	0.022	0.021	0.021	0.02
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Manual workers	0.019	0.019	0.015	0.015	0.015
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	NA	-0.014	-0.014	-0.01	-0.006	-0.006
		(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Geographic Area	North	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.020**	0.021**	0.019*	0.020**	0.020**
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	South and Islands	0.098***	0.039***	0.038***	0.037***	0.037***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Type of secondary degree	Scientific Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.
	Classical Lyceum	0.014	0.013	0.012	0.012	0.012
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	Other Lyceum	-0.038***	-0.038***	-0.039***	-0.040***	-0.039***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	Technical school	0.005	0.004	0.004	0.006	0.006
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	Vocational school	-0.001	-0.002	-0.001	0.002	0.001
		(0.017)	(0.017)	(0.017)	(0.018)	(0.017)
Secondary graduation mark		-0.001*	-0.001*	-0.001*	-0.001**	-0.001*
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matriculation Year	1999-2000 or later	Ref.	Ref.	Ref.	Ref.	Ref.
	1998-1999 or before	0.002	0.003	0.001	0.002	0.002
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Field of study	Mathematics	Ref.	Ref.	Ref.	Ref.	Ref.
	ICT and Engineering	0.030*	0.029*	0.024	0.030*	0.031*
		(0.015)	(0.015)	(0.014)	(0.014)	(0.014)
	Natural Sciences	0.03	0.028	0.03	0.038*	0.034
		(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
	Pharmacy, Veterinary	-0.105***	-0.105***	-0.105***	-0.106***	-0.107***
		(0.021)	(0.021)	(0.021)	(0.020)	(0.021)
	Medicine	-0.118***	-0.118***	-0.113***	-0.115***	-0.117***
		(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
	Medical Professions	-0.108***	-0.108***	-0.112***	-0.103***	-0.106***
		(0.027)	(0.027)	(0.026)	(0.026)	(0.026)
	Architecture	-0.015	-0.014	-0.013	-0.01	-0.011
		(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
	Business and Administration, Statistics	-0.028	-0.030*	-0.035*	-0.023	-0.034*
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	Social sciences	0.001	-0.005	-0.004	0.017	0.007
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)

(continue)

		SA_g	SA_{hm}	SA_p	RM_{md}	JA
	Law	-0.058***	-0.059***	-0.056***	-0.053***	-0.059***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Arts and Humanities	-0.008	-0.011	-0.011	0.006	-0.002
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	Education, Psychology	-0.085***	-0.086***	-0.089***	-0.089***	-0.085***
		(0.016)	(0.016)	(0.015)	(0.015)	(0.015)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.013	-0.012	-0.012	-0.012	-0.011
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	101-105	-0.031	-0.030	-0.030	-0.030	-0.029
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	106-110	-0.032*	-0.031*	-0.032*	-0.033*	-0.032*
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	110 cum laude	-0.052**	-0.052**	-0.050*	-0.054***	-0.052**
		(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Years of graduation delay		-0.004	-0.004	-0.002	-0.002	-0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Other formative activities	No	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	0.053***	0.053***	0.053***	0.049***	0.050***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Current job started	Before graduation	Ref.	Ref.	Ref.	Ref.	Ref.
	After graduation	0.023	0.022	0.02	0.014	0.013
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Type of contract	Stable	Ref.	Ref.	Ref.	Ref.	Ref.
	Unstable	0.111***	0.110***	0.108***	0.109***	0.109***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Working time	Full time	Ref.	Ref.	Ref.	Ref.	Ref.
	Part time	0.112***	0.114***	0.116***	0.122***	0.122***
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
	NA	0.107***	0.103***	0.105***	0.107***	0.108***
		(0.013)	(0.013)	(0.012)	(0.013)	(0.013)
R2		0.078	0.079	0.084	0.074	0.075
N		16,374	16,374	16,594	16,594	16,594

Standard errors in parentheses.

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

Appendix D - The evolution over time of overeducation. Multivariate analyses.

Tab. D.1 Probability of educational mismatch by graduation cohort. Logit models, average marginal effects

		1992	1995	1998	2001	2004	2007
Gender	Male	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.007	0.046***	-0.017**	-0.011	0.001	-0.013**
		(0.011)	(0.012)	(0.008)	(0.007)	(0.006)	(0.005)
Geographic area	North	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	-0.004	-0.006	-0.016*	0.009	0.007	0.029***
		(0.013)	(0.013)	(0.010)	(0.009)	(0.007)	(0.006)
	South and islands	-0.045***	-0.042***	-0.045***	-0.027***	-0.010	0.028***
		(0.012)	(0.013)	(0.010)	(0.009)	(0.007)	(0.006)
Age	Less than 30	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	30 or more	0.012	-0.009	-0.011	0.021*	0.031***	0.150***
		(0.013)	(0.020)	(0.011)	(0.012)	(0.012)	(0.007)
Parents' education	Primary or less	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	0.020	-0.023	-0.017	-0.037***	-0.006	-0.040***
		(0.015)	(0.016)	(0.013)	(0.013)	(0.012)	(0.009)
	Upper secondary	0.020	-0.032**	-0.032**	-0.048***	-0.008	-0.039***
		(0.017)	(0.016)	(0.014)	(0.013)	(0.012)	(0.010)
	Tertiary	0.009	-0.047***	-0.042***	-0.056***	-0.027*	-0.056***
		(0.018)	(0.018)	(0.016)	(0.016)	(0.014)	(0.011)
Parents' occupation	Managers and professionals	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Entrepreneurs	-0.044***	0.025	0.009	0.002	0.009	0.030***
		(0.016)	(0.017)	(0.014)	(0.012)	(0.010)	(0.009)
	Non manual employees	-0.010	-0.004	0.019	0.020*	0.008	0.017**
		(0.015)	(0.015)	(0.012)	(0.010)	(0.008)	(0.007)
	Self-employed	0.001	-0.015	-0.015	-0.015	0.020*	0.023**
		(0.019)	(0.016)	(0.016)	(0.014)	(0.012)	(0.010)
	Manual workers	-0.014	-0.013	-0.003	0.016	0.012	0.016*
		(0.021)	(0.028)	(0.016)	(0.014)	(0.011)	(0.010)
	Unemployed	-0.074**	0.000	-0.007	0.025	0.015	0.050*
		(0.033)	(0.000)	(0.050)	(0.045)	(0.041)	(0.027)
Upper secondary education	Classical Lyceum	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Scientific Lyceum	0.030**	0.035**	0.023**	0.002	0.016*	-0.002
		(0.013)	(0.014)	(0.011)	(0.011)	(0.009)	(0.008)
	Other lyceum	0.085***	0.080***	0.083***	0.040***	0.057***	0.025**
		(0.019)	(0.020)	(0.015)	(0.015)	(0.012)	(0.010)

(continue)

		1992	1995	1998	2001	2004	2007
	Technical school	0.039**	0.075***	0.077***	0.051***	0.058***	0.034***
		(0.015)	(0.016)	(0.012)	(0.012)	(0.010)	(0.009)
	Vocationa school	0.051	0.089***	0.044*	0.049**	0.054***	0.017
		(0.034)	(0.031)	(0.024)	(0.022)	(0.018)	(0.013)
Field of study	Scientific	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Medicine	-0.156***	-0.220***	-0.189***	-0.180***	-0.205***	-0.280***
		(0.011)	(0.014)	(0.012)	(0.009)	(0.009)	(0.010)
	Engineer	-0.035***	-0.090***	-0.043***	-0.021**	-0.025**	-0.076***
		(0.013)	(0.015)	(0.011)	(0.010)	(0.011)	(0.010)
	Agriculture	0.018	0.137***	0.097***	0.102***	0.116***	0.092***
		(0.023)	(0.041)	(0.024)	(0.021)	(0.023)	(0.020)
	Economics	0.186***	0.150***	0.141***	0.163***	0.164***	0.118***
		(0.017)	(0.017)	(0.013)	(0.013)	(0.012)	(0.011)
	Social and political sciences	0.402***	0.340***	0.291***	0.332***	0.304***	0.207***
		(0.030)	(0.028)	(0.018)	(0.020)	(0.015)	(0.012)
	Law	0.076***	0.036*	0.063***	0.086***	0.076***	0.046***
		(0.021)	(0.020)	(0.016)	(0.016)	(0.015)	(0.012)
	Humanities	0.235***	0.361***	0.220***	0.310***	0.222***	0.158***
		(0.019)	(0.020)	(0.014)	(0.014)	(0.012)	(0.010)
	Medical professions					-0.168***	-0.123***
						(0.009)	(0.010)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.024	0.012	0.032	-0.035*	-0.058***	-0.021**
		(0.025)	(0.027)	(0.020)	(0.019)	(0.014)	(0.009)
	101-105	-0.031	-0.027	-0.002	-0.073***	-0.075***	-0.044***
		(0.026)	(0.028)	(0.021)	(0.019)	(0.015)	(0.010)
	106-110	-0.025	-0.052*	-0.006	-0.081***	-0.100***	-0.053***
		(0.026)	(0.028)	(0.021)	(0.019)	(0.015)	(0.010)
	110 cum laude	-0.034	-0.072**	-0.036*	-0.131***	-0.123***	-0.087***
		(0.027)	(0.028)	(0.021)	(0.020)	(0.016)	(0.010)
Work experience during Higher Education	No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Temporary	0.045***	-0.006	0.004	-0.012	0.008	0.046***
		(0.010)	(0.011)	(0.008)	(0.008)	(0.007)	(0.006)
	Permanent	0.050**	-0.069***	-0.016	-0.008	0.006	0.182***
		(0.020)	(0.020)	(0.013)	(0.012)	(0.009)	(0.008)
Graduation delay	No delay	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	One year	0.012	0.015	0.017	0.005	0.013*	0.037***
		(0.015)	(0.017)	(0.015)	(0.011)	(0.007)	(0.007)
	Two years	0.035**	0.042**	0.057***	0.014	0.016*	0.039***
		(0.016)	(0.018)	(0.015)	(0.011)	(0.009)	(0.008)

(continue)

		1992	1995	1998	2001	2004	2007
	Three years	0.058***	0.055***	0.078***	0.031***	0.039***	0.025***
		(0.020)	(0.020)	(0.016)	(0.012)	(0.011)	(0.007)
	Four years or more	0.069***	0.094***	0.088***	0.047***	0.055***	0.000
		(0.020)	(0.020)	(0.017)	(0.011)	(0.011)	(0.000)
Further education	No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.053***	-0.063***	-0.111***	-0.083***	-0.075***	-0.064***
		(0.012)	(0.012)	(0.008)	(0.007)	(0.006)	(0.005)
Observations		7,359	7,781	13,629	15,405	21,056	34,319

Standard errors in parentheses

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

Tab. D.2 Probability of skill mismatch by graduation cohort. Logit models, average marginal effects

		1992	1995	1998	2001	2004	2007
Gender	Male	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Female	0.023*	0.052***	0.032***	-0.013*	0.018***	-0.003
		(0.012)	(0.011)	(0.007)	(0.008)	(0.006)	(0.005)
Geographic area	North	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Centre	0.030**	-0.010	0.028***	-0.000	-0.007	0.012*
		(0.014)	(0.012)	(0.008)	(0.009)	(0.008)	(0.006)
	South and islands	0.010	-0.042***	0.038***	-0.057***	-0.038***	0.001
		(0.014)	(0.012)	(0.008)	(0.009)	(0.007)	(0.006)
Age	Less than 30	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	30 or more	-0.002	-0.036**	-0.004	-0.015	-0.009	0.002
		(0.015)	(0.015)	(0.009)	(0.012)	(0.011)	(0.007)
Parents' education	Primary or Less	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Lower secondary	-0.001	-0.027*	-0.020*	-0.019	-0.003	-0.008
		(0.018)	(0.015)	(0.010)	(0.013)	(0.012)	(0.009)
	Upper secondary	-0.006	-0.035**	-0.025**	-0.029**	0.004	-0.001
		(0.019)	(0.014)	(0.012)	(0.014)	(0.012)	(0.010)
	Tertiary	0.011	-0.051***	-0.015	-0.044***	-0.011	-0.004
		(0.022)	(0.016)	(0.013)	(0.016)	(0.014)	(0.011)
Parents' occupation	Managers and Professionals	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Entrepreneurs	-0.042**	-0.034**	-0.003	-0.021*	0.004	0.005
		(0.018)	(0.016)	(0.011)	(0.013)	(0.010)	(0.009)
	Non manual employees	-0.000	0.014	0.019**	0.032***	0.010	0.018**
		(0.017)	(0.014)	(0.010)	(0.011)	(0.008)	(0.007)
	Self-employed	-0.003	-0.004	0.008	0.000	0.008	0.023**
		(0.022)	(0.015)	(0.013)	(0.014)	(0.012)	(0.010)
	Manual workers	-0.022	0.001	0.021	0.016	0.021*	0.020**
		(0.023)	(0.025)	(0.013)	(0.015)	(0.012)	(0.010)
	Unemployed	-0.077**	-0.071	-0.028	0.044	0.001	0.038
		(0.038)	(0.121)	(0.035)	(0.048)	(0.042)	(0.028)
Upper secondary education	Lyceum Classical	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Scientific Lyceum	0.047***	0.016	0.025***	0.014	0.019**	0.008
		(0.015)	(0.014)	(0.009)	(0.011)	(0.009)	(0.008)
	Other Lyceum	0.103***	0.004	0.010	0.016	0.028**	-0.003
		(0.022)	(0.017)	(0.011)	(0.015)	(0.012)	(0.010)
	Technical school	0.050***	0.037**	0.046***	0.036***	0.046***	0.026***
		(0.018)	(0.015)	(0.010)	(0.012)	(0.010)	(0.009)
	Vocational school	0.044	0.008	0.040**	0.044*	0.046**	0.031**
		(0.037)	(0.027)	(0.019)	(0.023)	(0.018)	(0.014)

(continue)

		1992	1995	1998	2001	2004	2007
Field of study	Scientific	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Medicine	-0.198***	-0.195***	-0.093***	-0.225***	-0.236***	-0.248***
		(0.021)	(0.015)	(0.013)	(0.010)	(0.010)	(0.011)
	Engineer	-0.029	-0.024	-0.024**	-0.023**	-0.014	-0.043***
		(0.018)	(0.015)	(0.009)	(0.011)	(0.011)	(0.010)
	Agriculture	-0.078***	0.117***	0.032	0.047**	0.076***	0.059***
		(0.027)	(0.039)	(0.020)	(0.021)	(0.023)	(0.021)
	Economics	0.020	0.045***	0.028***	0.117***	0.134***	0.109***
		(0.018)	(0.015)	(0.010)	(0.013)	(0.013)	(0.011)
	Social and political sciences	0.243***	0.156***	0.085***	0.201***	0.215***	0.179***
		(0.031)	(0.024)	(0.014)	(0.020)	(0.015)	(0.012)
	Law	-0.067***	-0.020	0.018	0.013	0.000	-0.008
		(0.023)	(0.018)	(0.013)	(0.016)	(0.015)	(0.012)
	Humanities	0.047**	0.122***	0.081***	0.155***	0.116***	0.083***
		(0.020)	(0.018)	(0.011)	(0.014)	(0.013)	(0.011)
	Medical professions					-0.196***	-0.179***
						(0.010)	(0.010)
Tertiary graduation mark	66-90	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	91-100	-0.005	0.009	-0.016	-0.031	-0.017	-0.017*
		(0.028)	(0.023)	(0.017)	(0.019)	(0.014)	(0.009)
	101-105	0.016	0.025	-0.023	-0.051***	-0.035**	-0.017*
		(0.029)	(0.024)	(0.018)	(0.020)	(0.015)	(0.010)
	106-110	-0.009	-0.006	-0.029	-0.058***	-0.058***	-0.030***
		(0.029)	(0.024)	(0.018)	(0.020)	(0.015)	(0.010)
	110 cum laude	-0.025	-0.033	-0.059***	-0.090***	-0.076***	-0.060***
		(0.030)	(0.025)	(0.018)	(0.021)	(0.016)	(0.010)
Work experience during Higher Education	No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Temporary	0.038***	-0.011	0.009	0.018**	0.018***	0.041***
		(0.012)	(0.010)	(0.007)	(0.008)	(0.007)	(0.006)
	Permanent	-0.031	-0.025	0.002	-0.002	0.010	0.057***
		(0.022)	(0.015)	(0.010)	(0.013)	(0.010)	(0.007)
Graduation delay	No delay	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	One year	-0.002	0.032**	0.034***	0.028***	0.008	0.021***
		(0.018)	(0.016)	(0.011)	(0.011)	(0.008)	(0.007)
	Two years	0.016	0.058***	0.053***	0.025**	0.030***	0.029***
		(0.019)	(0.017)	(0.012)	(0.011)	(0.009)	(0.008)
	Three years	0.021	0.049***	0.068***	0.033***	0.030***	0.030***
		(0.023)	(0.018)	(0.012)	(0.012)	(0.011)	(0.007)
	Four years or more	0.067***	0.095***	0.078***	0.044***	0.041***	0.000
		(0.023)	(0.017)	(0.013)	(0.012)	(0.012)	(0.000)

(continue)

		1992	1995	1998	2001	2004	2007
Further education	No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
	Yes	-0.076***	-0.037***	-0.046***	-0.084***	-0.074***	-0.073***
		(0.014)	(0.011)	(0.007)	(0.007)	(0.006)	(0.005)
Observations		7,359	9,290	15,168	15,405	21,050	34,898

Standard errors in parentheses

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

Appendix E - Overidentification strategies

Tab. E.1 Pre-program test, whole sample

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.305	-1.593***
		(0.561)	(0.284)
	1998	0.561	-1.244***
		(0.521)	(0.248)
	2001	0.142	-2.078***
		(0.471)	(0.223)
Treatment Status	Control	Ref.	Ref.
	Treated	3.421***	1.213***
		(0.412)	(0.128)
Cohort*Treatment Status	1995*Treated	0.022	1.132***
		(0.562)	(0.286)
	1998*Treated	-0.420	0.215
		(0.522)	(0.250)
	2001*Treated	0.058	1.834***
		(0.473)	(0.225)
N		44,484	47,563

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.2 Pre-program test, Scientific fields and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.268	-1.630
		(0.562)	(0.286)
	1998	0.421	-1.329
		(0.522)	(0.250)
	2001	0.22	-2.127
		(0.472)	(0.225)
Treatment Status	Control	Ref.	Ref.
	Treated	2.760***	1.135***
		(0.418)	(0.139)
Cohort*Treatment Status	1995*Treated	0.123	1.007***
		(0.570)	(0.297)
	1998*Treated	-0.217	0.121
		(0.529)	(0.261)
	2001*Treated	0.109	1.596***
		(0.480)	(0.235)
N		10,646	10,966

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.3 Pre-program test, Engineer and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.428	-1.554***
		(0.562)	(0.285)
	1998	0.636	-1.244***
		(0.522)	(0.250)
	2001	0.190	-2.078***
		(0.472)	(0.224)
Treatment Status	Control	Ref.	Ref.
	Treated	2.522***	1.037***
		(0.420)	(0.140)
Cohort*Treatment Status	1995*Treated	-0.289	0.908***
		(0.570)	(0.295)
	1998*Treated	-0.272	-0.011
		(0.529)	(0.260)
	2001*Treated	0.305	1.660***
		(0.480)	(0.233)
N		13,100	13,500

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.4 Pre-program test, Agriculture and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.328	-1.745***
		(0.565)	(0.293)
	1998	0.484	-1.411***
		(0.525)	(0.257)
	2001	0.113	-2.195***
		(0.475)	(0.229)
Treatment Status	Control	Ref.	Ref.
	Treated	2.967***	0.827***
		(0.435)	(0.174)
Cohort*Treatment Status	1995*Treated	0.688	1.770***
		(0.604)	(0.350)
	1998*Treated	0.113	0.667**
		(0.550)	(0.302)
	2001*Treated	0.446	2.181***
		(0.501)	(0.270)
N		4,424	4,528

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.5 Pre-program test, Economics and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.313	-1.635***
		(0.561)	(0.286)
	1998	0.566	-1.2264***
		(0.522)	(0.250)
	2001	0.155	-2.076***
		(0.472)	(0.225)
Treatment Status	Control	Ref.	Ref.
	Treated	3.850***	1.312***
		(0.416)	(0.140)
Cohort*Treatment Status	1995*Treated	0.104	1.232***
		(0.566)	(0.295)
	1998*Treated	-0.524	0.250
		(0.526)	(0.261)
	2001*Treated	-0.014	2.136***
		(0.477)	(0.236)
N		10,959	11,476

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.6 Pre-program test, Social and Political Sciences and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.229	-1.647***
		(0.564)	(0.288)
	1998	0.526	-1.304***
		(0.524)	(0.254)
	2001	0.099	-2.135***
		(0.473)	(0.173)
Treatment Status	Control	Ref.	Ref.
	Treated	4.773***	2.132***
		(0.428)	(0.173)
Cohort*Treatment Status	1995*Treated	-0.249	0.712**
		(0.583)	(0.320)
	1998*Treated	-0.886*	-0.359
		(0.538)	(0.284)
	2001*Treated	-0.336	1.489***
		(0.492)	(0.263)
N		5,406	5,913

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.7 Pre-program test, Law and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.0254	-1.761***
		(0.564)	(0.290)
	1998	0.439	-1.406***
		(0.525)	(0.256)
	2001	0.059	-2.155***
		(0.474)	(0.228)
Treatment Status	Control	Ref.	Ref.
	Treated	3.259**	0.871***
		(0.424)	(0.160)
Cohort*Treatment Status	1995*Treated	-0.054	1.285***
		(0.577)	(0.313)
	1998*Treated	-0.296	0.657**
		(0.537)	(0.280)
	2001*Treated	0.255	2.057***
		(0.488)	(0.255)
N		6,607	6,955

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree

Tab. E.8 Pre-program test, Humanities and Medicine

		Educational Mismatch	Skill Mismatch
Cohort	1992	Ref.	Ref.
	1995	0.323	-1.532***
		(0.561)	(0.285)
	1998	0.565	-1.184***
		(0.521)	(0.249)
	2001	0.120	-2.080***
		(0.472)	(0.224)
Treatment Status	Control	Ref.	Ref.
	Treated	4.092***	1.473***
		(0.416)	(0.141)
Cohort*Treatment Status	1995*Treated	0.382	1.297***
		(0.567)	(0.294)
	1998*Treated	-0.659	0.249
		(0.525)	(0.258)
	2001*Treated	0.096	1.935***
		(0.477)	(0.235)
N		10,851	12,005

*** p<0.01, ** p<0.05, * p<0.1
Controls for: sex, geographic area, age, parents'education, social origin, type of secondary degree