(Endogenous) occupational choices and job satisfaction among recent PhD recipients

1) Introduction

The creation of new knowledge represents a crucial element to reach a sustainable growth pattern and progress towards a knowledge-based economy. The significant expansion of doctoral education, which many European countries experienced during the last decades (Kehm, 2006; Halse & Mowbray, 2011), might represent a stepping stone towards the achievement of these ambitious but necessary objectives (Neumann & Khim-Tan, 2011). Indeed, PhD holders have a key role in fostering innovation, because they represent an important channel through which new knowledge flows from universities to the productive system (Stephan et al, 2005; Auriol, 2010). For this reason, the production of new PhDs might constitute a fundamental contribution of universities in enhancing economic growth and development (Stephan et al, 2004). This positive impact of doctoral education on innovation and economic growth would be especially relevant when PhD holders are directly (and properly) employed in the productive sectors of the economy. However, while industry and the private sector represent a common destination of new PhDs in the US reality, the academy still remains the main employer of PhD recipients in European countries (as revealed by the data from the 'Career of Doctorate Holders' surveys[1] in 2006 and 2009). Nevertheless, the career prospects in industry or other private firms and in public administration and government jobs are becoming more and more common over time (Enders, 2002; Schwabe, 2011; and Neumann & Khim-Tan, 2011).

The existing evidence points out that doctorate graduates who are likely to self-select into the academic career are characterised by a stronger 'taste for science', i.e. preferences for publishing in academic journals and for carrying out basic research, for freedom in choosing research topics, for interacting with the scientific community, as well as for other non-pecuniary aspects of the job (Stern, 2004; Aghion et al, 2008; Roach & Sauermann, 2010; Agarwal & Ohyama, 2013). On the contrary, those who prefer other kinds of professional careers tend to assign more importance to economic remuneration, job stability and to other monetary aspects of the job (Sauermann & Roach, 2014). Moreover, the preferences of PhD holders for their labour market career might be skewed even more towards the academy in the case that the productive structure is not endowed of the sufficient 'absorptive capacity'. In fact, as suggested by Garcia-Quevedo et al (2011), a firm's absorptive capacity represents the main factor behind the demand of PhD workers by private firms. However, on the one hand, insufficient firms' absorptive capacity and the lack of non-academic jobs in which

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PhD skills are still common aspects of several European Countries such as Spain. On the other hand, the progressive contraction of academic hiring in universities (and research institutes) due to public spending cuts and the overall structural changes of the Spanish university system are likely to create queues for academic jobs among new PhD graduates and to increase the likelihood of being employed outside the traditional academic sector (Canal-Domínguez & Muñiz-Pérez, 2012). This overall situation opens the door to a substantial incidence of 'underemployment' among PhD holders in Spain, where the number of PhD holders is increasing substantially and exceeds the number of jobs that are suitable for them. That would be the case of working in occupations where the skills and competences acquired during the PhD are not relevant and where new PhDs cannot fully exploit their productive and innovative potential (Lee et al, 2010). Adding some piece of evidence about this issue would be of crucial importance for R&D and academic policies of the countries and would also contribute to the recent debate about whether or not the 'PhD Factory' is currently producing an excessive number of PhD graduates (Cyranoski et al, 2011).

Given this background, drawing on data from recent PhD graduated from public universities of the Spanish region of Catalonia, in this paper we analyse differences job satisfaction by employment sector. More specifically, we aim to estimate job satisfaction differentials among PhD holders employed in four specific sectors: academia, research institutes, the public sector (public administration, government jobs and other governmental institutions) and the private sector (industry and other private firms). We take job satisfaction as a comprehensive measure of perceived job quality, since conditional differences in satisfaction between employment sectors (relative to the academy) would be informative about the existence and the extent of underemployment of PhDs who are working outside the traditional academic world. Moreover, we also consider disparities in satisfaction with specific job domains (concretely earnings, promotion opportunities, job content and job-skills match), which yield a deeper insight about between-sector differences in monetary and non-monetary aspects of the job. The contribution of this paper to the existing literature is threefold: first, we present covariate-adjusted job satisfaction and job domains satisfaction differentials and we examine the potential mechanism that might drive such disparities. Second, we control for self-selection of PhD holders into different sectors, which so far has been completely neglected in the literature about job satisfaction among PhDs. In order to do that, we estimate job satisfaction differentials from a joint model of sector choice and job satisfaction that allows for the presence of latent factors affecting both outcomes. Finally, we also present estimates of the determinants of sector choice, which provide an insight into the way in which individual and academic attributes affect the observed occupational choices of recent PhD graduates.

2) Related research

From the seminal studies of Hamermesh (1977), Freeman (1978) and Clark (1996), job satisfaction is nowadays widely accepted as an informative economic variable. The debate as to whether job satisfaction constitutes a good representation of worker utility derived from a job remains on-going. However, job satisfaction is a strong predictor of labour market behaviour, including future job quits, absenteeism and work productivity (see Ferrer-i-Carbonell, 2013 for a recent overview). Overall, job satisfaction might be taken as a comprehensive measure of perceived job quality, generated from the individual consideration of all the relevant (monetary and non-monetary) aspects of the job. Hence, in this paper we infer about disparities in job quality across sectors of employment by analysing (conditional) job satisfaction disparities between PhD holders employed in different occupations.

A modest but growing number of papers analysed the relevance of the employment sector for job satisfaction among PhD recipients. Bender and Heywood (2006), using US data from the Survey of Doctoral Recipients (SDR), found that gender differences in job satisfaction are strongly dependent on the sector of employment. Moreover, they argued that tenured faculty members are significantly more satisfied than PhD holders employed outside academia, although the relative difference also varies by gender. In a subsequent paper, Bender and Heywood (2009) considered the issue of educational mismatch among PhD holders, reporting considerably lower job satisfaction for PhDs working in jobs unrelated to their academic skills. They also find that the negative impact of mismatch on job satisfaction is the same regardless of whether PhD holders are employed in academic or non-academic jobs. Schwabe (2011) and Canal-Domínguez and Muñiz-Pérez (2012) analysed, respectively, Austrian and Spanish data of the 2006 CDH survey. They examined unconditional differences in job domains satisfaction among doctors in the Austrian and in the Spanish labour markets, obtaining that those who work outside the academy tend to be more satisfied with earnings — but less satisfied with non-monetary aspects of the job — than their academic counterparts.

Overall, the previous findings are quite consistent and suggest that working in non-academic jobs is detrimental for job satisfaction among PhD graduates. Nevertheless, all the existing works on PhD holders are based on econometric techniques (i.e. OLS or ordered models) that are unlikely to produce consistent estimates if selection into sectors in not random. This would be the case if sector choice

among PhD holders depends on unobserved personal traits[2] that, in turn, are quite likely related to perceived job satisfaction. The importance of controlling for self-selection into employment sectors has been explicitly considered in the general literature examining job satisfaction. For example, Heywood, Siebert and Wei (2002), Clark and Senik (2006) and Demoussis and Giannakopoulos (2007) seek to accommodate the endogenous sorting of workers using individual fixed effects models. Other papers rely on endogenous switching models that account for selection on unobservable characteristics. Luechinger et al (2006) and Luechinger et al (2010) use a simultaneous models for sector choice and job satisfaction, highlighting the relevance of the endogenous sorting of workers into different sectors. Most recently, Danzer (2013) estimates differences in job satisfaction between public and private workers in Ukraine. She applies an IV strategy to solve the self-selection of workers into specific economic sectors, exploiting the post-Soviet privatisation process as a source of exogenous variation in the sector allocation of workers. Most of these papers report a positive job satisfaction differential in favour of public workers, which seems to be higher when self-selection into occupation is taken into account. In general, the above-mentioned authors suggested that the existence of a public sector satisfaction premium derives from the presence of 'rents', such as monetary and non-monetary fringe benefits, increased job security and, more in general, from the presence of queues for public sector jobs.

Drawing from this general literature and considering the existing evidence about job satisfaction among PhD holders, we expect to find substantial differences in job satisfaction among doctorate holders employed in different occupations — which should be in general positive in favour of the academy. In doing that, with the aim of going a step further with respect to the existing literature, we explicitly account for the presence of endogenous occupational sorting among PhDs, which should be taken into account to obtain a consistent estimate of job satisfaction differentials across sectors.

3) Data and descriptive evidence

We draw on data from two successive waves of the survey conducted by the *Agència per la Qualitat del Sistema Universitari de Catalunya* (Quality Assurance Agency for the University System in Catalonia, AQU). The AQU surveys of 2008 and 2011 were carried out to monitoring the labour market situation of PhD holders four years after graduation. The target population comprises all the

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[2] Such unobserved individual characteristics that might correlate with both sector choice and job satisfaction are, for example, job expectations, impatience, risk aversion and/or the degree of 'taste for science'. The existence of occupational self-selection among PhD holders has been previously reported by Recotillet (2007) and by Bonnard (2012) using French data, in the context of wage differentials.

Spanish-born individuals who were awarded their PhD by the seven Catalan public universities during the academic years 2003-2004 and 2006-2007 for the first and the second waves[3], respectively. The populations of the two graduating cohorts were 1,612 and 1,824 individuals and the questionnaire was completed by 934 in 2008 (response rate of 58%) and by 1,225 in 2011 (response rate of 67%). We restricted the sample to those individuals that had a regular, full-time job at the time of the survey and were under the age of 50 when they completed their PhD[4]. After cleaning for missing values in the variables of interest, we end up with a pooled sample of 1,709 observations.

The dataset contains information about socio-demographic variables and academic attributes, as well as (current) job-related variables. The survey classifies the employment sectors into four main categories, namely: 1) University, 2) Research Institutes, 3) Public Sector (public administration and government jobs) and 4) Private Sector (industry or other private firms). As expected, employment in the academic sector is the most common occupation (37%) while the remaining observations are almost uniformly distributed among the other three categories. The interviewees were asked to report their perceived satisfaction with four specific facets of their job and with their job as a whole, using a Likert scale ranging from 1 (very unsatisfied) to 7 (very satisfied) — which represent the main outcome variables in our empirical analysis. Table 1 displays descriptive statistics for these job satisfaction variables by employment sector, which suggest that those employed in academia and in research institutes are more satisfied with their job than those employed in the other two sectors. These differences are even more marked in terms of the two domains that capture most closely the intrinsic quality of the job — i.e. satisfaction with the job content and, more especially, with how well this content matches the skills acquired as PhD students (job-skills match). By contrast, the raw differentials in satisfaction with pecuniary aspects of the job — i.e. earnings and promotion opportunities — are significantly smaller. Moreover, PhD holders that work in the private sector are clearly more satisfied than their counterparts working in other sectors with these last two facets of the job.

[TABLE 1 HERE]

However, these raw differentials are likely to be confounded by the relationship between job satisfaction and other observed characteristics, the distribution of which might also differ across the sectors. Therefore, in the next section we present covariate-adjusted job satisfaction differentials

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[3] The Catalan Public Education System comprises seven universities: University of Barcelona (UB), Autonomous University of Barcelona (UAB), Polytechnic University of Catalonia (UPC) and Pompeu Fabra University (UPF) — all located in the metropolitan area of Barcelona — University of Lleida (UdL), University of Girona (UdG) and Rovira i Virgili University (URV).

[4] This restriction was made to avoid including observations of individuals who were already at an advanced point in their professional careers when they received their PhD. Moreover, the fact that the AQU survey includes only Spanish-born PhD holders reduces the degree of labour market-related heterogeneity in the sample.

across sectors, exploiting the relevant details contained in the AQU survey regarding socio-demographic characteristics, academic information and job-related variables (see Table 1A in the Appendix for descriptive statistics and definitions of the list of variables employed in the empirical analysis). The set of explanatory variables included in the job satisfaction equation(s) has been selected (subject to data availability) with the aim of capturing objective characteristics that may influence perceived job satisfaction and controlling for observed individual attributes that may affect the scale of reference used to value job satisfaction.

4) Employment sector and job satisfaction

The covariate-adjusted job satisfaction differentials are obtained from an OLS[5] regression(s) that relates each of the job satisfaction variables (y) to a set of covariates (x) and to dummies for employment sector (s), such as

$$y_i = x_i'\beta + \sum_j \gamma_j s_{ij} + \varepsilon_i. \tag{1}$$

Table 2 displays the estimates of the employment sector indicators from equation (1), taking the University as the base category. The estimates for the rest of the control variables are not discussed here for space reasons (Table 2A contains the complete results for overall job satisfaction).

The covariate-adjusted job satisfaction differentials from the baseline specification (model [1]) are estimated conditioning on individual socio-demographic characteristics, academic variables and job location. The results suggest that, compared to faculty members, PhD recipients employed in the public and — especially — in the private sectors are substantially more satisfied with their earnings. Moreover, the latter are also significantly more satisfied with the future prospects offered by their professional career. By contrast, working outside traditional academic jobs has a detrimental impact on satisfaction with job content and with the job-skills match (especially for those employed in the public sector). Our findings regarding overall job satisfaction also reveal a negative differential for PhD holders employed in other private and — even more — public jobs. In the literature, overall job satisfaction is considered to be an aggregate measure of satisfaction for all relevant facets of a job (as pointed out by van Praag et al 2003 and Skalli et al 2008). Therefore, our results suggest that the pecuniary domains of the job do not fully compensate PhD holders employed in the public and private

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[5] We adopt a Probit-adapted Ordinary Least Squares (POLS) specification for the job satisfaction equations (van Praag et al 2003). This methodology consists in replacing the ordinal job satisfaction variables with normalised variables that vary on the real axis, which enables the job satisfaction differentials to be estimated by OLS using the transformed LHS variables. The results are qualitatively the same when using OLS with the original ordinal variables or ordered probit/logit technique.

sectors for the shortfall in other job's aspects. Finally, there are no significant differences in job satisfaction between PhD holders employed in universities and those employed in research institutes.

[TABLE 2 HERE]

We subsequently add different sets of job-related controls to the job satisfaction equations (models [2]-[5]). However, claims might be made that the inclusion of job-related controls would make it more difficult to interpret the conditional job satisfaction differentials — i.e. job characteristics are likely to depend on the sector of employment[6]. However, we consider the estimates from these augmented models to be informative anyway, since they highlight the underlying mechanisms that generate job satisfaction differentials across sectors.

First of all, the positive earnings satisfaction differential in favour of public sector workers disappears when we control for job-tenure, type of contract and firm size (model [2]), while it loses significance for private sector workers when annual earnings are controlled for (model [3]). This evidence suggests that public sector workers tend to be more satisfied than faculty members because of the pecuniary compensations associated with a greater likelihood of having a permanent contract and a more secure tenure. Moreover, in the case of private sector workers, the differential observed in earnings satisfaction is mostly explained by the higher salaries they receive (relative to their academic counterparts). Second, the PhD holders who work in the private sector are not more satisfied as regards their prospects of promotion once other job characteristics are kept fixed. By contrast, public sector employees report low levels of satisfaction with their promotion opportunities when we condition on job-related variables. Furthermore, model [5] reveals a negative effect of being employed outside the university, which means that the 'average' PhD holder employed outside academia is less satisfied with his/her prospects of promotion, while those who fulfil some specific role or task in their job tend to be — at least to some extent — compensated for this negative differential (especially managerial tasks, R&D or health-related activities, as revealed from the full estimates — not shown).

Third, the negative conditional difference in satisfaction with job content reported by PhD holders employed in the public and private sectors persists with the inclusion of job-tenure, type of contract, firm size and earnings, although it is slightly attenuated when we control for job-entry degree requirements (model [4]). Fourth, in the case of job content and job-skill match satisfaction, controlling for the main tasks performed in the workplace (model [5]) emphasises the negative effect

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[6] Moreover, it should be noted that the AQU survey reports information about the main activity developed at the workplace as non-exclusive dichotomous variables (model [5]), but only for individuals who are not working in universities. Therefore, the work activity dummies are settled equal to zero for individuals working in the academy, which means that the respective coefficients should be interpreted as a deviation from the average satisfaction differential by sector.

of working outside the university, which is now significant also for those employed by research institutes. In fact, as expected, developing R&D activities has a strong positive effect on satisfaction with job content and job-skill match (and 93% of PhD recipients employed in research institutes develop R&D activities). Finally, the estimated differentials for overall job satisfaction remain roughly stable after the progressive inclusion of job-related variables, suggesting the existence of a certain penalisation for working in the public or private sector among PhDs. Nevertheless, the extent of job dissatisfaction among public and private sector workers seems to depend on the specific activity being performed at work, given the stronger negative impact estimated in model [5]. Additionally, PhD holders employed in research institutes are equally satisfied with their job than the academics if they are engaged in specific activities that are most likely to generate higher levels of job satisfaction (especially managerial and R&D tasks).

Yet, these job satisfaction differentials are unlikely to represent the true impact of sector choice on the job satisfaction of our sample of PhD holders, since these estimations neglected for the non-random allocation of PhDs into sectors. Indeed, the sorting of PhD holders into different occupations based on unobservable characteristics might generate a problem of self-selection bias in the estimated relationship between employment sector and job satisfaction. Therefore, the next section illustrates the empirical methodology that we adopted to control for selection bias in the estimation of job satisfaction differentials.

5) Endogenous occupational choices and job satisfaction

5.1 Empirical strategy

The empirical strategy adopted to provide consistent estimates of job satisfaction differentials involves the joint estimation of an endogenous multinomial treatment equation (i.e. sector choice, s) and an outcome equation (i.e. job satisfaction, y). Specifically, we consider that the choice of employment sector follows a mixed multinomial distribution, which means that the probability of observing individual i in sector j (i.e. $s_{ij} = s_{i1}, s_{i2}...s_{iJ}$) can be described as

$$\Pr\left(s_{ij} \mid z_i, l_i\right) = \frac{\exp\left(z_i'\alpha_j + \delta_j l_{ij}\right)}{1 + \sum_{k=1}^{J} \exp\left(z_i'\alpha_k + \delta_j l_{ik}\right)} \quad . \tag{2}$$

Here, the likelihood of being assigned to sector s_j depends on observed characteristics z_i and latent factors l_{ij} with their respective factor loadings (δ), which represent the unobserved individual

heterogeneity affecting the utility of working in a given sector. The expected value of the final outcome (i.e. job satisfaction) can be expressed as,

$$E\left(y_i \mid s_i, x_i, l_i\right) = x_i'\beta + \sum_j \gamma_j s_{ij} + \sum_j \lambda_j l_{ij}, \tag{3}$$

which depends on a vector of control variables x_i, a set of dummies denoting sector choice relative to the reference category ($s = University$) and the latent factors l_{ij}, capturing the unobserved factors determining sector choice that also affect the final outcome. The associated factor loadings λ_j can be interpreted as selection terms, which reflect the correlation between the unobservable determinants of sector choice (relative to the base category) and job satisfaction. Assuming that the latent factors follow a standard normal distribution, the estimation of this joint model can be carried out through maximum simulated likelihood, using the STATA routine 'MTREATREG' (Deb & Trivedi, 2009).

Given the nonlinear functional form of the multinomial equation, the parameters of this joint model for sector choice and job satisfaction can be identified even if the variables that appear in the two equations are identical (i.e. $x_i = z_i$). However, to avoid this tedious method of identification, exclusion restrictions can be incorporated into the model. These are variables that predict sector choice, but — conditional on the large set of explanatory variables included in the outcome equation(s) — they are assumed to be uncorrelated to unobserved determinants of job satisfaction(s). Specifically, we consider that the (logged) elapsed time between the completion of the undergraduate degree and PhD enrolment affects occupational choices, but not job satisfaction directly. Indeed, each additional year between completion of the undergraduate degree and enrolment on a PhD programme represents more exposure to the labour market — increasing the chances of finding employment outside academia (during and) after the doctorate programme — and is exogenous to the individual at the time of the survey. Moreover, we assume that having carried out a research stay in another university/research institution after completing the doctorate determines the likelihood of being employed in a given sector, although this is not directly related to job satisfaction four years after being awarded a doctorate degree. The underlying hypothesis is that the propensity to undertake a post-doctoral research visiting in another institution is greater among those who express a stronger preference for research-oriented jobs — especially in academia — while research mobility has a low or even null value in other professional occupations in the public or private sectors. However, the existence of unobserved individual attributes that affect both the attitudes towards geographical mobility and job satisfaction might invalidate the usefulness of post-doctoral mobility as exclusion restriction in our estimation. Therefore, we included indicators for pre-doctoral mobility as further control in both sector choice and satisfaction equations, because this would break the potential link between post-doctoral mobility and the error term of equation (3), under the reasonable assumption

that mobility-related unobserved traits are constant over time (i.e. the same unobservables affect pre-and-post doctoral research mobility in a similar way).

The relevance of the exclusion restrictions in terms of their predictive power of sector choice can be directly tested from the model estimates. However, no formal overidentification test has been developed for this specific framework. We are aware of the fact that, as usual, the validity of our exclusion restrictions is debatable, because it can be argued that the selected variables might be related to unobserved determinants of job satisfaction. This would be especially true in the case that the list of control variables in the job satisfaction equation(s) does not include all the relevant features of the current job. Nevertheless, we tried to perform several informal tests[7] for the excludability of the elicited exclusion restrictions from the outcome equation(s), which provided evidence in favour of the validity of the exclusion restrictions.

5.2 Sector choices among PhD holders

The estimates the multinomial equation for sector choice (equation (3)) are of independent interests, as they provide some insight as to whether and how individual characteristics and academic attributes affect occupational choices among recent PhD graduates (average marginal effects are reported in Table 3A in the Appendix). The results indicate that PhD holders belonging to the second cohort (i.e. those that graduated in 2006/2007) are somewhat less likely to work in research institutes. Female PhDs are more likely to join a research institute and less likely to be employed in a university than males, while age is not a significant determinant of occupational choices. Parental education has a positive effect on the probability of being a faculty member and a negative impact on the likelihood of holding a public sector job. The time elapsed between the completion of the undergraduate degree and enrolment on the doctorate programme increases the chances of working in a research institute at the time of the survey, which might be picking up those individuals that began working in research institutes as undergraduate technicians during their doctoral studies. PhD funding represents an important determinant of sector choice. As expected, compared to those who were working in a job unrelated to their field of study during the PhD, recipients of research fellowships are more likely to join a research institute and — to a lesser extent — to find an academic job, and less likely to take up a position in the public sector. Moreover, having a teaching or research assistant contract during the

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[7] Specifically, we regressed the residuals from the job satisfaction equations on the same controls included in eq. (3) plus the exclusion restrictions. The F-tests for the joint statistical significance of the exclusion restrictions did not provide evidence against the null that these variables are conditionally unrelated to job satisfaction' residuals (complete results available upon request).

PhD increases the individual's chances of working in academia and reduces the likelihood of employment in the public or private sectors. Finally, working outside academia while completing the doctorate but in a job related to the field of study has a negative effect on the probability of working in the private sector and a positive effect on the likelihood of obtaining a public sector job. The time taken to complete a PhD seems to be unrelated to occupational choices in our sample of doctorate recipients. By contrast, being awarded the highest grade for the PhD thesis' defence (*summa cum laude*) increases the probability of working in academia and reduces their likelihood of obtaining a public sector job, while those who wrote their thesis in English (as opposed to Spanish or Catalan) and/or undertook their doctoral research within a research group are more likely to enter a research institute and less likely to work in the public sector.

The estimates highlight the relevance of pre- and post-doctoral research mobility in explaining occupational choices among recent PhD graduates. Compared to those who did not undertake research mobility during their doctorate studies, experiencing a research stay in a national centre reduces the probability of being employed by a university and augments the chances of obtaining a public sector job. However, participating in a mobility programme outside Spain makes employment in the public sector less likely and increases the likelihood of working in academia. The conditional impact of post-doctoral mobility is even more significant and goes in the expected direction. Indeed, PhD holders who experienced a visiting stay at another institution after completing their thesis are significantly more likely to be employed in academia and — to a lesser extent — in research institutes, while the probability of being employed in non-academic/research oriented jobs is significantly reduced. Interestingly, the impact of research mobility on sector choice is conditional on the geographical location of the individual's current job. Moreover, the estimates are completely unaffected by the exclusion of job-location indicators from the model. Overall, this evidence suggests that the impact of undertaking a post-doctoral research visiting on occupational choices among PhD holders is not driven by the potential relationship between research mobility and (current) job location. The estimated model of occupational choice also contains PhD-type and university fixed effects as additional controls, which captures factors that are common among doctorate holders with similar PhDs across the different universities. The estimates of PhD-type FEs suggest that, compared to PhDs in Biology, those who have a PhD in the Humanities or Social Science are more likely to work at the university and less likely to be employed in research institutes and in the private sector. Moreover, having a PhD in History, Philosophy and Arts or in Language, Linguistic and Literature increases the chances of working in the public sector. Within the area of Hard Sciences, a PhD in Chemistry — compared to one in Biology — raises the likelihood of employment in the private sector and reduces the likelihood of being employed in a research institute, whereas PhD holders in

Environmental Studies are more likely to obtain public sector occupations and PhDs in Maths and Physics have greater probabilities of entering the university and fewer of entering the private sector. As expected, PhDs in Medicine tend to concentrate more in the public sector and less in other occupations. Finally, again in comparison with PhDs in Biology, those who have doctorates in Production Engineering and Computer and Information Engineering are more likely to work in academia, while the latter are less prone to work in research institutes.

5.3 Selectivity-corrected job satisfaction differentials

The selectivity-corrected job satisfaction differentials[8] resulting from the joint estimation of equations (3) and (4) are shown in Table 3, together with the factor loading associated with the latent elements affecting both sector choice and job satisfaction. The results concerning earnings satisfaction indicate that, after controlling for selection on unobservable traits, PhD holders employed in research institutes are significantly more satisfied with their pecuniary remuneration than is the case of academics. The associated lambda parameter is consistently negative, suggesting that the PhD holders that are more likely to find employment in research institutes than in the academy are less likely to be happy with their earnings than a random worker. The positive differential found in favour of public sector workers disappears when we account for endogenous workers' sorting, as it is entirely captured by the positive selection coefficient. By contrast, the positive effect of working in the private sector on the degree of satisfaction with the level of earnings is even more marked once the endogenous selection is controlled for, since this sector is likely to attract PhD holders that are 'intrinsically' less satisfied with their earnings (i.e. negative selection).

In general, satisfaction with promotion prospects seems not to be so strongly affected by endogenous selection into employment sectors. However, the case of the public sector is a clear exception, in the light of the negative and significant selectivity-corrected differential and the positive selection coefficient, which again indicates that the PhD holders that are most likely to express greater satisfaction with their promotion opportunities tend to self-select into the public sector. Even when taking into account the endogenous selection of PhD recipients into employment sectors, the estimates of degrees of job content and job-skills match satisfaction are still consistent with the idea that not being employed in academic or research-oriented occupations generates more dissatisfaction with these two job's facets. Indeed, the estimated differentials for both domains are somewhat higher

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[8] The results obtained after controlling for the (non-excluding) dummies for main activity at work in the simultaneous estimation framework are not reported, given that this information is not reported by individuals working in universities.

than the non-corrected estimates. This is especially true for the former domain, for which we also obtain a positive and significant selection coefficient. In the case of job-skill match satisfaction, self-selection appears to be relevant and positive only for private sector workers. Moreover, they are actually equally unsatisfied with this aspect of the job than public sector workers when the endogenous sorting into sectors is taken into account.

Finally, the evidence concerning overall job satisfaction confirms that, even when controlling for observed and unobserved individual characteristics affecting sector choice, PhD holders employed in academia and in research institutes do not differ significantly in terms of satisfaction with the job as a whole. However, private and, more especially, public sector workers are significantly less satisfied with their job than their faculty counterparts. Moreover, the resulting differentials are higher than without controlling for selection, since the estimated differences in job satisfaction were confounded by the strong positive selection of more satisfied PhD holders into public and private occupations.

The selectivity-corrected job satisfaction differentials are, in general, less sensitive to the inclusion of job-related variables as additional controls. The positive earnings satisfaction gap between PhD holders employed in research institutes and those working at university remains stable across the different specifications, while the negative impact on PhD holders of working in the public sector rises somewhat when controlling for job characteristics (model [2]) and (even more) for earnings (model [3]). The positive differential for private sector workers decreases, especially when we include annual earnings, but still remains sizable and significant. Promotion satisfaction differentials across sectors are mostly unchanged when job characteristics are included in the satisfaction equation (with the exception of public sector workers). Interestingly, controlling for earnings, the negative differential in job content satisfaction among private workers tends to lose importance. This result might be due to the fact that, for a PhD holder, obtaining a highly paid job in the private sector is synonymous with finding a good quality job, which provides roughly the same level of well-being as an — equally well-paid — job in academia. With respect to the job-skills match, the dissatisfaction expressed by public and private sector workers is only slightly affected by the inclusion of qualification requirements (model [4]), although the estimated coefficient is still relevant and significant. Finally, the estimates for overall job satisfaction confirm the similarity between academia and research institutes in terms of the overall job quality, but also the existence of significant disparities between PhD holders employed in the private and public sectors and their academic counterparts.

[TABLE 3 HERE]

6) Discussion and Conclusions

This paper has examined differences in the degree of job satisfaction and job domains satisfaction among recent PhD recipients employed in different sectors. The results reveal the existence of significant disparities in job satisfaction between PhD holders working in the academia and those working in other sectors. In general, PhDs working in the public and private sectors are less satisfied than their academic counterparts with the non-pecuniary aspects of their work — i.e. job content and job-skills match. However, those employed in the public and private sectors tend to be more satisfied with the pecuniary aspects of their jobs (i.e. earnings and promotion opportunities among private sector workers), mostly because they tend to earn more and to enjoy better employment conditions (e.g. type of contract and more secure job-tenure) than academic workers. On average, when controlling for individual, academic and job characteristics, PhD holders working in universities and research institutes are almost equally satisfied with their jobs. In addition, the main activity developed in the workplace explains part of the job satisfaction differentials between sectors.

The paper also considers the non-random allocation of PhD holders into different occupations, based on unobserved characteristics and latent personal traits that are likely to affect job satisfaction. Based on the simultaneous estimation of job satisfaction and sector choice equations, we obtained a consistent but somewhat distinct picture that makes also evident the importance of self-selection based on unobservable traits. The selectivity-corrected job satisfaction differentials indicate that PhD holders employed in research institutes and in the private sector are significantly more satisfied with their earnings than is the case of their faculty counterparts, while after accounting for selection public sector workers are likely to be less satisfied with both earnings and promotion prospects. The negative impact in terms of job content satisfaction and job-skills match satisfaction for PhD holders that work outside the academic world is even more marked when the endogenous sorting of workers is taken into account. Moreover, our evidence regarding overall job satisfaction confirms that working in a university or in a research institute provides almost the same degree of well-being to recent PhD recipients, while being employed in other occupations generates certain dissatisfaction with the job that is not fully offset by pecuniary elements. Indeed, satisfaction with other non-monetary aspects of the job (not observed in the data) might be also playing a role, given that faculty workers might be more satisfied with working time flexibility, working conditions and, most importantly, academic freedom for publishing, peer recognition and contribution to the society than public and private sector workers. The higher satisfaction differentials that we obtained controlling for the endogenous sorting of PhD holders across sectors suggest that being employed outside traditional academic and research-

oriented jobs is synonymous with a substantial deficit in terms of perceived job quality. In fact, the positive selection obtained for almost all the cases indicates that intrinsically more satisfied PhDs tend to self-select outside the academy. Therefore, differences in job satisfaction and job domains satisfactions are even more severe once this sorting process based on latent traits is taken into account.

In parallel to what has been concluded in the general literature regarding public sector workers, our results point to the existence of 'academic rents', at least for our sample of recent Spanish doctorate graduates. These 'academic rents' represent, in all likelihood, the result of substantial queues for academic and research-oriented positions among recent PhD graduates, in combination with the lack of adequate jobs for PhDs outside the traditional academic sector. Moreover, on the one hand, the presence of positive selection among public and private sector workers also reflect that a non-trivial proportion of new PhDs with marked preferences for the academia (i.e. those with a higher 'taste for science') ends up working in other occupations because of constrained choices. Therefore, these highly-educated workers are likely to be especially disappointed with their labour market situation and could be significantly better off if they were working as faculty or research institute members. On the other hand, the negative correlation between the unobserved determinants of earnings satisfaction and latent traits that favour the employment in the private sector (but also in research institutes) confirm that 'professionally-oriented' doctors assign more weight to the economic remuneration relative to faculty members.

Even if the data reflects only PhD holders' labour market situation in a fixed period of time — i.e. four years after completing doctoral studies — it has been argued that when PhD graduates move away from the academic track, the chances of returning to the academy in later stages of their career are quite low (Schwabe, 2011). Therefore, our results should be seriously considered by policymakers, because they reveal that a substantial share of recent PhD graduates is at risk of being underemployed outside traditional academic occupations[9]. This would represent a huge misuse of public and private resources devoted to doctoral education, which is mainly due to the lack of benefit from the suitable employment of PhD holders in the productive structure of the economy. In order to improve this worrisome picture about recent PhD holders, several policy measures could be advocated.

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[9] It must be noted that the parallelism between lower job satisfaction and underemployment of PhD holders working in non-academic (or research-oriented) jobs is based on the assumption that our joint model for sector choice and job satisfaction properly captures the intrinsic preferences of PhD holders for working in a given sector, which should be picked up by the common latent factors (i.e. the selection terms). In fact, without controlling for self-selection into sectors, the job satisfaction differentials reflect both the lack of suitable objective job attributes and other unobservable characteristics that affect sector choice (including, among other things, the initial working preferences that might be unfulfilled due to constraints in the academic labour market).

From the supply side, there is space for academic policies aimed at reorienting doctoral education in order to improve employability outside the traditional academic sector, which appears in the agenda of several European higher education institutions. One possibility could be increasing the endowment of horizontal and transferable skills acquired during doctoral education, facilitating the adaptability of new doctors in private firms and public institutions (as suggested by Lee et al, 2010; Halse & Mowbray, 2011; Neumann & Khim-Tan, 2011). In fact, doctoral training in European countries is generally oriented towards the acquisition of competences that enable pursuing academic research, which could be relatively less valuable outside the academy. Therefore, PhD holders could not be able to exploit their capabilities when employed in industry, private firms or other public sector jobs than the academia. In this scenario, it is quite likely that fostering the formation of other skills that are useful in non-academic environments would contribute to reducing the extent of dissatisfaction with the intrinsic aspects of the job. Related to this, more structural changes in doctoral studies could also be beneficial for the suitable employability of PhDs outside the academy (Kehm, 2007). An appealing option consists in increasing the supply of professional PhDs — which are implicitly more firm and business-oriented — following the new model that is gaining importance in the US and also in the UK and other countries (Huisman & Naidoo, 2006; Wildy et al, 2013).

Nevertheless, the above-mentioned supply side policies would be barely effective if not accompanied by demand side interventions aimed at guaranteeing the (suitable) employability of PhDs in industry, private business and public (non-academic) institutions. First, policies should be focussed on increasing absorptive capacity, R&D expenditure and the intensive use of knowledge, as this would help in exploiting and stimulating the innovative potential of new PhD holders and make them more gratified with their jobs. Likewise, promoting university-firms collaborations would be a sensitive route to follow, as PhD holders employed in firms can make these relationships more effective thanks to their network connections with the academic world. The government (at different levels) and other non-academic public institutions should create and enhance their own research divisions, favouring the provision of public job positions in which being endowed with PhD skills and competences represents a relevant asset. More in general, innovative firms and public institutions that are linked to academic and policy-oriented research might also implement and enhance open science policies, as well as introduce publication premiums and more flexibility to remaining connected with the academic environment. Indeed, this could mitigate the perceived dissatisfaction of academically oriented PhDs who work outside the university. In parallel, given the absence of (perceived) job quality differentials between university and research centres, stimulating hiring of new doctors in research institutes would contribute in reducing the inefficient allocation of PhDs in the economy. More public and private investment in research institutions, including those that belong

to supranational entities (i.e. Research Institutes of the European Commission, OECD etc.), could thus balance the current compression of university hiring and the lack of academic jobs for incoming doctors.

REFERENCES

Agarwal, R. & Ohyama, A. (2013). Industry or Academia, Basic or Applied Career Choices and Earnings -Trajectories of Scientists, *Management Science*. (59)4: 950-970.

Aghion, P., Dewatripont, M. & Stein, J.C. (2008). Academic freedom, private-sector focus, and the process of innovation, *RAND Journal of Economics*, 39(3): 617-635.

Auriol, L. (2010). Careers of Doctorate Holders: Employment and Mobility Patterns, OECD Science, Technology and Industry Working Papers 2010/4, OECD Publishing.

Bender, K.A. & Heywood, J.S. (2006). Job Satisfaction of the Highly Educated: The Role of Gender, Academic Tenure, and Earnings, *Scottish Journal of Political Economy*. 53(2): 253-279.

Bender, K.A. & Heywood, J.S. (2009). Educational Mismatch among Ph.D.s: Determinants and Consequences, NBER Chapters, in: *Science and Engineering Careers in the United States: An Analysis of Markets and Employment*, pages 229-255, National Bureau of Economic Research, Inc.

Bonnard, C. (2012). The access of the Young Graduates in Science into R&D Professions: A Switching Model Treatment for the French Case, *LABOUR*. 26(1): 46-65.

Canal-Domínguez, J.F. & Muñiz-Pérez, M. (2012). Professional doctorates and the careers: present and future. The Spanish case, *European Journal of Education*. 47(1): 153-171.

Clark, A. (1996). Job satisfaction in Britain, *British Journal of Industrial Relationship*. 34(2): 189-217.

Clark, A.E. & Senik, C. (2006). The (unexpected) structure of rents on the French and British labour markets, *The Journal of Socio-Economics*. 35(2): 180-196.

Cyranoski, D., Gilbert, N., Ledford, H., Nayar, A., & Yahia, M. (2011). The PhD Factory, *Nature*. 472: 276-279.

Danzer, N. (2013). Job Satisfaction and Sorting into the Public and Private Sector: Evidence from a Natural Experiment, IZA discussion paper no. 7644, Institute for the Study of Labour (IZA).

Deb, P. (2009). MTREATREG: Stata module to fits models with multinomial treatments and continuous, count and binary outcomes using maximum simulated likelihood, Statistical Software Components S457064, Boston College Department of Economics.

Demoussis, M. & Giannakopoulos, N. (2007). Exploring Job Satisfaction in Private and Public Employment: Empirical Evidence from Greece, *LABOUR*. 21(2): 333-359.

Enders, J. (2002). Serving many masters: The PhD on the labour market, the everlasting need of inequality, and the premature death of Humboldt, *Higher Education*. 44(3-4): 493-517.

Freeman, R. (1978). Job satisfaction as an economic variable, *American Economic Review*. 68: 135-41.

Ferrer-i-Carbonell, A. (2013). Happiness Economics, *SERIEs*. 4(1): 35-60.

García-Quevedo, J., Mas-Verdú, F. & Polo-Otero, J. (2012). Which firms want PhDs? An analysis of the determinants of the demand, *Higher Education*. 63:607–620.

Halse, C. & Mowbray, S. (2011). The impact of the doctorate, *Studies in Higher Education*. 36(5): 513-525.

Hamermesh, D.S. (1977). Economic aspects of job satisfaction, in O.C. Ashenfelter & W.E. Oates (eds.), *Essays in Labor Market Analysis*. New York: John Wiley.

Heywood, J.S, Siebert, W.S. & Wei, X. (2002). Worker sorting and job satisfaction: The case of union and government jobs, *Industrial and Labor Relations Review*. 55(4): 595-609.

Huisman, J. & Naidoo, R. (2006). The Professional Doctorate: from Anglo-Saxon to European Challenges, *Higher Education Management and Policy*. 18(2): 1-13.

Kehm, B.M. (2006). Doctoral education in Europe and North America: A comparative analysis. In *The formative years of scholars*, by Teichler, U. (Ed), WennerGren International Series vol. 83. London: Portland Press.

Kehm, B.M. (2007). Quo vadis doctoral education? New European approaches in the context of global changes, *European Journal of Education*. 42(3): 307-319.

Lee, H.-F. & Miozzo, M. & Laredo, P. (2010). Career patterns and competences of PhDs in science and engineering in the knowledge economy: The case of graduates from a UK research-based university, *Research Policy*. 39(7): 869-881.

Luechinger, S., Stutzer, A. & Winkelmann, R. (2006). The Happiness Gains from Sorting and Matching in the Labor Market, IZA Discussion Papers no 2019, Institute for the Study of Labor (IZA).

Luechinger, S., Stutzer, A. & Winkelmann, R. (2010). Self-selection models for public and private sector job satisfaction, In: Jobs, Training, and Worker Well-Being, *Research in Labor Economics*. 30: 233–251.

Neumann, R. & Khim-Tan, K. (2011). From PhD to initial employment: the doctorate in a knowledge economy, *Studies in Higher Education*. 36:5, 601-614

Recotillet, I. (2007). PhD Graduates with Post-doctoral Qualification in the Private Sector: Does It Pay Off? *LABOUR*. 21(3): 473–502.

Roach, M. & Sauermann, H. (2010). A taste for science? Ph.D. scientists' academic orientation and self-selection into research career in industry, *Research Policy*. 39(3): 422–434.

Sauermann, H. & Roach, M. (2014). Not all scientists pay to be scientists: PhDs' preferences for publishing in industrial employment, *Research Policy*. 43(1): 32-47.

Schwabe, M. (2011). The Career Paths of Doctoral Graduates in Austria, *European Journal of Education*. 46(1): 153-168.

Skalli, A., Theodossiou, I. & Vasileiou, E. 2008. Jobs as Lancaster goods: Facets of job satisfaction and overall job satisfaction," *The Journal of Socio-Economics*, 37(5): 1906-1920.

Stephan, P., A. Sumell, G. Black, and J. Adams. (2004). Doctoral education and economic development: The flow of new PhDs to industry, *Economic Development Quarterly.* 18 (2): 151–67.

Stephan, P.E., Sumell, A.J., Adams, J.D. & Black, G. (2005). Firm Placements of New PhDs. *In The Role of Labour Mobility and Informal Networks for Knowledge Trans*fer, by Fornahl, D., Zellner, C., Audretsch, D.B. (Eds.). International Studies in Entrepreneurship, 6 (XII): 123-146.

Stern, S. (2004). Do scientists pay to be scientists? *Management Science*. 50(6):835–853.

van Praag, B. M. S., Frijters, P. & Ferrer-i-Carbonell, A. (2003). The anatomy of subjective well-being, *Journal of Economic Behavior & Organization*. 51(1): 29-49.

Wildy, H., Peden, S., & Chan, K. (2014). The rise of professional doctorates: case studies of the Doctorate in Education in China, Iceland and Australia, *Studies in Higher Education*, (on-line first, DOI:10.1080/03075079.2013.842968).

TABLES

Table 1: Job satisfaction by sector of occupation (%)

	University	Research Institutes	Public Sector	Private Sector	Total
Satisfaction with Earnings					
1 (very unsatisfied)	2.37	3.06	3.83	1.07	2.52
2	5.85	7.50	5.01	2.14	5.22
3	11.22	11.94	10.91	10.16	11.08
4	22.91	17.50	23.30	14.44	19.99
5	29.86	26.94	28.61	35.83	30.30
6	20.70	23.06	19.76	27.01	22.39

7 (very satisfied)	7.11	10.00	8.55	9.36	8.50
Average	4.63	4.67	4.61	5.00	4.72

Satisfaction with Promotion Opportunities

1 (very unsatisfied)	3.46	7.20	7.96	2.67	4.97
2	4.41	8.03	5.90	5.08	5.62
3	10.87	9.14	9.14	7.22	9.36
4	16.54	18.01	16.22	12.57	15.92
5	26.30	24.10	24.48	29.68	26.21
6	25.51	21.05	25.66	26.74	24.87
7 (very satisfied)	12.91	12.47	10.62	16.04	13.05
Average	4.86	4.57	4.63	5.06	4.80

Satisfaction with Job Content

1 (very unsatisfied)	0.16	0.28	1.18	0.00	0.35
2	0.31	0.83	1.18	1.34	0.82
3	0.94	0.83	4.14	1.34	1.64
4	3.78	5.26	7.40	6.15	5.33
5	16.22	16.07	20.12	21.93	18.21
6	42.52	42.38	37.57	43.32	41.69
7 (very satisfied)	36.06	34.35	28.40	25.94	31.97
Average	6.07	6.01	5.70	5.82	5.93

Satisfaction with Job-Skills Match

1 (very unsatisfied)	1.10	2.22	13.61	8.29	5.39
2	0.95	0.83	10.06	10.70	4.86
3	3.31	3.60	11.83	8.29	6.15
4	9.78	7.76	15.98	15.78	11.89
5	21.45	21.61	21.30	19.79	21.09
6	36.12	36.84	18.05	24.33	30.11
7 (very satisfied)	27.29	27.15	9.17	12.83	20.50
Average	5.67	5.65	4.12	4.52	5.11

Overall Job Satisfaction

1 (very unsatisfied)	0.47	0.83	1.77	0.27	0.76
2	0.47	0.28	2.06	0.27	0.70
3	1.89	2.49	3.24	4.55	2.87
4	7.56	7.48	11.21	9.63	8.72
5	20.00	26.87	26.55	27.54	24.40
6	49.29	44.88	41.30	44.12	45.64
7 (very satisfied)	20.31	17.17	13.86	13.64	16.91
Average	5.75	5.63	5.38	5.51	5.60
% Selected Sample	37.16%	21.12%	19.84%	22.88	100%

Table 2: Covariate-Adjusted Job Satisfaction Differentials (POLS)

	(1)	(2)	(3)	(4)	(5)
	Satisfaction with Earnings				
University	*reference category*				
Research Institutes	0.088	0.075	0.047	0.049	0.123
	(0.072)	*(0.081)*	*(0.078)*	*(0.078)*	*(0.100)*
Public Sector	0.153	0.092	0.007	-0.003	0.044
	(0.078)*	*(0.087)*	*(0.084)*	*(0.086)*	*(0.101)*
Private Sector	0.344	0.272	0.103	0.098	0.141
	(0.066)***	*(0.092)****	*(0.090)*	*(0.090)*	*(0.102)*

	(1)	(2)	(3)	(4)	(5)
Adjusted R²	0.060	0.062	0.143	0.143	0.145

Satisfaction with Promotion Opportunities					
University	*reference category*				
Research Institutes	-0.055	-0.108	-0.119	-0.119	-0.319
	(0.072)	(0.080)	(0.079)	(0.079)	(0.105)***
Public Sector	-0.077	-0.169	-0.214	-0.216	-0.435
	(0.078)	(0.086)*	(0.085)**	(0.087)**	(0.106)***
Private Sector	0.246	0.100	-0.011	-0.012	-0.200
	(0.067)***	(0.093)	(0.093)	(0.094)	(0.110)*
Adjusted R²	0.049	0.063	0.107	0.105	0.114

Satisfaction with Job Content					
University	*reference category*				
Research Institutes	-0.007	0.034	0.020	0.025	-0.225
	(0.066)	(0.075)	(0.075)	(0.075)	(0.104)**
Public Sector	-0.372	-0.369	-0.393	-0.309	-0.521
	(0.079)***	(0.087)***	(0.087)***	(0.089)***	(0.109)***
Private Sector	-0.188	-0.160	-0.215	-0.156	-0.352
	(0.065)***	(0.089)*	(0.091)**	(0.091)*	(0.108)***
Adjusted R²	0.040	0.039	0.045	0.058	0.069

Satisfaction with Job-Skills Match					
University	*reference category*				
Research Institutes	-0.044	0.021	0.012	0.012	-0.496
	(0.061)	(0.069)	(0.069)	(0.068)	(0.096)***
Public Sector	-0.766	-0.695	-0.721	-0.577	-0.820
	(0.076)***	(0.083)***	(0.083)***	(0.086)***	(0.103)***
Private Sector	-0.608	-0.508	-0.562	-0.467	-0.782
	(0.065)***	(0.087)***	(0.088)***	(0.088)***	(0.100)***
Adjusted R²	0.164	0.168	0.170	0.199	0.229

Overall Job Satisfaction					
University	*reference category*				
Research Institutes	-0.075	-0.064	-0.075	-0.072	-0.278
	(0.067)	(0.075)	(0.075)	(0.075)	(0.103)***
Public Sector	-0.284	-0.280	-0.313	-0.238	-0.459
	(0.078)***	(0.085)***	(0.085)***	(0.088)***	(0.107)***
Private Sector	-0.175	-0.180	-0.247	-0.195	-0.377
	(0.066)***	(0.089)**	(0.091)***	(0.092)**	(0.106)***
Adjusted R²	0.032	0.032	0.041	0.050	0.063

Note: model (1) includes controls for the year of the survey, gender, log-age, parental education, PhD-funding, log-PhD duration, PhD thesis in English, PhD thesis developed within a research group, extraordinary PhD thesis prize, dummies for pre-doctoral mobility, PhD-type FEs, university FEs and job location indicators. Model (2) contains additional controls for log-job tenure, permanent contract, firm size. Model (3) contains additional controls for annual earnings categories. Model (4) contains additional controls for academic requirements to enter the current job. Model (5) contains additional controls for the main activity at the current job (non-excluding categories). Robust standard errors within parenthesis. * Significant at 10%, **significant at 5%, *** significant at 1%.

Table 3: Selectivity-Corrected Job Satisfaction Differentials

	MODEL			
	(1)	(2)	(3)	(4)
Satisfaction with Earnings				
University	*reference category*			
Research Institutes	0.387	0.343	0.303	0.308
	(0.136)***	(0.127)***	(0.112)***	(0.113)***

	(1)	(2)	(3)	(4)
Public Sector	-0.171	-0.240	-0.321	-0.330
	(0.119)	(0.115)**	(0.125)**	(0.126)***
Private Sector	0.842	0.765	0.543	0.535
	(0.193)***	(0.143)***	(0.120)***	(0.128)***
$Lambda_{research}$	-0.350	-0.336	-0.319	-0.322
	(0.160)**	(0.125)***	(0.111)***	(0.115)***
$Lambda_{public}$	0.445	0.439	0.455	0.457
	(0.126)***	(0.127)***	(0.089)***	(0.087)***
$Lambda_{private}$	-0.647	-0.682	-0.544	-0.537
	(0.263)**	(0.228)***	(0.123)***	(0.137)***
Satisfaction with Promotion Opportunities				
University	*reference category*			
Research Institutes	-0.138	-0.209	-0.124	-0.124
	(0.153)	(0.171)	(0.205)	(0.225)
Public Sector	-0.521	-0.556	-0.632	-0.636
	(0.170)***	(0.189)***	(0.134)***	(0.134)***
Private Sector	0.242	0.052	-0.095	-0.106
	(0.215)	(0.364)	(0.435)	(0.521)
$Lambda_{research}$	0.091	0.111	-0.015	-0.015
	(0.160)	(0.180)	(0.220)	(0.239)
$Lambda_{public}$	0.575	0.497	0.535	0.536
	(0.200)***	(0.237)**	(0.137)***	(0.141)***
$Lambda_{private}$	0.006	0.056	0.101	0.111
	(0.254)	(0.420)	(0.502)	(0.600)

*Note: model (1) includes controls for the year of the survey, gender, log-age, parental education, PhD-funding, log-PhD duration, PhD thesis in English, PhD thesis developed within a research group, extraordinary PhD thesis prize, dummies for pre-doctoral mobility, PhD-type FEs, university FEs and job location indicators. Model (2) contains additional controls for log-job tenure, permanent contract, firm size. Model (3) contains additional controls for annual earnings categories. Model (4) contains additional controls for academic requirements to enter the current job. Robust standard errors within parenthesis. * Significant at 10%, **significant at 5%, *** significant at 1%.*

Table 3 (*continued*): Selectivity-Corrected Job Satisfaction Differentials

	MODEL			
	(1)	(2)	(3)	(4)
Satisfaction with Job Content				
University	*reference category*			
Research Institutes	-0.120	-0.081	0.102	-0.139
	(0.309)	(0.298)	(0.164)	(0.148)
Public Sector	-0.792	-0.799	-0.803	-0.759
	(0.111)***	(0.114)***	(0.132)***	(0.124)***
Private Sector	-0.546	-0.548	-0.176	-0.363
	(0.105)***	(0.140)***	(0.211)	(0.234)

Lambda$_{research}$	0.115	0.109	-0.121	0.176
	(0.393)	*(0.392)*	*(0.168)*	*(0.154)*
Lambda$_{public}$	0.548	0.544	0.527	0.559
	(0.100)***	*(0.099)****	*(0.116)****	*(0.105)****
Lambda$_{private}$	0.467	0.484	-0.045	0.254
	(0.112)***	*(0.117)****	*(0.214)*	*(0.269)*

Satisfaction with Job-Skills Match

University	*reference category*			
Research Institutes	-0.089	-0.049	-0.054	-0.038
	(0.171)	*(0.154)*	*(0.156)*	*(0.362)*
Public Sector	-0.946	-0.878	-0.931	-0.736
	(0.157)***	*(0.150)****	*(0.189)****	*(0.123)****
Private Sector	-0.915	-0.795	-0.850	-0.671
	(0.131)***	*(0.145)****	*(0.148)****	*(0.158)****
Lambda$_{research}$	0.031	0.059	0.054	0.043
	(0.194)	*(0.171)*	*(0.171)*	*(0.432)*
Lambda$_{public}$	0.228	0.221	0.255	0.189
	(0.177)	*(0.165)*	*(0.222)*	*(0.117)*
Lambda$_{private}$	0.389	0.348	0.349	0.245
	(0.138)***	*(0.138)***	*(0.141)***	*(0.148)**

Overall Job Satisfaction

University	*reference category*			
Research Institutes	-0.094	-0.028	-0.009	-0.083
	(0.099)	*(0.191)*	*(0.176)*	*(0.222)*
Public Sector	-0.797	-0.618	-0.623	-0.543
	(0.101)***	*(0.324)**	*(0.141)****	*(0.162)****
Private Sector	-0.620	-0.582	-0.621	-0.622
	(0.087)***	*(0.244)***	*(0.151)****	*(0.240)****
Lambda$_{research}$	-0.002	-0.082	-0.118	-0.022
	(0.107)	*(0.231)*	*(0.204)*	*(0.271)*
Lambda$_{public}$	0.657	0.423	0.386	0.369
	(0.075)***	*(0.386)*	*(0.133)****	*(0.159)***
Lambda$_{private}$	0.587	0.492	0.456	0.514
	(0.076)***	*(0.292)**	*(0.153)****	*(0.282)**

Note: model (1) includes controls for the year of the survey, gender, log-age, parental education, PhD-funding, log-PhD duration, PhD thesis in English, PhD thesis developed within a research group, extraordinary PhD thesis prize, dummies for pre-doctoral mobility, PhD-type FEs, university FEs and job location indicators. Model (2) contains additional controls for log-job tenure, permanent contract, firm size. Model (3) contains additional controls for annual earnings categories. Model (4) contains additional controls for academic requirements to enter the current job. Robust standard errors within parenthesis. * Significant at 10%, **significant at 5%, *** significant at 1%.

APPENDIX

Table 1A: Descriptive Statistics

	University		Research Institutes		Public Sector		Private Sector	
CONTROLS	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Cohort 2011	0.550	*0.498*	0.551	*0.498*	0.560	*0.497*	0.586	*0.493*
SOCIODEMOGRAPHIC VARIABLES								
Female	0.376	*0.485*	0.554	*0.498*	0.493	*0.501*	0.492	*0.501*
Age (survey year)	37.23	*5.32*	35.73	*4.17*	41.13	*6.05*	36.71	*5.51*
Parental education = primary or less	0.386	*0.487*	0.380	*0.486*	0.481	*0.500*	0.409	*0.492*

	University Mean	University S.D.	Research Institutes Mean	Research Institutes S.D.	Public Sector Mean	Public Sector S.D.	Private Sector Mean	Private Sector S.D.
Parental education = secondary	0.250	*0.434*	0.233	*0.423*	0.218	*0.414*	0.246	*0.431*
Parental education = tertiary	0.364	*0.481*	0.388	*0.488*	0.301	*0.459*	0.345	*0.476*
ACADEMIC VARIABLES								
Research fellowship during the PhD	0.528	*0.500*	0.814	*0.389*	0.298	*0.458*	0.639	*0.481*
Teaching/research contract during the PhD	0.306	*0.461*	0.069	*0.254*	0.035	*0.185*	0.080	*0.272*
Work related to the PhD	0.123	*0.329*	0.091	*0.289*	0.546	*0.499*	0.179	*0.384*
Work not related to the PhD or others	0.044	*0.205*	0.025	*0.156*	0.121	*0.327*	0.102	*0.303*
PhD duration (in years)	5.728	*3.020*	4.601	*2.349*	6.327	*3.929*	5.286	*3.227*
Extraordinary PhD prize	0.170	*0.376*	0.147	*0.354*	0.097	*0.297*	0.091	*0.288*
PhD thesis in English	0.304	*0.460*	0.271	*0.445*	0.056	*0.230*	0.184	*0.388*
PhD thesis within a research group	0.687	*0.464*	0.878	*0.328*	0.472	*0.500*	0.741	*0.439*
PRE & POST DOCTORAL MOBILITY								
No pre-doctoral mobility	0.359	*0.480*	0.341	*0.475*	0.676	*0.469*	0.460	*0.499*
Pre-doctoral mobility in national centres	0.030	*0.171*	0.055	*0.229*	0.083	*0.276*	0.067	*0.250*
Pre-doctoral mobility in European centres	0.380	*0.486*	0.385	*0.487*	0.145	*0.352*	0.307	*0.462*
Pre-doctoral mobility in U.S. centres	0.140	*0.347*	0.166	*0.373*	0.071	*0.257*	0.099	*0.299*
Pre-doctoral mobility in other countries	0.091	*0.288*	0.053	*0.224*	0.027	*0.161*	0.067	*0.250*
No post-doctoral mobility	0.491	*0.500*	0.460	*0.499*	0.876	*0.330*	0.826	*0.379*
Post-doctoral mobility in national centres	0.061	*0.240*	0.078	*0.268*	0.018	*0.132*	0.043	*0.203*
Post-doctoral mobility in European centres	0.249	*0.433*	0.296	*0.457*	0.053	*0.225*	0.075	*0.264*
Post-doctoral mobility in U.S. centres	0.123	*0.329*	0.119	*0.324*	0.041	*0.199*	0.032	*0.176*
Post-doctoral mobility in other countries	0.076	*0.265*	0.047	*0.212*	0.012	*0.108*	0.024	*0.153*
Elapsed time between the degree and the PhD	2.75	*3.53*	2.90	*3.19*	5.40	*5.07*	3.13	*4.12*
WORKING REGION								
Working in Barcelona province	0.628	*0.484*	0.670	*0.471*	0.684	*0.465*	0.759	*0.428*
Working in Tarragona province	0.065	*0.246*	0.033	*0.180*	0.083	*0.276*	0.059	*0.236*
Working in Girona province	0.080	*0.272*	0.028	*0.164*	0.068	*0.252*	0.048	*0.214*
Working in Lleida province	0.041	*0.198*	0.025	*0.156*	0.062	*0.241*	0.008	*0.089*
Working in the rest of Spain	0.077	*0.267*	0.094	*0.292*	0.077	*0.267*	0.059	*0.236*
Working in the EU	0.060	*0.237*	0.094	*0.292*	0.021	*0.142*	0.029	*0.169*
Working outside the EU	0.049	*0.216*	0.055	*0.229*	0.006	*0.077*	0.037	*0.190*
JOB ATTRIBUTES								
Current job tenure	6.66	*5.98*	4.35	*4.34*	10.25	*7.32*	6.06	*5.95*
Permanent contract	0.250	*0.434*	0.402	*0.491*	0.853	*0.355*	0.939	*0.241*
# Workers ≤ 50	0.000	—	0.130	*0.337*	0.041	*0.199*	0.324	*0.468*
50 < # Workers ≤ 250	0.000	—	0.296	*0.457*	0.094	*0.293*	0.257	*0.437*
250 < # Workers ≤ 500	0.043	*0.202*	0.119	*0.324*	0.029	*0.169*	0.078	*0.268*
# Workers > 500	0.957	*0.202*	0.454	*0.499*	0.835	*0.372*	0.342	*0.475*

Table 1A (*continued*): Descriptive Statistics

	University		Research Institutes		Public Sector		Private Sector	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
ANNUAL EARNINGS								
Annual earnings < 18,000 €	0.044	*0.205*	0.025	*0.156*	0.050	*0.219*	0.035	*0.183*
Annual earnings between 18,000 € and 24,000 €	0.143	*0.351*	0.169	*0.375*	0.118	*0.323*	0.102	*0.303*
Annual earnings between 24,000 € and 30,000 €	0.293	*0.455*	0.341	*0.475*	0.177	*0.382*	0.163	*0.370*
Annual earnings between 30,000 € and 40,000 €	0.342	*0.475*	0.291	*0.455*	0.263	*0.441*	0.329	*0.470*
Annual earnings between 40,000 € and 50,000 €	0.083	*0.277*	0.080	*0.272*	0.124	*0.330*	0.115	*0.319*
Annual earnings > 50,000 €	0.025	*0.157*	0.055	*0.229*	0.201	*0.401*	0.198	*0.399*

Annual earnings missing	0.069	*0.254*	0.039	*0.193*	0.068	*0.252*	0.059	*0.236*
ACADEMIC REQUIREMENTS (CURRENT JOB)								
PhD required for the job	0.540	*0.499*	0.693	*0.462*	0.038	*0.192*	0.329	*0.470*
Specific undergraduate degree required	0.395	*0.489*	0.252	*0.435*	0.832	*0.375*	0.519	*0.500*
Specific undergraduate degree required	0.060	*0.237*	0.050	*0.218*	0.094	*0.293*	0.112	*0.316*
No academic requirements for the job	0.005	*0.069*	0.006	*0.074*	0.035	*0.185*	0.040	*0.196*
MAIN ACTIVITY (NON-EXCLUDING)								
Direction	—	—	0.194	*0.396*	0.254	*0.436*	0.422	*0.495*
Teaching	—	—	0.197	*0.398*	0.560	*0.497*	0.195	*0.397*
R&D	—	—	0.931	*0.254*	0.307	*0.462*	0.489	*0.501*
Technical tasks	—	—	0.186	*0.389*	0.221	*0.416*	0.366	*0.482*
Health-related tasks	—	—	0.028	*0.164*	0.419	*0.494*	0.086	*0.280*
PHD TYPE								
Geography and Demography	0.017	*0.131*	0.011	*0.105*	0.009	*0.094*	0.008	*0.089*
History, Philosophy and Arts	0.060	*0.237*	0.033	*0.180*	0.091	*0.289*	0.051	*0.220*
Language, Linguistics and Literature	0.054	*0.225*	0.011	*0.105*	0.062	*0.241*	0.024	*0.153*
Economics, Business and Related Fields	0.079	*0.270*	0.003	*0.053*	0.024	*0.152*	0.027	*0.162*
Pedagogy and Psychology	0.076	*0.265*	0.011	*0.105*	0.053	*0.225*	0.019	*0.136*
Other Social Sciences	0.080	*0.272*	0.014	*0.117*	0.118	*0.323*	0.043	*0.203*
Chemistry	0.074	*0.262*	0.127	*0.334*	0.038	*0.192*	0.190	*0.393*
Biology	0.099	*0.299*	0.313	*0.464*	0.088	*0.284*	0.201	*0.401*
Environmental Studies	0.041	*0.198*	0.091	*0.289*	0.041	*0.199*	0.053	*0.225*
Maths and Physics	0.093	*0.291*	0.075	*0.263*	0.024	*0.152*	0.035	*0.183*
Medicine	0.030	*0.171*	0.105	*0.307*	0.375	*0.485*	0.096	*0.295*
Other Health-Related Fields	0.033	*0.179*	0.069	*0.254*	0.038	*0.192*	0.099	*0.299*
Architecture and Civil Engineering	0.036	*0.187*	0.019	*0.138*	0.003	*0.054*	0.021	*0.145*
Production Engineering	0.072	*0.259*	0.075	*0.263*	0.018	*0.132*	0.061	*0.241*
Computers and Information Engineering	0.156	*0.363*	0.042	*0.200*	0.018	*0.132*	0.072	*0.259*
UNIVERSITY								
University of Barcelona (UB)	0.372	*0.484*	0.460	*0.499*	0.487	*0.501*	0.455	*0.499*
Autonomous University of Barcelona (UAB)	0.239	*0.427*	0.283	*0.451*	0.316	*0.465*	0.275	*0.447*
Polytechnic University of Catalonia (UPC)	0.209	*0.407*	0.091	*0.289*	0.029	*0.169*	0.120	*0.326*
Pompeu Fabra University (UPF)	0.047	*0.212*	0.033	*0.180*	0.024	*0.152*	0.037	*0.190*
University of Lleida (UdL)	0.055	*0.228*	0.050	*0.218*	0.032	*0.177*	0.040	*0.196*
University of Girona (UdG)	0.036	*0.187*	0.039	*0.193*	0.056	*0.230*	0.013	*0.115*
Rovira i Virgili University (URV)	0.041	*0.198*	0.044	*0.206*	0.056	*0.230*	0.059	*0.236*
Number of observations (%)	635	37%	361	21%	339	20%	374	23%

Table 2A: Overall Job Satisfaction, Complete Estimates (POLS)

MODEL	(1)	(2)	(3)	(4)	(5)
Constant	0.679	0.393	0.879	0.962	1.070
	(0.912)	*(0.962)*	*(0.975)*	*(0.979)*	*(0.974)*
University			*reference category*		
Research Institutes	-0.075	-0.064	-0.075	-0.072	-0.278
	(0.067)	*(0.075)*	*(0.075)*	*(0.075)*	*(0.103)***
Public Sector	-0.284	-0.280	-0.313	-0.238	-0.459
	*(0.078)***	*(0.085)***	*(0.085)***	*(0.088)***	*(0.107)***

	(1)	(2)	(3)	(4)	(5)
Private Sector	-0.175	-0.180	-0.247	-0.195	-0.377
	(0.066)***	(0.089)**	(0.091)***	(0.092)**	(0.106)***
Cohort 2011	0.117	0.120	0.113	0.116	0.118
	(0.050)**	(0.052)**	(0.052)**	(0.053)**	(0.052)**
Female	0.068	0.070	0.096	0.098	0.103
	(0.048)	(0.048)	(0.049)*	(0.049)**	(0.049)**
Log(Age)	-0.240	-0.124	-0.251	-0.246	-0.284
	(0.245)	(0.263)	(0.264)	(0.265)	(0.265)
Parental education = primary or less			reference category		
Parental education = secondary	-0.068	-0.069	-0.070	-0.072	-0.070
	(0.060)	(0.060)	(0.060)	(0.060)	(0.059)
Parental education = tertiary	0.048	0.044	0.035	0.036	0.034
	(0.053)	(0.053)	(0.053)	(0.053)	(0.052)
Research fellowship during the PhD	0.095	0.084	0.104	0.063	0.076
	(0.123)	(0.124)	(0.124)	(0.122)	(0.121)
Teaching/research contract during the PhD	0.090	0.088	0.102	0.083	0.097
	(0.125)	(0.126)	(0.126)	(0.124)	(0.123)
Work related to the PhD	0.066	0.067	0.058	0.013	-0.001
	(0.116)	(0.117)	(0.117)	(0.115)	(0.114)
Work not related to the PhD or others			reference category		
Log(PhD duration)	-0.001	0.006	0.001	0.006	0.001
	(0.050)	(0.050)	(0.049)	(0.049)	(0.049)
Extraordinary PhD prize	0.012	0.006	0.003	-0.004	-0.020
	(0.065)	(0.065)	(0.065)	(0.064)	(0.064)
PhD thesis in English	-0.151	-0.158	-0.169	-0.165	-0.172
	(0.064)**	(0.065)**	(0.065)***	(0.065)**	(0.065)***
PhD thesis within a research group	-0.020	-0.029	-0.032	-0.036	-0.037
	(0.064)	(0.065)	(0.064)	(0.064)	(0.063)
No pre-doctoral mobility			reference category		
Pre-doctoral mobility in national centres	0.100	0.108	0.113	0.119	0.109
	(0.107)	(0.108)	(0.110)	(0.108)	(0.107)
Pre-doctoral mobility in European centres	0.044	0.041	0.047	0.041	0.024
	(0.059)	(0.059)	(0.059)	(0.059)	(0.059)
Pre-doctoral mobility in U.S. centres	-0.047	-0.048	-0.061	-0.078	-0.072
	(0.074)	(0.074)	(0.075)	(0.075)	(0.075)
Pre-doctoral mobility in other countries	-0.036	-0.037	-0.047	-0.034	-0.018
	(0.096)	(0.096)	(0.097)	(0.097)	(0.096)

*Robust standard errors in italic. * Significant at 1%, **significant at 5%, *** significant at 1%. All the model contain fixed effects for PhD-type and university.*

Table 2A (*continued*): Overall Job Satisfaction, Complete Estimates (POLS)

MODEL	(1)	(2)	(3)	(4)	(5)
Working in Barcelona province			reference category		
Working in Tarragona province	0.108	0.105	0.093	0.073	0.036
	(0.118)	(0.118)	(0.116)	(0.115)	(0.117)
Working in Girona province	0.197	0.200	0.215	0.225	0.226
	(0.133)	(0.133)	(0.131)	(0.130)*	(0.126)*
Working in Lleida province	0.028	0.028	0.040	0.023	0.002
	(0.159)	(0.160)	(0.161)	(0.157)	(0.157)
Working in the rest of Spain	-0.130	-0.139	-0.126	-0.128	-0.129

	(1)	(2)	(3)	(4)	(5)
	(0.094)	*(0.095)*	*(0.095)*	*(0.095)*	*(0.093)*
Working in the EU	0.356	0.350	0.253	0.225	0.246
	(0.096)***	*(0.096)****	*(0.097)****	*(0.098)***	*(0.098)***
Working outside the EU	0.205	0.193	0.128	0.078	0.099
	(0.109)*	*(0.109)**	*(0.111)*	*(0.112)*	*(0.111)*
log(Current job tenure)		-0.037	-0.041	-0.012	-0.018
		(0.032)	*(0.031)*	*(0.034)*	*(0.035)*
Permanent contract		0.003	-0.022	-0.007	-0.002
		(0.062)	*(0.061)*	*(0.062)*	*(0.062)*
# Workers ≤ 50		*reference category*			
50 < # Workers ≤ 250		-0.166	-0.171	-0.193	-0.163
		(0.096)*	*(0.096)**	*(0.094)***	*(0.093)**
250 < # Workers ≤ 500		-0.057	-0.113	-0.138	-0.090
		(0.117)	*(0.117)*	*(0.115)*	*(0.113)*
# Workers > 500		-0.075	-0.103	-0.112	-0.085
		(0.090)	*(0.090)*	*(0.088)*	*(0.087)*
Annual earnings < 18,000 €		*reference category*			
Annual earnings between 18,000 € and 24,000 €			-0.050	-0.062	-0.060
			(0.149)	*(0.147)*	*(0.147)*
Annual earnings between 24,000 € and 30,000 €			-0.054	-0.082	-0.070
			(0.142)	*(0.140)*	*(0.141)*
Annual earnings between 30,000 € and 40,000 €			0.055	0.024	0.011
			(0.140)	*(0.139)*	*(0.139)*
Annual earnings between 40,000 € and 50,000 €			0.268	0.245	0.213
			(0.151)*	*(0.149)*	*(0.151)*
Annual earnings > 50,000 €			0.282	0.273	0.199
			(0.156)*	*(0.154)**	*(0.157)*
Annual earnings missing			0.121	0.084	0.058
			(0.169)	*(0.167)*	*(0.167)*
PhD required for the job			*reference category*		
Specific undergraduate degree required				-0.159	-0.153
				(0.066)**	*(0.067)***
Specific undergraduate degree required				-0.243	-0.212
				(0.105)**	*(0.106)***
No academic requirements for the job				-0.677	-0.614
				(0.217)***	*(0.216)****
Direction					0.260
					(0.069)***
Teaching					0.143
					(0.072)**
R&D					0.152
					(0.070)**
Technical tasks					-0.081
					(0.070)
Health-related tasks					0.245
					(0.124)**
Adjusted R²	0.032	0.032	0.041	0.050	0.063

Table 3A: Average Marginal Effects for Sector Choice — Mixed Multinomial Logit

	ΔPr[s = University]			ΔPr[s = Research Institute]			ΔPr[s = Public Sector]			ΔPr[s = Private Sector]		
	Marg. Eff.	S.E.		Marg. Eff.	S.E.		Marg. Eff.	S.E.		Marg. Eff.	S.E.	
Cohort 2011	0.011	0.023		-0.063	0.022	***	0.026	0.018		0.026	0.021	
SOCIODEMOGRAPHIC VARIABLES												
Female	-0.050	0.021	**	0.055	0.019	***	0.010	0.017		-0.015	0.020	
log(Age)	0.019	0.129		0.140	0.131		0.034	0.095		-0.192	0.129	
Parental education = primary or less				*reference category*								
Parental education = secondary	0.058	0.025	**	-0.027	0.023		-0.039	0.020	*	0.007	0.024	
Parental education = tertiary	0.042	0.023	*	-0.007	0.021		-0.027	0.018		-0.007	0.022	
ACADEMIC VARIABLES												
Log(Elapsed time between degree and PhD)	-0.018	0.015		0.032	0.015	**	0.010	0.013		-0.025	0.015	
Research fellowship during the PhD	0.091	0.048	*	0.113	0.054	**	-0.056	0.034		-0.148	0.044	***
Teaching/research contract during the PhD	0.364	0.065	***	-0.040	0.061		-0.139	0.027	***	-0.185	0.027	***
Work related to the PhD	0.033	0.053		0.008	0.060		0.064	0.032	**	-0.104	0.034	***
Work not related to the PhD or others				*reference category*								
log(PhD duration)	0.019	0.025		-0.003	0.024		-0.008	0.018		-0.008	0.024	
Extraordinary PhD prize	0.088	0.031	***	0.002	0.027		-0.024	0.024		-0.066	0.026	**
PhD thesis in English	0.026	0.029		0.057	0.030	*	-0.062	0.027	**	-0.021	0.027	
PhD thesis within a research group	0.004	0.027		0.066	0.027	**	-0.051	0.023	**	-0.020	0.026	
PRE & POST DOCTORAL MOBILITY												
No pre-doctoral mobility				*reference category*								
Pre-doctoral mobility in national centres	-0.097	0.044	**	0.024	0.043		0.062	0.036	*	0.012	0.043	
Pre-doctoral mobility in European centres	0.041	0.026		0.006	0.024		-0.052	0.022	**	0.005	0.025	
Pre-doctoral mobility in U.S. centres	0.062	0.035	*	0.029	0.031		-0.060	0.025	**	-0.031	0.030	
Pre-doctoral mobility in other countries	0.128	0.044	***	-0.044	0.040		-0.104	0.033	***	0.020	0.040	
No post-doctoral mobility				*reference category*								
Post-doctoral mobility in national centres	0.146	0.050	***	0.101	0.043	**	-0.156	0.028	***	-0.091	0.047	*
Post-doctoral mobility in European centres	0.176	0.029	***	0.162	0.029	***	-0.145	0.023	***	-0.193	0.024	***
Post-doctoral mobility in U.S. centres	0.214	0.041	***	0.094	0.036	***	-0.081	0.032	**	-0.227	0.030	***
Post-doctoral mobility in other countries	0.186	0.055	***	0.096	0.053	*	-0.113	0.036	***	-0.169	0.040	***

*Note: marginal effects are derivatives for continuous variables and probability changes for discrete variables. Robust standard errors in italic. * Significant at 10%, **significant at 5%, *** significant at 1%.*

Table 3A (*continued*): Average Marginal Effects for Sector Choice — Mixed Multinomial Logit

	ΔPr[s = University]			ΔPr[s = Research Institute]			ΔPr[s = Public Sector]			ΔPr[s = Private Sector]		
	Marg. Eff.	S.E.		Marg. Eff.	S.E.		Marg. Eff.	S.E.		Marg. Eff.	S.E.	
WORKING REGION												
Working in Barcelona province						*reference category*						
Working in Tarragona province	0.089	0.048	*	-0.114	0.035	***	0.067	0.056		-0.042	0.041	
Working in Girona province	0.152	0.049	***	-0.180	0.024	***	0.102	0.043	**	-0.074	0.045	*
Working in Lleida province	0.198	0.070	***	-0.078	0.044	*	0.041	0.055		-0.160	0.039	***
Working in the rest of Spain	-0.018	0.035		0.004	0.031		0.054	0.029	*	-0.040	0.033	
Working in the EU	-0.014	0.053		-0.014	0.038		0.084	0.068		-0.057	0.050	
Working outside the EU	0.002	0.058		-0.037	0.046		-0.103	0.061	*	0.138	0.086	
PhD TYPE												
Geography and Demography	0.205	0.087	**	-0.035	0.072		-0.041	0.057		-0.129	0.048	***
History, Philosophy and Arts	0.149	0.048	***	-0.126	0.030	***	0.075	0.040	*	-0.098	0.034	***
Language, Linguistics and Literature	0.176	0.050	***	-0.172	0.025	***	0.106	0.049	**	-0.110	0.039	***
Economics, Business and Related Fields	0.332	0.051	***	-0.210	0.015	***	-0.018	0.050		-0.103	0.039	***
Pedagogy and Psychology	0.299	0.053	***	-0.177	0.025	***	0.036	0.045		-0.159	0.028	***
Other Social Sciences	0.280	0.047	***	-0.183	0.021	***	0.032	0.037		-0.129	0.030	***
Chemistry	-0.016	0.039		-0.071	0.026	***	0.001	0.040		0.086	0.040	**
Biology						*reference category*						
Environmental Studies	-0.033	0.047		-0.037	0.033		0.126	0.049	**	-0.056	0.038	
Maths and Physics	0.129	0.054	**	-0.054	0.035		0.040	0.053		-0.115	0.034	***
Medicine	-0.127	0.044	***	-0.069	0.030	**	0.253	0.043	***	-0.058	0.035	*
Other Health-Related Fields	0.019	0.052		-0.065	0.031	**	-0.004	0.038		0.049	0.045	
Architecture and Civil Engineering	0.087	0.091		-0.087	0.056		-0.018	0.124		0.018	0.087	
Production Engineering	0.112	0.056	**	-0.042	0.041		-0.045	0.050		-0.025	0.047	
Computers and Information Engineering	0.231	0.058	***	-0.142	0.029	***	-0.026	0.056		-0.063	0.043	
UNIVERSITY												
University of Barcelona (UB)						*reference category*						
Autonomous University of Barcelona (UAB)	0.013	0.025		0.009	0.022		-0.024	0.018		0.002	0.023	
Polytechnic University of Catalonia (UPC)	0.067	0.046		0.002	0.044		-0.080	0.038	**	0.012	0.047	
Pompeu Fabra University (UPF)	-0.029	0.050		0.033	0.055		-0.042	0.041		0.038	0.062	
University of Lleida (UdL)	-0.093	0.060		0.194	0.087	**	-0.074	0.040	*	-0.027	0.063	
University of Girona (UdG)	-0.075	0.060		0.050	0.064		0.095	0.061		-0.070	0.062	

| Rovira i Virgili University (URV) | -0.055 *0.055* | 0.052 *0.065* | -0.014 *0.061* | 0.018 *0.059* |