

PhD graduates in Spain

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Abstract

In this paper, we provide information on PhD graduates using the Spanish University Graduate Placement Survey from 2019. We identify who is more likely to pursue a PhD and we learn about who decides to study it abroad. We also analyze the probability of PhD holders to follow an academic career, as well as the returns to study the PhD abroad. Our results suggest that those who like their studies and study for the PhD abroad are likelier to have an academic job. Living abroad also increases the likelihood of having an academic job, indicating that it may be easier to find an academic job abroad. Similarly, studying a PhD abroad yields positive returns only if one finds an academic job abroad. These results are important to understand the job opportunities of PhD holders in Spain and their job characteristics.

1. Introduction

There is a growing body of research on the careers of PhDs (Keith A. Bender & Heywood, 2011; Canal-Domínguez & Wall, 2013; Di Paolo, 2016; Gaeta, Lubrano Lavadera, & Pastore, 2021). Studies concentrate mainly on the quality of labor match of doctoral graduates (Keith A Bender & Heywood, 2009; Ermini, Papi, & Scaturro, 2017; Gaeta, 2015; Gaeta et al., 2021) and their subsequent wages (Canal-Domínguez & Wall, 2013; Canal Domínguez & Rodríguez Gutiérrez, 2013; Gaeta, Lubrano Lavadera, & Pastore, 2022; Schwabe, 2011) and job satisfaction (Di Paolo, 2016; Parenti, Pinto, & Sarno, 2020; Waaijer, Belder, Sonneveld, van Bochove, & van der Weijden, 2016). In this paper, we add to this literature by analyzing a sample of Spanish PhDs and identify the main determinants of pursuing a PhD, doing it abroad, and following an academic career afterward. We also analyze how these decisions affect the wage returns of PhD graduates with a particular focus on mobility choices.

There is a stream of research looking at the international mobility of PhDs (Caparros-Ruiz, 2019; Docquier & Rapoport, 2012). PhDs move during and after their studies, creating networks that result in higher academic prestige and wages (Gupta, Nerad, & Cerny, 2003; Kim, Bankart, & Isdell, 2010) Having studied in one place and worked or done research, even if only temporarily, in another is thought to provide extra experience and thus, the ability to command higher salaries. International experience renders individuals with more networks and better skills which, in turn, weigh positively into their academic prestige (Melin, 2004; Woolley, Turpin, Marceau, & Hill, 2008). Thus, attracting talent from abroad requires offering higher wages for such an experience. On the other hand, however, domestic PhDs may flee from their home country in search of higher wages and better labor market prospects abroad contributing to the well-known phenomenon of brain drain (Cattaneo, Malighetti, & Pleari, 2018). Both ways are additionally complemented by the fact that PhDs can choose either academic or industry career (Caparros-Ruiz, 2019).

In this paper we look at the wage effects of the international experience during or after the PhD and their vertical match to jobs in terms of overeducation. Resorting to a recent wave of Spanish University Graduate Placement Survey from 2019 we show that having studied abroad partially or entirely during the PhD studies provides wage benefits in employment in Spain or abroad. This finding has two implications. Firstly, by showing that living abroad after PhD combined with the having studied in Spain may be a signal of brain drain, we contribute to the literature on international labor mobility of doctors. Secondly, by showing that choosing industry over academic career recent PhDs can command higher wages. This in turn demonstrates, that academic careers are more of a vocational than rational choice of scientists. Turning down higher wages in industry for academic career would be a demonstration of taste for research career over business career.

Our research differs from that of Caparros-Ruiz (2019) and others in several ways. Firstly, we use a novel dataset from Spain from the year 2019. All previous research for Spain is either based on subsamples of the countrywide surveys (Di Paolo, 2016) or older data from 2010 (Caparros-Ruiz, 2019). We are able to show how PhD mobility (either in terms of where the PhD was completed or in terms of where the PhD graduates currently works) affects wages but also the vertical job match. Secondly, our results are robust to changes of the field of study between undergraduate studies and PhD studies, which is the first time that such a variable is accounted for in PhD career research (Canal Domínguez & Rodríguez Gutiérrez, 2013).

The next section describes the data and explains the econometric specifications used in the analysis. Section 3 presents and discusses the estimation results. Finally, section 4 concludes.

2. Data and econometric specifications

2.1 Data

We use the Survey on the Labour Insertion of University Graduates 2019 (EILU 2019 by the Spanish acronym). EILU aims to provide information on the transition of university graduates to the labor market. The data consist of a representative sample of bachelor's and master's graduates of the 2013-2014 academic year at a Spanish university. The survey was conducted in 2019. Individuals are asked about their current labor situation, further studies attained, several characteristics of their study path, mobility experiences, and working experience. This is the second job placement survey of university graduates that the INE (Spanish National Statistical Institute) has carried out (the first was carried out in 2014). The sample consists of approximately 32,000 university graduates and 12,000 master's degree holders.

We have several dependent variables. We first use a dummy variable indicating whether the individual completed a Ph.D. after the studies in 2014. The individual reports whether the PhD studies were completed fully in Spain, partly in Spain and partly abroad, or fully abroad. This is our second dependent variable. Third, we consider that a Ph.D. holder follows an academic

career when three conditions are simultaneously satisfied: the job requires a PhD, is in the education sector and the occupation reported is teacher/professor. Finally, we use two characteristics of the current job: the monthly wage after taxes reported in wage bands, and the education-job match.

Table 1 reports the descriptive statistics of the sample split between PhD holders and no PhD holders. PhD holders represent 3.7% of the full sample and are almost three times more likely to have graduated from a master's program in 2014 rather than a bachelor's degree. The share of females is larger in the non-PhD holders' sample. Pursuing a PhD is more common in Sciences than Education and Services. The parents of PhD holders are likelier to have a university education than parents of non-PhD holders. Moreover, 8% of PhD holders have enjoyed some excellence scholarship versus 4% of non-PhD holders. In contrast, general scholarship is more common among non-PhD holders than among PhD holders. Although the satisfaction of studies is on average very high in both samples, it is slightly higher for the PhD holders.

Table 1. Descriptive statistics. Non-PhD holders and PhD holders

	Non-PhD holders				PhD holders			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Master vs bachelors' sample	0.246	0.431	0	1	0.733	0.442	0	1
Female	0.558	0.497	0	1	0.474	0.499	0	1
Age group:								
<30	0.433	0.495	0	1	0.473	0.499	0	1
30-34	0.308	0.462	0	1	0.300	0.458	0	1
>34	0.259	0.438	0	1	0.227	0.419	0	1
Field of previous studies:								
Education	0.156	0.362	0	1	0.070	0.256	0	1
Arts and humanities	0.106	0.308	0	1	0.123	0.329	0	1
Social sciences	0.104	0.305	0	1	0.082	0.275	0	1
Business Studies	0.156	0.363	0	1	0.036	0.187	0	1
Sciences	0.084	0.277	0	1	0.319	0.466	0	1
Informatics	0.035	0.184	0	1	0.044	0.205	0	1
Engineering	0.143	0.350	0	1	0.144	0.352	0	1
Agriculture	0.036	0.187	0	1	0.034	0.180	0	1
Health and welfare	0.126	0.332	0	1	0.118	0.323	0	1
Services	0.055	0.228	0	1	0.029	0.167	0	1
Father's education:								
At most low secondary	0.412	0.492	0	1	0.341	0.474	0	1
Higher secondary	0.280	0.449	0	1	0.289	0.454	0	1
University	0.308	0.462	0	1	0.370	0.483	0	1
Mother's education:								
At most low secondary	0.430	0.495	0	1	0.367	0.482	0	1
Higher secondary	0.284	0.451	0	1	0.274	0.446	0	1
University	0.286	0.452	0	1	0.360	0.480	0	1
Excellence scholarship	0.038	0.190	0	1	0.080	0.271	0	1

General scholarship	0.345	0.475	0	1	0.277	0.448	0	1
Satisfaction with previous studies	0.881	0.323	0	1	0.933	0.250	0	1
N. observations	37.365				1.462			

Table 2 reports further descriptive statistics of the PhD sample. The number of observations is reduced for the academic career and wage band variables due to some PhDs not working at the time of the survey or not reporting their wage. We observe that most PhDs studied only in Spain, although around one-third completed part of their PhD studies abroad, and close to 8% did their PhD studies only abroad. Only 17,4% of employed PhDs follow an academic career. Most PhDs have a monthly net wage between 1000 and 1999 euros and only 16% earn more than 2500 euros monthly after taxes. The share of PhDs that participated in some exchange program within Spain (SICUE) during their studies is like the general population, while the share of PhDs participating in international exchange programs (ERASMUS) is slightly lower than the general population (around 14% in the general sample versus 11% in the PhDs sample). Finally, PhDs are more common in Sciences and Health Sciences, followed by Engineering, Social Sciences, and Arts and Humanities.

Table 2. More descriptive statistics of the PhD graduates

	Obs	Mean	Std Dev	Min	Max
Only Spain	1,485	0.587	0.493	0	1
Spain & Abroad	1,485	0.335	0.472	0	1
Only Abroad	1,485	0.078	0.268	0	1
Academic	1,376	0.174	0.380	0	1
Wage band:					
<700 Euro	1,180	0.052	0.222	0	1
700-999 euros	1,180	0.087	0.282	0	1
1000-1499 euros	1,180	0.286	0.452	0	1
1500-1999 euros	1,180	0.269	0.443	0	1
2000-2499 euros	1,180	0.146	0.353	0	1
2500-2999 euros	1,180	0.081	0.273	0	1
>3000 Euros	1,180	0.080	0.271	0	1
Exchange experience during previous studies:					
SICUE	1,485	0.087	0.282	0	1
ERASMUS	1,485	0.108	0.310	0	1
PhD field:					
Arts and Humanities	1,485	0.132	0.339	0	1
Science	1,485	0.302	0.459	0	1
Social Sciences	1,485	0.144	0.351	0	1
Engineering	1,485	0.185	0.389	0	1
Health Sciences	1,485	0.237	0.425	0	1

2.2 Econometric specification

As described above, we have two samples of individuals: those that graduated from a bachelor's degree and those that graduated from a master's degree in 2013/2014. We perform the econometric analysis independently in each sample.

We use a probit estimation for the analysis of whether individuals graduate from a PhD. The dependent variable is a dummy with value 1 if the respondent graduated from a PhD, 0 otherwise. As a robustness analysis, we study the probability of being a PhD student (independently whether already graduated in 2019).

We use a multinomial estimation for studying the determinants of whether PhD holders studied their PhD in Spain, partially abroad, or fully abroad. The multinomial estimation assumes that all students face the same choice set, which is reasonable in our context.

We use a probit estimation to analyze whether PhD holders follow an academic career. The dependent variable is a dummy with value one if PhD holders report that their job requires a PhD, it is in the education sector, and they define their occupation in the teacher/professor category, 0 otherwise. We also use probit estimation with sample selection, to control selection into PhD studies.

To analyze the returns to PhD mobility, given that the wage variable is an interval variable, we use the interval regression estimation. We use a simple probit estimation to analyze the probability of being overeducated after PhD studies.

3. Results

In this section, we present the results of the econometric estimations for each research question.

3.1 Who decides to study for a PhD?

In the undergraduate graduates' sample, 390 individuals obtained a Ph.D. by 2019 (1.4% of the sample), while in the master graduates' sample, 1072 students graduated with a PhD by 2019 (10% of the sample). Using a probit estimation, we check the determinants of pursuing a PhD.

Table 3a. Estimation results: who pursues a PhD? PhD graduates.

PhD graduate	Bachelor's sample			Master's sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.140*** (0.044)	-0.150*** (0.044)	-0.142*** (0.044)	-0.115*** (0.036)	-0.116*** (0.036)	-0.119*** (0.036)
Age: 30-34	-0.365*** (0.059)	-0.355*** (0.059)	-0.327*** (0.060)	-0.297*** (0.043)	-0.287*** (0.043)	-0.280*** (0.043)
Age: >34	-0.120** (0.058)	-0.164*** (0.057)	-0.110* (0.061)	-0.373*** (0.046)	-0.373*** (0.047)	-0.364*** (0.048)
Variables referring to previous studies (bachelor / master studies):						
Arts and humanities	0.580*** (0.118)	0.587*** (0.119)	0.576*** (0.119)	0.597*** (0.071)	0.596*** (0.071)	0.599*** (0.071)
Social sciences	0.308** (0.129)	0.309** (0.130)	0.297** (0.130)	0.413*** (0.073)	0.407*** (0.073)	0.412*** (0.073)
Business and law	0.121 (0.129)	0.110 (0.129)	0.091 (0.130)	-0.249*** (0.089)	-0.251*** (0.089)	-0.257*** (0.089)
Sciences	1.148*** (0.112)	1.161*** (0.112)	1.148*** (0.113)	1.118*** (0.064)	1.111*** (0.064)	1.116*** (0.064)
Informatics	0.601*** (0.146)	0.589*** (0.147)	0.572*** (0.147)	0.631*** (0.099)	0.626*** (0.099)	0.630*** (0.099)
Engineering	0.523*** (0.118)	0.510*** (0.118)	0.491*** (0.119)	0.552*** (0.067)	0.552*** (0.067)	0.556*** (0.068)
Agriculture	0.439*** (0.155)	0.440*** (0.156)	0.433*** (0.156)	0.631*** (0.106)	0.632*** (0.107)	0.638*** (0.107)
Health and welfare	0.376*** (0.122)	0.368*** (0.123)	0.334*** (0.123)	0.548*** (0.069)	0.549*** (0.069)	0.543*** (0.069)
Services	0.403*** (0.148)	0.410*** (0.149)	0.404*** (0.150)	-0.078 (0.097)	-0.090 (0.097)	-0.085 (0.097)
Father's education:						
Higher secondary / vocational	0.063 (0.058)		0.046 (0.058)	0.072 (0.047)		0.059 (0.047)
University	0.103* (0.061)		0.065 (0.063)	0.093* (0.051)		0.075 (0.052)
Mother's education:						
Higher secondary / vocational	-0.015 (0.060)		-0.018 (0.060)	-0.016 (0.047)		-0.017 (0.048)
University	0.162*** (0.062)		0.123* (0.063)	0.039 (0.052)		0.029 (0.052)
Excellence Scholarship		0.488*** (0.070)	0.466*** (0.071)		0.515*** (0.097)	0.495*** (0.097)
General Scholarship		-0.184*** (0.046)	-0.119** (0.050)		-0.056 (0.042)	-0.032 (0.044)
Studies satisfaction			0.288*** (0.082)			0.245*** (0.066)

Constant	-2.665*** (0.115)	-2.519*** (0.112)	-2.881*** (0.142)	-1.468*** (0.064)	-1.413*** (0.060)	-1.694*** (0.091)
Observations	28547	28547	28547	10280	10280	10280
Pseudo R^2	0.100	0.108	0.114	0.102	0.105	0.108

Probit estimations. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3b. Estimation results: who pursues a PhD? PhD graduates and PhD students

Phd student	Bachelor's sample			Master's sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.152*** (0.026)	-0.163*** (0.026)	-0.156*** (0.026)	-0.157*** (0.030)	-0.158*** (0.030)	-0.163*** (0.030)
Age: 30-34	-0.411*** (0.033)	-0.402*** (0.033)	-0.370*** (0.033)	-0.222*** (0.037)	-0.210*** (0.038)	-0.198*** (0.038)
Age: >34	-0.317*** (0.036)	-0.339*** (0.035)	-0.287*** (0.037)	-0.206*** (0.039)	-0.204*** (0.040)	-0.191*** (0.041)
Referring to previous studies (bachelor/master studies):						
Arts and humanities	0.792*** (0.062)	0.796*** (0.062)	0.801*** (0.063)	0.837*** (0.057)	0.835*** (0.057)	0.849*** (0.058)
Social sciences	0.457*** (0.067)	0.457*** (0.067)	0.454*** (0.067)	0.439*** (0.059)	0.430*** (0.059)	0.440*** (0.060)
Business and law	0.051 (0.070)	0.056 (0.070)	0.043 (0.070)	-0.190*** (0.066)	-0.192*** (0.066)	-0.197*** (0.066)
Sciences	1.462*** (0.061)	1.470*** (0.061)	1.475*** (0.061)	1.295*** (0.054)	1.291*** (0.055)	1.308*** (0.055)
Informatics	0.498*** (0.089)	0.483*** (0.089)	0.469*** (0.089)	0.663*** (0.083)	0.657*** (0.083)	0.665*** (0.083)
Engineering	0.537*** (0.064)	0.534*** (0.064)	0.521*** (0.064)	0.443*** (0.056)	0.443*** (0.056)	0.456*** (0.057)
Agriculture	0.530*** (0.085)	0.536*** (0.085)	0.536*** (0.086)	0.670*** (0.091)	0.671*** (0.091)	0.681*** (0.091)
Health and welfare	0.610*** (0.063)	0.608*** (0.063)	0.573*** (0.063)	0.697*** (0.056)	0.698*** (0.056)	0.695*** (0.056)
Services	0.224** (0.090)	0.229** (0.090)	0.237*** (0.091)	-0.042 (0.073)	-0.052 (0.073)	-0.039 (0.073)
Father's education:						
Higher secondary / vocational	0.009 (0.034)		0.007 (0.034)	0.053 (0.039)		0.043 (0.040)
University	0.089** (0.036)		0.086** (0.037)	0.090** (0.043)		0.077* (0.043)
Mother's education:						
Higher secondary / vocational	0.026 (0.034)		0.026 (0.034)	0.033 (0.040)		0.034 (0.040)
University	0.111*** (0.037)		0.104*** (0.038)	0.053 (0.044)		0.047 (0.044)
Excellence Scholarship		0.382*** (0.048)	0.360*** (0.048)		0.531*** (0.091)	0.507*** (0.091)
General Scholarship		-0.047* (0.026)	0.020 (0.029)		-0.015 (0.036)	0.013 (0.037)
Studies satisfaction			0.482*** (0.050)			0.426*** (0.057)
Constant	-1.976***	-1.899***	-2.448***	-1.139***	-1.081***	-1.553***

	(0.061)	(0.059)	(0.080)	(0.053)	(0.050)	(0.077)
Observations	28547	28547	28547	10280	10280	10280
Pseudo R^2	0.135	0.136	0.147	0.108	0.110	0.117

Probit estimations. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3a reports the results of estimating the likelihood of being a PhD graduate in 2019. Columns (1)-(3) report the results of the estimations using the sample of individuals who graduated with a bachelor's degree in 2013-2014, while columns (4)-(6) report the results for the individuals who graduated with a master's degree that academic course.

We obtain a gender difference in all estimations. Females and older individuals are less likely to pursue a PhD. Older individuals in this sample are likely to have repeated some courses, which indicates a lower academic ability, or started studies after some work experience. The field of study that leads to Ph.D. studies afterward with a higher probability is Sciences, followed by Arts and Humanities, Informatics, and Engineering. Doing a master's in business and law is less likely to lead to Ph.D. studies than a master's in education (the base category).

Having parents with a university education increases the probability of studying for a PhD. However, the variables that have a significant and large effect are whether individuals had some scholarship in previous studies and the studies' satisfaction. Having enjoyed an "excellence" scholarship, which is given to students with good academic records, increases the probability of pursuing a Ph.D. in both samples. Instead, the general scholarship, which is given to students with limited financial resources, hurts the probability of pursuing a PhD for the undergraduate graduate sample only. This suggests that economic difficulties may prevent some students from pursuing a PhD. The fact that the coefficient is not significant for the Master sample could indicate that the students that can afford to study a master do not have financial problems to continue with a PhD. At the same time, students who are satisfied with their previous studies are more likely to continue studying for a Ph.D. We obtain a rather high pseudo-R-squared. The variables in the estimation manage to explain above 10% of the variance.

Table 3b reports the results when estimating the probability of having been in a PhD program in 2019 (either finished or ongoing studies). The five years between 2014 and 2019 may not be enough for some individuals to have completed their PhD studies, especially for the bachelor graduates' sample. The share of individuals who are either a PhD graduate or a PhD student in 2019 is 6% in the bachelor graduate's sample and 20% in the master graduates' sample. The results are very similar to those in table 3a. The only significant difference is that now father's education becomes significant in all equations.

3.2 What determines where to study for the PhD?

Most PhD graduates from the sample studied their PhD studies in Spain (53% of the Bachelors' sample and 61% of the master graduates' sample). Around one-third of the graduates did part of their PhD studies abroad in both samples, while around 14% did the PhD studies abroad

among those that got their bachelors in 2014, and only 5.5% of the master graduates' sample did the full PhD abroad.²

The choice about where to study may determine the future of the individual's career. It is, therefore, an important decision. In this section we want to understand who decides to study abroad.

Table 4 reports the estimation results of the multinomial probit for the sample of bachelor graduates. Table 5 reports the estimation results for the sample of master graduates. A few variables have a significant effect in table 4, maybe because only 1.4% of the sample obtained a PhD by 2019.

The estimation results of the multinomial probit reveal gender differences for the master graduates only. We find that females are more likely to study partially abroad as compared to studying either only in Spain or abroad in this sample. Younger individuals are more likely to study abroad (either partially or fully) in both samples. We do not observe differences across fields of study for the bachelor sample in Table 4, while Table 5 shows that individuals with PhDs in the Science field are more likely to study abroad. Engineering and architecture are more likely to study partially abroad for this sample.

In estimation (2) of tables 4 and 5, we add as controls variables that refer to the undergraduate and master studies to proxy for academic ability and family financial resources of individuals. As mentioned above, the Excellence scholarship is just given to students with high academic achievement, so it indicates high academic ability. We observe that it is positively related to studying for the PhD abroad for the master graduate sample. Similarly, those students who would study again their undergraduate studies, indicating a high level of satisfaction with their previous studies, are more likely to pursue a Ph.D. abroad. This effect is again not significant for the bachelor graduates' sample. In estimation (2), we add as control whether the individual participated in the SICUE or ERASMUS program while in undergraduate or master studies. Having already had an experience abroad should reduce uncertainties and fears, increasing the probability of studying for a PhD abroad. This hypothesis is confirmed by our estimation results. Moreover, since ERASMUS possibilities are higher for high academic achievers, the significance of having a scholarship of excellence disappears for the equation of studying abroad for the Ph.D. Interestingly, the effect of having experienced ERASMUS exchange is much stronger for studying fully abroad than partially abroad.

² For this analysis we cannot use the individuals that are still studying their PhD in 2019 as we do not know whether they do it in Spain or abroad.

Table 4. Estimation results for bachelor graduates' sample: where to study for the PhD?

Place PhD studies	(1)		(2)	
	Partially Abroad	Only Abroad	Partially Abroad	Only Abroad
Female	0.194 (0.196)	0.043 (0.235)	0.201 (0.198)	0.041 (0.255)
Age: 30-34	-0.334 (0.282)	-0.299 (0.333)	-0.293 (0.287)	-0.217 (0.372)
Age: >34	-1.133*** (0.301)	-1.191*** (0.410)	-1.057*** (0.306)	-0.822* (0.444)
Excellence Scholarship	0.389 (0.277)	0.458 (0.316)	0.318 (0.282)	0.258 (0.344)
General Scholarship	0.073 (0.205)	-0.226 (0.249)	0.109 (0.208)	-0.176 (0.275)
Science	0.388 (0.324)	0.347 (0.359)	0.361 (0.330)	0.413 (0.400)
Social Sciences	-0.122 (0.375)	-0.818* (0.486)	-0.167 (0.381)	-0.829 (0.528)
Engineering & Architecture	0.527 (0.356)	0.128 (0.409)	0.460 (0.363)	-0.052 (0.454)
Health Science	-0.354 (0.339)	-0.579 (0.392)	-0.404 (0.345)	-0.711 (0.443)
Studies satisfaction	0.600 (0.395)	0.608 (0.482)	0.564 (0.401)	0.623 (0.563)
SICUE			0.082 (0.407)	0.068 (0.639)
Erasmus			0.647*** (0.246)	1.972*** (0.273)
Constant	-1.023** (0.471)	-1.306** (0.570)	-1.099** (0.482)	-1.975*** (0.673)
Observations	400		400	

Multinomial Probit Estimation. Base category: Studying in Spain. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Estimation results for the master graduates' sample: where to study for the PhD?

Place PhD studies	(1)		(2)	
	Partially Abroad	Only Abroad	Partially Abroad	Only Abroad
Female	0.414*** (0.119)	0.083 (0.177)	0.420*** (0.119)	0.112 (0.178)
Age: 30-34	-0.242* (0.132)	-0.137 (0.195)	-0.266** (0.132)	-0.190 (0.198)
Age: >34	-1.359*** (0.171)	-0.897*** (0.265)	-1.371*** (0.171)	-0.901*** (0.265)
Excellence Scholarship	0.567** (0.248)	0.611* (0.338)	0.445* (0.255)	0.389 (0.351)
General Scholarship	-0.052 (0.134)	-0.257 (0.208)	-0.077 (0.135)	-0.293 (0.210)
Science	0.460** (0.195)	0.821*** (0.303)	0.447** (0.195)	0.784*** (0.304)
Social Sciences	0.072 (0.228)	-0.216 (0.409)	0.055 (0.229)	-0.251 (0.409)
Engineering & Architecture	0.565*** (0.212)	0.272 (0.349)	0.549*** (0.212)	0.230 (0.350)
Health Science	-0.302 (0.209)	0.029 (0.328)	-0.307 (0.209)	0.004 (0.329)
Studies satisfaction	0.614** (0.248)	0.731* (0.433)	0.621** (0.249)	0.711 (0.433)
SICUE			0.031 (0.203)	0.179 (0.291)
Erasmus			0.550** (0.241)	0.900*** (0.310)
Constant	-1.122*** (0.313)	-2.497*** (0.530)	-1.135*** (0.314)	-2.506*** (0.530)
Observations	1085		1085	

Multinomial probit estimation. Base category: Studying in Spain. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.3 Who pursues an academic career after the PhD?

We consider that the individual has an academic career if their current job requires having a PhD, the occupation reported is teacher/professor, and it is in the education sector. We create a dummy with the value of 1 if the individual has an academic career, 0 otherwise, and we estimate a probit model. We join the two samples in this exercise to have a larger number of observations. Results are similar across the Bachelor's and master's graduates' samples. Estimation (1) considers gender, age, field of PhD studies, parental education, place of doing the PhD, whether currently living abroad, and undergraduate studies satisfaction. Estimation (2) adds the interaction between living abroad and the place of doing the Ph.D. Finally, estimation (3) includes sample selection for PhD graduation. The selection equation is not reported, but it

is based on the estimation presented in section 3.1 about pursuing PhD studies. The exclusion restriction variables are the excellence and general scholarships.

The variable that best explains the probability of being in an academic job is undergraduate studies satisfaction. The students that like studying their undergraduate studies and pursued a PhD afterwards are more likely to continue an academic career. This result highlights the vocational aspect of such a career. The rest of variables have insignificant coefficients. Only the PhDs in Health science and to a lesser extent in Sciences are less likely to pursue an academic career, most likely due to the larger private market job opportunities of PhD holders in these fields. In estimations (2) and (3), the interaction term between living abroad and having done the PhD abroad also has a positive and significant coefficient. This may indicate higher opportunities for an academic career abroad.

In estimation (3), the correlation of the error terms of the two equations is positive and significant, indicating that some omitted variables affect positively both the choice of doing a Ph.D. and following an academic career.

Table 6. Estimation results for the academic job choice of PhD holders.

	(1) Academic job	(2) Academic job	(3) Academic job
Female	0.107 (0.087)	0.103 (0.087)	0.058 (0.084)
Age: 30-34	-0.013 (0.098)	-0.001 (0.099)	-0.027 (0.093)
Age: >34	-0.154 (0.119)	-0.148 (0.120)	-0.198* (0.113)
Science	-0.295** (0.143)	-0.263* (0.144)	-0.111 (0.147)
Social Sciences	0.191 (0.153)	0.208 (0.153)	0.109 (0.149)
Engineering & Architecture	0.137 (0.147)	0.155 (0.147)	0.167 (0.137)
Health Science	-0.594*** (0.156)	-0.584*** (0.157)	-0.490*** (0.154)
Father's education level:			
Higher secondary / vocational	-0.083 (0.113)	-0.099 (0.113)	-0.081 (0.106)
University	-0.162 (0.121)	-0.189 (0.122)	-0.162 (0.115)
Mother's education level:			
Higher secondary / vocational	-0.018 (0.117)	-0.018 (0.117)	-0.012 (0.109)
University	0.190 (0.121)	0.193 (0.122)	0.192* (0.114)
Place of doing the PhD (base category: Spain):			
Spain & Abroad	-0.008 (0.096)	-0.017 (0.101)	-0.006 (0.094)
Only Abroad	-0.031 (0.189)	-0.917* (0.480)	-0.836* (0.449)
Living abroad=1	0.102 (0.140)	-0.213 (0.269)	-0.192 (0.251)
Studies satisfaction	0.427** (0.199)	0.441** (0.200)	0.489*** (0.187)
Spain & Abroad # Living abroad=1		0.258 (0.329)	0.233 (0.307)
Only Abroad # Living abroad=1		1.355** (0.571)	1.288** (0.534)
Constant	-1.225*** (0.245)	-1.229*** (0.246)	-2.074*** (0.356)
corr(e.other_phd,e.academic)			0.401*** (0.145)

Observations	1313	1313	1313
Pseudo R^2	0.048	0.054	

Probit estimations. Estimation (3) is probit with sample selection. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.4 What are the returns to mobility in PhD studies?

In this section we want to analyze whether doing the PhD abroad has an economic return after the PhD. To do that we estimate a wage equation. In this case, we join the two samples of PhD holders together to have a larger number of observations. Since wages are reported in wage bands, we resort to the interval regression estimation. The coefficients inform us about the effect of each variable on the wage of individuals, which refers to the monthly wage after taxes.

Table 7 provides the main results. Column (1) reports the basic estimation. We find a significant wage gender gap of 95 euros among PhD holders and positive returns to experience as wages increase with age. Having studied for a PhD abroad implies a larger wage of around 475 euros. There is however a wage penalty for those following an academic career or working part-time.

In column (2) we add as a control whether individuals are living abroad. This variable is highly correlated with the place of PhD studies. The results show that having studied abroad is now not significant while living abroad leads to a large wage increase. A drawback of our data is that wages are not measured at purchasing power parity, so the wage effect of living abroad is not corrected by different price levels across countries. This may overestimate the wage effect of living abroad if prices abroad are larger than prices in Spain.

In column (3) we interact the variable living abroad with the place of doing the PhD. In this case, the coefficient of living abroad remains large and statistically significant. Having studied the PhD partly abroad and living abroad has a positive coefficient significant at the 10% confidence level.

Finally, in column (4) we interact the academic career variable with the place of doing the PhD. Maybe the place of the PhD studies is only relevant for those in an academic career. We obtain that having an academic job has a wage penalty, as in the previous estimation results. However, we observe that for those who studied for a PhD abroad, the academic career has a wage premium.

Table 7. Estimation results for the interval regression of wages.

Wageband	(1)	(2)	(3)	(4)
Female	-95.204** (39.662)	-96.243*** (34.732)	-94.247*** (34.679)	-98.283*** (34.705)
30-34	34.047 (45.203)	59.160 (39.644)	52.208 (39.699)	59.244 (39.558)
>34	117.489** (53.747)	178.729*** (47.180)	168.906*** (47.296)	178.081*** (47.065)
Science	190.685*** (70.895)	120.729* (62.132)	114.339* (62.294)	121.058* (62.063)
Social Sciences	64.796 (75.124)	67.237 (65.635)	64.288 (65.518)	69.526 (65.565)
Engineering & Architecture	230.192*** (72.424)	181.430*** (63.429)	176.986*** (63.328)	185.410*** (63.415)
Health Science	188.175*** (72.348)	154.783** (63.266)	151.507** (63.152)	156.991** (63.285)
Spain & Abroad	69.445 (44.873)	-18.618 (39.644)	-49.144 (42.248)	-26.537 (44.468)
Only Abroad	473.323*** (74.155)	-105.895 (72.825)	-22.848 (113.811)	-161.021** (77.082)
Academic job	-142.729*** (47.398)	-154.915*** (41.520)	-154.710*** (41.486)	-193.652*** (53.945)
Part-time job	-893.675*** (56.185)	-777.064*** (49.520)	-777.173*** (49.446)	-774.661*** (49.423)
Permanent contract	271.682*** (42.140)	311.249*** (37.011)	309.013*** (36.988)	307.209*** (37.002)
Living abroad		949.213*** (54.484)	839.461*** (93.525)	938.348*** (54.552)
Spain & Abroad # Living abroad			225.980* (119.664)	
Only Abroad # Living abroad			-18.124 (160.314)	
Spain & Abroad # Academic job				40.504 (87.067)
Only Abroad # Academic job				349.169** (164.226)
Constant	1611.924*** (74.585)	1521.150*** (65.447)	1537.102*** (65.794)	1530.730*** (66.403)
Lnsigma Constant	6.371*** (0.025)	6.227*** (0.025)	6.225*** (0.025)	6.225*** (0.025)
Observations	1002	1002	1002	1002

Interval regression estimation. Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.5 Overeducation among PhD holders

In this section, we draw attention to the quality of the current job in terms of the match between the education acquired (PhD) and the required education in the job. For example, PhD holders that follow an academic career are clearly in a matched job, as the PhD is required in this occupation. We consider overeducated those PhD holders that perform a job which does not require a PhD, according to the information provided by the respondent.

Table 8 presents the results of the probit estimation where the dependent variable is whether the individual is overeducated. Results show that older PhD holders are more likely to be overeducated, while those with a PhD in Engineering and architecture, and to a lesser extent, Science, are less likely to be overeducated. Having experiences abroad during their PhD studies, and especially living abroad reduces the probability of overeducation. According to our results, the availability of jobs adequate for PhD holders is scarce in Spain.

Table 8. Estimation results for overeducation.

	(1)	(2)	(3)
	Overeducated in present job	Overeducated in present job	Overeducated in present job
Female	-0.034 (0.079)	-0.032 (0.080)	-0.031 (0.080)
30-34	0.131 (0.091)	0.126 (0.092)	0.124 (0.093)
>34	0.502*** (0.105)	0.462*** (0.107)	0.457*** (0.107)
Science	-0.440*** (0.139)	-0.406*** (0.140)	-0.407*** (0.141)
Social Sciences	-0.251* (0.151)	-0.265* (0.151)	-0.266* (0.151)
Engineering & Architecture	-0.756*** (0.146)	-0.743*** (0.147)	-0.744*** (0.147)
Health Science	-0.223 (0.141)	-0.224 (0.142)	-0.226 (0.142)
Part-time job	0.065 (0.111)	-0.018 (0.111)	-0.019 (0.112)
Father's education level:			
Higher secondary / vocational	0.047 (0.103)	0.054 (0.105)	0.053 (0.105)
University	0.041 (0.111)	0.032 (0.113)	0.031 (0.113)
Mother's education level:			
Higher secondary / vocational	-0.101 (0.105)	-0.044 (0.107)	-0.045 (0.107)
University	-0.034 (0.112)	0.006 (0.114)	0.007 (0.114)

Spain & Abroad	-0.258*** (0.088)	-0.199** (0.090)	-0.211** (0.094)
Only Abroad	-0.496*** (0.153)	0.071 (0.180)	0.082 (0.252)
Excellence Scholarship	0.040 (0.147)	0.048 (0.151)	0.050 (0.151)
Studies satisfaction	-0.254 (0.166)	-0.220 (0.169)	-0.218 (0.169)
Living abroad		-1.009*** (0.147)	-1.079*** (0.254)
Spain & Abroad # Living abroad			0.135 (0.335)
Only Abroad # Living abroad			0.046 (0.398)
Constant	0.479** (0.224)	0.492** (0.226)	0.496** (0.226)
Observations	1156	1156	1156
Pseudo R^2	0.070	0.103	0.103

Probit estimation. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4. Conclusions

In this paper, we provide information on PhD graduates using the Spanish University Graduate Placement Survey from 2019. We identify who is more likely to pursue a PhD and we learn about who decides to study it abroad. We also analyze the probability of PhD holders to follow an academic career, as well as the returns to study the PhD abroad.

Academic ability (proxied by having an excellence scholarship) and satisfaction with previous studies are the most important variables to explain who pursues a PhD. We also observe a gender bias, as girls are less likely to study for a PhD, and large heterogeneity across fields of study.

The variable that has a significant impact on studying for the PhD abroad is having had an ERASMUS experience in the previous studies. Results suggest that the ERASMUS program encourages mobility in the long run.

Our results suggest that those who like their studies and study for the PhD abroad are likelier to have an academic job. Living abroad also increases the likelihood of having an academic job, indicating that it may be easier to find an academic job abroad. Similarly, studying a PhD abroad yields positive returns only if one finds an academic job abroad.

These results are important to understand the job opportunities of PhD holders in Spain and their job characteristics.

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