DETERMINANTS AND CONSEQUENCES OF QUALIFICATION AND SKILLS MISMATCH AMONG RECENT PHD GRADUATES

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Abstract
This paper focuses on overeducation among highly educated workers. Drawing on a very rich data from a recent cohort of PhD graduates from the seven Catalan Public Universities, we examine the determinants of qualification mismatch and skills mismatch among PhD recipients, as well as their consequences in terms of earnings and job satisfaction. With respect to the determinants of mismatch, we show that job characteristics such as the economic sector and the main activity at work play a fundamental role in explaining the probability of being well matched. However, the effect of academic attributes in determining the propensity to be well matched seem to be mainly indirect, given that it tends to disappear once we control for the full set of work characteristics. Moreover, we detect a significant earning penalisation for those who are both overqualified and overskilled. Finally, we find that being mismatched reduces satisfaction with the content of the job, with the match between the job and the acquired competences as well as with the job as a whole, especially among those who are underutilising the skills acquired during the PhD. On the contrary, job mismatch among PhDs appears to be (statistically) unrelated to satisfaction with earnings and with promotion opportunities.
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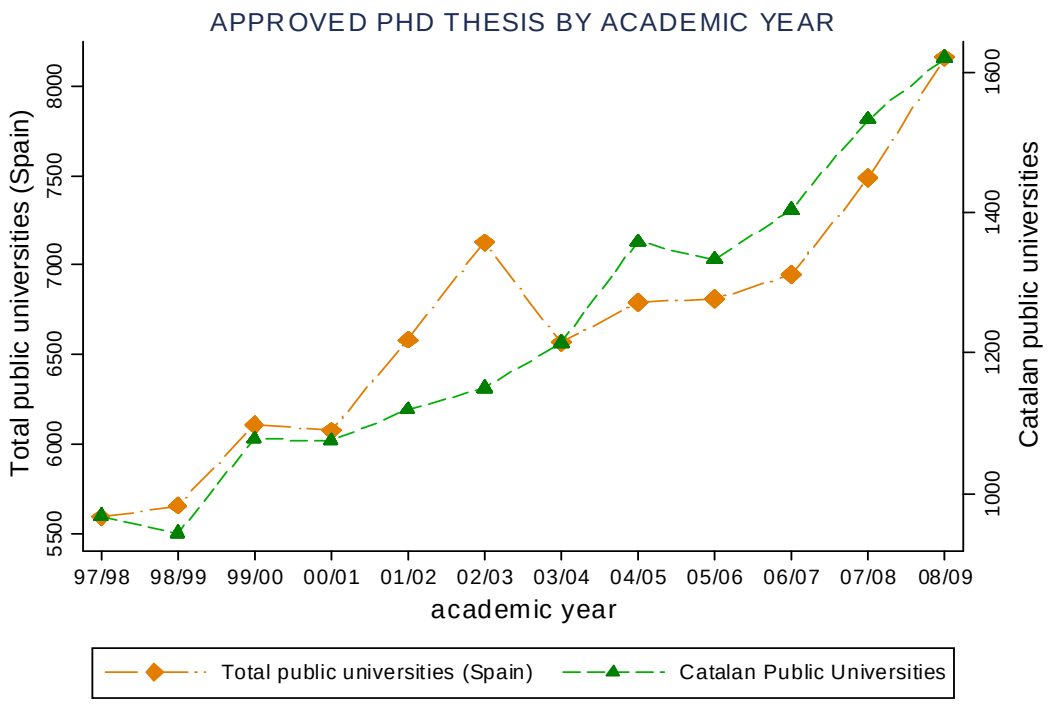
[VERY PRELIMINARY DRAFT, NOT FOR QUOTATION]

1. Introduction

During the last decades many European Countries have experienced a significant expansion of higher education. This process involved not only undergraduate education, but also postgraduate and, more specifically, doctoral education. The enlargement of doctoral education has been driven, on the one hand, by supply-side elements such as the creation of new educational sites and the increase of doctorate programmes. On the other hand, the increasing demand for PhDs (e.g. the number of matriculations) also played an important role in boosting its expansion. Spain does not represent an exception of this general tendency. In fact, as shown in Figure 1, the number of approved PhD thesis between the academic years 1997/1998 and 2008/2009 in any public university of the Spanish Education System follows a clear rising trend. Within Spain, some region such as Catalonia — which represents the focus of this paper — contributed relative more than others to the production of new PhDs. Indeed, as also shown

in Figure 1, along the entire period almost one fourth of the flow of graduating doctors came from Catalan Public Universities[1].

Figure 1: PhD Thesis approved in Spain and in Catalonia, period 1997/1998-2008/2009



Source: Spanish National Statistical Institute (INE).

It seems worth asking about which incentives lie behind this strong expansion of doctoral education. From the societal point of view, fostering doctoral education is important because PhD holders represent a key element for innovation and for the generation of new knowledge in the economy (Auriol 2010). From the individual perspective, the most important reason for pursuing a doctorate is to achieve a job where having a PhD is important[2], which typically consists in an academic job or, more in general, in research-oriented occupations (Mangematin 2000). However, especially in countries such as Spain, the creation of academic and research-oriented jobs did not follow the increasing pattern of PhDs' production. This means that a certain number of new doctors may end up being mismatched in the labour market — i.e. they

[1] The Catalan Public Education System is composed by seven universities: University of Barcelona (UB), Autonomous University of Barcelona (UAB), Polythecnic University of Catalonia (UPC) and Pompeu Fabra University (UPF) — which are placed in the Barcelona's province — University of Lleida (UdL), University of Girona (UdG) and Rovira i Virgili University (URV, placed in the province of Tarragona). See García-Quevedo et al. (2010) for a comprehensive overview about the Catalan Higher Education System.

[2] On a secondary level, some individual may choose to do a PhD with the aim of improving his/her professional prestige in non-research occupations, which might be more common among the fields of social science, humanities and, to some extent, in medicine. Finally, a very residual number of individual could be motivated by pure vocational reasons.

are in jobs that are not adjusted to their acquired education[3] — because the supply of PhD workers exceeds its demand.

On the basis of this background, this paper focuses on the determinants and the consequences of mismatch among PhD recipients, adding new evidence about the issue of labour market mismatch among highly educated workers. Drawing on very detailed data on a recent cohort of PhD graduates from the Catalan Public Universities, the contribution of this paper is threefold. First, we examine the determinants of mismatch, distinguishing between overqualification and overskilling, and focusing on the role of socio-demographic elements, academic attributes and job characteristics. Second, combining the information on qualification requirements and skills utilisation, we analyse the earnings penalty associated with different cases of mismatch. Third, we explore the relationship between mismatch and job satisfaction, exploiting the available information about perceived satisfaction with the job as a whole and with four distinct facets of the job.

Our findings suggest that job characteristics such as the economic sector and the main activity at work play a fundamental role in explaining the probability of being well matched. However, the effect of academic attributes in determining the propensity to be well matched seem to be mainly indirect, given that it tends to lose importance once we control for the full set of work characteristics. Moreover, we detect a significant earning penalisation for those who are both overqualified and overskilled. Finally, we find that being mismatched reduces satisfaction with the content of the job, with the match between the job and the acquired competences, as well as with the job as a whole. This is especially true among those who are underutilising the skills acquired during the PhD. On the contrary, job mismatch among PhDs appears to be (statistically) unrelated to satisfaction with earnings and with promotion opportunities. Overall, it appears that the problem of overskilling among this cohort of doctors is important, and represents a significant waste of individual and public resources.

With these purposes in mind, the next section contains a brief review of the relevant literature. Section 3 presents the data and section 4 illustrates the determinants of mismatch among doctors. Section 5 is dedicated to examine the consequences of mismatch, in terms of earnings (5.1) and in terms of job satisfaction (5.2) respectively. Finally, Section 6 concludes.

[3] The term mismatch represents a general labelling for the case in which the adequate education for the job is either higher or lower than the acquired one. Given that the doctorate represents the highest possible level of education, here mismatch represents a situation that has been usually classified as overeducation, in which the adequate education is less than a PhD.

2. Related Research

There exists a well-established field of the literature concerned with labour market mismatch (see McGuinnes 2006 and Leuven & Oosterbeek 2011 for extensive reviews about this topic). A growing number of contributions explore the determinants and the effects of mismatch among workers with the same level of formal education, which are typically graduate workers. Usually, these works are based on surveys that contain information about labour market mismatch. Some paper focused on formal qualification mismatch —alternatively labelled overeducation or overqualification— which means that a graduate is classified as overeducated if he/she performs a job in which having a degree does not constitute a hiring requisite. For example, Battu et al. (1999) estimated the determinants of education mismatch in different points of the professional career, reporting that overeducated UK graduates tend to earn less and to be less satisfied with their job. Also drawing on UK data, Dolton & Vignoles (2000) confirmed the negative conditional association between overeducation and earnings[4].

Other contributions also contemplate the issue of skills mismatch — broadly defined as the lack of adjustment between the acquired skills and the functional content of the job — in addition to formal educational requirements. The paper by Allen & van der Velden (2001) considers both qualification and skills mismatch among two cohorts of Dutch graduates from university and higher vocational education. They reported that the negative impact of overeducation on earnings overpasses the effect of skill underutilisation, whereas only the latter form of mismatch seems to affect (negatively) job satisfaction and, to a lesser extent, the intention of job quitting. McGuinness (2003) found that the negative effect of overeducation is significantly reduced once a measure of the degree of skills utilisation within the job is added to the wage equation. Other authors combined formal qualification mismatch with different measure of skills mismatch (see Chevalier 2003, Chevalier & Lindley 2009 and Green & Zhu 2010 among others[5]), stressing the importance of the latter over the former in the UK graduate labour market. Specifically, it seems that qualification mismatch *per se* is less important, whereas underutilising the acquired skills has more negative consequences in terms of earnings — and job satisfaction in Green & Zhu 2010 — and even more when accompanied by the lack of degree requirements. The dichotomy between educational requirements and skills utilisation has been also explored by McGuinness & Sloane (2011) using REFLEX data from the UK, who

[4] Other papers, based on Quantile Regression methods, provide partial evidence in favour of the hypothesis that the negative effect of overeducation on earnings is more pronounced in the lower tail of the unobserved ability distribution (see McGuinnes & Bennet 2007 and Bárcena-Martín et al. 2011).

[5] Further details are provided below. Notice that Chevalier (2003) and Chevalier & Lindley (2009) constructed a proxy of unobservable skills from the residuals of the first job wage equation, which was included as determinant of mismatch and as control in the final wage equation. The negative impact of mismatch on earnings was just slightly modified by the inclusion of this proxy of unobservable skills.

found that overeducation has a greater earnings penalty than overskilling, while the latter provokes more dissatisfaction with the job than the former. Exploiting additional information of the REFLEX database, the authors also shown that overeducation (but not overskilling) is in part a voluntary phenomenon, given that overeducated graduates are likely to trade-off this partial mismatch status with compensating job attributes such as job security and job-family balance.

There is a general concern in the literature about the fact that the estimates of the impact of mismatch may be inconsistent because of the presence of two potential sources of bias: unobserved individual heterogeneity and measurement/misclassification errors in self-reported mismatch variables[6]. The first issue has been usually been addressed by means of fixed-effects strategies. For example, Frenette (2004) and Dolton & Silles (2008) exploited a survey in which the same individual was observed in two different points of time, which allowed ruling out time-invariant unobserved heterogeneity. Even including individual fixed-effects, they reported a negative earnings penalty for being mismatched. Moreover, Dolton & Silles (2008) also tried to solve the second problem of measurement error in their estimations by instrumenting overeducation with overskilling and viceversa, finding slightly higher (and very similar) coefficients for the two mismatch situations[7]. In contrast, The Australian evidence presented in Mavromaras at al. (2011) suggests that the relationship between mismatch and job outcomes (earnings and job satisfaction) is more strongly affected by unobserved heterogeneity. However, the authors found that overskilling, especially when combined with overeducation, is still harmful for job satisfaction and to a lesser extent for earnings.

The existing contributions provide informative evidence about the issue of mismatch among university graduates. Much less has been said about PhD holders, which represents the topic of this paper. To the best of our knowledge, there are only two papers concerning mismatch among doctors and are based on US panel data from the Survey of Doctoral Recipients. Bender & Heywood (2009) used three different subjective indicators of mismatch, which appear to be negatively related to earnings and to job satisfaction and positively related to the probability of turnover. They also estimates the determinants of being mismatched[8] according to each of the three indicators, highlighting the importance of socio-demographic factors, academic attributes

[6] Other measures of mismatch that are not self-reported exists, such as the *realized matches* method (i.e. mismatched if out of the 1 standard deviation bound from the average/modal educational level in the appropriate occupational category) or the *job analyst* method (based on the information contained in occupational classifications). See Kler (2005) for a comparison of these two methods in a sample of Australian graduates. Notice that each alternative (including self-reported information) has his owns limitations and the final choice normally depends on data availability (Leuven & Oosterbeek 2011).

[7] It is notably difficult to find reliable solutions to the measurement/misclassification issue. Usually, as in this case, estimates based on self-assessed measures are reported making explicit reference to the potential drawbacks that this choice may imply.

[8] More evidence about the determinants of mismatch among highly educated workers (mainly undergraduates) can be found in Battu et al. (1999), Chevalier (2003), Frenette (2004), Dolton & Silles (2008) and Chevalier & Lindley (2009) among others.

and job characteristics on the likelihood of being mismatched. Bender & Heywood (2011) present panel data estimates of the earning penalty for mismatch for different fields of study and over different stages of the professional career, finding stronger negative effects for PhDs in Hard and (to a less extent) in Social Sciences, as well as in an advanced stage of the career. They also explore the existence of differential effects by reason of mismatch and the determinants of transitions in-and-out of mismatch, suggesting a clear relationship between mismatch status and career development.

Our paper is based on data about a recent cohort of PhD graduates from the seven Catalan Public Universities. Unfortunately, the cross-sectional nature of the data does not allow ruling out time-invariant unobserved heterogeneity as in Bender & Heywood (2009, 2011). However, the homogeneity of the sample and the inclusion of a large list of control variables, together with PhD-type and university fixed effects would limit the extent of unobserved heterogeneity bias in our estimates. Moreover, even if the information collected regards a fixed point of time (about four years after PhD completion), the estimation of the determinants of qualification and skills mismatch still provide informative evidences about which factor may affect the likelihood of suffering some degree of mismatch during the early stage of the career as doctor.

3. Data and Descriptive Statistics

The data that we use in the empirical analysis are taken from the last wave of the survey conducted by the *Agència per la Qualitat del Sistema Universitari de Catalunya*[9] (Quality Assurance Agency for the University System in Catalonia, AQU). The AQU survey was carried out in 2011 and was aimed at examining the labour market situation of doctorate recipients some year after obtaining the PhD. The target population consists in all the Spanish-born individuals who completed their PhD in the seven Catalan public universities during the academic year 2006/2007. The entire population consists in 1,824 individuals and the questionnaire was correctly completed by 1,225, which implies a fairly high response rate of about 67%. We restrict the sample to those individuals who were regularly employed in a full-time job when the survey was carried out and were aged 40 or less when they completed their PhD; after cleaning for missing observation of our main variables of interest we end up with a final sample of 1,002 individuals[10].

[9] See http://www.aqu.cat/insercio/estudi_2008_doctors.html for additional details about the survey. Notice that the first wave of the AQU survey about doctoral recipients was conducted in 2008. Despite that, in this study we only consider the data from the second wave of 2011 because the questions about educational mismatch were posted in a different way in the 2008 survey.

[10] Given the aims of this paper, the restriction on the age at PhD completion has been included in order to prevent including observations of individuals who were in an advanced stage of their professional career when they enrolled at the doctorate programme. Moreover, the fact that the AQU survey covers only Spaniard doctors might appear as a limitation of the database. However, this does not represent a real restriction for our purposes, because having only

The dataset contains basic socio-demographic information, several specific elements concerning academic attributes and the doctorate programme, as well as detailed information about the current job. The main variables of interest are those concerning the job (mis)match of PhD holders, which are taken from two specific questions of the AQU survey. The first question asks which qualification was required for entering the current job. Four distinct possibilities were considered: a) a PhD degree, b) a specific undergraduate degree (i.e. the same degree held by the individual), c) any undergraduate degree and d) no qualification requirements. The second question is a self-reported statement about the skills that are used/necessary to perform the job. Specifically, respondents were asked about whether the PhD-specific skills are useful to carry out the current job. Given that our sample contains only individuals who completed the PhD, following Dolton & Silles (2008) we define an individual to be overqualified if he/she responded that the PhD was NOT required for entering the job. Moreover, we classify as overskilled every individual who considers that the PhD skills are NOT necessary to perform the job.

Table 1 shows the marginal and the joint distribution of these two distinct dimensions of mismatch among PhDs. The data indicates that slightly more than 72% of our selected sample declares that they are carrying out jobs that require PhD skills, whereas for just somewhat less than an half of the sample having a PhD was a pre-requisite for being recruited. As expected, the probability of being well matched in terms of skills is significantly higher for those who are working in occupations that require the PhD, meaning that these two distinct facets of (mis)match are clearly not independent. Indeed, the correlation between the two mismatch indicators is 0.51, suggesting that both measures are actually capturing the same underlying issue. It appears that (only) 45% of the selected sample of PhD holders can be considered as adequately matched — i.e. their doctorate qualification was required for entering the job and the skills acquired during the PhD are useful to perform it. However, up to 26% of this sample of doctors is likely to work in occupations that do not require the PhD qualification nor the PhD skills — i.e. are overqualified and overskilled. Finally, a very small proportion of doctors declare that the PhD was required for getting the job, but it was actually unnecessary to perform it.

[TABLE 1 ABOUT HERE]

This preliminary descriptive analysis indicates that there exists a significant risk of being mismatched, at least to some extent, four years after completing the PhD. Given that the probability of being overskilled and/or overeducated are likely to covariate with observed characteristics, in the next section we explore the determinants of mismatch in a multivariate framework. We exploit all the relevant information collected in the AQU survey regarding socio-demographic characteristics, academic information and job-related variables. Table 1A in the

Spanish-born individuals would limit the degree of labour market-related heterogeneity in our sample. Finally, notice that the size of the final sample is somewhat reduced when we consider earnings and job satisfaction, because of the presence of additional missing values for these variables.

Appendix contains the complete list of explanatory variables (the meaning of the variables is self-explanatory) and the mean for the whole sample as well as for four mains mismatch status — adequately matched, overskilled, overqualified, oveskilled and overqualified. Overall, it appears that the mismatch status is clearly related to the academic and professional profile of the individual. Specifically, well-matched PhD holders are more likely to be male and younger with a clear academic orientation. They are also less tenured and are more inclined to end up working in the university, in research centers or in private firms doing R&D tasks. Overskilled and overeducated PhDs are in general similar in terms of observed characteristics, except for the fact that the latter are significantly more tenured, and are more likely to be individuals who entered the university as adjunct professors or research assistants before completing the PhD — i.e. they funded their doctoral studies doing teaching or research tasks and still work in the university at the time of the survey.

The subsequent step consists in quantifying the potential penalty from being mismatched in terms of earnings and job (dis)satisfaction in a regression framework. Table 1A also contains descriptive information about these job outcomes. With respect to annual gross earnings (collected in intervals in the AQU survey), it appears that 33.4% of doctors in our sample earn between 30,000 € and 40,000 € (the modal category), being this percentage slightly higher among those who are employed in occupations that are adequately matched with their education. Moreover, PhD recipients that earn more than 50,000 € (the top-coding category) are significantly more represented among the mismatched sub-sample (especially among the overskilled), which means that for a given number of PhD recipients, working in high paid occupations translates into a certain extent of mismatch. Finally, we dispose of information about the perceived degree of satisfaction with the job as a whole and with four specific facets of the job: promotion opportunities, earnings, job content and the match between the skills and the job. The average job satisfaction is quite high (5.7 on a 1-7 scale) and our doctors are especially satisfied with their promotion opportunities, but less satisfied with the content of their job and with their remuneration. As expected, those who are overqualified and even more those who are overskilled appear to be significantly less satisfied with the match between the job and their skills.

4. The determinants of qualification and skills mismatch

Descriptive statistics reveal a significant incidence of overskilling and overeducation among this recent cohort of doctors from the Catalan Public Universities. Moreover, the mismatch status appears to be related to observed characteristics. In this section we examine the determinants of mismatch in a multivariate framework. This allows us to better understand the

channels through which socio-demographic variables, academic and job attributes affect the likelihood of being mismatched. We estimate two Seemingly Unrelated Bivariate Probit equations with identical regressors, which model the probability of being overskilled and overqualified respectively. In this way we are able to check whether and how there exists some difference in the conditional association between the explanatory variables and each of the two type of mismatch[11]. Table 2 contains the average changes in the predicted probabilities for four different specifications of the two equations. The baseline specification (1) contains only socio-demographic variables and academic credentials, as well as a set of indicators for pre and post-doctoral mobility. Model (2) includes the type and the region of work. Model (3) adds job attributes and model (4) incorporates the information about the main activity at work[12]. Moreover, every model contains PhD-type and university fixed effects, picking up factors that are common among doctors holding similar PhDs across the seven Catalan Public Universities. As expected, the estimated correlation between the residuals of the two equations is always positive and significant, pointing out the presence of common unobserved determinants of overskilling and overqualification.

The results indicate that female doctors are 5% more likely to be overskilled than male doctors with similar characteristics, while gender differences in the probability of being mismatched in terms of qualifications are not significant. Age increases the probability of underutilize the PhD skills at a decreasing rate, and age differences are somewhat more pronounced among workers in similar jobs (i.e. they increase with the inclusion of job-related variables). An increase in the elapsed time between the completion of the undergraduate degree and the beginning of the PhD raises the exposure to overqualification. Compared to those who funded the PhD working in jobs not related to their studies, those who were adjunct professors or research assistants during their doctorate — and even more those who had a PhD fellowship have more chances to be matched in the labour market. However, the effect of doctorate funding decreases for the case of overqualification and vanishes for overskilling once job-related variables are included in the model. Most of the variables that capture the individual performance during the PhD[13] have little or any effect on the probability of being mismatched,

[11] An alternative specification to obtain different estimates for the probability of being overskilled/overqualified could be the Multinomial Logit Model (as in Chevalier 2003 and in Chevalier and Lindley 2009). We tried to use this alternative specification and the results obtained are qualitatively similar. However, we retained the current specification because, contrary to the Multinomial Logit, it is not subject to the Independence of Irrelevant Alternative assumption, which is clearly not supported by our data. Notice that the lack of identifying variables (i.e. there is no reason to include one variable in one equation but not in the other) precludes estimating the conditional effect of overqualification on overskilling using a recursive model.

[12] The various categories are not-excluding, in the sense that an individual may declare that he/she performs more than one activity in his/her job. Moreover, this information is reported only for individuals who work outside the university.

[13] The estimates of PhD-type and university fixed effects are not reported for space reason. The results show a substantial *ceteris paribus* effect of the field of study on the probability of mismatch (more pronounced in the case of overqualification), which in general remains stable across specifications. University dummies display positive and

with some exception. First, developing the PhD thesis within a research group favours the access to jobs that require the PhD. Second, and contrary to our expectations, participating to external conferences increases the probability of being overqualified by 8.5-11%. Third, pre-doctoral research mobility in European or US centers reduces the probability of overqualification albeit, as for PhD funding, the effect of pre-doctoral mobility looses importance once we control for job-related variables. Moreover, post-doctoral mobility is found to be a strong predictor of both overskilling and overqualification, showing a similar effect for the two indicators. Specifically, having a visiting stay in European or US centers reduces the probability of overskilling/overeducation of about 26-30% in the baseline model (1) that only include socio-demographic and academic variables. Also in this case of post-doctoral mobility, the estimated marginal effects are progressively reduced once more job-related variables are included into the model, but still remain significant even in the most complete specification (model (4)).

[TABLE 2 ABOUT HERE]

The progressive inclusion of job-related variables reveals several additional evidences. The results from model (2) show that the choice of the sector is of fundamental importance for explaining the incidence of overskilling and overeducation. Compared with PhDs who work in the university, being employed in the private and (even more) in the public sector increases the chances of being mismatched of a substantial amount. However, this penalization is markedly reduced when the main activity at work is included into the model, but still remains sizeable and significant. On the contrary, those who work in research centers are not more prone to be overskilled and just somewhat more likely to be overqualified when job attributes and the main activity are maintained fixed. Moving away from Spain is associated with a lower probability of mismatch, which could reflect either the positive sorting of PhD holders who migrate after the PhD or the higher availability of adequate jobs in typical destination countries where Spanish doctors are likely to migrate (e.g. Northern Europe countries or US).

The estimated marginal effects for the additional controls included in model (3) point out a sizeable positive effect of job tenure on the probability of overqualification, which might be explained by the cohort-nature of our data together with the possibility that a certain number of doctors in our sample may have entered the current job before achieving the PhD. However, seniority in the current job seems to be unrelated with the probability of overskilling. Surprisingly, those with a permanent contract are slightly more likely to be matched in terms of qualifications than others. We also detected a significant beneficial effect for the chances of being matched of working in a medium-large firm (between 250 and 500 workers), compared to

significant coefficients for the University of Girona, and negative coefficients for the Pompeu Fabra University and for the Polytechnic University of Catalonia in the overskilling equation.

PhD recipients who are employed in small firms. Finally, model (4) controls for the main activity at work for those who are employed outside the academia. As expected, performing R&D tasks reduced the likelihood of being mismatched in a consistent way for both indicators (-30% and -23% for overskilling and overeducation respectively), meaning that working in research-oriented occupations outside the university is not detrimental for the educational match of PhDs (i.e. it compensate the negative impact of working in the public or in the private sector[14]). Moreover, those who develop technical assistance tasks are more prone to be overskilled and even more to be overqualified, and doctors who are in directive positions are slightly less likely to fully utilize their skills.

Overall, it seems that academic credentials that are likely to characterise the academic/professional profile of PhD recipients such as PhD funding, working or not in research groups and research mobility, mostly represent indirect determinants of mismatch. Their effect is actually strongly reduced when job characteristics are controlled for, which means that to some extent the individual profile just affects job choices that in turns determine the chances of being or not mismatched. This is especially the case of those job-related variables that are clearly connected with educational requirement and with the degree of skills' utilization, such as the type of the job and the main activities developed herein. In fact, moving away from academic or research-oriented jobs increases the likelihood of being mismatched. In any case, it should be noted that our mismatch indicators are not exempt of the implicit limitations of any self-reported measure of mismatch, as well discussed in the literature (see McGuinnes 2006 and Leuven & Oosterbeek 2011). Therefore, the reader should bear in mind that the presence of misclassification errors and/or individual heterogeneity in the perceived use of skills may provoke some bias in our results. Even so, we believe that the reported evidence is still informative about conditional differences in the propensity of ending up mismatched after the PhD — or at least of perceiving to be mismatched.

5. Are mismatched doctors penalised?

5.1 Mismatch and earnings

In this section we examine the potential labour market penalisation of being mismatched for our graduating cohort of PhD holders. Our starting point consists in the analysis of earning differences by mismatch status. As usually done in the literature, we estimate an extended

[14] We also tried to introduce interaction between the type of work and the main activities. The results indicate that the beneficial effect of doing R&D job is very similar across sectors, meaning that the common coefficient represents a reasonable and parsimonious approximation.

earning equation[15] that includes several academic attributes and job characteristics as control variable, following an "assignment" view of the labour market in which both individual human capital as well as academic and job characteristics determine earnings (as in Battu et al. 1999, Dolton & Vignoles 2000, Chevalier 2003, Kler 2005, Dolton & Silles 2008, Chevalier & Lindley 2009, McGuinnes & Sloane 2011 and Bender & Heywood 2009, 2011 among others).

We are aware of the fact that the conditional association between mismatch and earnings may not represent the true causal effect because of the presence of unobserved individual heterogeneity. Unfortunately, we were unable to specifically address this potential source of bias, because of the absence of credible instruments and the cross-sectional structure of our data. However, we argue that drawing from data about doctors from the same graduating cohort, together with the inclusion of PhD-type fixed effect and an extensive list of academic and job-related controls, would limit the extent of unobserved ability bias. On the contrary, misclassification errors in our self-reported mismatch indicators may still represent a source of bias and the results must be interpreted under this potential caveat.

Keeping in mind the previous discussion, Table 3 contains the estimates from the augmented earning regression[16]. Our primary interest relies on whether there exists some earning penalty for being mismatched about four years after completing the PhD. Aimed at obtaining a more complete and compelling picture about the relationship between mismatch and earnings among PhDs, we combine both overskilling and overeducation indicators in a similar fashion than in Mavromaras et al. (2011)[17]. Based on the two questions of the AQU survey, a doctor might be classified either as 1) Well-Matched (PhD required and skills used/necessary), 2) Overskilled but NOT Overqualified, 3) Overqualified but NOT Overskilled and 4) Overskilled and Overqualified. The results indicate that being only overskilled or only overqualified is not statistically associated with earnings, suggesting that PhD recipients who are in these two partial mismatch situations do not earn less than their well-matched counterpart. On the contrary, compared to well-matched doctors, only those who are both overqualified and

[15] In order to better adapt to the interval-coding of annual gross earnings we opted for an interval regression method (*intreg* command in STATA). Nevertheless, the estimates obtained by OLS using the typical mid-point approximation are virtually the same, although somewhat less efficient.

[16] Notice that the set of RHS variable in the earning equation is almost the same than in the mismatch equations, with some exception. First, we retained only those academic attributes that are directly related to human capital accumulation; the results are virtually the same including all the mismatch equations' covariates. Second, we included the age at the job entry instead of current age to better proxy for potential previous labour market experience. Notice also that we adopted a linear specification for both age at the job entry and current job tenure because, given the cohort-nature of the AQU data, there is no sufficient variability to capture quadratic effects. The results were invariant to the inclusion of quadratic terms, which were statistically insignificant at any conventional significance level.

[17] The main difference with respect to the approach of Mavromaras et al (2011) consists in the fact that we dispose of an explicit measure of overqualification, whereas they define a person to be overeducated (following their labeling) if his/her education is above the mode of the respective occupational group. Alternative — and conceptually similar — classifications that combine different mismatch indicators can be found in Green & Zhu (2010), which distinguish between "real" and "formal" overqualification, as well as in Chevalier (2003) and Chevalier & Lindley (2009), which define "apparent" and "genuine" overeducation combining educational requirements with job satisfaction.

overskilled suffer an earning penalty of about 12% for being in this severe mismatch status. These findings are consistent with the panel data evidence reported in Mavromaras et al. (2011), which indicates that only the combination of overskilling and overeducation is really harmful (in terms of earnings) among Australian graduates. Our results are also in line with those reported by Chevalier (2003), Chevalier & Lindley (2009) and Green & Zhu (2010), which suggest a stronger negative effect of the most severe mismatch status among UK graduates. It seems also worth notice that our results are just barely comparable with the existing evidence concerning the earning effect of mismatch among PhD holders. In fact, Bender & Heywood (2009, 2011) draw from US panel data of the Survey of Doctoral Recipients (SDR) and exploit a quite different question(s) about mismatch. Nevertheless, they also report a negative earnings return to mismatch among doctors, which seems to persist even in a fixed-effects framework. Also using panel data, Frenette (2004) reports no substantial earnings penalisation among Canadian PhDs who are overqualified[18], which might be taken as further evidence in favour of the claim that overqualification *per se* is not harmful among doctors if it is not accompanied by a certain degree of skill mismatch.

[TABLE 3 ABOUT HERE]

The estimates of the included control variables are quite standard and are just briefly discussed. The results show a significant *ceteris paribus* gender difference in annual earnings in favour of male doctors. As expected, earnings rise with age at the job entry — which is actually capturing previous potential experience, although an increase in the elapsed time between the undergraduate degree and the beginning of the PhD has a negative effect. Those doctors who founded their PhD working in a job related with their studies have higher earnings than others, suggesting that previous work experience accumulation is better rewarded if the pre-PhD job is related to the field of study. Moreover, keeping fixed other academic attributes and job characteristics, it appears that taking more than 6 years to finish the PhD represents a penalisation in terms of earnings. There exists a sizable positive earning differential in favour of those doctors who work in the private sector (compared to the university), while there is no statistical difference in earnings for working in research centers or in the public sector[19]. Doctors from the Catalan Universities who work in other Spanish regions earn less than their peers who are employed in the province of Barcelona, while those who moved away from Spain obtain higher earnings. As usual, we also found a positive earning effect of an increase of current job tenure, of having a permanent contract and of working in a medium-large firm.

[18] Notice that Frenette (2004) uses a pooled sample that combines College and Bachelor graduates with Master and PhD holders, and identifies separate effects by means of interaction terms.

[19] The public sector dummy's coefficient is significantly higher and statistically different from zero when the main activities are excluded from the model, suggesting that PhD recipients who work in the public sector earn more than those who work in the university only if they perform specific activities that are better remunerated (specifically, direction tasks and medical assistance).

Moreover, PhD recipients who develop direction and medical assistance tasks (outside the university) are better paid than others. The estimates from PhD-type fixed effect reveal that doctors in biology earn more than their counterparts who studies humanistic fields and sociology, political science and communication, but less than doctors in economics and business, chemistry, medicine and computer and information engineering. Finally, it appears that even conditioning to the type of PhD and other characteristics, studying at the Pompeu Fabra University is associated with higher annual earnings.

5.2 Mismatch and job satisfaction

The results in the last section indicate that being only overskilled or overqualified is conditionally not associated with fewer earnings. It appears instead that it is only the strongest degree of mismatch in which having a PhD is completely irrelevant — i.e. it is not required and the skills acquired during the doctorate are not useful — that generates an earnings penalty. In this section we analyse the conditional association between these different mismatch situations and job satisfaction. It has been argued that relationship between mismatch and job satisfaction may provide some information regarding whether or not this status represents a voluntary situation, complementing the evidence about monetary aspects of mismatch (McGuinnes & Sloane 2011, Mavromaras et al. 2011). We consider the reported satisfaction with the job as a whole (overall job satisfaction) as an aggregate indicator of all the relevant aspects of the job. Moreover, as introduced before, we also dispose of information about the perceived degree of satisfaction with four distinct facets of the employment: promotion opportunities, earnings, job content and job-skills match. Adding a separate analysis of the perceived satisfaction with these four specific domains would give some indication about the channel through which mismatch affects the utility from the job. Given the ordinal nature of the job satisfaction variables, we apply the standard Ordered Probit approach[20].

Table 4 contains the marginal effect of each mismatch indicator in the probability of being very satisfied (the highest category) with the job as a whole and with each job domain[21]. It appears that mismatched PhD holders are statistically not less satisfied that their well-matched

[20] The results using simple OLS are quite similar in terms of trade-off ratios between coefficients. It should be noted that the existence of common latent traits that simultaneously affect job satisfaction and the self-reported measures of mismatch may provoke some bias in the estimates. For example, intrinsically optimist PhDs might be less likely to declare that they are mismatched and more likely to declare that they are satisfied with their job. Moreover, the economic and professional expectations created during the PhD may also play some unobserved influence. Also in this case the results must be just considered as conditional associations that may not represent true causal effects.

[21] The complete models (see table 2A in the Appendix) contains, as usual, a large list of individual, academic and job controls that might covariate with job satisfaction and with mismatch, as well as a set of earning categories dummies. The models also include indicators for missing information about annual earnings, as well as PhD-type and university fixed effects. The estimated coefficients of the entire list of control variables are quite standard and not discussed here for brevity reasons.

peers with respect to their remuneration and only those who are classified as overskilled and overqualified are just slightly less satisfied with their earnings. However, suffering a certain degree of mismatch is significantly associated with a lower probability of being very satisfied with the content of the job and with how well it matches the skills acquired during the PhD — which reflect more intrinsic and non-monetary aspects of the job. Specifically, being only overqualified — but not overskilled — reduces satisfaction with these two specific domains, although educational requirements *per se* appear to be a less significant concern for job satisfaction than skills utilization. Indeed, skills underutilization makes PhD holders significantly less likely to be very satisfied with the content of their job and whit how well it fits with their competences. Notice that the satisfaction loss associated with the combination of the two forms of mismatch is very similar to the estimate of being overskilled only, which can be taken as an evidence that overskilling and overqualification are different phenomena and the former is significantly more damaging for job satisfaction.

[TABLE 4 ABOUT HERE]

A more general of evidence regarding the relationship between mismatch and job satisfaction among PhDs can be obtained from the estimates of the overall satisfaction equation. In fact, overall job satisfaction represents an aggregate of job domains satisfaction, which would include other aspects of the job than the four specific facets considered above (Ferrer-i-Carbonell & Van Praag 2007). Also in this case, it appears that being overqualified only is just slightly negatively associated with a lower degree of job satisfaction. More importantly, job satisfaction is significantly lower when overqualification and overskilling come together and the impact of being overskilled but not overqualified is even slightly higher (but less precise due to the low number of observations in this category). There are at least two alternative explanations for this result. First, it might be that overqualified doctors enjoy of other valuable characteristics of the job (unobserved in our data) that tend to compensate the lack of skills utilisation, which is consistent with the idea of compensating differentials (see McGuinnes & Sloane 2011 among others). Second, it is possible that (unfulfilled) expectations are playing some role. That is, the fact that the PhD represented a requirement during the hiring process might increase the expectations about the quality of the job, which end up to be unfulfilled once it appears that PhD-level skills are unnecessary to develop the job, generating more dissatisfaction with the job as a whole. In any case, consistent with the international literature about highly educated workers, our findings point out that overskilling among PhDs represents troublesome issue — and quite unlikely to be a voluntary situation — which make them less satisfied with their job and penalised in terms of earnings once it is combined with overqualification.

6. Conclusions

This paper focuses on the issues of job mismatch among PhD holders. We draw on data from a recent cohort of PhD graduates (academic year 2006/2007) from any of the seven public universities of Catalonia, which contain detailed information about academic background and current job characteristics of the job held in 2011 (i.e. about 4 years after achieving the PhD). Following the most recent literature on job mismatch among highly educated workers, in the empirical analysis we distinguish between two different forms of mismatch: 1) qualification mismatch, which affects all doctors who work in occupations that do not required the PhD qualification during the hiring process, and 2) skill mismatch, which represents the situation in which the PhD-level skills are not necessary or useful to develop the job.

In the first step of our analysis we model the likelihood of overqualification and overskilling as two separate but interrelated processes, by progressively including individual and academic attributes, job type and location, specific job characteristics and working activities. Our findings suggest that academic credentials that are likely to characterise the academic/professional profile of PhD recipients such as PhD funding, working or not in research groups and research mobility, mostly represent indirect determinants of mismatch. Their effect is actually strongly reduced when job characteristics are controlled for, which means that to some extent the individual profile just affect job choices that in turns determine the chances of being or not mismatched. This is especially the case of those job-related variables that are clearly connected with educational requirement and with the degree of skills' utilization, such as the type of the job and the main activities developed herein. In fact, working in not academic or research-oriented jobs increases the likelihood of being mismatched.

In the second step we consider whether suffering a certain degree of mismatch has some consequence in terms of earnings and job (dis)satisfaction. In doing so, the two measures of mismatch are combined with the aim of providing more detailed evidence about of the issue of mismatch among PhD recipients and about which type of mismatch is more harmful for them. In line with the findings of Chevalier (2003), Chevalier & Lindley (2009), Green & Zhu (2010) and Mavromaras et al. (2011) for the case of university graduates, our results point out a special concern about skills underutilisation, whereas overqualification seems to be a less important issue. Indeed, it appears that overqualification *per se* does not reduce earnings among PhDs, while the combination of the two forms of mismatch generates an important *ceteris paribus* earnings penalty. Moreover, the analysis of job satisfaction and job domains satisfaction indicates that mismatched doctors — especially those who are overskilled — are less satisfied with their job as a whole, with the content of their job and with how well it matches with their

competences, but mismatch seems not to be related to satisfaction with earnings and promotion possibilities.

Overall, our analysis reveals a worrisome context in which a non-trivial proportion of new PhD graduates are exposed to the non-voluntary situation of mismatch, which generates a significant penalty in terms of job satisfaction and — in the most severe case — foregone earnings, which is probably caused by an excess of PhDs' supply in the labour market. Policies aimed at reducing the incidence and the extent of skills underutilisation among doctors would be especially useful in order to prevent this waste of individual and public resources devoted to pursue and foster doctoral education.

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Table 1: cross tabulation of qualification and skills mismatch

		PhD qualification required		
		No	***Yes***	***Total***
PhD skills necessary	***No***	260 *(25.95%)*	16 *(1.6%)*	276 *(27.54%)*
	Yes	275 *(27.45%)*	451 *(45%)*	726 *(72.46%)*
	Total	535 *(53.4%)*	467 *(46.6%)*	1,002 *(100%)*

Table 2: Probability of overskilling/overqualification — average marginal effects

	ΔPr[Overskilling]				ΔPr[Overqualification]			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
SOCIODEMOGRAPHIC VARIABLES								
Female	0.05	0.04	0.041	0.048	0.032	0.025	0.013	0.033
	0.021[b]	*0.021[c]*	*0.02[b]*	*0.017[a]*	*0.037*	*0.031*	*0.027*	*0.03*
Age/10	0.333	0.557	0.439	0.533	0.014	0.194	0.047	0.045
	0.307	*0.248[b]*	*0.237[c]*	*0.239[b]*	*0.363*	*0.31*	*0.354*	*0.411*
$(Age/10)^2$	-0.044	-0.066	-0.052	-0.06	0.002	-0.019	-0.024	-0.023
	0.037	*0.03[b]*	*0.029[c]*	*0.029[b]*	*0.045*	*0.038*	*0.045*	*0.053*
ACADEMIC VARIABLES								
Elapsed time between the degree and the PhD/10	0.004	0.002	0.002	-0.001	0.007	0.006	0.009	0.009
	0.006	*0.004*	*0.004*	*0.004*	*0.007*	*0.006*	*0.004[b]*	*0.004[b]*
PhD funding: research fellowship during the PhD	-0.142	-0.04	-0.044	0.026	-0.258	-0.199	-0.152	-0.161
	0.065[b]	*0.061*	*0.063*	*0.054*	*0.065[a]*	*0.058[a]*	*0.039[a]*	*0.037[a]*
PhD funding: teaching or research during the PHD	-0.143	0.022	-0.001	0.037	-0.149	-0.06	-0.106	-0.117
	0.06[b]	*0.068*	*0.066*	*0.061*	*0.056[a]*	*0.056*	*0.043[b]*	*0.036[a]*
PhD funding: Work related to the PHD	-0.056	-0.066	-0.063	-0.018	-0.104	-0.12	-0.092	-0.106
	0.055	*0.046*	*0.047*	*0.045*	*0.056[c]*	*0.05[b]*	*0.047[c]*	*0.041[b]*
PhD funding: work not related/other situations	*Reference Category*							
PhD duration > 6 years	0.012	0.004	-0.002	-0.025	0.048	0.036	0.023	0.028
	0.043	*0.031*	*0.031*	*0.028*	*0.041*	*0.04*	*0.03*	*0.031*
Extraordinary PhD prize	-0.104	-0.041	-0.038	-0.024	-0.068	-0.032	0.002	0.007
	0.034[a]	*0.041*	*0.041*	*0.036*	*0.03[b]*	*0.027*	*0.024*	*0.02*
PhD thesis in English	-0.051	-0.026	-0.03	-0.03	-0.037	-0.018	0.004	0.013
	0.041	*0.038*	*0.037*	*0.033*	*0.035*	*0.035*	*0.026*	*0.027*
PhD thesis within a research group	-0.065	-0.019	-0.011	0.008	-0.146	-0.112	-0.064	-0.054
	0.041	*0.034*	*0.034*	*0.029*	*0.032[a]*	*0.031[a]*	*0.032[a]*	*0.027[b]*
Participation to internal seminars	-0.023	-0.029	-0.035	-0.043	-0.002	0.01	0.006	-0.003
	0.034	*0.03*	*0.03*	*0.029*	*0.031*	*0.029*	*0.025*	*0.025*
Participation to external conferences	0.005	-0.005	-0.003	0.005	0.11	0.105	0.084	0.088
	0.04	*0.029*	*0.028*	*0.025*	*0.046[b]*	*0.039[a]*	*0.029[a]*	*0.026[a]*
PRE & POST DOCTORAL MOBILITY								
No pre-doctoral mobility	*Reference Category*							
Pre-doctoral mobility in national centers	-0.069	-0.06	-0.031	-0.043	-0.027	-0.003	0.001	-0.001
	0.043	*0.036[c]*	*0.03*	*0.03*	*0.056*	*0.048*	*0.039*	*0.036*
Pre-doctoral mobility in European centers	-0.022	-0.001	-0.001	0.002	-0.086	-0.056	-0.045	-0.041
	0.036	*0.026*	*0.025*	*0.029*	*0.038[b]*	*0.031[c]*	*0.022[c]*	*0.022[c]*
Pre-doctoral mobility in U.S. centers	-0.08	-0.006	-0.001	0.007	-0.132	-0.077	-0.057	-0.053
	0.041[c]	*0.032*	*0.03*	*0.03*	*0.05[a]*	*0.046[c]*	*0.041*	*0.044*
Pre-doctoral mobility in other countries	-0.077	-0.072	-0.07	-0.06	-0.021	0.002	0.017	0.012
	0.054	*0.038[c]*	*0.04[c]*	*0.04*	*0.057*	*0.047*	*0.035*	*0.036*
No post-doctoral mobility	*Reference Category*							
Post-doctoral mobility in national centers	-0.237	-0.132	-0.142	-0.122	-0.214	-0.128	-0.059	-0.054
	0.047[a]	*0.052[b]*	*0.049[a]*	*0.045[a]*	*0.059[a]*	*0.051[a]*	*0.05*	*0.043*
Post-doctoral mobility in European centers	-0.261	-0.115	-0.116	-0.079	-0.27	-0.122	-0.058	-0.06
	0.028[a]	*0.036[a]*	*0.037[a]*	*0.038[b]*	*0.036[a]*	*0.033[a]*	*0.034[c]*	*0.032[c]*
Post-doctoral mobility in U.S. centers	-0.27	-0.138	-0.139	-0.083	-0.304	-0.184	-0.102	-0.071
	0.035[a]	*0.039[a]*	*0.036[a]*	*0.035[b]*	*0.041[a]*	*0.037[a]*	*0.037[a]*	*0.037[c]*
Post-doctoral mobility in other countries	-0.217	-0.087	-0.104	-0.106	-0.223	-0.085	-0.02	-0.026
	0.055[a]	*0.065*	*0.074*	*0.067*	*0.049[a]*	*0.048*	*0.041*	*0.039*

Note: all the estimations include fixed effects for PhD type and university (not shown). Standard errors (in italic) are clustered at the PhD program level; [a] significant at 0.01%, [b] significant at 0.05%, [c] significant at 0.01%.The average marginal effect for indicator variables are average discrete changes in the predicted probabilities.

Table 2 (continued): Probability of overskilling/overqualification — average marginal effects

	ΔPr[Overskilling]				ΔPr[Overqualification]			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
TYPE OF WORK								
University				*Reference Category*				
Research Institute	0.036	0.007	0.025		-0.013	0.064	0.081	
	0.032	*0.036*	*0.035*		*0.041*	*0.031[b]*	*0.028[b]*	
Public Sector	0.508	0.484	0.301		0.357	0.412	0.287	
	0.036[a]	*0.045[a]*	*0.057[a]*		*0.035[a]*	*0.026[a]*	*0.042[a]*	
Private Sector	0.388	0.345	0.21		0.215	0.254	0.144	
	0.043[a]	*0.045[a]*	*0.048[a]*		*0.035[a]*	*0.038[a]*	*0.041[a]*	
WORKING REGION								
Working in Barcelona province				*Reference Category*				
Working in Tarragona province	-0.046	-0.067	-0.04		-0.005	0.003	0.018	
	0.06	*0.055*	*0.048*		*0.052*	*0.037*	*0.033*	
Working in Girona province	-0.07	-0.073	-0.077		-0.003	-0.003	0.003	
	0.053	*0.052*	*0.041[c]*		*0.057*	*0.058*	*0.064*	
Working in Lleida province	-0.039	-0.038	-0.059		-0.116	-0.11	-0.125	
	0.048	*0.046*	*0.044*		*0.055[b]*	*0.032[a]*	*0.037[a]*	
Working in the rest of Spain	0.026	0.01	-0.002		-0.027	0.009	-0.009	
	0.033	*0.035*	*0.028*		*0.043*	*0.039*	*0.038*	
Working in the EU	-0.149	-0.154	-0.137		-0.205	-0.11	-0.063	
	0.059[b]	*0.054[a]*	*0.058[b]*		*0.044[a]*	*0.047[b]*	*0.05*	
Working outside the EU	-0.123	-0.122	-0.049		-0.229	-0.154	-0.128	
	0.078	*0.084*	*0.083*		*0.052[a]*	*0.039[a]*	*0.047[a]*	
JOB ATTRIBUTES								
Current job tenure (in years/10)		-0.01	-0.014			0.568	0.543	
		0.028	*0.026*			*0.054[a]*	*0.053[a]*	
Permanent contract		0.012	-0.009			-0.036	-0.042	
		0.028	*0.024*			*0.025*	*0.019[b]*	
# Workers < 50				*Reference Category*				
50 < # Workers < 250		0.052	0.058			-0.04	-0.058	
		0.038	*0.034[c]*			*0.031*	*0.03[b]*	
250 < # Workers < 500		-0.112	-0.121			-0.126	-0.136	
		0.037[a]	*0.031[a]*			*0.046[a]*	*0.043[a]*	
# Workers > 500		-0.029	-0.018			-0.031	-0.031	
		0.037	*0.033*			*0.028*	*0.026*	
MAIN ACTIVITIES (OUSTIDE UNIVERSITY; NON-EXCLUDING)								
Direction			0.044				0.013	
			0.023[c]				*0.021*	
R&D			-0.304				-0.234	
			0.041[a]				*0.033[a]*	
Technical assistance			0.057				0.118	
			0.025[b]				*0.028[a]*	
Teaching			0.007				0.037	
			0.021				*0.033*	
Medical assistance			0.062				0.083	
			0.04				0.102	

Note: all the estimations include fixed effects for PhD type and university (not shown). Standard errors (in italic) are clustered at the PhD program level; [a] significant at 0.01%, [b] significant at 0.05%, [c] significant at 0.01%.The average marginal effect for indicator variables are average discrete changes in the predicted probabilities.

Table 3: Interval Regression for annual gross earnings (in logs)

Dependent Variable: Ln(annual earnings)	**Coefficient**	***S.E.***
Constant	9.595	*0.169****
MISMATCH VARIABLES		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.034	*0.089*
Overqualified but NOT Overskilled	-0.032	*0.028*
Overqualified and Overskilled	-0.121	*0.043****
SOCIODEMOGRAPHIC VARIABLES		
Female	-0.115	*0.021****
(Age at the job entry)/10	0.129	*0.043****
ACADEMIC VARIABLES		
Elapsed time between the degree and the PhD/10	-0.088	*0.047**
PhD funding: research fellowship	0.057	*0.066*
PhD funding: teaching or research	0.062	*0.066*
PhD funding: work related to the PHD	0.111	*0.063**
PhD funding: work not related to the PHD or other situations	*Reference Category*	
PhD duration > 6 years	-0.075	*0.036***
TYPE OF WORK		
University	*Reference Category*	
Research Center	0.029	*0.032*
Public Sector	0.065	*0.047*
Private Sector	0.14	*0.043****
WORKING REGION		
Working in Barcelona province	*Reference Category*	
Working in Tarragona province	0.066	*0.057*
Working in Girona province	0.009	*0.056*
Working in Lleida province	-0.054	*0.056*
Working in the rest of Spain	-0.091	*0.034****
Working in the EU	0.16	*0.037****
Working outside the EU	0.221	*0.051****
JOB ATTRIBUTES		
Current job tenure (in years/10)	0.17	*0.040****
Permanent contract	0.169	*0.028****
# Workers < 50	*Reference Category*	
50 < # Workers < 250	0.051	*0.046*
250 < # Workers < 500	0.155	*0.052****
# Workers > 500	0.148	*0.039****
MAIN ACTIVITIES (OUSTIDE UNIVERSITY; NON-EXCLUDING)		
Direction	0.11	*0.022****
R&D	0.015	*0.035*
Technical assistance	-0.007	*0.028*
Teaching	-0.023	*0.027*
Medical assistance	0.253	*0.057****

*Note: robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

Table 3 (continued): Interval Regression for annual gross earnings (in logs)

Dependent Variable: Ln(annual earnings)	**Coefficient**	***S.E.***
PHD TYPE		
Geography and Demography	-0.199	*0.086***
History. Philosophy and Arts	-0.139	*0.054****
Language. Linguistic and Literature	-0.216	*0.051****
Economics and Related Fields	0.129	*0.062***
Law and Related Fields	0.071	*0.097*
Sociology, Political Sciences and Communication	-0.189	*0.077***
Pedagogy and Education	-0.061	*0.064*
Psychology	0.093	*0.069*
Chemistry	0.073	*0.031***
Biology	*Reference Category*	
Environmental Studies	0.034	*0.043*
Mathematics	0.049	*0.051*
Physics	0.031	*0.08*
Medicine	0.091	*0.041***
Pharmacy	0.021	*0.067*
Veterinary	0.07	*0.094*
Architecture	-0.109	*0.139*
Civil, Nautical and Aeronautical Engineering	0.109	*0.079*
Production Engineering	0.093	*0.049**
Computers and Information Engineering	0.164	*0.041****
Agricultural Engineering	0.004	*0.116*
UNIVERSITY		
University of Barcelona (UB)	*Reference Category*	
Autonomous University of Barcelona (UAB)	-0.001	*0.023*
Polytechnic University of Catalonia (UPC)	0.04	*0.043*
Pompeu Fabra University (UPF)	0.159	*0.049****
University of Lleida (UdL)	-0.034	*0.061*
University of Girona (UdG)	-0.025	*0.061*
Rovira i Virgili University (URV)	-0.08	*0.068*
Pseudo R^2	0.331	
N	937	

*Note: robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

Table 4: Job Satisfaction Ordered Probits — average marginal effects (probability of being very satisfied)

	Coefficient	S.E.
PROMOTION OPPORTUNITIES		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.061	*0.04*
Overqualified but NOT Overskilled	-0.012	*0.021*
Overqualified and Overskilled	-0.038	*0.025**
EARNINGS		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.028	*0.028*
Overqualified but NOT Overskilled	0.009	*0.015*
Overqualified and Overskilled	-0.014	*0.018*
JOB CONTENT		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.266	*0.096****
Overqualified but NOT Overskilled	-0.072	*0.038**
Overqualified and Overskilled	-0.226	*0.042****
JOB-SKILL MATCH		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.259	*0.041****
Overqualified but NOT Overskilled	-0.101	*0.032****
Overqualified and Overskilled	-0.282	*0.028****
OVERALL JOB SATISFACTION		
Matched (PhD required and skills necessary)	*Reference Category*	
Overskilled but NOT Overqualified	-0.158	*0.048****
Overqualified but NOT Overskilled	-0.044	*0.029**
Overqualified and Overskilled	-0.102	*0.032****

*Note: each model includes controls for gender, age and age squared, elapsed time between the degree and the PhD, PhD-funding, PhD duration greater than six years, PhD type and university FE, type of job, job location, current job tenure, permanent contract, firm size, main activities and annual earnings categories. Complete estimates are reported in Table 2A in the Appendix. Robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

APPENDIX

Table 1A: descriptive statistics by mismatch status

	Total	Adequately Matched	Overskilled	Overqualified	Overskilled & Overqualified
SOCIODEMOGRAPHIC VARIABLES					
Female	0.485	0.439	0.569	0.516	0.558
Age	36.92	34.71	38.23	38.81	38.33
Age at the job entry	30.7	31.83	30.26	29.64	30.05
ACADEMIC VARIABLES					
Elapsed time between the degree and the PhD	3.789	2.803	4.659	4.624	4.719
PhD funding: research fellowship	0.616	0.823	0.493	0.441	0.485
PhD funding: teaching or research	0.132	0.091	0.076	0.161	0.062
PhD funding: work related to the PHD	0.199	0.071	0.330	0.310	0.346
PhD funding: work not related/other situations	0.054	0.016	0.101	0.088	0.108
PhD duration > 6 years	0.225	0.095	0.283	0.333	0.285
Extraordinary PhD prize	0.148	0.208	0.072	0.099	0.073
PhD thesis in English	0.277	0.370	0.159	0.202	0.158
PhD thesis within a research group	0.731	0.891	0.627	0.593	0.615
Participation to internal seminars	0.720	0.787	0.659	0.664	0.658
Participation to external conferences	0.894	0.947	0.819	0.849	0.812
PRE & POST DOCTORAL MOBILITY					
No pre-doctoral mobility	0.397	0.248	0.565	0.523	0.577
Pre-doctoral mobility in national centers	0.053	0.051	0.047	0.056	0.050
Pre-doctoral mobility in European centers	0.335	0.432	0.239	0.249	0.223
Pre-doctoral mobility in U.S. centers	0.138	0.193	0.087	0.092	0.085
Pre-doctoral mobility in other countries	0.077	0.075	0.062	0.080	0.065
No post-doctoral mobility	0.604	0.399	0.873	0.772	0.881
Post-doctoral mobility in national centers	0.056	0.080	0.022	0.037	0.023
Post-doctoral mobility in European centers	0.197	0.299	0.058	0.110	0.050
Post-doctoral mobility in U.S. centers	0.092	0.149	0.025	0.045	0.023
Post-doctoral mobility in other countries	0.052	0.073	0.022	0.036	0.023
TYPE OF WORK					
University	0.361	0.463	0.054	0.279	0.042
Research Center	0.209	0.348	0.043	0.095	0.042
Public Sector	0.175	0.022	0.442	0.307	0.465
Private Sector	0.255	0.166	0.460	0.320	0.450
WORKING REGION					
Working in Barcelona province	0.664	0.570	0.732	0.736	0.723
Working in Tarragona province	0.061	0.058	0.058	0.065	0.062
Working in Girona province	0.053	0.049	0.054	0.058	0.058
Working in Lleida province	0.030	0.029	0.040	0.032	0.042
Working in the rest of Spain	0.079	0.084	0.091	0.077	0.096
Working in the EU	0.068	0.124	0.011	0.021	0.008
Working outside the EU	0.046	0.086	0.014	0.011	0.012
JOB ATTRIBUTES					
Current job tenure (in years)	6.248	2.905	7.984	9.171	8.308
Permanent contract	0.441	0.271	0.743	0.576	0.742
# Workers < 50	0.129	0.086	0.217	0.161	0.215
50 < # Workers < 250	0.108	0.109	0.149	0.103	0.142
250 < # Workers < 500	0.044	0.060	0.025	0.030	0.023
# Workers > 500	0.720	0.745	0.609	0.707	0.619
MAIN ACTIVITY (OUSTIDE UNIVERSITY; NON-EXCLUDING)					
Direction	0.307	0.226	0.406	0.374	0.408
R&D	0.711	0.960	0.236	0.505	0.215
Technical assistance	0.183	0.109	0.297	0.247	0.308
Teaching	0.458	0.386	0.399	0.521	0.400
Medical assistance	0.085	0.004	0.207	0.153	0.215

Table 1A (continued): descriptive statistics by mismatch status

	Total	Adequately Matched	Overskilled	Overqualified	Overskilled & Overqualified
PHD TYPE					
Geography and Demography	0.011	0.018	0.007	0.006	0.008
History. Philosophy and Arts	0.054	0.040	0.080	0.067	0.085
Language. Linguistic and Literature	0.042	0.013	0.051	0.065	0.050
Economics and Related Fields	0.032	0.020	0.029	0.043	0.031
Law and Related Fields	0.017	0.009	0.025	0.022	0.023
Sociology, Political Sciences and Communication	0.023	0.022	0.011	0.024	0.012
Pedagogy and Education	0.032	0.009	0.043	0.050	0.042
Psychology	0.020	0.004	0.033	0.034	0.035
Chemistry	0.120	0.177	0.091	0.067	0.081
Biology	0.175	0.244	0.145	0.112	0.135
Environmental Studies	0.053	0.071	0.051	0.037	0.050
Mathematics	0.044	0.062	0.033	0.030	0.035
Physics	0.018	0.018	0.018	0.017	0.015
Medicine	0.112	0.051	0.199	0.166	0.212
Pharmacy	0.031	0.027	0.040	0.036	0.042
Veterinary	0.021	0.013	0.036	0.028	0.038
Architecture	0.015	0.002	0.011	0.026	0.012
Civil, Nautical and Aeronautical Engineering	0.020	0.022	0.011	0.019	0.012
Production Engineering	0.060	0.069	0.040	0.054	0.042
Computers and Information Engineering	0.087	0.086	0.040	0.086	0.035
Agricultural Engineering	0.015	0.022	0.007	0.009	0.008
UNIVERSITY					
University of Barcelona (UB)	0.399	0.406	0.464	0.389	0.458
Autonomous University of Barcelona (UAB)	0.293	0.299	0.297	0.288	0.296
Polytechnic University of Catalonia (UPC)	0.148	0.133	0.091	0.164	0.096
Pompeu Fabra University (UPF)	0.036	0.035	0.025	0.036	0.023
University of Lleida (UdL)	0.041	0.042	0.036	0.039	0.035
University of Girona (UdG)	0.034	0.038	0.040	0.032	0.042
Rovira i Virgili University (URV)	0.049	0.047	0.047	0.052	0.050
GROSS ANNUAL EARNINGS					
Annual earnings < 18.000 €	0.034	0.018	0.047	0.049	0.050
Annual earnings between 18.000 € and 24.000 €	0.132	0.137	0.134	0.127	0.135
Annual earnings between 24.000 € and 30.000 €	0.244	0.288	0.214	0.207	0.215
Annual earnings between 30.000 € and 40.000 €	0.334	0.390	0.275	0.286	0.269
Annual earnings between 40.000 € and 50.000 €	0.095	0.086	0.080	0.105	0.085
Annual earnings > 50.000 €	0.097	0.053	0.156	0.133	0.158
Missing annual earnings	0.065	0.027	0.094	0.093	0.088
JOB SATISFACTION VARIABLES					
Promotion Opportunities	6.020	6.119	5.667	5.960	5.690
Earnings	4.792	4.777	4.719	4.807	4.718
Job Content	4.789	4.822	4.715	4.761	4.710
Job-Skill Match	5.200	5.907	3.678	4.651	3.651
Overall Job Satisfaction	5.674	5.768	5.401	5.617	5.425

Table 2A: job satisfaction equations (ordered probit)

Dependent variable: satisfaction with	promotion opportunities	earnings	job content	job-skills match	job as a whole
MISMATCH VARIABLES					
Matched (PhD required and skills necessary)			*Reference Category*		
Overskilled but NOT Overqualified	-0.339	-0.218	-0.839	-1.143	-0.765
	(0.260)	*(0.242)*	*(0.381)***	*(0.303)****	*(0.339)***
Overqualified but NOT Overskilled	-0.057	0.061	-0.201	-0.326	-0.166
	(0.103)	*(0.101)*	*(0.107)**	*(0.103)****	*(0.111)*
Overqualified and Overskilled	-0.195	-0.099	-0.685	-1.389	-0.423
	(0.131)	*(0.136)*	*(0.140)****	*(0.142)****	*(0.137)****
SOCIODEMOGRAPHIC VARIABLES					
Female	-0.005	0.129	0.140	0.124	0.132
	(0.076)	*(0.075)**	*(0.080)**	*(0.076)*	*(0.076)**
Age/10	-0.216	0.905	1.010	0.341	0.243
	(0.977)	*(0.850)*	*(0.919)*	*(0.855)*	*(0.983)*
$(Age/10)^2$	-0.005	-0.118	-0.154	-0.061	-0.062
	(0.120)	*(0.105)*	*(0.114)*	*(0.103)*	*(0.122)*
ACADEMIC VARIABLES					
Elapsed time between the degree and the PhD/10	0.003	-0.231	0.238	-0.025	0.252
	(0.156)	*(0.166)*	*(0.182)*	*(0.165)*	*(0.178)*
PhD funding: research fellowship			*Reference Category*		
PhD funding: teaching or research	-0.022	0.178	-0.237	0.126	-0.169
	(0.180)	*(0.192)*	*(0.197)*	*(0.195)*	*(0.195)*
PhD funding: work related to the PHD	0.121	0.166	0.146	0.044	0.077
	(0.194)	*(0.201)*	*(0.210)*	*(0.208)*	*(0.205)*
PhD funding: work not related to the PHD or other situations	0.113	-0.019	0.020	0.037	-0.085
	(0.184)	*(0.192)*	*(0.191)*	*(0.194)*	*(0.193)*
PhD duration > 6 years	0.101	-0.078	-0.091	0.025	0.013
	(0.121)	*(0.122)*	*(0.133)*	*(0.126)*	*(0.133)*
TYPE OF WORK					
University			*Reference Category*		
Research Center	-0.139	0.060	0.171	0.187	0.049
	(0.130)	*(0.132)*	*(0.137)*	*(0.128)*	*(0.130)*
Public Sector	-0.220	-0.130	0.049	-0.277	-0.094
	(0.159)	*(0.156)*	*(0.173)*	*(0.171)*	*(0.168)*
Private Sector	0.090	0.041	-0.025	-0.357	-0.055
	(0.162)	*(0.153)*	*(0.163)*	*(0.163)***	*(0.161)*
WORKING REGION					
Working in Barcelona province			*Reference Category*		
Working in Tarragona province	0.203	-0.173	-0.025	-0.123	-0.069
	(0.180)	*(0.205)*	*(0.198)*	*(0.201)*	*(0.207)*
Working in Girona province	-0.245	-0.278	0.143	-0.129	0.022
	(0.194)	*(0.222)*	*(0.173)*	*(0.183)*	*(0.192)*
Working in Lleida province	0.307	0.520	-0.206	0.444	0.113
	(0.283)	*(0.211)***	*(0.252)*	*(0.289)*	*(0.266)*
Working in the rest of Spain	-0.045	-0.121	-0.313	0.126	-0.354
	(0.142)	*(0.136)*	*(0.148)***	*(0.136)*	*(0.141)***
Working in the EU	0.645	0.794	0.147	0.131	0.418
	*(0.170)****	*(0.160)****	*(0.161)*	*(0.164)*	*(0.148)****
Working outside the EU	0.191	0.429	0.181	-0.041	0.343
	(0.209)	*(0.177)***	*(0.179)*	*(0.168)*	*(0.171)***

*Robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

Table 2A: job satisfaction equations (ordered probit)

Dependent variable: satisfaction with	promotion opportunities	earnings	job content	job-skills match	job as a whole
JOB ATTRIBUTES					
Current job tenure (in years/10)	-0.186	0.022	0.085	0.197	0.062
	*(0.092)***	*(0.100)*	*(0.106)*	*(0.099)***	*(0.110)*
Permanent contract	0.073	0.041	-0.088	-0.108	-0.133
	(0.100)	*(0.099)*	*(0.109)*	*(0.102)*	*(0.102)*
# Workers < 50			*Reference Category*		
50 < # Workers < 250	-0.235	-0.089	-0.317	-0.304	-0.335
	(0.152)	*(0.147)*	*(0.152)***	*(0.158)**	*(0.143)***
250 < # Workers < 500	-0.264	0.037	-0.322	-0.330	-0.224
	(0.199)	*(0.211)*	*(0.199)*	*(0.216)*	*(0.204)*
# Workers > 500	-0.325	-0.021	-0.104	-0.214	-0.214
	*(0.139)***	*(0.137)*	*(0.142)*	*(0.141)*	*(0.127)**
MAIN ACTIVITIES (OUSTIDE UNIVERSITY; NON-EXCLUDING)					
Direction	0.201	0.103	0.330	0.104	0.298
	*(0.084)***	*(0.085)*	*(0.089)****	*(0.086)*	*(0.089)****
R&D	-0.027	-0.301	-0.000	0.125	-0.063
	(0.105)	*(0.111)****	*(0.125)*	*(0.115)*	*(0.116)*
Technical assistance	-0.060	-0.151	-0.063	-0.124	-0.196
	(0.100)	*(0.098)*	*(0.104)*	*(0.103)*	*(0.103)**
Teaching	0.149	-0.002	0.097	0.064	0.154
	(0.092)	*(0.091)*	*(0.094)*	*(0.088)*	*(0.094)*
Medical assistance	0.449	-0.293	0.466	0.499	0.324
	*(0.204)***	*(0.201)*	*(0.218)***	*(0.197)***	*(0.202)*
ANNUAL EARNINGS					
Annual earnings < 18.000 €			*Reference Category*		
Annual earnings between 18.000 € and 24.000 €	0.044	0.159	-0.072	-0.086	-0.192
	(0.255)	*(0.240)*	*(0.254)*	*(0.235)*	*(0.258)*
Annual earnings between 24.000 € and 30.000 €	0.207	0.273	0.014	-0.031	-0.019
	(0.246)	*(0.230)*	*(0.235)*	*(0.226)*	*(0.246)*
Annual earnings between 30.000 € and 40.000 €	0.313	0.634	-0.071	-0.083	-0.043
	(0.244)	*(0.232)****	*(0.234)*	*(0.222)*	*(0.242)*
Annual earnings between 40.000 € and 50.000 €	0.808	1.253	0.110	0.025	0.319
	*(0.262)****	*(0.249)****	*(0.263)*	*(0.245)*	*(0.262)*
Annual earnings > 50.000 €	0.618	1.309	0.243	0.153	0.205
	*(0.268)***	*(0.258)****	*(0.264)*	*(0.255)*	*(0.269)*
Missing annual earnings	0.436	0.681	-0.156	-0.144	-0.150
	(0.277)	*(0.263)****	*(0.284)*	*(0.254)*	*(0.287)*

*Robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

Table 2A (continued): job satisfaction equations (ordered probit)

Dependent variable: satisfaction with	promotion opportunities	earnings	job content	job-skills match	job as a whole
JOB ATTRIBUTES					
Current job tenure (in years/10)	-0.186	0.022	0.085	0.197	0.062
	*(0.092)***	*(0.100)*	*(0.106)*	*(0.099)***	*(0.110)*
Permanent contract	0.073	0.041	-0.088	-0.108	-0.133
	(0.100)	*(0.099)*	*(0.109)*	*(0.102)*	*(0.102)*
# Workers < 50			*Reference Category*		
50 < # Workers < 250	-0.235	-0.089	-0.317	-0.304	-0.335
	(0.152)	*(0.147)*	*(0.152)***	*(0.158)**	*(0.143)***
250 < # Workers < 500	-0.264	0.037	-0.322	-0.330	-0.224
	(0.199)	*(0.211)*	*(0.199)*	*(0.216)*	*(0.204)*
# Workers > 500	-0.325	-0.021	-0.104	-0.214	-0.214
	*(0.139)***	*(0.137)*	*(0.142)*	*(0.141)*	*(0.127)**
MAIN ACTIVITIES (OUSTIDE UNIVERSITY; NON-EXCLUDING)					
Direction	0.201	0.103	0.330	0.104	0.298
	*(0.084)***	*(0.085)*	*(0.089)****	*(0.086)*	*(0.089)****
R&D	-0.027	-0.301	-0.000	0.125	-0.063
	(0.105)	*(0.111)****	*(0.125)*	*(0.115)*	*(0.116)*
Technical assistance	-0.060	-0.151	-0.063	-0.124	-0.196
	(0.100)	*(0.098)*	*(0.104)*	*(0.103)*	*(0.103)**
Teaching	0.149	-0.002	0.097	0.064	0.154
	(0.092)	*(0.091)*	*(0.094)*	*(0.088)*	*(0.094)*
Medical assistance	0.449	-0.293	0.466	0.499	0.324
	*(0.204)***	*(0.201)*	*(0.218)***	*(0.197)***	*(0.202)*
ANNUAL EARNINGS					
Annual earnings < 18.000 €			*Reference Category*		
Annual earnings between 18.000 € and 24.000 €	0.044	0.159	-0.072	-0.086	-0.192
	(0.255)	*(0.240)*	*(0.254)*	*(0.235)*	*(0.258)*
Annual earnings between 24.000 € and 30.000 €	0.207	0.273	0.014	-0.031	-0.019
	(0.246)	*(0.230)*	*(0.235)*	*(0.226)*	*(0.246)*
Annual earnings between 30.000 € and 40.000 €	0.313	0.634	-0.071	-0.083	-0.043
	(0.244)	*(0.232)****	*(0.234)*	*(0.222)*	*(0.242)*
Annual earnings between 40.000 € and 50.000 €	0.808	1.253	0.110	0.025	0.319
	*(0.262)****	*(0.249)****	*(0.263)*	*(0.245)*	*(0.262)*
Annual earnings > 50.000 €	0.618	1.309	0.243	0.153	0.205
	*(0.268)***	*(0.258)****	*(0.264)*	*(0.255)*	*(0.269)*
Missing annual earnings	0.436	0.681	-0.156	-0.144	-0.150
	(0.277)	*(0.263)****	*(0.284)*	*(0.254)*	*(0.287)*
PHD TYPE					
Geography and Demography	0.230	0.322	0.058	0.319	0.346
	(0.269)	*(0.399)*	*(0.344)*	*(0.384)*	*(0.264)*
History. Philosophy and Arts	0.192	0.333	0.224	-0.191	0.248
	(0.185)	*(0.185)**	*(0.206)*	*(0.205)*	*(0.200)*
Language. Linguistic and Literature	0.282	0.216	0.552	0.230	0.427
	(0.219)	*(0.202)*	*(0.254)***	*(0.201)*	*(0.241)**
Economics and Related Fields	0.388	-0.003	0.052	0.101	0.170
	*(0.221)**	*(0.180)*	*(0.192)*	*(0.202)*	*(0.202)*
Law and Related Fields	0.964	0.250	0.295	0.416	0.291
	*(0.258)****	*(0.293)*	*(0.299)*	*(0.272)*	*(0.293)*
Sociology, Political Sciences and Communication	0.615	0.267	0.260	0.208	0.208
	*(0.250)***	*(0.254)*	*(0.300)*	*(0.262)*	*(0.282)*
Pedagogy and Education	0.897	0.217	0.530	0.273	0.221
	*(0.238)****	*(0.232)*	*(0.297)**	*(0.258)*	*(0.284)*
Psychology	1.089	0.349	0.746	-0.057	0.631
	*(0.246)****	*(0.264)*	*(0.260)****	*(0.285)*	*(0.315)***

*Robust standard errors in italic; * significant at 0.1%, **significant at 0.05%, *** significant at 0.01%.*

Table 2A (continued): job satisfaction equations (ordered probit)

Dependent variable: satisfaction with	promotion opportunities	earnings	job content	job-skills match	job as a whole
PHD TYPE					
Chemistry	0.010	-0.108	-0.105	0.071	-0.066
	(0.135)	*(0.126)*	*(0.133)*	*(0.120)*	*(0.134)*
Biology			*Reference Category*		
Environmental Studies	0.064	-0.007	-0.090	0.205	0.036
	(0.176)	*(0.184)*	*(0.194)*	*(0.177)*	*(0.191)*
Mathematics	-0.088	0.267	-0.212	-0.135	-0.314
	(0.198)	*(0.206)*	*(0.189)*	*(0.189)*	*(0.166)**
Physics	0.423	-0.440	0.557	0.257	0.182
	(0.329)	*(0.303)*	*(0.347)*	*(0.278)*	*(0.327)*
Medicine	0.171	-0.123	0.032	-0.036	-0.036
	(0.161)	*(0.170)*	*(0.181)*	*(0.162)*	*(0.170)*
Pharmacy	0.321	-0.043	0.269	-0.088	0.062
	(0.230)	*(0.234)*	*(0.220)*	*(0.238)*	*(0.221)*
Veterinary	0.209	0.064	-0.059	-0.155	0.304
	(0.342)	*(0.247)*	*(0.252)*	*(0.302)*	*(0.266)*
Architecture	0.716	-0.141	0.418	0.699	0.275
	*(0.365)***	*(0.380)*	*(0.472)*	*(0.363)**	*(0.428)*
Civil, Nautical and Aeronautical Engineering	0.108	-0.098	-0.006	0.434	0.049
	(0.282)	*(0.287)*	*(0.261)*	*(0.274)*	*(0.257)*
Production Engineering	0.047	-0.015	-0.035	0.174	-0.177
	(0.203)	*(0.205)*	*(0.205)*	*(0.217)*	*(0.201)*
Computers and Information Engineering	-0.002	-0.290	0.067	0.419	0.021
	(0.168)	*(0.173)**	*(0.171)*	*(0.184)***	*(0.171)*
Agricultural Engineering	-0.241	-0.213	0.839	0.288	-0.310
	(0.414)	*(0.366)*	*(0.471)**	*(0.412)*	*(0.475)*
UNIVERSITY					
University of Barcelona (UB)			*Reference Category*		
Autonomous University of Barcelona (UAB)	0.143	-0.029	0.048	0.008	0.071
	(0.088)	*(0.092)*	*(0.094)*	*(0.090)*	*(0.094)*
Polytechnic University of Catalonia (UPC)	0.132	-0.052	0.203	-0.285	0.199
	(0.164)	*(0.170)*	*(0.176)*	*(0.177)*	*(0.166)*
Pompeu Fabra University (UPF)	0.013	0.212	-0.084	-0.088	0.019
	(0.177)	*(0.201)*	*(0.229)*	*(0.186)*	*(0.223)*
University of Lleida (UdL)	0.568	0.460	0.156	0.093	0.670
	*(0.226)***	*(0.251)**	*(0.194)*	*(0.223)*	*(0.232)****
University of Girona (UdG)	0.709	0.130	0.109	-0.482	0.614
	*(0.318)***	*(0.255)*	*(0.342)*	*(0.329)*	*(0.344)**
Rovira i Virgili University (URV)	0.388	0.072	0.438	-0.228	0.544
	(0.245)	*(0.244)*	*(0.247)**	*(0.247)*	*(0.242)***
CUT POINTS					
Cut point 1	-2.257	0.040	-1.835	-2.081	-3.050
	(2.016)	*(1.756)*	*(1.933)*	*(1.811)*	*(2.008)*
Cut point 2	-1.814	0.625	-0.908	-1.694	-2.615
	(2.015)	*(1.757)*	*(1.913)*	*(1.807)*	*(1.998)*
Cut point 3	-1.375	1.178	-0.547	-1.277	-1.919
	(2.013)	*(1.757)*	*(1.899)*	*(1.803)*	*(1.996)*
Cut point 4	-0.895	1.794	0.005	-0.741	-1.260
	(2.012)	*(1.756)*	*(1.901)*	*(1.804)*	*(2.000)*
Cut point 5	-0.129	2.648	0.837	-0.015	-0.486
	(2.012)	*(1.755)*	*(1.901)*	*(1.804)*	*(2.001)*
Cut point 6	0.726	3.707	1.980	1.017	0.925
	(2.010)	*(1.755)***	*(1.903)*	*(1.805)*	*(2.003)*
Pseudo R^2	0.179	0.181	0.210	0.372	0.160
N	958	965	965	964	964