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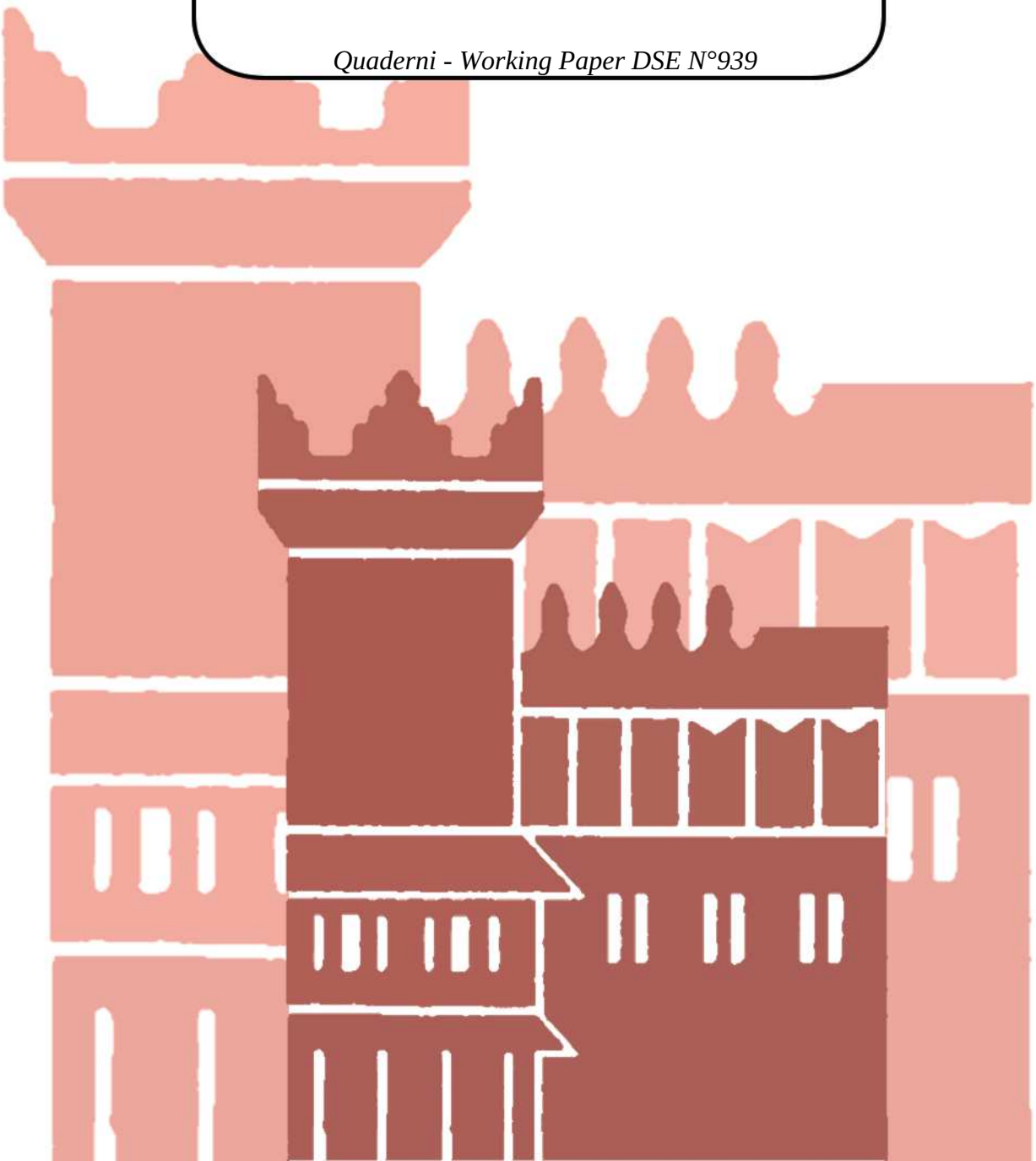

Assessing the incidence and wage effects of overeducation among Italian graduates using a new measure for educational requirements

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Abstract

This paper investigates three dimensions of overeducation: incidence, impact on earnings and possible determinants. The analysis focuses on Italian graduates and refers to the cohort that graduated in 2007 using data from the AlmaLaurea survey on graduates' career paths. A new measure of overeducation is introduced and it is jointly examined along with other pre-existing measures based on workers' self-assessment. The analysis is carried out by comparing the different results obtained adopting the two different measures of overeducation. Results show that the newly introduced measure can deal with the biases affecting workers' self- assessment measures.

JEL: I2, J31

Key words: overeducation, graduate labour market, wage differentials

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Introduction

Overeducated workers are basically individuals endowed with educational attainments, were they knowledge, competences or skills, in excess of what is actually needed or required to perform tasks associated with their current job. The economic literature on overeducation starts with Freeman (1976) as an aggregate study on decreasing returns to education investments, proxied by the average college premium paid to graduate workers in American labour markets. In this view, public and private overinvestments in education result in lower levels of returns due to the fact that the supply of highly qualified labour is outpacing its relative demand and causing a depreciation of college premiums. At a micro level, overeducation is interpreted as a source of inequality among peers, such as workers with the same educational levels but earning different wages once employed in differently demanding jobs (Frank, 1978; Berg, 1970). Duncan and Hoffman (1981) implement an extended version of the Mincerian equation in order to estimate separately the effects on wages of required, surplus or deficit years of schooling and kick-start the overeducation literature, a popular and much debated economic subfield lying in between labour economics and the economics of education. At the operational level, measuring overeducation consists in the assessment of the gap between the required and the attained years of schooling for each individual in a given sample. However, while it is quite easy to assess employees' education with a simple question, measuring what employers are effectively demanding has proved to be slightly more complicated, dividing most of the contributions to the debate between supporters of workers' self-assessment (WA) or job analysis (JA) measures.

In this paper we contribute to this debate by introducing a new JA measure based on the Italian Standard Occupational Classification (SOC(HE) built by Cattani et al. (2014) and applying it to Italian graduates interviewed after five years from the degree. Our purpose is to determine the incidence, determinants and impact on earnings of overeducation by using this new JA measure and iterate the same analysis utilizing an alternative WA measure in order to compare the two different outcomes.

In this respect, the Italian context represents an interesting case study. In early 2000s Italy has experienced a sudden increase in the number of graduates due to the participation expansion in tertiary education and to the implementation of the so-called "3+2" system[1]. This expansion combined with the dramatic recession that hit the country in the 2008-2012 period, has raised

[1] The reform was termed "3+2" and represented the implementation of the so-called "Bologna process" being it based onto a two-cycles degree structure: a first-level three-year undergraduate course plus a second-level two-years master's degree. Few programs maintained their five/six-year single-cycle structure.

growing concerns for a proper employability of the Italian graduates and for the wage penalty associated with overeducation.

The structure of the paper is as follows. Paragraph 1 introduces some theoretical issues together with the most relevant measurement issues, paragraph 2 presents the new measurement of overeducation adopted in the paper, paragraphs 3 and 4 describe the estimation methodology along with the dataset, paragraphs 5 and 6 present and discuss estimates concerning determinants of overeducation and its impact on wages. Paragraph 7 concludes.

1. Theoretical framework(s) – Labour market theories

There are no generally accepted theories of overeducation, its determinants and its effects on wages although a good number of applied studies has tried to relate it to the main labour market theories. The most adopted model in such studies was first proposed by Duncan and Hoffman in 1981 as an extension of the Mincerian equation, relating wage differentials to attained years of schooling now decomposed in required, excess and deficit ones. Although this peculiar model was developed starting from a typical human capital framework, it can be placed in a theoretical middle ground between human capital theory and institutional theories as it allows to test their different hypothesis. Before discussing measurement issues, it could be salutary to remember such hypothesis.

a. Human capital theory

Becker (1964) suggests that wages are only determined by and equal to workers' marginal productivity in turn influenced by their human capital level, however accumulated. In fact, there is no distinction between formal education and on-the-job training and firms will adequately adapt production processes in order to fully utilize the supply of qualified labour. This assumption has a perfect formalization in Mincer's (1974) equation where the logarithm of wages (lnw_i) equals attained years of schooling plus working experience.

$$lnw_i = \delta_r S_i^a + x'_i\beta + \varepsilon_i$$

Where S_i^a is the number of attained years of school and x' is a vector of controls including years of working experience and experience squared. By disaggregating attained schooling into required (S_i^r), surplus (S_i^o) and deficit (S_i^u) years it is assumed that not all of them will result in the same wage differentials, which is in contradiction with the postulated identity between human capital, marginal productivity and wages.

$$lnw_i = \delta_r S_i^r + \delta_o S_i^o + \delta_u S_i^u + x'_i\beta + \varepsilon_i$$

Broadly speaking, if there is no correspondence between workers' marginal productivity and wages, productivity levels will be attached to job characteristics rather than to individual ones, making overeducation inconsistent with the human capital perspective. Imposing in the Duncan and Hoffman specification equal returns to all schooling years it can be tested whether human capital theory fits data or not:

$$\delta_r = \delta_o = \delta_u$$

However, there is a number of objections to the postulated inconsistence of overeducation with the human capital view that it is worth reporting. First, if overeducation is only a transitory phenomenon, it can be still consistent with HC theory: in the short run firms can face some problems in adapting their production processes to take full advantage of their human capital. Frictions and constraints can lead to transitory disequilibria affecting the supply side as well: as we discuss more in depth in subparagraph 1.1, the *search theory* and the *career mobility theory* support the idea that skilled workers may accept unskilled jobs if these last let them free to engage in job search (Gautier, 2002; Hornstein et al., 2006; Dolado et al., 2009) or promise them higher promotion probabilities (Sicherman and Galor, 1990). Unfortunately, all of these theories are at odds with the observed persistency of overeducation for many individuals (Sicherman, 1991). Secondly, workers could lack of working experience and thus being properly matched once they acquire it. This is consistent with Becker's assertion on the substitutability between formal and informal human capital: workers with less experience have less (informal) human capital as they haven't had the chance to accumulate it with on-the-job training. Thus, they are not actually overeducated and are paid exactly their marginal productivity (Sicherman, 1991; Kiker et al, 1997). However, little evidence supports the idea

that formal education and informal training are treated as substitutes by employers (Duncan and Hoffman, 1981; Groot, 1993) and, moreover, overeducated workers still suffer significant wage penalties after having controlled for training and experience (Ramirez, 1993; Dolton and Vignoles, 2000; McGuinness, 2003; McGuinness, 2006). Finally, human capital measures can fail to capture all individual abilities, namely workers' skills heterogeneity. Thus, overeducation can be interpreted, according to *heterogeneous skills theory*, as a lack of controls in Mincerian equation resulting in, at best, omitted variable biases where the omitted variable is unobservable ability (Chevalier, 2003).

b. Job competition model

Institutional theories suggest that wage levels are only related to job characteristics, while hiring processes are carried out in a lack of information that forces firms to require formal qualifications to minimize expected training costs (Thurow, 1975; 1979). In the human capital perspective investments in education affect wages through marginal productivity while labour oversupply always leads to lower wages because unemployed individuals compete among themselves lowering their requests. In the job competition model workers compete in the hiring process to obtain a particular job. Labour oversupply leads workers to queue up on the basis of their expected trainability and not to lower their wages. In this model, labour demand and labour supply are not independent one each other and the supply of skilled labour depends on its relative demand. In fact, workers cannot affect their wages and will invest in education to minimize training costs for the possible employers: this is possibly the best framework to explain overinvestments in education and thus overeducation. Frictions on both sides of the labour market can lead to mismatches while individuals are engaged in increasing educational attainments in their attempt to avoid unemployment. Similar assumptions are shared by the signalling theory (Spence, 1973), where education still plays a major role in shaping jobs allocation among workers. Given that only required education affects wage levels, it is relatively straightforward to test in the Duncan and Hoffman extended equation whether excess and deficit years of schooling are not significantly different from zero:

$$(\delta_o = \delta_u = 0)$$

c. Assignment theory

Placed in a theoretical middle ground between human capital and job competition models, the assignment theory proposed by Sattinger (1993) states that both demand and supply factors affect wage levels. On the one hand, qualifications and education levels drive allocating processes like in the job competition model. On the other hand, workers will not be randomly assigned to jobs as investments in education are driven by income maximization. In fact, wages are determined by job characteristics and those workers who are willing to obtain better (and better paid) jobs will increasingly accumulate skills, knowledge and qualifications to win the competition. Individual characteristics will also play a role in job allocation and thus in earnings distribution. Hence, wages are not entirely determined by job requirements and a straightforward way to test assignment theory is to impose the restriction proposed by McGuinnes (2006): $\delta_r \neq \delta_o \neq \delta_u$.

Several works on the topic adopt a different model specification, first proposed by Verdugo and Verdugo (1989), which employs dummy variables to capture the effects on earnings of over and under education. This is the specification we use in this paper and there are three notes we should unavoidably mention before continuing to other theoretical issues. First, as we will argue more in depth in paragraph 3, coefficients associated with these dummy variables do not estimate the impact on earnings of an additional year of education but the fact itself that a worker is over or under educated. Second, dummy variables are especially useful when analysing samples or populations composed by graduates only, where individuals can be only matched or overeducated. This is exactly how our sample is defined and our study should therefore be benchmarked against similar graduates' labour markets analyses, particularly popular in Europe and UK (Dolton and Vignoles, 2000; Allen and Van der Velden, 2001; Green, McIntosh and Vignoles, 2002; Green and McIntosh, 2007; Dolton and Silles, 2008; Green and Zhu, 2010 and many others). Third, if regressors cannot be interpreted as returns to schooling years but just as differences among different employment realizations, it is impossible to test which labour market theory fits best our data. With respect to this last issue, there is to be said that tests presented in this section are taken by McGuinness (2006) and Hartog (2000) and are not necessarily to be taken for granted. In fact, once assessed that the three coefficients are different it is impossible to reject in a neat way the human capital theory because of the three mentioned objections to the inconsistence of overeducation with this theory. Furthermore, Thurow's job competition model is not necessarily unfit to explain results with returns to excess and deficit years different from zero as in this model wages are not deterministically determined solely by demand side factors and their relationship with

educational attainments, which are supply side factors by definition, is indirect. Notably, these restrictions intended to test the human capital theory and the job competition model have always been rejected by data (Hartog, 2000; Leuven and Oosterbeek, 2011). Finally, the proposed test for the assignment theory could be questioned and labelled as residual with respect to the former two.

1.1 Theoretical framework – Determinants

Estimating returns to education with separate information on required, exceeding and deficit years of schooling is only useful when Freeman's view is adopted: overeducation is due to an oversupply of qualified labour at an aggregate level that calls in turn for policies intended to stimulate its demand or limit its formation. However, no sufficient empirical evidences have been brought in support to Freeman's interpretation: were wages only determined by market forces, we should then expect a relative depreciation of skilled professions against non-skilled ones. However, recent analyses report substantial relative gains for graduate workers (Machin, 1999; Dearden et al., 2002). It is not clear, moreover, to what extent overeducation is related to macro dimensions, such as business cycles (Rubb, 2003), and surveys of the UK business community on job vacancies and skills deficiencies report, even at times of cyclical upswing, recruitment difficulties (see Campbell et al., 2001). It is hard to assess these relationship without discussing and testing potential determinants of overeducation. Furthermore, assuming that overeducation is a matter of private investments that affects only a given proportion of workers because of their individual characteristics, brings us to the same conclusions. In fact, no information concerning returns to required, surplus or deficit years will be capable to affect individual investments in education and training without a clear and reliable tool to predict who will be matched, overeducated and undereducated. Strategies to achieve this goal include measuring the incidence of overeducation for different categories of workers, estimating distribution function models to assess different probabilities to be overschooled as driven by individual characteristics and assessing differential wage-effects for such characteristics.

a. Differential overeducation

Women tend to show a higher probability to be overeducated in almost all studies on the topic. Frank (1978) measures its incidence controlling by gender and theorizes that married women can be heavily constrained in their quest for an appropriate job by the location of their families

in case this is based on their men's career needs. Sloane et al. (1999) explain similar findings otherwise, suggesting that part-time workers are more likely to be overeducated and women with young children are more likely to accept part-time jobs. All in all, gender is considered to be heavily affected by supply side rigidities such as time and mobility constraints in skilled labour markets, including a lower propensity to commuting for married women and families with children (McGoldrick and Robst, 1996; Green et al., 2002; Buchel and Van Ham, 2003; Buchel and Battu, 2003). Ethnicity can play a similar role in increasing such rigidities as immigrants can be limited in commuting or less proficient in the host country language and thus experience difficulties in finding jobs that are appropriate to their educational titles, once these have been recognized or achieved in place (Green et al., 2007; Battu et al., 2004). Additional sources of differential overeducation can be identified in workers' social background and the contractual basis. In fact, education can have a consumption value for richer families whose children may be driven to attend more years of schooling than those suggested by their potential role of human capital investments (Leuven and Oosterbeek, 2011). On the contrary, richer families and graduates with graduated parents can benefit of a larger number of opportunities and acquaintances when looking for a proper job. The contractual basis can affect individuals' capability to learn on the job and gain field experience and, for subjective measures (WA) heavily affect workers' perception when asked to state whether they are matched or overeducated.

b. Age and work experience

Skilled labour mismatches can be just a temporary phenomenon and tend to disappear as young graduates' careers evolve gaining field experience. At least two theories are based on this assumption, the search theory and the career mobility theory. According to the former, highly qualified workers can accept jobs for which they are overeducated but highly productive or rewarded and allowed to engage in on-the-job search to obtain a better job, resulting in progressively better matches (Gautier, 2002; Hornstein et al., 2006; Dolado et al., 2009). According to the latter one, developed by Sicherman and Galor (1990), graduates may accept jobs with lower educational requirements associated with lower wages but with higher probabilities to be promoted. Many works support the idea that overeducation is only transitory and due to a lack of experience (Dolton and Vignoles, 1997; Sloane et al., 1999; Kiker et al., 2000) but applied studies show difficulties in testing such hypothesis. Moreover, a huge amount of structural overeducated workers that never switch their statuses, reported by the

same authors that supported this view clearly tackles its explanatory potential (Sicherman, 1991; Dolton and Vignoles, 1997; Sloane et al., 1999; Dolton and Vignoles, 2000; Rubb, 2003). In conclusion, negative relationships between age and the probability to be overeducated has been assessed for all countries and periods and this fact is one of the few constants in this economic subfield. Nonetheless, we lack of a clear explanation for this, while evidence supports the idea that skills and abilities, more than age, can explain these differentials (Battu et al., 1999; Bauer, 2002). Some graduate workers who are overeducated and don't shift to better jobs can, in the end, be less skilled or, alternatively, those who are able to get better jobs could have developed further skills on the job thus explaining a new and secondary role played by age.

c. Skills

Chevalier (2003) builds up a measure to capture the structural overeducated share of workers and tries to explain it. He distinguishes between apparent and genuine overeducated applying the idea that workers with the same education level not necessarily share the same level of skills. He thus defines overeducation as *apparent* where graduates employed in non-graduate jobs don't state to be dissatisfied with their jobs, proving to share a lower skill level and being adequately matched for such jobs. *Genuine* overeducation, on the contrary, occurs where overeducated workers perceive it, reporting a certain degree of dissatisfaction thus signalling they have higher skill levels compared to those required by their particular job post. Basically, in Chevalier's view, the distinction between genuine and apparent overeducation is marked by job satisfaction. A similar approach is used by Allen and Van der Velden (2001) who conceptualize *overskilling* as the excess skill levels workers are endowed with, not necessarily correlated to overeducation. They aren't interested in the overall job satisfaction and ask workers only about skills utilizations. They have the same purpose as Chevalier: explaining structural overeducation with an heterogeneity in human capital dimensions not referred to formal education such as innate ability. The *heterogeneous skills theory* states that individuals with equal education titles don't match equally demanding jobs if they're actually offering different skill levels: less skilled graduates, for instance, are matched in non-graduate jobs and their overeducation is just apparent (Chevalier, 2003) or formal (Green and Zhu, 2010) if, respectively, it doesn't imply effects on job satisfaction or wage penalties. Skills and abilities are considered by the majority of contributions in this field as determinants of overeducation and possibly of wage penalties, although assessing this last causal relationship has proved to be problematic as we discuss in paragraph 3. All the attempts to measure or capture skills and ability levels we have presented so far are proxies based on workers self-assessment (WA). Di

Pietro and Urwin (2009) applies this strategy to the Italian case, but there are pros and cons one should take into account before relying on such information. On the one hand, in small surveys on workers or graduates it is rather simple to ask them directly whether skills acquired via higher education are being utilized on the job or not. On the other hand, when elaborating already available data on the entire labour force this question may not be included in the questionnaire. Moreover, regardless data availability WA is subjective and can bring significant biases in the measurement if workers tend to over/under state systematically their job requirements. In fact, there is a number of studies based on objective measures for skills and ability. Green et al. (2002) test relationships between the possibility to be overeducated and, respectively, math marks achieved during the high school and data from the International Adult Literacy Survey (IALS). Similar evidence is also found with data from the UK Skills Survey (Green and McIntosh, 2007). Hartog et al. (1996) report a negative relation between quantitative literacy and underschooling and a weak but positive relation between this last one and IQs (Hartog and Jonker, 1996). Ability has been also proxied by high school final marks (Buchel and Pollmann-Schult, 2001) while a certain degree of diversity in the probability to be overeducated can be explained by the type of skills imparted via education, such as the disciplinary field (Dolton and Vignoles, 2000).

1.2 The different approaches to the measurement of overeducation

Individual characteristics, anyhow measured, represent the supply side of the human capital matching in the labour markets. Measuring workers' titles and skills is thus just half of the work one should accomplish in order to assess overeducation incidence and wage effects. Education and skill levels demanded by employers are, in fact, the benchmark to which we have to refer individual endowments of human capital in order to understand who is matched, who has deficit and who has excess schooling. We discuss in this paragraph the three main methods adopted in the economic literature to proxy for job requirements.

a. Worker self-assessment (WA)

The first and most utilized strategy to measure job requirements is to directly ask workers what is required or needed to obtain or carry out the job. Duncan and Hoffman (1981) along with others (Hartog and Tsang, 1987; Sicherman, 1991) refer to the formal education required to *obtain* the job, while Ramirez (1993) refers to the informal education needed to *perform* the job. These are quite different things to analyse, being the former referred to hiring standards and the latter to the cognitive content encompassed in the assigned tasks. Nonetheless, WA is

not available for most labour force surveys and it is subjective, given that it only reflects the worker's point of view. This fact can bring to biases as workers tend to overstate their job requirements to inflate their job position during the interview or, in newly hired workers, reflect qualification inflation in firms' hiring strategies (Hartog, 2000). In our view, a subjective measure of job requirements can be affected also by workers' job satisfaction including economic rewards for their educational titles. Individuals can perceive their job as inadequate to their educational level, in fact, basing their evaluation on poor college wage premiums even if the cognitive content of the assigned tasks is in line with their studies.

b. Job-analysis (JA)

This measurement is obtained by looking at information provided in the occupational classifications and thus building a correspondence table that assigns an educational level to each job title. Many works adopt this strategy (Eckaus, 1964; Thurow and Lucas, 1972; Hartog, 1980; Rumberger, 1987; Kiker and Santos, 1991; Oosterbeek and Webbink, 1996) referring to the General Educational Development (GED) taxonomy or the Dictionary of Occupation Titles (DOT). Unfortunately, this measurement hasn't gain much popularity as classifications are rarely updated because updates are costly (Mason, 1996; Hartog, 2000) and there is no consensus when converting occupational scales into schooling years (Halaby, 1994).

c. Realized matches.

One may also look at market realizations such as the mean educational attainment in a given occupation or as hiring standards used by firms' personnel departments (Verdugo and Verdugo, 1989; Groot and Maassen van der Brink, 1997; Groenveld and Hartog, 2004). Unfortunately, these matches are the result of demand and supply forces and don't reflect only job requirements (Leuven and Oosterbeek, 2011).

2 The new measurement of overeducation adopted in the paper

In this study we try to address the job requirements measurement error problem highlighted in the above mentioned literature (Hartog, 2000; Leuven and Oosterbeek, 2011) by adopting a mixed method of measurement. In fact, we infer employers' job requirements from Italian occupational classification (CP 2006) after having attached to each job title its European

Qualification Framework (EQF)[2] corresponding level as identified by Cattani et al. (2014). In his application to Italian labour force of the Warwick IER's SOC(HE) classification, the allocation of job titles to major groups (Experts, Strategists, Communicators and Non-graduate-jobs) is based on data from the Istat survey on Italian professions (2009) in which 16,000 workers are asked to assign a score (1-100) to 109 variables referred to the O*Net[3] taxonomy for knowledge, skills and competences. These variables are grouped into the three categories of SOC(HE): experts, strategists and communicators. Following Istat-Isfol methodology, Cattani et al. (2014) assigns a difficulty score to each group of variables for each job title[4]. This score is then translated into an equivalent 1-8 scale EQF score. The highest score of the three groups is then adopted as the job title's EQF level. This is particularly useful as the translation from occupational classifications into schooling years still lacks an adequate level of consensus among economists and EQF provides us with a correspondence table which is, at least, accepted by all European governments and their statistical offices.

< Insert Table 1 here>

Following this methodology, economists are, for instance, assigned to Experts major group while their EQF level is 7, equivalent to the Italian master degree (18 schooling years).

< Insert Table 2 here>

[2] The European Qualification Framework (EQF) is a common transnational translation device for all European qualifications. Qualifications are here defined as educational titles issued at the completion of an educational or training process. The aim of the EQF (issued by the European Commission in 2008) is to make different national qualifications more readable across the continent and "promoting workers' and learners' mobility between countries and facilitating their lifelong learning" (Recommendation 111/2008). It relates all European national qualifications to 8 major levels, referring to knowledge, skills and competences acquired in their relative education/training process. In our study, this is of crucial importance given the univocal translation from Italian qualifications into EQF levels letting room for a univocal translation of EQF levels into schooling years.

[3] O*Net (Occupational Information Network) is an American data collection and spreading system focused on employment, jobs, skills shortages, professional profiles and individual characteristics. It is based on the SOC classification and it has been structured to describe tasks and professional profiles demanded and supplied enacting work processes. O*Net embodies the advantages of SOC classification and its implementation took large account of the indications emerged from the SCAN works, such as the distinction within the three types (basic, thinking and personal) of *soft skills*. It is divided into six dimensions: *Experience Requirements*, *Occupation Requirements*, *Occupation Specific Information*, *Occupation Characteristics*, *Worker Characteristics* and *Worker Requirements*. This particular structure allows the in-depth description of different job profiles and it is fit, thanks to transcode tools, to networking by exploiting linkages with other classification systems.

[4] The difficulty index varies in each group of variables between 1 and 100 and is calculated as the average score of variables selected case by case for each job title. The selection of variables in each group however is not subjective and it is based on the standard deviation rule: for each job title Cattani et al. (2014) selected those variables exceeding the mean of all variables in the grouping (experts, strategists or communicators) incremented by the value of the standard deviation. Knowledge, skills and competences selected in this way are the ones needed to carry out the most characterizing tasks of the profession.

This job requirement measure shares with JA measures the advantage of avoiding biases driven by WA. In fact, the employers' point of view is represented by educational requirements stated by workers without including the job satisfaction dimension and their subjective job position assessment. Interviews in the Istat survey are carried out referring explicitly only to skills, knowledge and competences utilization on the job place without mentioning job positions. Moreover, workers are sampled and selected on the basis of the position they hold in the firm and there is no room for them to overstate it. Finally, workers interviewed in Istat survey are not the same ones we observe in our model. Our study on overeducation is based on AlmaLaurea data on Italian graduates as described in paragraph 3 and their individual point of view is completely neglected when considering job requirements.

The described methodology allows Istat-Isfol[5] to attach to each job title an objective degree of skills utilizations on which we build our measure that captures what is actually needed to carry out a specific profession in terms of cognitive contents embodied in its constituent tasks. SOC(HE)-Italy measure for overeducation comes to be a sort of JA measure expressed in schooling years which are in turn determined by EQF framework and therefore granted of a certain degree of consensus. However, JA measures are, as noted above, affected also by imprecision as they are costly to revise and thus rarely updated. Our measure can be, in other words, objective and precise to some extent but limited in time as professions evolve changing their typical tasks and their relative cognitive contents. Basing our measure on data from the Istat survey on Italian professions partially addresses this problem as this survey is periodically held by Istat and thus data availability should not represent a major problem with respect to Italy. We do recognize however that such data can be unavailable for many European and western countries and in that case our SOC(HE)[6] measure for overeducation could be limited when trying to extend its application to other national contexts.

3 The estimation methodology

The basic specification of our model consists in a Duncan and Hoffmann extended wage equation as modified by Verdugo and Verdugo (1989), while alternative specifications will be obtained by adding controls for observable abilities and family or social background.

[5] The Italian Institute for the Development of Vocational Training (Isfol) implemented the methodology with which Istat assigned to each job title a corresponding EQF level, working on data from the above mentioned survey. This is why in this work we refer to this methodology as Istat, Isfol or Istat/Isfol methodology.

[6] For a complete description of the original SOC(HE) classification see Elias and Purcell (2004; 2011) and Purcell et al. (2012).

$$lnw_i = \delta_o D_i + x'_i\beta + \varepsilon_i$$

Where D_i is the dummy variable for overeducation and x'_i is the vector of controls including experience, experience squared, gender, working area, field of study and industry and others, fully described in paragraph 3.3. The three specifications differ in additional controls that are included step by step. In the first specification we include experience, gender, working area, tenure, field of study. In the second specification we add (see Tables 11 and 12) abilities related variables. In the third and last specification, social and family background proxies are included. The model is run onto AlmaLaurea data, referring to a sample of Italian graduates so that individuals can only be overeducated or matched. Overeducation here is a dummy variable defined by SOC(HE)-Italy, where D=1 if the individual is overeducated (employed in job titles with EQF Level below or equal to 6), D=0 otherwise.

It is important to stress that when adopting this specification we compare overeducated workers and individuals with the same level of education but employed in adequate jobs. Thus, the sign of regressor δ_o is often negative, suggesting that overeducated workers earn less than their adequately matched ex schoolmates. This is not exactly what Verdugo and Verdugo (1989) suggest. They erroneously interpret this negative sign as a negative return to overschooling in opposition to higher and positive returns to required schooling and in contradiction with previous empirical evidences of positive although lower returns to excess schooling. This is actually a misinterpretation as the utilization of dummy variables relates the selected individuals in comparison with their direct counterparts: in this case, matched people. Returns to overschooling may well be positive even in case their regressor has a negative sign: this just means, as noted above, that these returns are lower compared to those earned by matched workers (Cohn and Kahn, 1995; Leuven and Oosterbeek, 2011).

Although highly criticized[7], this specification has gained some popularity due to its capacity to describe differences among graduates' entering the labour market. Allen and Van der Velden (2001) find for the Netherlands that overeducated graduates earn some 5-10% less than their matched former schoolmates while, in the UK, a large literature based on this estimation strategy highlights wage penalties as large as 16% associated with overeducation statuses (Dolton and Silles, 2008) with significant differences between males and females who suffer respectively penalties equal to 10% and 27% (Green, McIntosh and Vignoles, 2002). Similar evidence is found by a number of studies for the UK and Northen Ireland (Sloane et al. 1999; Sloane, 2003; McGuinness, 2006; Green and McIntosh, 2007; Green and Zhu, 2010 among the

[7] Hartog asserted in the year 2000 its deletion would have benefited to researches in this field.

others). Although estimating returns to schooling seems not to be affected by the utilized overeducation measurement, overeducation incidence varies a lot: objective measures (JA) are significantly lower than subjective (WA) ones (Groot and Maassen van der Brink, 2000; McGuinness, 2006; Cedefop, 2010). The total share of the labour force that is affected by overeducation increased in the last two decades with little differences between genders, from 21.7% to 33.2% for men and from 23.8% to 32.1% for women (Green and Zhu, 2010). Significant differences can also be found when comparing different European countries, reaching a minimum of 14-15% in the Netherlands (Allen and van del Velden, 2001; Groot and Maassen van der Brink, 2000) and a maximum of 30-40% in the UK (Green and Zhu, 2010; Dolton and Vignoles, 2000).

However, evidence for Italy is contradictory: Ferrante et al. (2010) find that wages are affected by overskilling only and there is no relationship with overeducation. Di Pietro and Urwin (2006) estimate a 5.5% wage penalty for those 25.5% of Italian graduates that state to be overeducated.

3.1 The analysis of the determinants of overeducation

As outlined in the previous paragraphs, the new measure of overeducation is dichotomous and, therefore, its determinants can be estimated through a straightforward Probit model. Applying standard treatment of the Probit model, we have that Overeducation =1 (YES) when a latent variable Y is strictly positive, Y>0, and that Overeducation =0 (NO) when Y is nil, Y=0.

The latent variable is linked through a linear function to a set of statistical variables so that:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots . \beta_n X_n + \varepsilon_i = X'_i \beta + \varepsilon_i$$

Where ε_i is a normally and independently distributed error term (NID)

Consequently, we have:

$$\text{P(Overeducation=1=YES)= P(Y>0)=} P(X'_i \beta + \varepsilon_i > 0) = P(-\varepsilon_i \leq X'_i \beta) = F(X'_i \beta)$$

where F is the distribution function for ε_i, which in the case of the Probit model is a standard normal distribution function.

3.2 The analysis of the effects of overeducation on wages

In order to investigate the effects of both measures of overeducation on the level of wages, one cannot simply run a standard OLS to estimate a multivariate regression model in which the level of wage depends on a dummy variable indicating overeducation and a set of covariate as control variables. As the level of wage cannot be observed for, voluntarily or involuntarily, unemployed graduates, a straightforward OLS estimate would contain a sample selection bias, which would bias the estimation of the parameters. To overcome this problem, one has to model, in a first step, the decision to work. Therefore, following Heckman (1979), one has to estimate a system of two equations:

$$W_i = X_{1i}'\beta_1 + \varepsilon_{1i}$$

Of course, *W* can be observed only if the individual works. The decision to work is moulded by a Probit model, which is the second equation of the system:

$$h_i = X_{2i}' + \varepsilon_{2i}$$

The wage can be observed if and only if $h_i > 0$ and cannot be observed if $h_i \leq 0$. The model is completed, assuming that the error terms $(\varepsilon_{2i}, \varepsilon_{2i})$ are normally distributed with variance σ_1^2 and σ_2^2, respectively, and covariance σ_{12}.

3.3 Dataset and variables.

The empirical analysis presented in this essay is based on data from the AlmaLaurea dataset on Italian graduates. AlmaLaurea is a consortium of Italian Universities aimed at fostering highly qualified labour demand and supply matching for graduates, universities and the business world. AlmaLaurea collects every year extensive data on the graduates of each cohort and on their early working career path. This complex information is gathered in two stages. At the time of graduation students fill in a questionnaire providing their personal data and information

concerning their social and family background, educational path and performances, intrinsic motivation and other subjective features. Then, graduates are interviewed after one, three and five years after graduation on their career paths and/or their post-graduate studies.

In our analysis we refer to the last cohort of graduates whose information is fully available for both steps of the survey. This cohort includes individuals graduated in either a two-year Master's degree or a five/six-year university degree (such as Medicine and Law faculties) during 2007, who completed their two-step survey in 2012. The relevant population is composed by 184.669 graduates in 46 Italian universities, representing 61.5% of the Italian graduates in that year[8]. The subsample of graduates who answered the questionnaire after five years from graduation is composed by 31,162 individuals. Since we are only interested employed graduates, we exclude all those reporting to be either unemployed or inactive. Accordingly, we end up with a final sample of 25,523 graduates reporting to be employed at the time of the interview. Due to missing data our descriptive statistics on JA overeducation are limited to 18,269 individuals.

Our main variables of interest are represented by the wage levels and by two dummies that capture overeducation in both WA and JA terms. Wages are measured in terms of net monthly earning. Our measures of overeducation are based onto two items of the AlmaLaurea questionnaire. The JA measure is built on the occupational code, provided at a 5 digit level. Individuals are considered matched if their job is included in one of the three 'graduate-jobs' categories of the newly introduced SOC(HE)-Italy classification, overeducated otherwise. The WA measure is based on a specific question for job requirements as reported by respondents. However, 5-digit occupational codes are only available in the 5-year after graduation interview. Consequently, our empirical analysis is cross-sectional and referred to the 5-year after graduation survey, held in 2012.

Additional variables in the analysis include standard covariates of the human capital model: personal characteristics, educational path and achievements (field of study, graduation mark, and delay in completing the degree) and employment history (experience, tenure). Individual heterogeneity is also captured by data on skills concerning software usage, foreign languages and the attainment of a scholarship, which are used as proxies of intrinsic abilities. In addition, we include variables related to current job's characteristics, such as the industrial sector, the working region, and the type of contract.

[8] Source: our elaborations on ISTAT data.

4. Descriptive statistics.

Table 3 shows descriptive statistics for the two measures of overeducation used in our empirical analysis. 20.9% of graduates are currently employed in jobs that require an undergraduate educational attainment (JA measure), while 26.1% of graduates report to be overeducated in their current job (WA measure). However, the two definitions of overeducation do not perfectly overlap. On the one side, 71.5% of JA overeducated individuals also perceive themselves in such a status. On the other side, only 42.1% of individuals reporting to be overeducated are classified as overeducated in JA terms. All in all, both percentages confirm that Italy has one of the highest incidence in Europe of overeducated workers five years after graduation (Ferrante et al., 2010; Verhaest and Van der Velden, 2010)[9].

< Insert Table 3 here >

The interaction of wage levels and overeducation with the other variables included in our models reveals some interesting findings with respect to both types of overeducated graduates.

Concerning individual characteristics (Table 4), we find that the gender variable acts in a different way according to the measure of overeducation. Women show higher proportions of JA overeducation (24.2%) than men (21.4%). Conversely, the share of men that perceive themselves as overeducated (28.2%) is higher than the correspondent share of women (24.9%), although the gender gap in terms of wage is substantial (504 €). Moreover, women with children show higher proportions of WA overeducated (32.7%). Similarly, the share of working students reporting to be WA overeducated 5 years after graduation (33.9%) is higher than that of full time students, because the former tend not to change job once graduated. Finally, a higher social and/or family background is associated with a lower share of overeducated, as expected.

< Insert Table 4 here >

When reference is made to the field of study (Table 5), the best results in terms of JA matching are achieved by sciences, medicine and pedagogy, all of them showing a rate of overeducated lower than 10%. On the contrary, economics, statistics, sport sciences, geo-biological disciplines, agriculture and architecture show the highest share of JA overeducated (more than 30%). These results partly differ from those reported by the WA measure, which is higher for engineering and political and social sciences, while it is lower for agriculture and architecture.

[9] Notably, the greatest part of the European countries has shares of overeducated workers ranging from 10% to 15% (Verhaest and Van der Velden, 2010).

< Insert Table 5 here >

The difference between the two measures of overeducation is clearly highlighted by descriptive statistics referred to job characteristics (Table 6). In this respect, we analyse the type of contract and the working area. In terms of geographical distribution, all Italian macro-regions show similar percentages of overeducated (slightly more than 20%). Foreign countries are the only working area reporting a substantially lower share of overeducated (17,6%). Italian regions differ with respect to workers' distribution and wages: the majority of respondents works in northern Italy, where wages are also substantially higher than in other regions. The highest wages, however, are reported by graduates working abroad, who earn on average 2229€. Looking at the contractual basis, summary statistics primarily show the heterogeneity of the employment relationships and the relatively low diffusion of open-ended contracts (covering only half of the sample), which is connected with the short working experience reported by our sample (on average 2.8 years out of a five-year period). Then, in terms of both JA and WA measures, descriptive statistics show that self-employed workers are less overeducated than employees. Additionally, workers on fixed-term and non-standard contracts are less overeducated than those with open-ended contracts. The highest shares of overeducated graduates (more than 50%) are associated with apprentices and temporary contracts.

< Insert Table 6 here >

Finally, overeducation incidence varies greatly even across industries (Table 7). The different sectors can be grouped into three clusters identified on the basis of the level of the incidence of overeducated graduates. The first one, which shows low levels of overeducation (less than 20%), includes electronic, education, information technology, health, professional consultancy, and other services. The second one, which shows average levels of overeducation in the range between 20% and 30%, comprehends printing industry, construction industry, public administration, information and communication industry. The last one, reporting high levels of overeducation (more than 30%), includes agriculture, energy and mining, manufacture of metal products and machineries, wholesale and retail trade, transporting and storage activities, financial and insurance activities, arts, entertainment and recreation sector, other manufacturing. However, three of those sectors with an incidence of overeducation above 30% (manufacture of metal products, other manufacturing, financial and insurance activities) are also characterized by wages that, on average, are higher than 1500 €. This evidence confirms the relevance of the industry sector as an expected determinant of both JA/WA overeducation and wages.

< Insert Table 7 here >

5. The determinants of overeducation

a. The determinants of JA overeducation

In order to analyse thoroughly the determinants of JA, five different specifications of the same model have been taken into account.

In the first specification (column 1 in Table 8) the relationship between the likelihood to be overeducated and the characteristics of the job post have been investigated. Available information on job posts includes the industry, the contractual basis and whether the work activity is full time or part time. Each sector is identified by a dummy variable; IND_OTH_SERV is omitted in the model and therefore selected as benchmark for all other industries. An identical procedure has been applied to identify each contractual basis; in this case the open-ended employment contract has been chosen as benchmark. The estimates show that, with few exceptions, most of the sectors show a positive and statistically significant coefficient. Consultancy (IND_OTHCONS) and the education sector (IND_EDU_RES) are the only exceptions as they show negative and statistically significant coefficients. This result can be interpreted as remarkable evidence that JA is spread in most of the sectors of the economic system, at least for graduate workers, and is not a phenomenon observable in few well defined sectors. As far as the contractual basis is concerned, the evidence is more controversial. Self-employed and fixed term employment contracts (SELF_EMPL and FIX_CON, respectively) affect negatively the probability to be overeducated, whereas the opposite impact on overeducation is estimated for non-standard and training contracts (PERM_CON and TRAIN_CON, respectively). In addition to sectorial and contractual dummies, the model also includes a gender dummy, whose coefficient is negative and statistically significant: males are more likely to be overeducated than females. This counterintuitive evidence is in line with previous analyses (Franzini and Raitano, 2009) that pointed out how Italy actually represents an exception to differential overeducation theories. Finally, it should be observed that full time employment relationship has a negative impact on the probability to be overeducated.

In the second specification (column 2 in Table 8) five dummy variables, each one identifying a single macro geographical area, are added. All parameters related to the Italian macro geographical areas present a positive sign but these are all statistically not significant. Interestingly, only the parameter identifying the foreign macro geographical area (AREA_ABR) arises with a statistically significant parameter. In this case the sign is negative, which indicates that the likelihood to be over educated is lower for graduates working abroad.

Moreover, it is worth noting that in this second specification the estimated parameters associated with sectors and contractual basis do not change significantly with respect to the first specification.

In the third specification (column 3 in Table 8) two sets of variables related to the graduates' characteristics are added. Unfortunately, due to missing data concerning these variables, the number of observations in this model is reduced by over 60%, making any comparison between this model and the previous ones problematic. The first set of variables includes information concerning graduates' work experience, postgraduate studies and age. As far as this set of variables is concerned, postgraduate studies is the only significant dimension showing a negative sign. This result suggests that the probability to be overeducated is higher for graduates entering the labour market and decreases with working experience. The second set of dummy variables includes the field of study and a dummy variable associated with the attainment of a PhD. The parameters for most of the humanities and for law studies and medicine show a positive and statistically significant sign, whereas techno-scientific degrees such as engineering and chemical-pharmaceutical degrees have negative and statistically significant coefficients. Not surprisingly, the parameter for the attainment of a PhD. is positive and statistically significant.

In the fourth specification (column 4 in Table 8) we add few further individual variables such as the graduation mark (DEG_MARK), the average mark in university studies (AV_MARK) and marks in high school leaving certificates. All these variables can be considered as proxies of individual ability. As expected, the estimates for these parameters turn out to be positive and statistically significant for the variables concerning the university studies, whereas the parameter for the achievement at the secondary school is negative, but statistically non-significant.

Finally, the fifth specification (column 5 in Table 8) includes dummy variables for graduates' social background. The coefficient of parents' education is negative and statistically significant, whereas father's social position is not statistically different from nil.

< Insert Table 8 here >

b. The determinants of WA overeducation

The analysis on WA overeducation reiterates that with the JA measure, allowing staightforward comparisons between the two.

The results of the first specification (column 1 in Table 9) almost coincide with those obtained for JA. First, sectorial dummies show similar results with exception for the parameter associated with the health sector, which in this estimate shows a negative and statistically significant sign. As far as the contractual basis is concerned, only parasubordinated contracts change their effect on the probability to be overeducated, showing a negative and statistically significant parameter.

However, results change significantly in the second specification (column 2 in Table 9), where a set of dummy variables identifying macro geographical areas have been included. All areas, with the exception of AREA_ISL, show a statistically significant parameter. As observed for JA, the parameter for the AREA_ABR is negative, whereas for all the other macro geographical area the sign is strictly positive. Overeducation seems to be a widespread phenomenon not confined to few specific areas.

Graduates' individual characteristics are added in the third specification (column 3 in Table 9). In this case, comparisons with the estimate run for JA highlight striking differences. Postgraduate studies are the ones having a negative impact on the probability to be overeducated, while both years of work experience (EXP) and tenure in the current job (TENURE) show positive signs. Results are quite different compared to the JA measure estimates even when controlling for the field of study. In this case, graduates from STEM faculties are not the ones showing a lower propensity to be overeducated as law and medicine show negative sign too. Finally, we find differences between WA and JA measures when considering the effect of having completed a PhD course.

Ability proxies are included in the fourth specification (column 4 in Table 9). The variable measuring the average mark in university exams is positive and statistically significant as in the case for JA; the variable reporting the degree final evaluation is also positive but the statistical significance is limited to 10%.

Finally, the fifth specification (column 5 in Table 9) shows the irrelevance of variables catching the individual social background as all the variables are statistically non-significant.

< Insert Table 9 here >

c. The bivariate Probit model

Following Greene (2013), one can say that a bivariate Probit consists of two Probit equations with correlated disturbances (error). Following the notation used for the Probit model, the general specification for this two equations model is given by:

P(Objective Overeducation=1=YES) = $P(Y_1) > 0, where Y_1 = X'_1\beta_1 + \varepsilon_1 > 0$

P(Subjective Overeducation=1=YES) = $P(Y_2) > 0, where Y_2 = X'_2\beta_2 + \varepsilon_2 > 0$

and the error specification is given by:

$$E[\varepsilon_1 | X_1 X_2] = E[\varepsilon_2 | X_1 X_2]$$

$$var[\varepsilon_1 | X_1 X_2] = var[\varepsilon_2 | X_1 X_2] = 1$$

$$cov[\varepsilon_1 \varepsilon_2 | X_1 X_2] = \rho$$

Interestingly, even though the assumptions of the bivariate Probit (see Table 10) differ substantially from those of a standard Probit model, the results of the estimate are consistent with those obtained estimating the two Probit models. Starting from the analysis of the determinants of JA, the bivariate Probit confirms the pivotal role played by the variables identifying the job post (sector and contracts) as drivers affecting significantly overeducation, contrary to individual characteristics, which play a marginal role. Moreover, the bivariate Probit also confirms the results concerning the WA overeducation. This result confirms the relevance of variables related to the graduates' experience in the labour market and raises doubts about the role of ability proxies.

< Insert Table 10 here >

6. The wage penalty

Table 11 and 12 report estimates of the two Heckit models, used to assess possible wage penalties associated with overeducation as measured with WA and JA, respectively. Three different specifications have been estimated for both measurements, following basically the same steps adopted for the Probit estimates. The expected sign for the parameters of

overeducation is negative. Ceteris paribus, an overeducated worker is expected to earn a lower wage compared with that of a matched peer as a consequence of market wage differentials between graduate and non-graduate jobs. First, it is worth noting that the sign and the level of significance remains unaltered for most of the variables when comparing the corresponding columns between the two tables. Second, whatever the measure adopted, overeducation has a negative and statistically significant impact on wages in all of the three models. Overeducated graduate workers earn, *ceteris paribus*, lower wages than their matched counterparts. This evidence is consistent with evidence highlighted in pre-existing literature. In particular, our coefficients are close to those of Allen and Van der Velden (2001) and Di Pietro and Urwin (2006), ranging between 5% and 10% for both JA and WA measures. However, the penalty is lower than the one measured by Dolton and Vignoles (2000), Dolton and Silles (2008) and Chevalier and Lindley (2007) for overeducated graduates in the UK, and by Rubb (2003) for the US. This result is also in line with international comparisons showing that Italian overeducated graduates suffer one of the lowest pay-penalty in Europe (Ferrante et al., 2010; Barcena et al., 2011)[10]. Actually, other empirical studies referring to Italian data come out with even lower penalties. Cutillo and Di Pietro (2006) report a 4.4% wage penalty for WA overeducation using the same estimation method adopted in this study (while the penalty raise to 5.7% using instrumental variables). Franzini and Reitano (2009) find that the wage penalty is not significant once controlled for individual ability. This result can be explained by the poor tendency of wages in the Italian graduate labour market in the last decade as suggested by Ferrante et al. (2010). This is consistent with our evidence on wage premia earned by Italian graduates working abroad (+45%). Other studies report slightly higher wage penalties for overeducated Italian graduates, ranging between 10% and 15% (Carmen and Pastore, 2013).

< Insert Table 11 here >

However, it is important to emphasize that in all the three specifications the WA measure for overeducation is associated with higher penalties compared to those reported for the JA measure. This evidence can be interpreted referring to the results obtained in the analysis of the determinants. As expected, individual characteristics play a more relevant role in the analysis of WA overeducation than in that of JA overeducation. The way in which graduates perceive

[10] Ferrante et al. (2010) report the absence of a wage penalty for Italian (and Estonian) overeducated graduate workers, whereas in the other surveyed countries such penalty ranges between 21% and 54%. Barcena-Martin et al. (2011) estimate that Italy is the only European country where the wage penalty fails to be statistically significant.

their job position or their relative position in the labour market can affect their perception to be overeducated. WA overeducation can be thus considered to be more than a simple indicator of educational mismatch as it accounts also for graduates' perception of their relations to either the job or the labour market. As a result, WA overeducation is a biased indicator of overeducation. Accordingly, it is not surprising that the wage penalty associated with WA overeducation is significantly higher than that of JA overeducation.

< Insert Table 12 here >

Conclusion

This paper introduces a new measurement of overeducation in order to address the measurement error problem highlighted by the relevant economic literature. As the measurement error is typically associated with biases generated by workers' self-assessment (WA) we develop a job analysis measure (JA) based on the SOC(HE)-Italy occupational classification dealing with possible further sources of measurement error. We thus carry out analyses with both measures on the possible determinants and the impact on wages of overeducation. We try to assess the extent to which certain factors affect the probability to be overeducated by estimating five different specifications of a single Probit model.

We can derive at least three conclusions from our analysis.

First, it is important to emphasize that job characteristics are significant determinants for both JA and WA. Data availability allows us to take into account two different factors which identify a job post: its techno-organisational content and its socio-institutional context, both regulating the employment relation and the performance of its constituent tasks. The former is proxied by two sets of dummy variables identifying the industry and the relevant field of study. Actually, this set of variables describes the cognitive content of the constituent tasks of a particular job. In this view, the relevant field of study represents job requirements of labour demand rather than a distinctive trait of labour supply. The latter is represented by the contractual basis. Graduates on either a self-employment or a fixed term contract are less likely to be overeducated than graduates with open-ended contracts. This evidence could be explained by two not mutually exclusive explanations. On the one hand, it may indicate that workers prefer a job on an open-ended contract, even though it does not fully match their skills and, possibly, their expectations. They accept job proposal on an open-ended employment contract, because they value the expected tenure and security above the match between their skills and the job contents. On the other hand, this lower probability can derive from employers' hiring

strategies. Firms could use the open-ended employment relationship as an incentive for employees' long term attachment. If internal labour markets operate and favour upward internal mobility, ports of entry can be opened at a low level with the prospect to match individual skills and job contents after a lapse of internal career or of on-the-job training.

Second, individual characteristics have a different impact on the two different measures of overeducation. The impact of gender supports the view that women are less JA overeducated than men, while the difference is not significant for WA. Thus, we do not find only that graduated women are less likely to be overeducated than men, but also that women may perceive to be overeducated although the cognitive content of their assigned job does match with their educational attainment. This insight is supported by our evidence that women win larger wage premia (17.6%) than men if they find a matched job[11]. Graduates' social and family background is a determinant of overeducation only when the JA measure is adopted. Consequently, our JA measure captures the better career opportunities entailed by a higher social background. On the contrary, effects on overeducation measured by WA are ambiguous as this subjective measure is upwardly biased by higher expectations in terms of wages and careers.

Finally, the characteristics of the graduates' experience in both the external and the internal labour market, such as working experience and tenure, measured in years, are relevant only as determinants of WA while they are not statistically significant for JA. This is not surprising as WA does not embody only job characteristics but accounts also for the overall individual experience in the labour market. Since we have only one observation at five years after the degree without any information on the number of jobs graduates had in that period we cannot derive any suggestion with regard to the hypothesis that overeducation is just a temporary phenomenon.

We have thus run Heckit estimates to assess the impact of overeducation on wages. We find that, anyhow defined, overeducated workers suffer a wage penalty when compared to their peers employed in a matched job. Nevertheless, differences between alternative definitions of overeducation arise when referring to the magnitude of such penalty. The JA measure reports a lower wage penalty (8.0%) than the WA measure does (9.9%). This evidence is consistent with previous findings by Sloane et al. (1999) for the UK, by Cohn and Kahn for the US and by Groot and van den Brink (2000) for the Netherlands. From this result we draw two different conclusions. First, job satisfaction and individual expectations may affect the perception to be overeducated. If so, the WA measure of overeducation accounts also for factors other than educational mismatches. Individual motivation, job satisfaction and wellbeing at work can be

[11] Rubb (2003) obtains similar results.

positively correlated with WA overeducation while omitting variables related to such dimensions can result in upward biases (Pollmann-Schult and Buchel, 2004; Vaisey, 2006; Green and Zhu, 2008). Accordingly, wage penalties associated with WA overeducation incorporate the lower intrinsic motivation of graduated reporting to be overeducated. For this reason the introduction of these variables in the specification can represent a further step in the empirical research on this topic applied to the Italian context. Second, skill heterogeneity can play a different role according to the chosen measure. Unobserved individual characteristics can affect overeducation perception and thus WA measures while this is not the case when using JA measures. All in all, we can claim that WA measures of overeducation are spurious indicators of different, interrelated phenomena, which makes the use of this measure highly problematic.

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Table 1 EQF Framework (source: http://ec.europa.eu/education/lifelong-learning-policy/eqf_en.htm)

Level	Knowledge	Skills	Competence	Example
Level 1	Basic general knowledge	basic skills required to carry out simple tasks	work or study under direct supervision in a structured context	
Level 2	Basic factual knowledge of a field of work or study	basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	work or study under supervision with some autonomy	lower secondary school
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems	
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities	Lower middle school
Level 5	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	a comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others	Higher middle school
Level 6 (HE)	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups	Honours bachelor degree, vocational university German State-certified Engineer, Business Manager and Designer (Fachhcochschule) Bachelor, City and Guilds, Graduateship(GCGI)
Level 7 (HE)	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research; Critical awareness of knowledge issues in a field and at the interface between different fields	specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams	Masters, vocational university (Fachhcochschule) Masters, City and Guilds (MCGI)
Level 8 (HE)	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	the most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research	Doctorate Awards - Fellowship

Table 2 EQF levels for economists (2.5.3.1.1) according to SOC(HE)-Italy

CP Code	Job Title	Experts EQF	Strategists EQF	Communicators EQF	Highest EQF Score	Major Group
2.5.3.1.1	Specialists in economic systems	6.84	6.77	6.72	Experts (6.84)	EXP

Legend

Variable	Description
JA_OVERED	JA Overeducated
WA_OVERED	WA Overeducated
EXP	Years of experience after graduation
AGE	Age at the time of the interview
SEX	Male
EDU_PAR_PRIM	Parental education: primary school
EDU_PAR_SEC	Parental education: secondary school
EDU_PAR_HIGH	Parental education: high school
EDU_PAR_DEG	Parental education: degree (at least one)
OCC_FATH_ENT	Father's occupation: self-employed, entrepreneur, manager
OCC_FATH_OTH	Father's occupation: employee, unemployed, inactive
FATH_UPP	Father's social status: upper
MOTH	Mother
TEN	Tenured
POST_GRAD	Years of post-graduate education
PHD	Post graduate studies: Doctorate
FIELD_AGRIC	Field of study: Agriculture
FIELD_ARCH	Field of study: Architecture
FIELD_PHA	Field of study: Pharmaceutical
FIELD_ECO	Field of study: Economics and statistics
FIELD_SPO	Field of study: Sport science
FIELD_GEO	Field of study: Geo-biological
FIELD_LAW	Field of study: Law
FIELD_ENG	Field of study: Engineering
FIELD_EDU	Field of study: Education
FIELD_HUM	Field of study: Humanities
FIELD_LAN	Field of study: Foreign languages
FIELD_MED	Field of study: Medicine and dentistry
FIELD_POL	Field of study: Political and social sciences
FIELD_PSYCH	Field of study: Psychology
FIELD_SCIE	Field of study: Sciences
AV_MARK	Exams average mark
DEG_MARK	Degree mark
HSCH_MARK	High School mark
DEL_IND	Delay index
AREA_NW	Working area: North-west
AREA_NE	Working area: North-east
AREA_CEN	Working area: Centre
AREA_SOU	Working area: South
AREA_ISL	Working area: Islands
AREA_ABR	Working area: abroad
LIV_NW	Living area: North-west
LIV_NE	Living area: North-east
LIV_CEN	Living area: Centre
LIV_SOU	Living area: South
LIV_ISL	Living area: Islands
PERM_CON	Open-ended contract
FIX_CON	Fixed-term contract
SELF_EMPL	Self-employed
TRAIN_ CON	Training contract
TEMP_CON	Temporary contract
NONSTD_CON	Non-standard employment contract
NONSTD_SELF	Non-standard self-employed
OTH_NONSTD	Other non-standard contracts
NO_CON	Without contract
FULL_TIME	Full-time
IND_AGRIC	Industry: Agriculture, forestry and fishing
IND_PRINT	Industry: Printing and reproduction of recorded media

IND_ENERGY	Industry: Energy/mining
IND_CHEM	Industry: Manufacture of chemical products
IND_MET	Industry: Manufacture of metal products and machineries
IND_ELECT	Industry: Manufacture of electronic and electric products
IND_OTHMAN	Industry: Other manufacturing
IND_CONSTR	Industry: Construction
IND_TRADE	Industry: Wholesale and retail trade
IND_TRANSP	Industry: Transporting and storage
IND_COMM	Industry: Information and communication
IND_FIN	Industry: Financial and insurance activities
IND_OTHCONS	Industry: Other consulting and professional activities
IND_INFOR	Industry: Information service activities
IND_BUS_SERV	Industry: Other business support service activities
IND_PUB	Industry: Public administration and defence
IND_EDU_RES	Industry: Education/ R&D
IND_HEAL	Industry: Human health and social work activities
IND_CULT	Industry: Arts, entertainment and recreation
IND_OTH_SERV	Industry: Other services activities
REG_STUD	Regularity in studies
STUD_WORK	Working experience during studies
COMP_SKIL	Computer skills (ability in using excel spreadsheets)
CONS_JOB	Coherent job during studies
TRAINEESHIP	Training, apprenticeship

Table 3 – Descriptive statistics on overeducation

Overeducated workers	**%**
JA overeducated	20.9%
WA overeducated	26.1%
WA overeducated conditioned on being JA overeducated	72.4%
JA overeducated conditioned on being WA overeducated	42.1%

Table 4 - Overeducation by individual characteristics and social and family background

	%	**Monthly net earning**	**JA overeducated (%)**	**WA overeducated (%)**
Female	60.9%	1233	24.2%	24.9%
Male	39.1%	1737	21.4%	28.2%
Parental education: primary school	5.4%	1396	24.0%	30.5%
Parental education: secondary school	18.3%	1360	26.4%	31.4%
Parental education: high school	37.4%	1382	24.6%	28.2%
Parental education: degree (at least one)	26.3%	1451	19.3%	22.4%
Father's occupation: self-employed, entrepreneur, manager	55.2%	1482	21.6%	25.5%
Father's occupation: employee, unemployed, inactive	44.8%	1359	25.1%	28.9%
Mother	12.3%	1264	22.2%	32.7%
Tenured	44.7%	1501	24.9%	33.9%

Table 5 - Overeducation by educational attainment and field of study

	%	**Monthly net earning**	**JA overeducated (%)**	**WA overeducated (%)**
Agriculture	2.7%	1202	31.4%	18.5%
Architecture	5.0%	1222	30.7%	18.7%
Pharmaceutical	4.6%	1405	10.9%	6.1%
Economics and statistics	12.3%	1572	34.4%	40.4%
Sport science	1.0%	1101	43.4%	36.9%
Geo-biological	5.2%	1260	36.8%	19.0%
Law	7.0%	1240	12.5%	12.3%
Engineering	13.0%	1722	18.4%	33.1%
Education	7.9%	1175	4.3%	12.5%
Humanities	5.8%	1134	15.1%	20.8%
Foreign languages	2.7%	1184	14.4%	19.6%
Medicine and dentistry	13.2%	1459	7.8%	11.5%
Political and social sciences	10.5%	1273	24.4%	32.2%
Psychology	6.0%	1087	10.3%	19.6%
Sciences	3.1%	1259	8.4%	17.3%

Table 6 – Overeducation by job characteristics

	%	Monthly net earning	JA overeducated (%)	WA overeducated (%)
Working area: North-west	22.9%	1464	21.4%	40.4%
Working area: North-east	30.2%	1380	25.6%	44.7%
Working area: Centre	24.9%	1324	23.6%	40.5%
Working area: South	11.1%	1207	21.6%	40.7%
Working area: Islands	5.6%	1264	23.5%	40.5%
Working area: abroad	5.2%	2229	17.6%	38.1%
Open-ended contract	50.2%	1547	29.1%	51.9%
Fixed-term contract	15.3%	1345	19.3%	31.3%
Self-employed	19.4%	1298	8.2%	20.0%
Training contract	2.7%	1236	51.4%	66.4%
Temporary contract	0.8%	1126	52.4%	66.5%
Non-standard employment contract	8.1%	1334	26.5%	42.3%
Non-standard self-employed	1.7%	1094	12.0%	30.1%
Other non-standard contracts	0.2%	1102	21.0%	33.1%
Without contract	1.3%	706	21.4%	48.8%
Full-time	84.4%	1505	23.5%	41.9%
Part-time	15.6%	832	21.2%	40.4%

Table 7 - Overeducation by industry (NACE code)

	%	Monthly net earning	JA overeducated (%)	WA overeducated (%)
Agriculture, forestry and fishing	0.9%	1232	66.9%	53.4%
Printing and reproduction of recorded media	0.8%	1088	22.6%	74.6%
Energy/mining	2.7%	1759	35.0%	43.4%
Manufacture of chemical products	2.4%	1623	34.8%	44.3%
Manufacture of metal products and machineries	5.1%	1709	31.6%	56.9%
Manufacture of electronic and electric products	1.2%	1761	16.9%	41.6%
Other manufacturing	2.9%	1555	45.5%	63.9%
Construction	3.6%	1402	25.1%	33.0%
Wholesale and retail trade	7.5%	1315	38.1%	53.2%
Transporting and storage	1.3%	1425	45.5%	71.4%
Information and communication	2.5%	1335	21.0%	71.0%
Financial and insurance activities	6.2%	1571	57.8%	67.6%
Other consulting and professional activities	7.4%	1277	5.4%	13.8%
Information service activities	3.6%	1589	14.0%	65.4%
Other business support service activities	2.5%	1284	44.0%	66.2%
Public administration and defence	5.7%	1592	28.0%	54.4%
Education/ R&D	16.4%	1199	9.5%	19.1%
Human health and social work activities	12.7%	1579	12.4%	27.8%
Arts, entertainment and recreation	2.2%	1023	34.1%	71.7%
Other services activities	4.6%	1039	18.8%	54.0%
No answer	1.0%	-	-	-

Table 8- Probit model with JA measure for overeducation as dependent variable. Marginal effects

	(1) SOC_Overed	(2) SOC_Overed	(3) SOC_Overed	(4) SOC_Overed	(5) SOC_Overed
IND_AGRIC	1.825***	1.807***	1.535***	1.495***	1.496***
	(0.1151)	(0.1154)	(0.1985)	(0.2014)	(0.2019)
IND_PRINT	0.221*	0.224*	-0.00977	0.00150	0.00419
	(0.1245)	(0.1251)	(0.2325)	(0.2331)	(0.2332)
IND_ENERGY	0.751***	0.757***	0.916***	0.911***	0.921***
	(0.0831)	(0.0834)	(0.1647)	(0.1666)	(0.1668)
IND_CHEM	0.653***	0.644***	0.866***	0.871***	0.871***
	(0.0859)	(0.0862)	(0.1725)	(0.1752)	(0.1753)
IND_MET	0.624***	0.623***	0.992***	1.012***	1.014***
	(0.0730)	(0.0735)	(0.1427)	(0.1451)	(0.1454)
IND_ELECT	0.261**	0.275**	0.638***	0.646***	0.667***
	(0.1110)	(0.1114)	(0.2419)	(0.2431)	(0.2435)
IND_OTHMAN	0.916***	0.912***	0.878***	0.854***	0.858***
	(0.0790)	(0.0794)	(0.1468)	(0.1489)	(0.1493)
IND_CONSTR	0.489***	0.472***	0.923***	0.976***	0.971***
	(0.0873)	(0.0875)	(0.1698)	(0.1722)	(0.1725)
IND_TRADE	0.762***	0.743***	1.169***	1.167***	1.168***
	(0.0652)	(0.0654)	(0.1230)	(0.1248)	(0.1250)
IND_TRANSP	0.950***	0.947***	0.976***	1.003***	0.999***
	(0.1066)	(0.1071)	(0.1885)	(0.1906)	(0.1910)
IND_COMM	0.265***	0.276***	0.170	0.157	0.165
	(0.0866)	(0.0870)	(0.1552)	(0.1573)	(0.1574)
IND_FIN	1.325***	1.317***	1.261***	1.260***	1.267***
	(0.0714)	(0.0717)	(0.1341)	(0.1357)	(0.1360)
IND_OTHCONS	-0.210***	-0.233***	-0.126	-0.0943	-0.0949
	(0.0779)	(0.0781)	(0.1465)	(0.1482)	(0.1483)
IND_INFOR	0.0819	0.0836	0.360**	0.329*	0.331**
	(0.0823)	(0.0826)	(0.1646)	(0.1685)	(0.1687)
IND_BUS_SERV	0.884***	0.868***	0.905***	0.881***	0.885***
	(0.0822)	(0.0825)	(0.1458)	(0.1486)	(0.1489)
IND_PUB	0.556***	0.523***	0.198	0.247*	0.247*
	(0.0722)	(0.0726)	(0.1285)	(0.1312)	(0.1314)
IND_EDU_RES	-0.487***	-0.521***	-0.384***	-0.374***	-0.378***
	(0.0716)	(0.0719)	(0.1337)	(0.1357)	(0.1359)
IND_HEAL	0.0221	-0.00703	0.184	0.199	0.207
	(0.0657)	(0.0660)	(0.1334)	(0.1350)	(0.1352)
IND_CULT	0.671***	0.665***	0.526***	0.542***	0.534***
	(0.0942)	(0.0945)	(0.1555)	(0.1570)	(0.1572)
IND_OTH_SERV	0.233***	0.222***	0.213	0.235	0.226
	(0.0854)	(0.0857)	(0.1456)	(0.1476)	(0.1479)
SELF_EMPL	-0.586***	-0.604***	-0.649***	-0.633***	-0.618***
	(0.0404)	(0.0406)	(0.0719)	(0.0729)	(0.0732)
NONSTD_CON	0.447***	0.447***	0.483*	0.472*	0.466*
	(0.1102)	(0.1105)	(0.2567)	(0.2566)	(0.2563)
OTH_NONSTD	-0.482***	-0.484***	-0.355***	-0.347**	-0.326**
	(0.0803)	(0.0804)	(0.1377)	(0.1393)	(0.1399)
FIX_CON	-0.515***	-0.508***	-0.548**	-0.535**	-0.526**
	(0.1141)	(0.1144)	(0.2626)	(0.2628)	(0.2625)
FULL_TIME	-0.0951***	-0.0763**	-0.202***	-0.213***	-0.212***
	(0.0352)	(0.0355)	(0.0622)	(0.0635)	(0.0636)
SEX	-0.220***	-0.212***	-0.162***	-0.155***	-0.152***
	(0.0251)	(0.0253)	(0.0453)	(0.0466)	(0.0468)
AREA_NW		-0.109***	-0.0634	-0.0535	-0.0437
		(0.0347)	(0.0600)	(0.0612)	(0.0615)
AREA_SOU		0.0432	0.0463	0.0340	0.0265
		(0.0403)	(0.0682)	(0.0694)	(0.0695)
AREA_ABR		-0.368***	-0.532***	-0.516***	-0.498***
		(0.0616)	(0.1262)	(0.1330)	(0.1335)

POST_GRAD			-0.172***	-0.174***	-0.172***
			(0.0316)	(0.0322)	(0.0321)
AGE			-0.0260	-0.0184	-0.0258
			(0.0288)	(0.0308)	(0.0309)
AGE SQUARED			0.000381	0.000282	0.000352
			(0.0003)	(0.0004)	(0.0004)
EXP			0.356*	0.327	0.324
			(0.2030)	(0.2066)	(0.2068)
EXP SQUARED			-0.0432	-0.0385	-0.0383
			(0.0272)	(0.0276)	(0.0277)
TEN			-0.0362	-0.0423	-0.0470
			(0.0501)	(0.0509)	(0.0510)
FIELD_AGRIC			0.607***	0.242*	0.241*
			(0.1729)	(0.1292)	(0.1295)
FIELD_ARCH			0.216	-0.234	-0.235
			(0.1873)	(0.1526)	(0.1526)
FIELD_PHA			-0.956***	-1.272***	-1.263***
			(0.1783)	(0.1405)	(0.1406)
FIELD_ECO			0.202	-0.214***	-0.214***
			(0.1355)	(0.0733)	(0.0734)
FIELD_LAW			0.434***	-0.00923	-0.0110
			(0.1647)	(0.1184)	(0.1185)
FIELD_ENG			-0.367***	-0.759***	-0.762***
			(0.1424)	(0.0959)	(0.0961)
FIELD_HUM			0.523***	0.0659	0.0743
			(0.1503)	(0.0813)	(0.0813)
FIELD_MED			0.440***	0.0179	0.0129
			(0.1659)	(0.0982)	(0.0983)
FIELD_PSYCH			0.117	-0.328***	-0.332***
			(0.1540)	(0.0814)	(0.0815)
PHD			0.539***	0.550***	0.535***
			(0.1547)	(0.1575)	(0.1578)
AV_MARK				0.113**	0.108**
				(0.0493)	(0.0493)
DEG_MARK				0.0148***	0.0145***
				(0.0044)	(0.0044)
OCC_FATH_ENT					-0.0696
					(0.0437)
EDU_PAR_DEG					-0.125**
					(0.0556)
_cons	-0.952***	-0.933***	-1.205*	-2.413**	-2.149**
	(0.0669)	(0.0707)	(0.7030)	(0.9539)	(0.9580)
Pseudo R^2	0.1654	0.1691	0.2083	0.2108	0.2123
N	18045	18034	6219	6065	6065

Standard error in parenthesis
* Significant at 10%
**Significant at 5%
*** Significant at 1%

Table 9 - Probit model with WA measure for overeducation as dependent variable. Marginal effects

	(1) SOC_Overed	(2) SOC_Overed	(3) SOC_Overed	(4) SOC_Overed	(5) SOC_Overed
IND_AGRIC	0.671***	0.656***	0.988***	1.027***	1.022***
	(0.0922)	(0.0925)	(0.1746)	(0.1789)	(0.1790)
IND_PRINT	1.113***	1.121***	0.850***	0.842***	0.847***
	(0.1006)	(0.1007)	(0.1848)	(0.1853)	(0.1854)
IND_ENERGY	0.158***	0.167***	0.470***	0.455***	0.454***
	(0.0604)	(0.0606)	(0.1234)	(0.1244)	(0.1245)
IND_CHEM	0.191***	0.191***	0.765***	0.769***	0.769***
	(0.0628)	(0.0629)	(0.1380)	(0.1401)	(0.1401)
IND_MET	0.486***	0.481***	0.840***	0.850***	0.849***
	(0.0504)	(0.0507)	(0.1017)	(0.1033)	(0.1033)
IND_ELECT	0.130	0.133*	0.364**	0.322*	0.322*
	(0.0800)	(0.0803)	(0.1836)	(0.1856)	(0.1857)
IND_OTHMAN	0.676***	0.663***	0.934***	0.910***	0.906***
	(0.0592)	(0.0593)	(0.1125)	(0.1143)	(0.1143)
IND_CONSTR	0.105*	0.0997*	0.353***	0.355***	0.351***
	(0.0553)	(0.0555)	(0.1091)	(0.1108)	(0.1109)
IND_TRADE	0.458***	0.439***	1.118***	1.114***	1.109***
	(0.0451)	(0.0452)	(0.0927)	(0.0940)	(0.0941)
IND_TRANSP	0.909***	0.904***	1.026***	1.044***	1.046***
	(0.0805)	(0.0808)	(0.1459)	(0.1485)	(0.1486)
IND_COMM	0.967***	0.988***	0.933***	0.928***	0.928***
	(0.0630)	(0.0631)	(0.1169)	(0.1181)	(0.1181)
IND_FIN	0.758***	0.746***	0.832***	0.812***	0.812***
	(0.0486)	(0.0487)	(0.0942)	(0.0952)	(0.0952)
IND_OTHCONS	-0.390***	-0.414***	-0.161	-0.176*	-0.180*
	(0.0509)	(0.0510)	(0.0995)	(0.1010)	(0.1010)
IND_INFOR	0.757***	0.760***	1.185***	1.196***	1.196***
	(0.0557)	(0.0558)	(0.1183)	(0.1219)	(0.1219)
IND_BUS_SERV	0.776***	0.763***	0.955***	0.929***	0.927***
	(0.0625)	(0.0626)	(0.1129)	(0.1151)	(0.1151)
IND_PUB	0.450***	0.421***	0.257***	0.245***	0.246***
	(0.0488)	(0.0492)	(0.0853)	(0.0870)	(0.0870)
IND_EDU_RES	-0.469***	-0.493***	-0.238***	-0.242***	-0.241***
	(0.0432)	(0.0433)	(0.0836)	(0.0850)	(0.0850)
IND_HEAL	-0.0991**	-0.126***	0.161*	0.160*	0.160*
	(0.0416)	(0.0418)	(0.0885)	(0.0898)	(0.0898)
IND_CULT	1.046***	1.041***	0.772***	0.782***	0.782***
	(0.0667)	(0.0668)	(0.1107)	(0.1123)	(0.1123)
IND_OTH_SERV	0.480***	0.463***	0.355***	0.350***	0.349***
	(0.0517)	(0.0518)	(0.0908)	(0.0921)	(0.0921)
SELF_EMPL	-0.676***	-0.690***	-0.546***	-0.548***	-0.549***
	(0.0280)	(0.0282)	(0.0515)	(0.0524)	(0.0525)
NONSTD_CON	0.294***	0.297***	0.0266	0.0145	0.0110
	(0.0937)	(0.0939)	(0.2142)	(0.2147)	(0.2148)
OTH_NONSTD	-0.450***	-0.448***	-0.238**	-0.241**	-0.241**
	(0.0519)	(0.0520)	(0.0971)	(0.0985)	(0.0986)
FIX_CON	-0.545***	-0.540***	-0.0849	-0.0682	-0.0668
	(0.0959)	(0.0961)	(0.2176)	(0.2181)	(0.2182)
FULL_TIME	-0.140***	-0.124***	-0.217***	-0.232***	-0.233***
	(0.0257)	(0.0259)	(0.0468)	(0.0477)	(0.0478)
SEX	-0.0148	-0.00741	0.0483	0.0562	0.0588*
	(0.0186)	(0.0187)	(0.0343)	(0.0353)	(0.0354)
AREA_NW		-0.0751***	-0.0943**	-0.0818*	-0.0856*
		(0.0255)	(0.0440)	(0.0449)	(0.0451)
AREA_SOU		0.131***	0.212***	0.217***	0.217***
		(0.0296)	(0.0498)	(0.0506)	(0.0506)
AREA_ABR		-0.183***	-0.214**	-0.195**	-0.197**
		(0.0421)	(0.0848)	(0.0893)	(0.0894)

POST_GRAD			-0.144***	-0.146***	-0.146***
			(0.0207)	(0.0210)	(0.0210)
AGE			0.0781***	0.0880***	0.0870***
			(0.0202)	(0.0214)	(0.0215)
AGE SQUARED			-0.000956***	-0.00108***	-0.00107***
			(0.0002)	(0.0002)	(0.0002)
EXP			0.697***	0.746***	0.748***
			(0.1489)	(0.1516)	(0.1517)
EXP SQUARED			-0.0773***	-0.0837***	-0.0841***
			(0.0201)	(0.0205)	(0.0205)
TEN			0.454***	0.461***	0.460***
			(0.0361)	(0.0367)	(0.0367)
FIELD_AGRIC			-0.487***	-0.678***	-0.681***
			(0.1435)	(0.1138)	(0.1138)
FIELD_ARCH			-0.320**	-0.491***	-0.492***
			(0.1257)	(0.0896)	(0.0897)
FIELD_PHA			-1.930***	-2.088***	-2.085***
			(0.1497)	(0.1241)	(0.1241)
FIELD_ECO			-0.155	-0.338***	-0.340***
			(0.1065)	(0.0586)	(0.0587)
FIELD_LAW			-0.290**	-0.491***	-0.492***
			(0.1303)	(0.0949)	(0.0949)
FIELD_ENG			-0.578***	-0.753***	-0.756***
			(0.1088)	(0.0705)	(0.0706)
FIELD_HUM			0.260**	0.0524	0.0548
			(0.1181)	(0.0639)	(0.0639)
FIELD_MED			-0.140	-0.313***	-0.313***
			(0.1225)	(0.0681)	(0.0681)
FIELD_PSYCH			-0.0571	-0.259***	-0.264***
			(0.1153)	(0.0582)	(0.0583)
PHD			0.251**	0.281***	0.286***
			(0.1044)	(0.1069)	(0.1069)
AV_MARK				0.101***	0.101***
				(0.0367)	(0.0367)
DEG_MARK				0.00571*	0.00560*
				(0.0032)	(0.0032)
OCC_FATH_ENT					0.0340
					(0.0324)
EDU_PAR_DEG					-0.0529
					(0.0413)
_cons	-0.152***	-0.177***	-3.026***	-3.791***	-3.762***
	(0.0443)	(0.0472)	(0.5022)	(0.6753)	(0.6776)
Pseudo R^2	0.1433	0.1467	0.2187	0.2215	0.22217
N	25155	25131	9139	8912	8912

Standard error in parenthesis
* Significant at 10%
**Significant at 5%
*** Significant at 1%

Table 10 - Bivariate probit model with WA measure for overeducation as dependent variable

	OVERED	SOC_Overed
POST_GRAD	-0.143***	-0.172***
	(0.0251)	(0.0322)
AGE	0.0981***	-0.0264
	(0.0266)	(0.0307)
AGE_SQUARED	-0.00108***	0.000382
	(0.0003)	(0.0004)
EXP	0.737***	0.370*
	(0.1862)	(0.2066)
EXP SQUARED	-0.0847***	-0.0431
	(0.0251)	(0.0276)
TEN	0.501***	-0.0469
	(0.0459)	(0.0511)
FIELD_AGRIC	-0.573***	0.669***
	(0.1682)	(0.1761)
FIELD_ARCH	-0.169	0.197
	(0.1790)	(0.1927)
FIELD_PHA	-2.103***	-0.856***
	(0.1799)	(0.1857)
FIELD_ECO	-0.269**	0.222
	(0.1299)	(0.1378)
FIELD_LAW	-0.409***	0.435***
	(0.1554)	(0.1671)
FIELD_ENG	-0.652***	-0.317**
	(0.1335)	(0.1454)
FIELD_HUM	0.135	0.493***
	(0.1436)	(0.1531)
FIELD_MED	-0.189	0.415**
	(0.1558)	(0.1697)
FIELD_PSYCH	-0.294**	0.0814
	(0.1432)	(0.1562)
SEX	0.0448	-0.151***
	(0.0434)	(0.0467)
PHD	0.443***	0.543***
	(0.1353)	(0.1584)
IND_AGRIC	1.112***	1.482***
	(0.2040)	(0.2028)
IND_PRINT	0.784***	0.0427
	(0.1961)	(0.2264)
IND_ENERGY	0.433***	0.893***
	(0.1451)	(0.1656)
IND_CHEM	0.801***	0.865***
	(0.1603)	(0.1733)
IND_MET	0.837***	0.993***
	(0.1244)	(0.1437)
IND_ELECT	0.252	0.603**
	(0.2141)	(0.2461)
IND_OTHMAN	0.848***	0.837***
	(0.1341)	(0.1479)
IND_CONSTR	0.399***	0.925***
	(0.1517)	(0.1726)
IND_TRADE	1.105***	1.150***
	(0.1112)	(0.1240)
IND_TRANSP	0.939***	0.975***
	(0.1876)	(0.1891)
IND_COMM	0.886***	0.173
	(0.1352)	(0.1548)
IND_FIN	0.678***	1.244***
	(0.1166)	(0.1343)

IND_OTHCONS	-0.225*	-0.136
	(0.1152)	(0.1478)
IND_INFOR	1.222***	0.327**
	(0.1409)	(0.1663)
IND_BUS_SERV	0.895***	0.871***
	(0.1362)	(0.1475)
IND_PUB	0.0439	0.212
	(0.1074)	(0.1305)
IND_EDU_RES	-0.293***	-0.410***
	(0.1060)	(0.1343)
IND_HEAL	0.0483	0.182
	(0.1115)	(0.1352)
IND_CULT	0.627***	0.525***
	(0.1435)	(0.1553)
IND_OTH_SERV	0.292**	0.202
	(0.1229)	(0.1476)
SELF_EMPL	-0.566***	-0.633***
	(0.0634)	(0.0733)
NONSTD_CON	-0.0469	0.443*
	(0.2529)	(0.2528)
OTH_NONSTD	-0.438***	-0.331**
	(0.1258)	(0.1413)
FIX_CON	-0.0161	-0.496*
	(0.2574)	(0.2590)
FULL_TIME	-0.210***	-0.212***
	(0.0599)	(0.0639)
AV_MARK	0.146***	0.107**
	(0.0450)	(0.0492)
DEG_MARK	0.00892**	0.0151***
	(0.0038)	(0.0044)
OCC_FATH_ENT	0.0498	-0.0782*
	(0.0395)	(0.0437)
EDU_PAR_DEG	-0.0603	-0.119**
	(0.0498)	(0.0554)
_cons	-4.643***	-2.736***
	(0.8418)	(0.9595)
athrho		0.371***
		(0.0278)
N	6065	6065
Wald χ^2		2420.69
Log-likelihood		-5710.56

Standard error in parenthesis
* Significant at 10%
**Significant at 5%
*** Significant at 1%

Table 11 - Heckman selection model with natural logarithm of net monthly wage as dependent variable; overeducation measured as JA

	(1) lnW	(2) lnW	(3) lnW
SOC_Overed	-0.0827***	-0.0819***	-0.0801***
	(0.0130)	(0.0131)	(0.0131)
EXP	0.00177	-0.0174	-0.0167
	(0.0685)	(0.0692)	(0.0690)
EXP SQUARED	0.00481	0.00746	0.00739
	(0.0091)	(0.0092)	(0.0092)
TEN	0.0617***	0.0597***	0.0596***
	(0.0132)	(0.0133)	(0.0133)
SEX	0.169***	0.164***	0.164***
	(0.0138)	(0.0139)	(0.0140)
AREA_NW	0.0536***	0.0521***	0.0503***
	(0.0159)	(0.0160)	(0.0160)
AREA_SOU	-0.121***	-0.121***	-0.120***
	(0.0239)	(0.0242)	(0.0242)
AREA_ABR	0.440***	0.428***	0.424***
	(0.0339)	(0.0341)	(0.0341)
SELF_EMPL	0.778***	0.779***	0.775***
	(0.1064)	(0.1066)	(0.1061)
PERM_CONTR	0.889***	0.888***	0.889***
	(0.1042)	(0.1042)	(0.1037)
TRAIN_CONTR	0.775***	0.776***	0.775***
	(0.1071)	(0.1071)	(0.1066)
NONSTD_CONT	0.632***	0.633***	0.636***
	(0.1318)	(0.1314)	(0.1312)
NONSTD_SELF	0.644***	0.644***	0.644***
	(0.1083)	(0.1086)	(0.1081)
OTH_NONSTD	0.525***	0.537***	0.532***
	(0.1215)	(0.1211)	(0.1206)
FIX_CON	0.194**	0.192**	0.189**
	(0.0827)	(0.0820)	(0.0823)
IND_PRINT	0.0979	0.0979	0.0974
	(0.0646)	(0.0658)	(0.0658)
IND_ENERGY	-0.205***	-0.203**	-0.202**
	(0.0793)	(0.0794)	(0.0790)
IND_CHEM	0.142***	0.169***	0.165***
	(0.0382)	(0.0322)	(0.0325)
IND_MET	0.176***	0.174***	0.172***
	(0.0275)	(0.0279)	(0.0280)
IND_ELECT	0.128***	0.124***	0.124***
	(0.0248)	(0.0252)	(0.0251)
IND_OTHMAN	0.0977**	0.0956*	0.0905*
	(0.0497)	(0.0496)	(0.0492)
IND_FIN	0.122***	0.121***	0.119***
	(0.0256)	(0.0255)	(0.0255)
IND_INFOR	0.0839*	0.0846*	0.0834*
	(0.0452)	(0.0452)	(0.0453)
FIELD_AGRIC	-0.0951*	-0.0930*	-0.0954*
	(0.0528)	(0.0534)	(0.0533)
FILD_ECO	-0.0273	-0.0352	-0.0355
	(0.0577)	(0.0597)	(0.0593)
FIELD_SPO	0.116***	0.121***	0.120***
	(0.0387)	(0.0398)	(0.0397)
FIELD_ENG	0.146***	0.145***	0.141***
	(0.0328)	(0.0331)	(0.0331)
FIELD_HUM	-0.158**	-0.159**	-0.158**
	(0.0658)	(0.0663)	(0.0661)

FIELD_MED	0.00364	0.00469	0.00730
	(0.0482)	(0.0487)	(0.0485)
FIELD _POL	0.00691	0.0144	0.0132
	(0.0471)	(0.0483)	(0.0483)
FIELD _PSYCH	0.129***	0.126***	0.123***
	(0.0330)	(0.0332)	(0.0332)
HSCH_MARK	-0.000474	-0.000646	-0.000631
	(0.0005)	(0.0005)	(0.0005)
REG_STUD	-0.00321	-0.00279	-0.00227
	(0.0067)	(0.0070)	(0.0069)
STUD_WORK	0.0316**	0.0320**	0.0324**
	(0.0144)	(0.0144)	(0.0146)
COMP_SKIL		0.0106*	0.0106*
		(0.0062)	(0.0062)
OCC_FATH_ENT			0.0228*
			(0.0121)
_cons	6.062***	6.072***	6.063***
	(0.1706)	(0.1735)	(0.1733)
Occ_Heckit			
EDU_PAR_DEG	-0.180***	-0.176***	-0.181***
	(0.0397)	(0.0399)	(0.0400)
POST_GRAD	0.0587***	0.0593***	0.0597***
	(0.0226)	(0.0226)	(0.0226)
LIV_NW	0.260***	0.263***	0.264***
	(0.0537)	(0.0539)	(0.0539)
LIV_NE	0.222***	0.222***	0.222***
	(0.0491)	(0.0494)	(0.0493)
LIV_SOU	-0.245***	-0.262***	-0.262***
	(0.0551)	(0.0556)	(0.0555)
LIV_ISL	-0.107	-0.127*	-0.127*
	(0.0689)	(0.0696)	(0.0696)
LIV_ABR	-0.764***	-0.746***	-0.742***
	(0.2398)	(0.2398)	(0.2398)
DEL_IND	-0.167**	-0.162**	-0.162**
	(0.0676)	(0.0683)	(0.0683)
CONS_JOB	-0.113***	-0.107***	-0.107***
	(0.0233)	(0.0235)	(0.0235)
MOTH	-0.228***	-0.237***	-0.237***
	(0.0513)	(0.0518)	(0.0517)
STUD_WORK	0.424***	0.422***	0.421***
	(0.0458)	(0.0463)	(0.0463)
TRAINEESHIP	-0.253***	-0.247***	-0.246***
	(0.0484)	(0.0487)	(0.0488)
PHD	-1.390***	-1.382***	-1.382***
	(0.0943)	(0.0945)	(0.0945)
_cons	1.460***	1.377***	1.376***
	(0.3832)	(0.3881)	(0.3879)
Field of study	Yes	Yes	Yes
athrho			
_cons	-0.196***	-0.195***	-0.204***
	(0.0558)	(0.0548)	(0.0562)
lnsigma			
_cons	-0.994***	-0.997***	-0.997***
	(0.0188)	(0.0188)	(0.0190)
N	7408	7285	7285
Wald χ^2	1474.99	1644.56	2291.39

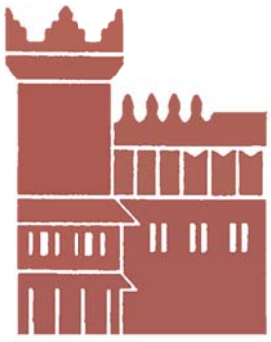
Robust standard error in parenthesis
* Significant at 10%
**Significant at 5%
*** Significant at 1%

Table 12 - Heckman selection model with natural logarithm of net monthly wage as dependent variable; overeducation measured as WA

	(1) lnW	(2) lnW	(3) lnW
OVERED	-0.101***	-0.0989***	-0.0993***
	(0.0097)	(0.0098)	(0.0098)
EXP	-0.00962	-0.0272	-0.0258
	(0.0544)	(0.0551)	(0.0551)
EXP SQUARED	0.00608	0.00844	0.00829
	(0.0073)	(0.0074)	(0.0074)
TEN	0.0553***	0.0537***	0.0546***
	(0.0104)	(0.0105)	(0.0105)
SEX	0.160***	0.158***	0.159***
	(0.0108)	(0.0109)	(0.0109)
AREA_NW	0.0462***	0.0448***	0.0435***
	(0.0102)	(0.0103)	(0.0103)
AREA_SOU	-0.0933***	-0.0942***	-0.0916***
	(0.0178)	(0.0182)	(0.0182)
AREA_ABR	0.452***	0.443***	0.439***
	(0.0263)	(0.0264)	(0.0264)
SELF_EMPL	0.698***	0.716***	0.711***
	(0.0870)	(0.0884)	(0.0881)
PERM_CONTR	0.848***	0.866***	0.867***
	(0.0853)	(0.0866)	(0.0863)
TRAIN_CONTR	0.722***	0.738***	0.738***
	(0.0871)	(0.0885)	(0.0881)
NONSTD_CONT	0.578***	0.595***	0.599***
	(0.1033)	(0.1042)	(0.1039)
NONSTD_SELF	0.576***	0.594***	0.594***
	(0.0881)	(0.0895)	(0.0892)
OTH_NONSTD	0.426***	0.451***	0.448***
	(0.0970)	(0.0980)	(0.0976)
FIX_CON	0.196***	0.197***	0.193***
	(0.0597)	(0.0594)	(0.0593)
IND_PRINT	-0.142*	-0.140*	-0.139*
	(0.0734)	(0.0734)	(0.0732)
IND_ENERGY	0.115***	0.138***	0.136***
	(0.0306)	(0.0264)	(0.0265)
IND_CHEM	0.171***	0.171***	0.171***
	(0.0224)	(0.0227)	(0.0226)
IND_MET	0.0908***	0.0882***	0.0881***
	(0.0194)	(0.0197)	(0.0196)
IND_ELECT	0.0760*	0.0766*	0.0710*
	(0.0423)	(0.0423)	(0.0420)
IND_OTHMAN	0.117***	0.116***	0.114***
	(0.0204)	(0.0204)	(0.0202)
IND_FIN	0.0823***	0.0807***	0.0810***
	(0.0144)	(0.0145)	(0.0145)
IND_INFOR	0.0963***	0.0867***	0.0869***
	(0.0270)	(0.0266)	(0.0265)
FIELD_AGRIC	-0.105***	-0.102***	-0.101***
	(0.0373)	(0.0372)	(0.0370)
FILD_ECO	0.131***	0.131***	0.130***
	(0.0140)	(0.0141)	(0.0141)
FIELD_SPO	-0.136***	-0.143***	-0.141***
	(0.0398)	(0.0402)	(0.0401)
FIELD_ENG	0.130***	0.129***	0.128***
	(0.0172)	(0.0174)	(0.0174)
FIELD_HUM	-0.112***	-0.110***	-0.110***
	(0.0190)	(0.0193)	(0.0193)

FIELD_MED	0.228***	0.231***	0.232***
	(0.0175)	(0.0181)	(0.0181)
FIELD _POL	0.0697***	0.0731***	0.0733***
	(0.0130)	(0.0129)	(0.0129)
FIELD _PSYCH	-0.233***	-0.238***	-0.237***
	(0.0192)	(0.0194)	(0.0194)
HSCH_MARK	-0.000774*	-0.000924**	-0.000881**
	(0.0004)	(0.0004)	(0.0004)
REG_STUD	-0.00974*	-0.0110**	-0.0107**
	(0.0051)	(0.0053)	(0.0053)
STUD_WORK	0.0359***	0.0388***	0.0399***
	(0.0112)	(0.0112)	(0.0112)
COMP_SKIL		0.00828*	0.00836*
		(0.0049)	(0.0049)
OCC_FATH_ENT			0.0195**
			(0.0097)
_cons	6.293***	6.283***	6.262***
	(0.1334)	(0.1355)	(0.1353)
Occ_Heckit			
EDU_PAR_DEG	-0.178***	-0.176***	-0.178***
	(0.0364)	(0.0366)	(0.0366)
POST_GRAD	0.0365*	0.0366*	0.0367*
	(0.0212)	(0.0214)	(0.0214)
LIV_NW	0.245***	0.247***	0.247***
	(0.0493)	(0.0496)	(0.0496)
LIV_NE	0.201***	0.205***	0.204***
	(0.0449)	(0.0452)	(0.0451)
LIV_SOU	-0.262***	-0.279***	-0.280***
	(0.0503)	(0.0508)	(0.0508)
LIV_ISL	-0.201***	-0.213***	-0.213***
	(0.0626)	(0.0633)	(0.0633)
LIV_ABR	-0.905***	-0.886***	-0.885***
	(0.2375)	(0.2374)	(0.2372)
DEL_IND	-0.128***	-0.125***	-0.124***
	(0.0468)	(0.0474)	(0.0474)
CONS_JOB	-0.133***	-0.126***	-0.126***
	(0.0211)	(0.0212)	(0.0212)
MOTH	-0.229***	-0.238***	-0.238***
	(0.0483)	(0.0487)	(0.0486)
STUD_WORK	0.423***	0.423***	0.422***
	(0.0419)	(0.0423)	(0.0423)
TRAINEESHIP	-0.338***	-0.335***	-0.334***
	(0.0433)	(0.0437)	(0.0437)
PHD	-1.180***	-1.168***	-1.168***
	(0.0845)	(0.0848)	(0.0848)
_cons	1.680***	1.602***	1.605***
	(0.3529)	(0.3573)	(0.3571)
Field of study	Yes	Yes	Yes
athrho			
_cons	-0.186***	-0.179***	-0.183***
	(0.0459)	(0.0444)	(0.0444)
lnsigma			
_cons	-1.015***	-1.017***	-1.018***
	(0.0154)	(0.0153)	(0.0154)
N	9594	9395	9395
Wald χ^2	2158.02	2420.68	3423.37

Robust standard error in parenthesis
* Significant at 10%
**Significant at 5%
*** Significant at 1%



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