

# EXAMINING JOB SATISFACTION AMONG RECENT PHD GRADUATES: EVIDENCE FROM CATALONIA

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**[PRELIMINARY DRAFT, DO NOT QUOTE]**

## **Abstract:**

In this paper we examined job satisfaction of recent PhD recipients, using data from two successive graduating cohorts from the seven public universities in Catalonia (a region of Spain). Our contribution to the growing literature concerning with job satisfaction of the highly educated is twofold. First, we examined the determinants of satisfaction with job content, with promotion possibilities, with earnings and with the match between the acquired skills and the job. The results indicate that the sector of employment and the type of work are strongly related to satisfaction with job content and with job-skill match. Moreover, qualification-skill mismatch has a significant and negative effect on these two domains of the job, even controlling for job characteristics. Second, we expressed the overall level of job satisfaction as an aggregate of satisfaction with the various domains of the job. It seems that the most important feature of the job is its content, whereas the monetary remuneration plays a limited role in generating job satisfaction among PhD recipients.

**JEL classifications: C23, C25, I31**

**Keywords: job satisfaction, PhD recipients, job domains, Catalonia**

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## **1. Introduction**

This paper focuses on the analysis of job satisfaction among PhD's recipients from several disciplines. It adds more evidences to the growing literature concerning the determinants of the level of utility perceived from the job, among this particular group of highly educated workers. In general, studying job satisfaction is useful, especially because higher job satisfaction usually means better performance at work (Hamermesh 1997). Moreover, job satisfaction can be considered a subjective and multidimensional measure of job quality. Several researchers have focused on the effect of specific characteristics of the individual on job satisfaction. For example, Clark & Oswald (1996) and Groot & van den Brink (1999) studied the relationship between age and job satisfaction, highlighting a U-shaped relationship. Other papers tried to examine the

complex impact of gender on job satisfaction (see, Clark 1997, Sousa-Posa & Sousa-Posa 2003, Kaiser 2005). Also the effect of job characteristics on satisfaction with work has been extensively investigated in the literature. For example, Bryson et al. (2010) look at the effect of unionization on job satisfaction, also taking into account selection effects. García-Serrano (2011) focused on the effect of firm size, which seems to be detrimental for job satisfaction via its effect on working environment.

An increasing number of contributions focus on specific group of workers, such as university graduates. Looking at job satisfaction for this very specific group of workers has two main appealing features. First of all, by considering only individuals who carried out a similar (and high) investment in human capital, we are able to avoid dealing with the complex relationship between education and self-reported satisfaction<sup>1</sup>. Also, the homogeneity of the sample helps us to reduce the potential bias due to the existence of unobserved determinants of job satisfaction. Among others, Mora & Ferrer-i-Carbonell (2009) revisited the gender gap in job satisfaction among a sample of recent university graduates from the seven public universities in Catalonia (a Spanish region). Another topic that has been intensively studied among university graduates is the effect of qualification/skill mismatch on job satisfaction, mainly focused on the United Kingdom (see McGuinness & Sloane 2011 or Green and Zhu 2010, among others). However, recent university graduates are not the only specific group of workers that has been considered in the literature about job satisfaction. Indeed, a reduced but growing number of works consider the situation of PhD graduates, especially in the US or in the UK (see Ward & Sloane 2000, 2001; Bender & Heywood 2006, 2009).

As we briefly introduced before, with this paper we provide more and recent evidence about job satisfaction among PhD recipients. We draw from two successive samples of doctoral graduates, who completed their studies during the period 2003/2004 and 2006/2007, respectively, in any of the seven public universities in Catalonia (Spain). The specific contribution of this paper to the existing literature is twofold: first, the our analysis provides information about whether and how individual characteristics, PhD-related aspects and several (general and specific) job features affect satisfaction with each domain of the job PhD workers. Second, we consider the overall job satisfaction as an aggregate of satisfaction with four main facets of the job — namely, with work

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<sup>1</sup> Previous literature suggested a negative impact of education on job satisfaction, whereas there is still not a unified consensus about whether this relationship comes from the expectations/aspiration channel or it is just the result of neglected individual heterogeneity.

content, promotion possibilities, earnings and job-skills (mis)match. Thus, we are thus able to determine the weight attached to each job domain, in terms of its contribution to the overall level of utility derived from the job. In the rest of the paper we proceed as follows: section 2 describes the data that we use in the empirical analysis, also providing some descriptive evidence. Section 3 illustrates the empirical methodology. Section 4 contains the results obtained from our empirical analysis and section 5 concludes.

## 2. Description of the Data

The data that we use in the empirical analysis are taken from two successive surveys conducted by the *Agència per la Qualitat del Sistema Universitari de Catalunya* (Quality Assurance Agency for the University System in Catalonia, AQU). The surveys were carried out in 2008 and 2011 and were directed to all the Spanish-born individuals who completed their PhD in the seven Catalan public universities during the academic year 2003/2004 for the first wave of 2008 and during the academic year 2006/2007 for the 2011's wave. The entire population (i.e. Spanish-born individuals who obtained the PhD during the two reference periods) consists in 1,611 and (XXX) individuals for the first and the second wave respectively. The questionnaire was correctly completed by 934 (1,225), which means that the average response rate was 58% (XXX). Even if this response rate is fairly high for this type of surveys, we carried out additional analysis using the original registers (available for the entire population), in order to check for potential attrition bias. Overall, the results indicate that the available sample can be reasonably considered representative of these two PhD's graduating cohorts from the Catalan public universities. We restrict the sample to those individuals who were regularly employed when the survey was carried out and were aged 65 or less. After cleaning for missing observation of our main variables of interest<sup>2</sup>, we end up with a pooled sample of 2,040 individuals.

The final aim of the survey was to examine the labour market situation of doctorate recipients after 4-5 years after obtaining the PhD (i.e. during 2008 and 2011 for the two graduating cohorts, respectively). The data set contains basic socio-demographic

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<sup>2</sup> We eliminate all the observation with no information regarding overall job satisfaction and satisfaction with job domains, because these are the dependent variables in our empirical analysis. Notice that the question about job satisfaction is not provided for unemployed individuals (3.8% of the pooled sample) and some individual provided no valid answer to at least one of the five questions about job satisfaction (1.4%).

information, detailed information about current or past job characteristics, as well as other elements concerning the doctorate programme. Our main interest relies on the questions about job satisfaction, which is defined upon a discrete scale of seven points (where the value of 1 stands for completely unsatisfied and the value of 7 for completely satisfied). Individuals were asked to rate their overall job satisfaction, as well as their satisfaction with four specific domains of the job: satisfaction with work content, with promotion possibilities, with earnings and with connection between the acquired skills and the occupation. Table 1 contains some basic descriptive statistics regarding these variables.

**Table 1: job satisfaction and its dimensions**

	<i>Overall Job Satisfaction</i>	<i>Job Content</i>	<i>Promotion Opportunities</i>	<i>Earnings</i>	<i>Job-Skill Match</i>
<b>Cohort 2008</b>					
<b>Mean</b>	5.547	5.841	4.778	4.629	4.945
<b>Standard Deviation</b>	1.144	1.088	1.646	1.434	1.714
<b>Cohort 2011</b>					
<b>Mean</b>	5.633	5.984	4.725	4.686	5.113
<b>Standard Deviation</b>	1.064	1.034	1.655	1.491	1.705
<b>Pooled Sample (2008-2011)</b>					
<b>Mean</b>	5.596	5.922	4.749	4.661	5.040
<b>Standard Deviation</b>	1.100	1.060	1.651	1.466	1.710

In general, it seems that PhD recipients from the two graduating cohorts are quite satisfied with their working situation in 2008 and 2011 respectively, given that the average rating of the overall job satisfaction is more than 1.5 points higher than the value on the middle of the scale (i.e. the value of 4). However, we observe a substantial heterogeneity when different dimensions of the job are considered in a separate fashion. Indeed, self-reported satisfaction is particularly higher for the job content domain, suggesting that the main benefit of doing a doctorate consists in achieving an appealing work in terms of its contents. In contrast, the degree of satisfaction with other domains is quite lower, indicating that PhD graduates from Catalan universities are not so happy with the match between their job and the acquired skills, with the prospects of improving their occupational position and, especially, with the monetary remuneration they get from their job. Overall, there are just minor differences in job satisfactions across the two cohorts, which seem to be somewhat higher among doctors from the 2006/2007 graduating cohort (especially with respect to job content and job-skill match).

Even so, our following empirical analysis is based on the pooled sample, because the analysis of changes across the cohorts is out of the purposes of this paper.

As we mentioned before, one of the aims of our work is to explain the perceived job domain satisfactions as a function of their observed determinants. Therefore, the first step of the empirical analysis consists in estimating a model that relates the job domain satisfactions to objective job's features and other related variables. Indeed, this enables analyzing whether and how different objective elements regarding socio-demographic characteristics, aspects of the PhD and job characteristics affect the subjective evaluations about job domains. The variables that we include in the econometric model (see Table 1A in the Appendix for details) provide also a general description of the pooled sample from the 2003/2004 and 2006/2007 graduating cohorts of PhDs from the Catalan public universities.

The descriptive statistics indicate that somewhat less than one half of the samples from the two graduating cohorts are composed by females and the average age is about 39. More than the 50% of PhD graduates from the two cohorts had a research fellowship during his/her PhD and the time-to-degree is higher than 6 years for somewhat less than the 30% of the pooled sample. As expected, pure science is the most represented area of study in our sample (mostly composed by doctors in biology), followed by medical sciences, social sciences, technical sciences and humanities. The 44% of doctors proceed from the University of Barcelona (UB), which is the largest one in terms of matriculation and supply of PhD programs.

The descriptive statistics of working-related variables indicate that four or five years after graduating job tenure is, on average, about eight years, meaning that entering the current job before completing the PhD is quite usual among recent doctors from the Catalan public universities. Somewhat less than the 60% of them have a permanent contract, but having a fixed-term contract with more than one year of duration is very frequent (25%). Almost the 93% of our sample of doctors work full time and the 67% of them work in a large institution (in terms of the total number of employees). The distribution of gross annual earnings (recorded in brackets) is mostly concentrated between 24,000 and 30,000 Euros (about 25%) and between 30,000 and 40,000 Euros (about 30%), whereas there is a significant proportion of doctors that earn more than 50,000 Euros per year (11%).

The academy is the main sector of employment for PhDs (36% of the pooled sample), where the most common positions some years after obtaining the title of doctor

are university reader or tenured professor. However, a substantial proportion of PhD recipients work outside the university: they end up working in research institutions (19%), in the public sector (20%) and in the private sector (25%), where the last sector is becoming a common alternative for PhD graduates, especially for those proceeding from pure sciences or technical disciplines. We also consider the information about which type of degree was required for entering the current job, distinguishing between the PhD, the specific undergraduate degree, any undergraduate degree or none, respectively — which can be taken as a broad proxy of educational mismatch<sup>3</sup> among doctors. The data reveal that the incidence of educational mismatch among doctors is notably high, given that only the 39% of our sample work in occupation that require the PhD qualification. Indeed, the most frequent situation among doctors from the Catalan public universities is working in occupations that just call for the (previous) specific undergraduate degree.

Finally, we also dispose of information about the geographical localization of the working place some year after completing the PhD. It appears that almost the 70% of the sample work in the province of Barcelona, which is the result of the higher demand of highly qualified workers with respect to the rest of Catalonia, together with a relatively low degree of geographical mobility of doctors from the Catalan universities. Indeed, 4-5 years after achieving the PhD, only the 7.4% of doctors is working in other Spanish regions (which are probably Spaniards who moved to Catalonia for studying the PhD) and the 8.2% of the sample is working outside Spain.

Apart from analyzing the determinants of the perceived satisfaction with the four facets of the job considered in the survey, the second objective of this paper consists in examining the relationship between job domain satisfactions and the overall job satisfaction. The main idea is that the judgment that workers have about how well they feel with their working situation as a whole, represents an aggregate of the perceived satisfaction with the most relevant aspects of the job. The pairwise correlations between overall job satisfaction and satisfaction with the four job domains (job content, promotion possibilities, earnings and job-skills match) give us a broad picture of how different features of the job contribute to generate the global perception about well-being with the job as a whole.

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<sup>3</sup> We are aware about the limitation of this educational mismatch variable, which is defined only with respect to educational certificates requirement, without considering the role of skills or qualification requirements at the working place (which seem to be what really matter for job satisfaction).

**Table 2: Pairwise Correlation Coefficients between Job Domain Satisfactions (Pooled Sample)**

	<i>Overall Job Satisfaction</i>	<i>Job Content</i>	<i>Promotion Opportunities</i>	<i>Earnings</i>	<i>Job-Skill Match</i>
<i>Overall Job Satisfaction</i>	1				
<i>Job Content</i>	0.709*	1			
<i>Promotion Opportunities</i>	0.498*	0.407*	1		
<i>Earnings</i>	0.372*	0.29*	0.485*	1	
<i>Job-Skill Match</i>	0.442*	0.426*	0.255*	0.175*	1

\*Significant at 0.01%

As shown in Table 2, satisfaction with job content displays the highest correlation with the overall job satisfaction, meaning that this feature might be the most important element that workers (or at least those with PhD) consider when they evaluate their working situation. The correlation with the domains of job content and job-skill match is somewhat lower, but it is always statistical significant and important in terms of magnitudes. It appears that this group of highly educated workers not only assign a lower rating to their satisfaction with earnings, but also that this specific aspect of the job is less correlated with the overall evaluation of their working situation. Overall, it might be that, among PhD recipients, monetary remuneration is not so important in generating the utility level they derive from the job, especially if compared with other elements that characterise their working situation.

In any case, it seems worth notice that these simple correlations might be confounded by the existing statistical association among the four job satisfaction domains reported by the individual. Indeed, the correlation between satisfactions with the four facets of the job is always positive and statistically significant. This claims for the use of partial correlation, for example, by means of regression models for explaining the overall job satisfaction as a function of the reported satisfaction with these specific aspects of the job. However, as we explain in the next section, partial correlations might also be misleading, because of the presence of common individual traits (unobserved to the econometrician) that are likely to influence in a similar way the several self-reported evaluations — i.e. and endogeneity problem.

### 3. Empirical Methodology

The empirical analysis used in this paper follows the original proposal by van Praag et al. (2003), which were aimed at examining overall life satisfaction as an aggregate of several life-domain satisfactions, such as job, health financial satisfaction and so on. Such methodology has been also applied to the analysis of job satisfaction, for example by de Graaf-Zijl (2005) or by Skalli et al. (2008). Specifically, the model assumes that the subjective perception about overall job satisfaction ( $JS$ ) is a multidimensional concept, which in turns depends on perceived satisfaction with the various domains of the job ( $JDS$ ). Job domain satisfactions ( $JDS$ ) are a function of a set of objective variables ( $X$ ), which capture (observable) individual and job characteristics. Moreover, there are latent individual traits (e.g. optimism) and other unobserved characteristics that may exert some influence on both overall satisfaction and job domain satisfaction. In formulae, this model for exploring the anatomy of job satisfaction takes the form,

$$JS = JS(JDS_1, JDS_2 \dots JDS_j; Z) \quad (1)$$

$$JDS_j = JDS_j(X_j; Z), \quad j = 1, \dots, J \quad (2)$$

Where  $X_j$  stands for the vector of objective elements that affect each job domain satisfaction ( $j$ ) and  $Z$  represents the vector of latent components. As briefly commented before, the unobservable nature of the vector  $Z$  implies that the estimation of the parameters that relate job domain satisfaction to the overall job satisfaction would be affected by endogeneity bias. In fact, the job domains satisfactions ( $JDS_j$ ) are correlated among them, but also with the error terms of the  $JS$  equation.

In order to obtain more reliable estimates of the weight that each job domain satisfaction has on the aggregate judgement about job satisfaction we proceed as follows. In the first step of our empirical analysis we estimate a system of equation by Seemingly Unrelated Regressions, for explaining the four domains satisfactions (work content, promotion possibilities, earnings and job-skill match) as a function of the previously-described objective explanatory variables — which represents the first aim of this paper. Notice that allowing for some arbitrary correlation among the error terms of the  $JDS_j$  equations would help to capture the presence of common unobserved elements ( $Z$ ) in the system. The residuals from this first-step estimation are then retained, in order to compute the part of the latent vector  $Z$  that is common to the four vectors of residuals. This is defined as the weighted sum of the four estimated residuals



( $Z^*$ ), where the weights are obtained from the first principal component of the *JDS* residuals' covariance matrix.

In the second step, we estimate the equation that explains the overall job satisfaction (*JS*) as a function of the four job domain satisfactions ( $JDS_j$ ), which now includes this surrogate latent variable ( $Z^*$ ):

$$JS = \mu + \alpha_1 JDS_1 + \alpha_2 JDS_2 + \alpha_3 JDS_3 + \alpha_4 JDS_4 + \phi Z^* + \varepsilon . \quad (3)$$

By including  $Z^*$  in equation (3) as an additional explanatory variable we may reasonably assume that the *JDS*s are no longer correlated with the error term of the *JS* equation, because it eliminates the covariance between the *JS* error and the *JDS* errors. This means that the coefficients  $\alpha_j$  can be taken as a consistent representation of the relative importance of each job domain satisfactions in generating the overall job satisfaction. This approach would provide an answer to our second empirical concern about the anatomy of job satisfaction among recent PhD graduates.

Some additional comment about the estimation procedure is needed to complete the description of our empirical strategy. First of all, it should be noted that the standard econometric framework adopted in this type of studies relies on individual random effect models with Mundlak-type corrections. This approach enables *i*) controlling for time-invariant individual unobserved characteristics and *ii*) distinguishing between permanent and transitory effects. Unfortunately, our cross-section data does not allow for this type of estimation procedure. Second, there is a concern in the literature about whether satisfaction variables can be taken as an ordinal or a cardinal representation of individual utility. In the former case, the Ordered Probit (or Logit) represents the most suitable econometric specification of the satisfaction equations. In this application we implicitly assume cardinality, given that all the equations are estimated through by linear regression models. Indeed, Ferrer-i-Carbonell and Frijters (2004) demonstrate that imposing cardinality or ordinality does not alter the overall results. Moreover, it avoids the cumbersome estimation of a system of correlated Ordered Probit equations. Finally, the *JDS* variables in equation (3) are exogenous explanatory variables that are categorically observed, which means that the correct approximation (without any adjustment) would consist in a dummy variables specification. As in van Praag et al. (2003), we use the methodology proposed by Terza (1987), through which the *JDS*

variables are transformed into ( $\ddot{JDS}_j$ ) in order to vary on the real axis<sup>4</sup>. This means that we are able to estimate the following linear model with continuous explanatory variables,

$$JS = \mu + \alpha_1 \ddot{JDS}_1 + \alpha_2 \ddot{JDS}_2 + \alpha_3 \ddot{JDS}_3 + \alpha_4 \ddot{JDS}_4 + \phi Z^* + \varepsilon, \quad (4)$$

without any need of including a large set of dummies into the *JS* equation.

## 4. Results

### 4.1 Job Domain Satisfaction Equations

Our econometric analysis of job satisfaction among PhD graduates begins with the estimation of the system of *JDS* equations by Seemingly Unrelated Regressions, using the pooled data from the 2008 and the 2011 waves of the AQU survey. As expected, the Breusch-Pagan test for independency of the *JDS* equations indicates that the unobserved determinants of job domain satisfactions are strongly correlated. Table 2 reports the estimated coefficients for the four equations. In general, the R-squared for the estimated equation is quite high (ranging from 0.142 to 0.292), which means that the objective variables included can explain a substantial proportion of job domains satisfactions variability. First of all, it should be noted that the coefficient associated to the year of the survey (year 2011) is positive and statistically different from zero only in the job content equation. This means that, conditional on the observed determinants of job domain satisfactions, doctors from the 2003/2004 are less satisfied with the content of their job with respect to doctors from the 2006/2007 graduating cohort in similar occupations. However, there are no significant cohort differences in satisfaction with the other domains.

As we introduced before, each equation includes individual characteristics, PhD-related controls<sup>5</sup> and several job characteristics as explanatory variables. By looking at

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<sup>4</sup> According to Terza (1987), our categorically observed job domain satisfactions are transformed into linear score such as:  $\ddot{JDS} = E(JDS \mid \theta_{m-1} < JDS \leq \theta_m)$ , where  $\theta_m$  are the normal quintile values of the original *JDS* variable (defined over with  $m$  categories) and  $\phi$  and  $\theta$  represent the normal density and distribution function respectively.

<sup>5</sup> Every equation includes PhD programme fixed effects (i.e. PhD type by University), which help to control for intrinsic characteristics of the PhD programme and other unobserved elements that are shared among individuals who did the same PhD and may exert some influence on job satisfaction. The obtained estimates are not shown for space

the estimated coefficients for individual characteristics, it emerges that female doctors are more satisfied than men in terms of work content. We also obtain a positive female coefficient in the earnings satisfaction equation, with a slightly significant coefficient, indicating that there are unobserved factors associated with the gender that make female doctors happier with their income (i.e. lower monetary expectations). The effect of age (in logs) is found to be negative and statistically significant only in the promotion possibilities equation. This means the evidence that we obtained for our sample of PhD graduates does not support the typical U-shaped relationship between age and job satisfaction<sup>6</sup>.

The coefficients of the selected proxies of performance during the PhD suggest that having a fellowship during the pre-doctoral research period makes people more satisfied with their earnings, but somewhat less satisfied with the content of their work. These evidences may indicate that those PhDs who had a fellowship during their studies have less earnings expectation but, at the same time, they are more exigent in terms of the tasks they have to do in their jobs. Moreover, people who took more than 6 years to get the PhD have a significantly lower level of satisfaction with the match between the acquired skills and their job. A potential explanation for this result could be that this group of doctor may share some attribute that make them more likely to get a job — even before completing the doctorate — where their skills are underutilised.

The estimates for general job characteristics reveal some interesting pattern. Once controlling for other factors, an increase in job-tenure decreases (linearly) satisfaction with promotion possibilities, indicating that the longer permanence within the same position/occupation, the lower the aspiration of achieving a better position within the same job. Comparing to doctors with a fixed-term contract of less than one year, having a permanent contract has a positive effect on satisfaction with promotion possibilities, whereas it reduces satisfaction with the job-skill match. This result suggests that those doctors who are in stable working situation have better expectation about their future professional career, but are also those who get worse jobs in terms of applicability of the knowledge they got during the PhD. Additionally, self-employed PhDs are in general more satisfied than employees with a temporary contract, with the exception of

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reasons. In general, their coefficients are barely significant at the individual level, but are jointly important for explaining the variability of job domain satisfactions.

<sup>6</sup> We tried to include a squared term for age as well as for job tenure, but these quadratic terms were statistically insignificant in all the cases. The explanatory power of the model did not improve with their inclusion and the other coefficients were virtually unchanged. So, we decided to maintain the log-linear specification for these continuous variables.

the job-skill match domain. Part-time workers are more satisfied than full-time workers in every job domain, which means that working part-time (while having a PhD) might reflect unobserved factors that are systematically associated with a lower intrinsic quality of the job.

The estimated relationship between annual earnings<sup>7</sup> and job domain satisfaction shows the expected patterns. The impact of earnings is barely significant for the job content and for the job-skill match equations, with a moderate positive effect only when moving from the reference category (less than 18,000 Euros per year) to the two highest categories. However, the increase of annual earnings generates more satisfaction with promotion possibilities — with a slightly decreasing pattern — and, obviously, even more satisfaction with the earnings domain.

**Table 3: JDS equations by Seemingly Unrelated Regressions (Pooled Sample)**

	Job Content		Promotion Possibilities		Earnings		Job-Skill Match	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Constant	4.810	(0.79)***	6.050	(1.2)***	4.920	(1.03)***	3.600	(1.16)***
Year 2011	0.114	(0.053)**	-0.034	(0.080)	0.016	(0.069)	0.061	(0.077)
INDIVIDUAL CONTROLS								
Female	0.110	(0.049)**	-0.073	(0.074)	0.109	(0.0638)*	0.065	(0.072)
ln(age)	0.091	(0.205)	-0.638	(0.311)**	-0.251	(0.269)	0.057	(0.301)
research fellowship during the PhD	-0.120	(0.063)*	-0.053	(0.095)	0.209	(0.0824)**	0.097	(0.092)
PhD duration > 6 years	-0.097	(0.061)	0.003	(0.093)	0.028	(0.080)	-0.168	(0.09)*
JOB CHARACTERISTICS								
ln(job tenure)	-0.003	(0.033)	-0.236	(0.0501)***	-0.011	(0.043)	0.049	(0.049)
contract duration ≤ 1 year & other situations	<i>Reference Category</i>							
contract duration > 1year	-0.050	(0.114)	0.072	(0.173)	0.004	(0.149)	-0.058	(0.167)
permanent contract	-0.012	(0.101)	0.376	(0.153)**	0.051	(0.132)	-0.245	(0.148)*
self-employed	0.382	(0.167)**	1.150	(0.254)***	0.467	(0.219)**	0.322	(0.246)
Part-time	-0.256	(0.101)**	-0.328	(0.153)**	-0.491	(0.132)***	-0.259	(0.148)*
number of workers > 500	0.042	(0.065)	-0.085	(0.099)	-0.040	(0.086)	0.047	(0.096)
annual earnings less than 18,000 Euros	<i>Reference Category</i>							
annual earnings between 18,000 and 24,000 Euros	-0.018	(0.111)	0.058	(0.169)	0.295	(0.146)**	-0.120	(0.163)
annual earnings between 24,000 and 30,000 Euros	-0.007	(0.106)	0.169	(0.161)	0.301	(0.139)**	0.014	(0.156)
annual earnings between 30,000 and 40,000 Euros	0.072	(0.108)	0.469	(0.163)***	0.771	(0.141)***	0.212	(0.158)
annual earnings between 40,000 and 50,000 Euros	0.234	(0.123)*	1.030	(0.187)***	1.460	(0.161)***	0.345	(0.181)*
Annual earnings > 50,000 Euros	0.267	(0.127)**	0.928	(0.192)***	1.460	(0.166)***	0.525	(0.186)***
EMPLOYMENT SECTOR (CATEGORY/FUNCTIONS)								
ACADEMIC SECTOR (UNIVERSITY)								
Assistant professor	0.609	(0.157)***	1.060	(0.239)***	-0.016	(0.206)	1.650	(0.231)***
Lecturer	0.692	(0.165)***	0.517	(0.25)**	-0.339	(0.215)	1.820	(0.242)***
Associate professor	0.517	(0.143)***	0.428	(0.217)**	-0.487	(0.188)***	1.690	(0.211)***
Adjunct professor	0.597	(0.201)***	0.096	(0.305)	-1.050	(0.263)***	1.730	(0.296)***
Researcher	0.793	(0.174)***	0.160	(0.264)	-0.209	(0.228)	1.830	(0.256)***
Post-doc	0.507	(0.183)***	0.392	(0.277)	-0.071	(0.239)	1.480	(0.268)***
Private University	0.633	(0.164)***	0.621	(0.249)**	-0.053	(0.215)	1.590	(0.241)***

<sup>7</sup> Notice that 7,6% of our selected pooled sample did not reported valid information about their annual earnings. In order to avoid losing observations, we introduced a dummy for missing values into the model (coefficients not shown). This missing indicator is statistically insignificant in every equation.

	Job Content		Promotion Possibilities		Earnings		Job-Skill Match	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
<b>RESEARCH INSTITUTES (NOT UNIVERSITY)</b>								
Direction or R&D	0.647	(0.138)***	0.309	(0.210)	-0.207	(0.181)	1.830	(0.203)***
Research assistant	0.462	(0.182)**	0.247	(0.276)	-0.331	(0.238)	1.610	(0.267)***
Teaching	0.431	(0.344)	0.117	(0.522)	0.630	(0.451)	0.070	(0.506)
Other functions	0.588	(0.185)***	0.521	(0.28)*	-0.346	(0.242)	1.400	(0.271)***
<b>PUBLIC SECTOR</b>								
Direction	0.468	(0.291)	0.776	(0.441)*	0.347	(0.381)	0.618	(0.427)
Teaching	<i>Reference Category</i>							
R&D or research assistance	0.367	(0.15)**	0.307	(0.227)	-0.044	(0.196)	0.841	(0.22)***
Medical assistance	0.383	(0.158)**	0.556	(0.239)**	-0.575	(0.206)***	0.752	(0.232)***
Other functions	-0.016	(0.186)	0.049	(0.281)	-0.543	(0.243)**	0.232	(0.273)
<b>PRIVATE SECTOR</b>								
Direction	0.635	(0.187)***	0.700	(0.283)**	0.148	(0.245)	0.493	(0.274)*
Teaching	0.535	(0.181)***	0.576	(0.274)**	0.207	(0.237)	0.637	(0.265)**
R&D	0.494	(0.149)***	0.495	(0.226)**	-0.046	(0.195)	1.270	(0.219)***
Research assistance	0.210	(0.146)	0.573	(0.221)***	-0.219	(0.191)	0.663	(0.214)***
Medical assistance	0.267	(0.206)	0.612	(0.312)*	0.110	(0.270)	0.508	(0.302)*
Other skilled functions	0.392	(0.162)**	0.343	(0.246)	-0.038	(0.212)	0.399	(0.238)*
<b>DEGREE REQUIREMENT VARIABLES</b>								
PhD degree required for the job	<i>Reference Category</i>							
specific undergraduate degree required for the job	-0.136	(0.068)**	0.004	(0.103)	0.079	(0.089)	-0.475	(0.0997)***
general undergraduate degree required for the job	-0.293	(0.097)***	0.062	(0.147)	0.013	(0.127)	-0.948	(0.143)***
no degree requirements for the job	-0.688	(0.151)***	-0.080	(0.228)	-0.021	(0.197)	-1.220	(0.221)***
<b>WORKING REGION</b>								
working in Barcelona province	<i>Reference Category</i>							
working in Tarragona province	-0.017	(0.125)	0.366	(0.19)*	0.052	(0.164)	-0.373	(0.184)**
working in Girona province	0.080	(0.132)	0.017	(0.200)	0.072	(0.173)	0.176	(0.194)
working in Lleida province	-0.260	(0.176)	0.026	(0.2607)	0.286	(0.231)	0.228	(0.259)
working in the rest of Spain	-0.188	(0.09)**	0.033	(0.136)	-0.162	(0.118)	0.033	(0.132)
working in the EU	0.191	(0.114)*	0.665	(0.173)***	0.728	(0.149)***	0.064	(0.167)
working outside the EU	0.065	(0.129)	0.311	(0.196)	0.539	(0.17)***	0.029	(0.190)
PhD programme fixed effects	<i>Yes</i>		<i>Yes</i>		<i>yes</i>		<i>Yes</i>	
R <sup>2</sup>	0.141		0.188		0.227		0.292	
Number of observations	2,040		2,040		2,040		2,040	

\* Significant at 0.1; \*\* significant at 0.05; \*\*\* significant at 0.01

The estimated *JDS* equations also include job-type specific indicators, which refer to employment categories for faculty members and to occupational roles/functions for those who work outside the university. Taking as a reference those PhDs who perform teaching tasks in the public sector (i.e. primary or secondary school teachers), working in the academy implies higher satisfaction with job content and, especially, with the match between the acquired skills and the job. Moreover, assistant professors, lecturers and those who work in private universities<sup>8</sup> are also more satisfied with their promotion possibilities, whereas associated and adjunct professors are less satisfied with their earnings. Being employed in a research institute is also associated with higher satisfaction with job content and — to a greater extent — with job-skill match. The

<sup>8</sup> Notice that the data does not allow differentiating the position of the 31 individuals who work in private universities.

exception is that those who perform teaching tasks in research institutes are not more satisfied with these two job domains than the reference group.

Among public sector workers, those doctors who execute directive functions are more satisfied only with their promotion possibilities, whereas research and technical functions are associated with a higher degree of satisfaction with job content and job-skill match. We also detected that medical assistance functions generate more satisfaction with the content of the job, promotion possibilities and job-skill match, but less satisfaction with earnings. Finally, PhD recipients who are employed in the private sector workers are in general more satisfied than teachers in the public sector for what concerns the content of the job, promotion possibilities and the match between the job and the acquired skills, but not with respect to earnings.

The group of variables that refers to degree requirements in the current job exert a significant impact on the degree of satisfaction with job content and with the match between the job and the skills acquired during the PhD. There are two particular findings that should be mentioned with some detail. First, as expected, the magnitude of their impact is higher in the latter domain than in the former, given the stronger connection between the objective information that is enclosed in such variables and the subjective evaluation about satisfaction with the job-skill match. Second, compared to doctors who are working in occupations that require the PhD qualification (the reference category), the decrease in the degree of satisfaction is higher the lower degree requirement for entering the current job. Notice also that these effects are statistically significant even controlling for job-type variables. Overall, these evidences suggest that mismatched PhDs are less satisfied not only because of the specific occupation they have, but also because of unobserved job's characteristics that make them unhappy with these intrinsic facets of the job.

We conclude this section with some comment on the estimates obtained for the working region variables. Taking as reference the Barcelona's province as reference, it appears that working in similar occupations in the province of Tarragona is associated with more satisfaction in terms of promotion possibilities, but less satisfaction with the job-skills match. Moreover, PhD recipients who are working in other Spanish regions are in general less satisfied with their promotion possibilities than those who are working in the province of Barcelona. Finally, working in the European Union increases satisfaction with promotion possibilities and with earnings, whereas working in other

countries has a positive and statistically significant effect only on satisfaction with earnings.

#### *4.2 Job Domain Satisfactions and Overall Job Satisfaction*

In this section we describe the results from the second step of our empirical analysis, in which we analyse the relationship between the overall job satisfaction and job domain satisfactions. Table 3 contains the results obtained from two OLS models<sup>9</sup>. The model in the first column regresses overall job satisfaction on the four *JDS* variables (transformed into continuous scores with the Terza's method<sup>10</sup>), while the model in the second column includes the surrogate latent variable ( $Z^*$ ) as an additional explanatory variable. Overall, it appears that overall job satisfaction represents an aggregate of the perceived satisfaction with different facets of the job. This evidence suggests that the same level of general satisfaction with job can be achieved with a different combination of satisfaction with its several domains. As expected, there exist some common latent factors that simultaneously affect overall job satisfaction and job domain satisfactions. Indeed, after the inclusion of the proxy variable of these latent factors, the weights assigned to each facet of the job (i.e. the point estimates) are significantly reduced. This means that, to some extent, the covariance between the *JS* equation's error term and the *JDS* variables provokes some bias, given that the  $Z^*$  variable is clearly statistically different from zero.

The main message that can be derived from these results is that, when evaluating their overall working situation, PhD recipients do not assign the same importance to the various domains of the job. In line with previous findings referring to general populations of workers (see de Graaf-Zijl 2005 and Skalli et al. 2008), job content seems to be the most influential aspect of the job. The weight they attach to this domain is significantly higher than the ones assigned to the others. After job content, the domain that is ranked in the second position in terms of its contribution to the overall job satisfaction consists in promotion possibilities, followed by the match between acquired skills and the job. Even so, there is a considerable difference with respect to

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<sup>9</sup> We also tried the Ordered Probit specification, which yields roughly the same results in terms of trade-off ratios between coefficients and statistical significance of the estimates. The results are available upon request.

<sup>10</sup> As suggested by Terza (1987), the standard errors of the estimates should be adjusted for the presence of estimated variables in the regression equation. This correction should be done; the presented standard errors are obtained through bootstrapping.

the importance of the first-ranked domain. Finally, satisfaction with earnings receives a slightly lower weight and appears to be the less-important domain of the job.

**Table 4: Overall job satisfaction and job domain satisfactions**

	Model 1	Model 2
Constant	5.6 (0.016)***	5.59 (0.016)***
Satisfaction with Job content	0.588 (0.026)***	0.498 (0.03)***
Satisfaction with Promotion Possibilities	0.233 (0.021)***	0.177 (0.024)***
Satisfaction with Earnings	0.122 (0.022)***	0.094 (0.022)***
Satisfaction with Job-Skill Match	0.19 (0.023)***	0.164 (0.024)***
Z*		0.183 (0.039)***
R <sup>2</sup>	0.553	0.558

Boostrapped standard errors in italic within parenthesis; \* significant at 0.1%; \*\* significant at 0.05%; \*\*\* significant at 0.01%.

An intuitive way of understanding the relative importance of each job domain in generating individuals' overall job satisfaction consists in computing the trade-off ratio between the coefficients associated with different facets of the job. This is because, assuming that the overall job satisfaction embodies a consistent measure of the worker's utility derived from the job, the ratio between coefficients would represent the marginal rate of substitution between the levels of satisfaction with different aspects of the job. Put in other words, the estimated trade-off ratios may provide an answer to the question: how much the degree of satisfaction with one domain should increase in order to maintain the same level of utility after a given reduction in the degree of satisfaction with another domain? Taking as reference the estimates from Model 2, it appears that — in order to keep PhD workers at the same degree of overall satisfaction with their job — after a decrease in satisfaction with job content, satisfaction with promotion possibilities should increase by a factor of  $0.498/0.177 = 2.95$ ; alternatively, satisfaction with earnings should rise by  $0.498/0.094 = 5.3$ . On the other hand, if satisfaction with the match between skills and the job decreases by one unit, the compensatory improvement in satisfaction with promotion possibilities consists in just 0.93 points, while satisfaction with earnings should increase by 1.74. Overall, this approach reveals the great



importance of job content, relatively to the other domains, in determining the utility that PhD recipients derive from their job.

## 5. Conclusions

In this paper we examined job satisfaction of recent PhD recipients, considering a sample of graduating cohort from the seven public universities in Catalonia (a region of Spain). We added some new evidence to the growing literature concerning with job satisfaction of the highly educated.

First, we analysed whether and how different objective characteristics related to the individual, to his/her PhD and to the job they have after some year from the finalisation of their PhD studies affect perceived satisfaction with four main domains of the job — i.e. job content, promotion possibilities, earnings and job-skill match. This first step of our investigation reveals that job satisfaction depends crucially on the sector of employment and on the type of work, especially for satisfaction with job content and with the match between the job and the skills acquired during the PhD. Moreover, the degree of satisfaction with these two specific (and interrelated) domains of the job is also strongly affected by educational mismatch (defined in terms of degree requirements for the current job), even controlling for the detailed information about the type of occupation.

Second, we expressed overall job satisfaction as an aggregate of different job domain satisfactions. By doing this, we provide evidence about the weight that PhD workers attach to specific facets of their job, when they express the judgment about the level of utility they derive from their work. The results that we obtained indicate that job content is the most important domain that this group of highly educated workers consider when they evaluate their current job situation. Promotion possibilities and the match between the skills and the job are, however, of secondary importance. That is, what really matter for making a doctor satisfied with its working situation is the content of the job, beyond the expectations about future career and the fact that the acquired skills are fully exploited or not. Moreover, among PhDs, the monetary aspect of the job (i.e. satisfaction with earnings) appears to be less important in determining the overall job satisfaction — at least during the initial part of the professional career as a doctor.

It seems worth notice that this relatively low importance of satisfaction with earnings might be a specific feature of highly educated workers. In fact, the paper by

Skalli et al. (2008) reports that satisfaction with earnings tends to be one of the most important components of the overall job satisfaction among workers with different levels of education. However, our hypothesis is in line with the findings obtained by Ward and Sloane (2000), who suggest that satisfaction with salary is of secondary importance among academics from Scottish universities. Overall, achieving an appealing job in terms of its contents might be the most important motivation for pursuing a PhD. The utility loss produced by the lack of this intrinsic aspect of the job can be hardly compensated by other domains such as the monetary remuneration.

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## Appendix

**Table 1A: data description and summary statistics**

	2008		2011		Pooled Sample			
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Max	Min
<b>INDIVIDUAL CONTROLS</b>								
female	0.448	0.498	0.485	0.500	0.469	0.499	0	1
Age (at the year of the survey)	39.2	7.306	38.79	7.398	38.97	7.359	30	65
research fellowship during the PhD	0.488	0.500	0.553	0.497	0.525	0.500	0	1
PhD duration > 6 years	0.42	0.494	0.188	0.391	0.289	0.453	0	1
<b>JOB CHARACTERISTICS</b>								
job tenure (in years)	7.917	7.611	7.747	7.619	7.821	7.614	0.5	40
self-employed	0.035	0.184	0.042	0.200	0.039	0.193	0	1
permanent contract	0.616	0.487	0.542	0.498	0.574	0.495	0	1
contract duration > 1 year	0.237	0.426	0.269	0.443	0.255	0.436	0	1
contract duration < 1 year & other situations	0.111	0.315	0.148	0.355	0.132	0.338	0	1
Part-time job	0.069	0.253	0.076	0.264	0.073	0.259	0	1
number of workers > 500	0.598	0.490	0.720	0.449	0.669	0.471	0	1
annual earnings less than 18,000 Euros	0.096	0.295	0.071	0.257	0.082	0.274	0	1
annual earnings between 18,000 and 24,000 Euros	0.160	0.367	0.131	0.338	0.144	0.351	0	1
annual earnings between 24,000 and 30,000 Euros	0.258	0.438	0.251	0.434	0.254	0.435	0	1
annual earnings between 30,000 and 40,000 Euros	0.280	0.449	0.327	0.469	0.307	0.461	0	1
annual earnings between 40,000 and 50,000 Euros	0.099	0.298	0.105	0.307	0.102	0.303	0	1
Annual earnings > 50,000 Euros	0.107	0.310	0.115	0.319	0.111	0.315	0	1
<b>EMPLOYMENT SECTOR (CATEGORY/FUNCTIONS)</b>								
<b>ACADEMIC SECTOR (UNIVERSITY)</b>								
Assistant professor	0.109	0.312	0.126	0.618	0.115	0.47	0	1
Lecturer	0.057	0.233	0.025	0.157	0.039	0.194	0	1
Associate professor	0.090	0.286	0.055	0.228	0.070	0.255	0	1
Adjunct professor	0.033	0.178	0.023	0.149	0.027	0.162	0	1
Researcher	0.027	0.162	0.064	0.245	0.048	0.214	0	1
Post-doc	0.028	0.165	0.040	0.196	0.035	0.183	0	1
Private university	0.035	0.184	0.037	0.190	0.036	0.187	0	1
<b>RESEARCH INSTITUTES (NOT UNIVERSITY)</b>								
Direction or R&D	0.109	0.312	0.156	0.363	0.135	0.342	0	1
Research assistance	0.021	0.145	0.029	0.167	0.025	0.158	0	1
Teaching	0.009	0.094	0.002	0.042	0.005	0.070	0	1
Other functions	0.052	0.222	0.003	0.059	0.025	0.155	0	1
<b>PUBLIC SECTOR</b>								
Direction	0.004	0.067	0.010	0.097	0.007	0.085	0	1
Teaching	0.047	0.212	0.050	0.217	0.049	0.215	0	1
R&D or research assistance	0.029	0.169	0.058	0.234	0.046	0.209	0	1
Medical assistance	0.065	0.247	0.076	0.266	0.072	0.258	0	1
Other functions	0.048	0.215	0.003	0.059	0.023	0.150	0	1
<b>PRIVATE SECTOR</b>								
Direction	0.017	0.129	0.030	0.172	0.025	0.155	0	1
Teaching	0.013	0.115	0.037	0.190	0.027	0.162	0	1
R&D	0.044	0.205	0.074	0.262	0.061	0.239	0	1
Research assistance	0.052	0.222	0.083	0.275	0.069	0.254	0	1
Medical assistance	0.025	0.155	0.023	0.151	0.024	0.153	0	1
Other functions	0.084	0.278	0.012	0.110	0.044	0.204	0	1
<b>DEGREE REQUIREMENT VARIABLES</b>								
PhD degree required for the job	0.354	0.479	0.412	0.492	0.387	0.487	0	1

specific undergraduate degree required for the job	0.568	0.496	0.453	0.498	0.503	0.500	0	1
general undergraduate degree required for the job	0.048	0.215	0.106	0.308	0.081	0.273	0	1
no degree requirements for the job	0.029	0.169	0.030	0.169	0.029	0.169	0	1
WORKING REGION								
working in Barcelona province	0.696	0.460	0.697	0.460	0.697	0.460	0	1
working in Tarragona province	0.054	0.226	0.061	0.239	0.058	0.234	0	1
working in Girona province	0.067	0.251	0.049	0.215	0.057	0.232	0	1
working in Lleida province	0.040	0.197	0.027	0.162	0.033	0.178	0	1
working in the rest of Spain	0.071	0.257	0.076	0.266	0.074	0.262	0	1
working in the EU	0.036	0.186	0.054	0.226	0.046	0.210	0	1
working outside the EU	0.035	0.184	0.036	0.188	0.036	0.186	0	1
PHD TYPE								
HUMANITIES								
Àrea Geogràfica i Història							0	1
Filosofia i Humanitats							0	1
Estudis comparats							0	1
Filologia 1							0	1
Filologia 3							0	1
Belles Arts							0	1
SOCIAL SCIENCES								
Economia							0	1
Dret							0	1
Polítiques							0	1
Comunicació							0	1
Psicologia							0	1
Pedagogia							0	1
Mestres o INEF							0	1
PURE SCIENCES								
Química							0	1
Biologia i Natura							0	1
Física i Matemàtiques							0	1
MEDICAL SCIENCES								
Medicina i Odontologia							0	1
Farmàcia i Cc. I tecnologia dels aliments							0	1
Veterinària							0	1
TECHNICAL DISCIPLINES								
Arquitectura							0	1
Enginyeria Civil i Nàutica							0	1
Àrea Tecnologies avançades de la producció							0	1
Àrea Informació i Comunicació							0	1
Àrea agrícola							0	1
UNIVERSITY								
UB	0.481	0.500	0.404	0.491	0.438	0.496	0	1
UAB	0.218	0.413	0.310	0.463	0.270	0.444	0	1
UPC	0.124	0.329	0.137	0.344	0.131	0.338	0	1
UPF	0.039	0.195	0.033	0.179	0.036	0.186	0	1
UdG	0.053	0.224	0.038	0.192	0.045	0.206	0	1
UdL	0.043	0.202	0.028	0.164	0.034	0.182	0	1
URV	0.042	0.200	0.050	0.217	0.046	0.210	0	1
Number of observations	889		1,151		2,040			