UNIVERSITAT DE BARCELONA
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Working Papers

Col·lecció d'Economia E24/482

PARENTAL EDUCATION AND THE TRANSITION TO MASTER AND PHD STUDIES IN SPAIN

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ISSN 1136-8365

UNIVERSITAT DE BARCELONA
SCHOOL OF ECONOMICS

Working Papers

UB Economics *Working Paper No. 482*

Title: Parental education and the transition to master and PhD studies in Spain

Abstract:

In a context of full equality of opportunity, bachelor graduates' decision to pursue further studies should not be affected by social origin. Using Spanish data, we analyze the role of parental background on the decision to study for a master degree and a PhD degree. We find that parental background may increase up to 10 percentage points the probability of studying for a master degree and close to 2 percentage points the likelihood of studying for a PhD. We use the KHB method to decompose the parental background effects into direct and indirect ones (Karlson et al., 2012). Indirect effects collect parental background's influence via previous studies. Our results show that the parental background effect is not mediated by previous studies' characteristics. Parental education directly affects the probability of studying for a master and PhD degree for bachelor graduates. In contrast, we find negligible effects of parental background on the likelihood of studying for a PhD degree for the master graduates. Since not all master programs give access to PhD studies, we argue that the decision to pursue a PhD is likely taken just after bachelor studies. We conclude that equality of opportunity in Spain can be improved by promoting master and PhD study paths during bachelor studies to all students, with particular emphasis on females and those students with parents without university education.

JEL Codes: I23, I24

Keywords: Equality of opportunity, Transition to master, Transition to PhD, Parental background

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Date: February 2025

Acknowledgements: Vilalta-Bufí is thankful for the Grants PID2021-126549NB-I00 and PID2022-139468NB-I00 funded by MICIU/AEI/10.13039/501100011033 and ERDF/EU; and the Grant 2021-SGR-00862 funded by Generalitat of Catalonia.

1. Introduction

The educational expansion experienced in the last decades has improved access to higher education and the number of master and PhD students has increased significantly (Shin et al., 2018). Whether this educational expansion has improved equality of opportunity is an object of study (van de Werfhorst, 2024, Bernardi and Ballarino, 2016, Breen and Goldthorpe, 2001, Breen, 2010, Katrňák and Hubatková, 2022, Bukodi and Goldthorpe, 2016). Most of this research finds that educational expansion indeed has provided for more equality of opportunity. At the same time, they note that despite the improvements in the equality of opportunity the class of origin effect on children's educational destinations persists across countries and cohorts. Parental education is considered a circumstance beyond the individual's control (Roemer and Trannoy, 2016). Therefore, in a world with perfect equality of opportunity, parental background should not influence the decision to pursue master or PhD studies.

In this paper, we explore to which extent this is satisfied in Spain. We provide insights into the level of equality of opportunity in the transition to master and PhD studies in Spain. We analyze the effects of parental background on enrollment in higher education after having graduated with a bachelor or a master degree. We distinguish between the indirect effects, that is those that are mediated via previous studies characteristics (field of study, university type) and a proxy measure of academic performance (scholarship of excellence), and the direct effects of parental background, which could include aspirations and financial support among other influences (Posselt and Grodsky, 2017). The direct effects should be small or negligible if there is equality of opportunity in the transition to master and PhD studies in Spain. This study complements the work of Ortiz-Gervasi (2023), who studied the effect of social origins on expectations of postgraduate enrolment in three Spanish regions.

We use the Spanish University Graduate Placement Survey from 2019 (EILU 2019). It is a sample of bachelor and master graduates from 2014 and provides information on their parental background, their previous studies and their education path until 2019.

Our paper contributes to the sociology literature on the effects of social origin on education attainment. Two early seminal papers found that parental background does not matter much for transitions into higher levels of education, especially when studying the transition into graduate studies (Mare, 1980, Stolzenberg, 1994). In contrast, a handful of other papers focused on the transition to PhD studies and found the opposite results. Mastekaasa (2006) studied the case of Norway. He found a positive effect of high parental background on the probability of studying for a PhD. His results are driven by parents having a doctoral degree, working in higher education, or in research institutions. Neugebauer et al. (2016) study the effects of Bologna reforms on the transitions to a master degree in Germany and find that parental background is mostly mediated through indirect effects, and in particular, the type of previous institution. Similarly, Bachsleitner et al. (2018) used German data and found that having highly educated parents increases the probability of studying for a PhD, especially if parents have a doctoral degree. They used the KHB method to decompose these effects into direct and indirect social background effects (Karlson et al., 2012, Kohler, 2011). They found that nearly half of the total effects can be attributed to differences in final secondary school and university grades. Helin et al. (2019) and Helin et al. (2022) confirm these results using Finnish data. Mullen et al. (2003) found a strong influence of parental background on the entry into doctoral programs in the US. Similarly, Wakeling and Laurison (2017)

find that bachelor expansion in the UK led to larger postgraduate differentiation by social origins. Triventi (2013), in contrast, in a comparative study did not find a significant effect of parental background on the PhD transition.

From the economics side, Björklund and Jäntti (2020) review the literature that uses siblings' correlations on the years of education to study the family effect on educational outcomes. Siblings' correlation includes nature and nurture effects. They find that siblings' education correlation lies between 0.4 and 0.6 in countries such as the Netherlands, Norway, and Sweden, indicating a significant level of inequality of opportunity in these society (Björklund and Salvanes, 2011). Strømme and Wiborg (2024) also use sibling correlation to analyze which social origin dimension is most important for children's educational attainment in Norway. They find that parental education is significantly more important than income and social class.

We study Spain from a sociological perspective. Only a few papers analyze equality of opportunity in Spain within this framework. Ortiz-Gervasi (2023) uses a survey in three Spanish regions to study the effect of socioeconomic origin on students' expectations for postgraduate enrolment. He finds a direct effect of parental background on these expectations. Suárez Álvarez and López Menéndez (2018) analyze the level of equality of opportunity in Spain using income data rather than the educational attainment. They find an increase in inequality of opportunity in Spain in the last two years of their 2009-2010 study period. We provide further evidence of the equality of opportunity in Spain using a representative sample of university graduates from 2014 observed until 2019.

The rest of the paper is organized as follows. The next section presents the theoretical background. Section 3 provides some context on the higher education Spanish system. Section 4 describes the data, and the econometric estimations used. Section 5 reports the main results on the effect of parental education and the role of other variables of interest. Finally, section 6 concludes.

2. Theoretical framework

Two seminal theories inform us on how industrialization and education expansion affect social mobility. The modernization theory posits that industrialization leads to educational expansion, which in turn fosters a more meritocratic society, with higher intergenerational social mobility and reduced effects of social origin on one's destination (Treiman, 1970). There is evidence of the modernization's positive effect on social mobility across time and countries (Breen and Müller, 2020, Bukodi et al., 2019). The major finding of this literature is that in certain times and countries there have been occurring equalizing processes in line with the predictions of the modernization thesis. For instance, van de Werfhorst (2024) shows that meritocratic assignment of workers to jobs, mainly due to educational expansion, takes place across 40 countries and several recent decades. In contrast, Boudon (1974) argued that educational expansion does not necessarily enhance social mobility. Families transmit cultural capital (Aschaffenburg and Maas, 1997, Bourdieu and Passeron, 1977) and aspirations to their offspring, impacting their future education levels and socioeconomic outcomes. This channel of parental influence hinders social mobility. Another channel of parental influence on educational choices goes through the subjective evaluation of costs and benefits of each education level, as well as the perceived probability of their children graduating. These differences in perceived costs and benefits lead to different educational choices, perpetuating educational inequality even amid educational expansion, according to Boudon (1974). Following this argument, Raftery and Hout (1993) forged a theoretical term of

"maximally maintained inequality" where educational expansion leads to greater social equality only if certain levels of education get saturated with the offspring of the privileged classes. However, even then, the children of the affluent classes will seize their advantage by moving on to higher levels of education. Such effects have been observed in Italy (Ballarino et al., 2021), the US (Torche, 2011) and Ireland (Raftery and Hout, 1993) among others.

In a similar vein, the "effectively maintained inequality" (EMI) hypothesis by Lucas (2001), suggests that the increased equality of opportunity through education expansion is counterbalanced by privileged families' efforts to maintain their social position, either by securing a high level of education if it is not universal, or a qualitatively better education if it is (either by field of study or by university prestige or both (Lucas and Byrne, 2017)).

In short, even in the era of educational expansion, the privileged classes will try to secure their advantaged position for their offspring, either by achieving higher levels of tertiary education (master, PhD) or by distinguishing themselves through prestigious studies within the same levels embodied in the more selective fields of study or generally more prestigious universities (or both). What remains unclear is how much such advantage is transmitted on the graduate levels of education nowadays and through which channels. Whether it is through more aspirations and thus, better choices of fields of study (Ortiz-Gervasi, 2023), or through financial constraints (Bachsleitner et al., 2018) or is there (almost) no effect of parents' privileged position on subsequent transitions to master and doctoral degrees as Triventi (2013) claims, it remains to be sorted with more evidence.

Two contradictory theories exist on the impact of parental background on the decision to pursue master and PhD studies (Triventi, 2013). The first theory claims that the effects of parental background "dissipate" when it comes to higher education enrollment. There are two main reasons for that. Firstly, from the life-course perspective, by the time students transition from secondary education to university, they have gained significant schooling experience and independence from their parents, reducing the effect of parental background (Muller and Karle, 1993, Davies and Guppy, 1997). Secondly, during the transition to higher education, only the most able students from lower social backgrounds are able to enter, as their less able peers have been adversely selected in the previous transitions (Mare, 1981). This selection process ensures that parental background becomes unimportant at higher levels of tertiary education (master or PhD) due to the selectivity process that equalizes the participants in terms of their ability rather than social background.

A second stream of literature claims that despite all their experience, autonomy and maturity, students still depend to some extent on their parental background in their higher education transitions. This is known as the "lingering effect" of parental background. The main claim here is that students from lower social backgrounds choose more vocationally oriented and more labor-applicable higher education studies because of their lower subjective thresholds of success (Becker and Hecken, 2008, Hillmert and Jacob, 2003). This effect of their social origin is visible in their subsequent choices at the university level. Therefore, it is expected that students from privileged social backgrounds are more likely to pursue further education and choose more prestigious studies at the tertiary level than students from lower social backgrounds (Reimer and Pollak, 2010, van de Werfhorst and Kraaykamp, 2001).

Other arguments support the relevance of parental background for transitions to master's and PhD studies. First, a better parental background provides more resources to prolong an individual's study period (Bachsleitner et al., 2018). Master's and PhD studies are human capital investments that often require significant financial support. Scholarships are limited, and study loans are

infrequent in Spain, leaving ample room for parental resources to matter. Second, having parents with a university education may imply better information on academic careers and higher aspirations for educational attainment than for those without university-educated parents (Ortiz-Gervasi, 2023). These and other arguments highlight the potential influence of parental background on the transition to master and PhD studies. Equality of opportunity can only be achieved when there are no financial and information frictions in the education system.

Given the aforementioned theories, we propose the following hypotheses:

Hypothesis 1: Parental education matters in enrollment into master studies according to the lingering effects hypothesis. Despite the vast democratization of undergraduate studies in Spain, there are still important parental background effects especially that master studies cost much more than undergraduate studies in Spain and stipends are scarce.

Hypothesis 2: Parental background has an indirect effect on the transition to a master's program via the choice of field of study in bachelor studies. According to the effectively maintained inequality hypothesis, as access to bachelor studies becomes more universal, privileged families will opt for more prestigious fields. Bachelor fields are decisive when it comes to the choice of master studies as some master degrees will be available only upon completion of previous undergraduate degrees from specific fields. It is difficult to imagine a humanities graduate enrolling in master in health and vice versa. However, it is quite common for engineering graduates to enroll in management masters.

Hypothesis 3: Parental background affects the likelihood of enrolling in a PhD program for bachelor graduates. The choice of a master program determines the possibility of continuing towards a PhD in Spain, thus the transition to a master program also indirectly influences the transition to PhD studies. Consequently, the same arguments as in hypothesis 1 apply. Master studies require time and money investment without a clear guarantee of labor market success in Spain. Therefore, privileged classes will invest in masters of their offspring more often than others in order to seize their privileged position in the next generation.

3. The Spanish higher education system

In this section, we briefly describe the Spanish university education system as it was in the period of analysis (2013-2019). Spanish universities may be public or private, with the biggest universities being public. In the academic year 2013-2014, around 230,000 people graduated with a bachelor degree. By then, 16% of them graduated from a private university, while the large majority graduated from a public university. The same year, around 67,000 students graduated with a master degree. Close to 30% of them graduated from a private university. Public universities also tend to be more research oriented than private ones, with a few exceptions.

The Spanish university education is organized into bachelor, master, and PhD studies. There have been some changes over time. The official bachelor program consists of 240 credits according to the European Credit Transfer System (ECTS), except for some cases that require more credits by specific legislation. By Royal Decree 43/2015, it was allowed for some years to offer some bachelor degrees of 180 credits as in most European countries, but it was not the case for the bachelor graduates of our sample who graduated in 2013-2014 (Real Decreto, 43/2015). The bachelor degree gives access to official university master degrees. A university master degree in Spain may have 60, 90, or 120 ECTS credits and a duration of one or two academic years. There are two types of masters. One type is oriented to develop a professional specialization and the other is research

oriented (Real Decreto, 1393/2007). The former includes an internship in their curricula, while the latter requires an end-of-degree research-oriented project. Universities can also provide non-official master degrees. These do not give access to PhD studies. To access a PhD program individuals must have completed a bachelor and an official master degree and have achieved 300 ECTS credits in total. The duration of PhD studies is set to three years in the Royal Decree 99/2011, but it can be extended up to five years (Real Decreto, 99/2011).

4. Data and methods

The Spanish University Graduate Placement Survey (EILU) from 2019 provides information about a representative sample of university students who graduated in the academic year 2013-2014 and were interviewed five years later. There are two samples, one consists of 29264 individuals who graduated from bachelor studies in 2013-2014 and the other consists of 11334 individuals who graduated from master studies in 2013-2014. We have information on whether they followed further studies in the following five years and their parental background among other variables. For the bachelor sample we drop those individuals that are older than 34 years old in 2019 since they are atypically old for a bachelor student and therefore, have different trajectories than the standard one. We are interested in equality of opportunity considering the standard academic trajectory where individuals go to university when they are between 18 and 25. This reduces the bachelors' sample in 6111 individuals.[1] After accounting for missing information, we end up with a sample of 23153 for the bachelor graduates and 10880 for the master graduates.

For the bachelor sample we construct two dependent variables. One takes value one if the individual graduated from or is currently studying for a master degree, and zero otherwise. Unfortunately, we do not know whether the master is official (which gives access to PhD studies) or whether it is research oriented (which generally gives better preparation for PhD studies). The other dependent variable refers to whether the individual obtained or is currently enrolled in PhD studies. For the master sample, the dependent variable takes value one if the respondent obtained a PhD or is currently enrolled in a PhD program, and zero otherwise.

Regarding the parental background, there is information on the education level of the father and the mother. Unfortunately, there is no distinction between university studies such as bachelor, master, and PhD levels. We will use a variable that identifies whether individuals have no parent with a university education, at least one parent with a university education, or both parents with a university education.

Table 1 provides the main descriptive statistics for the two samples. For the bachelor graduates, we restrict them to being below 35 years old in 2019 so that they were below 30 when they graduated with bachelor studies. From the Bachelor graduate sample, close to 46 % of them graduated or are currently studying a master program and 7 % became PhD students at some point during the five years after graduation. There is a majority of women, and most are below 30 years old. Close to half of them studied a bachelor in social sciences, almost 20 % studied Engineering programs, around 15% studied Health, 10% studied Sciences and the remaining 10% studied Humanities and arts.[2] Most respondents graduated from a public university reflecting the Spanish

[1] The main results are robust to including these individuals.

[2] In the estimations we use a more detailed list of fields of studies. We have grouped them here for a nicer presentation of the descriptive statistics.

university system. While around 57% of the sample have no parent with a university education, 22% have at least one father with a university education, and the remaining 21% have both parents with a university education. We also have information on whether the student enjoyed an excellence or a general scholarship during the bachelor studies. The excellence scholarship is granted according to academic performance and the general scholarship is based on family income, with some basic academic performance requirements. These two variables will proxy for ability and family income respectively. We can see that only 5.5% of the bachelor graduates had a scholarship of excellence, while the general scholarship was given to nearly 44% of the sample.

The descriptive statistics for the sample of the graduates of master programs in 2013/2014 are provided on the right side of Table 1. Around 20% of the master graduates enrolled in a PhD during the five years after graduating from the master program. This sample consists of 53% of women and, as expected, individuals are older than in the previous sample. Above one-third are older than 34 years old. The distribution across fields of study, which in this case refers to master studies, is similar to the previous sample. The share of respondents that graduated from a public university is slightly lower in the master graduates' sample than in the bachelor graduates' sample. Many masters are offered in private universities. Parental education is surprisingly similar, or even slightly lower than the bachelor graduate's sample. This seems to contradict the theory arguing for increased selectivity as higher levels of education are achieved. There is stronger selectivity in terms of ability, as the probability of graduates that enjoyed a scholarship of excellence is close to 15% in this sample, which is much higher than the 5.5% of the bachelor graduates' sample. There are no significant differences in terms of general scholarship.

In Table 2 we provide descriptive statistics distinguishing whether individuals enrolled in PhD studies for both samples. For both samples, we observe that males and younger individuals are more likely to get into PhD studies. In terms of the field of previous study programs, Sciences is the major group among PhD students, while Social Sciences is the major group among non-PhD students. PhD students are more likely to have studied in a public university, which is consistent with them being more research oriented than private universities in general. Regarding our variable of interest, parental education is higher for the group of PhD students in both samples, suggesting that it has a role in the decision to enroll in PhD studies. Finally, we observe that the share of students with an scholarship of excellence is larger for PhD students than for non-PhD students, indicating a selection in terms of ability into PhD programs. We do not observe a significant difference in terms of general scholarship.

Table 1. Descriptive statistics of each sample

	Bachelor graduates' sample		Master Graduates' sample			
Variable	Mean	Std. dev.	Mean	Std. dev.	Min	Max
PhD student	0.070	0.255	0.202	0.402	0	1
Master student	0.458	0.498	---	---	0	1
Female	0.591	0.492	0.525	0.499	0	1
Age group:						
<30	0.650	0.477	0.244	0.430	0	1
30-34	0.350	0.477	0.399	0.490	0	1
>34	--	--	0.357	0.479	0	1
Field studies 2013/2014:						

Humanities and arts	0.100	0.300	0.109	0.311	0	1
Sciences	0.098	0.297	0.110	0.313	0	1
Social sciences	0.464	0.499	0.476	0.499	0	1
Engineering	0.183	0.387	0.168	0.374	0	1
Health	0.154	0.361	0.137	0.344	0	1
Public university	0.877	0.328	0.750	0.433	0	1
Parents education:						
None has university education	0.568	0.495	0.591	0.492	0	1
One parent w/ university education	0.223	0.416	0.217	0.412	0	1
Both with university education	0.209	0.407	0.192	0.394	0	1
Scholarship excellence	0.055	0.228	0.022	0.147	0	1
Scholarship general	0.439	0.496	0.235	0.424	0	1
Observations	23153		10880			

To evaluate the role of parental background in the probability of pursuing further education, we analyze two educational choices. First, we study the decision to become a master student between 2014 and 2019 using the bachelor graduates' sample. Second, we study the decision to become a PhD student between 2014 and 2019 using the bachelor and master graduates' samples separately. In all cases, we want to identify the total effect of parental education on the dependent variables but also decompose this effect into direct and indirect effects.

We use the KHB method to compute the total, direct, and indirect effect of parental education on enrolment into master and PhD studies (Breen et al., 2013, Karlson and Holm, 2011). This method allows us to compare the estimated coefficients between two nested nonlinear probability models. It allows the decomposition of the total effect of a variable into the direct and indirect effects.

The model used to compute the total effects of parental background is a probit estimation that only controls for gender and age groups, apart from the variable of interest: parental background (equation 1). A second probit estimation adds a set of variables X describing the characteristics of the previous university studies: field of study, whether the university was public, and whether the individual had an excellence or a general scholarship (equation 2). If the effect of parental background works through these characteristics of the previous studies, controlling for them will reduce its coefficient in estimation (2). We use detailed fields of study to collect as much as possible the parental influence on the degree choice. Literature has found that lower socioeconomic background leads individuals towards more vocational oriented studies than higher socioeconomic background (TRIVENTI et al 2017, OH KIM 2020). The KHB method compares the coefficients of parental background in both estimations to discern the direct and indirect effects of this variable.

$$Prob(enrolment) = \Phi\left(\beta_a age + \beta_g\ gender + \beta_e\ parental\ education\right) \quad (1)$$

$$Prob(enrolment) = \Phi\left(\gamma_a age + \gamma_g\ gender + \gamma_e\ parental\ education + X\gamma_X\right) \quad (2)$$

Our estimation allows us to clear the total effects (β_e) from the influence of parental background on master and PhD enrollment decisions that go through the variables included in *X*: field of study choice in previous studies (32 fields for bachelor graduates and 10 fields for master graduates), family income, which we proxy by having enjoyed a general scholarship, and academic ability, which we proxy by having enjoyed a scholarship of excellence. Therefore, the direct effects of

parental background (γ_e) include concepts such as the impact on aspirations to achieve a higher education, or better information on the education system. We acknowledge that our measure of academic achievement in previous studies is limited, so direct effects may be overestimated and include part of the parental effect on previous academic achievement.
We also provide the percentage contribution of each confounder on the indirect effects when relevant. A positive percentage indicates that the confounder mediates part of the parental background effect on the dependent variable. Essentially, parental background positively influences the mediator variable, which in turn has a positive effect on the dependent variable. A negative percentage indicates a suppression effect. This happens when the effect of parental background on the confounder has an opposite sign to the effect of the confounder on the dependent variable. That is, either the parental background has a positive effect on the confounder and the confounder has a negative effect on the dependent variable or vice versa.

We cannot reject Hypothesis 1 if we obtain a positive and significant β_e when estimating the likelihood to enroll in a master program. We cannot reject Hypothesis 2 if fields of study of bachelor studies are a relevant mediator of the parental background effect. Finally, we cannot reject Hypothesis 3 if we obtain a positive and significant β_e when estimating the likelihood to enroll in a PhD program for the bachelor sample.

Table 2. Descriptive statistics comparing PhD and non-PhD students in each sample.

	Bachelor graduates' sample				Master graduates' sample					
	Not PhD student		PhD student		Not PhD student		PhD student			
Variable	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
Female	0.598	0.490	0.510	0.500	0.539	0.499	0.473	0.499	0	1
Age group:										
<30	0.636	0.481	0.838	0.368	0.224	0.417	0.324	0.468	0	1
30-34	0.364	0.481	0.162	0.368	0.407	0.491	0.364	0.481	0	1
>34	--	--	--	--	0.369	0.483	0.312	0.463	0	1
Field studies 2013/2014:										
Humanities and arts	0.096	0.295	0.154	0.361	0.095	0.293	0.162	0.368	0	1
Sciences	0.076	0.265	0.392	0.488	0.079	0.270	0.232	0.422	0	1
Social sciences	0.488	0.500	0.141	0.349	0.538	0.499	0.232	0.422	0	1
Engineering	0.186	0.389	0.151	0.358	0.168	0.374	0.168	0.374	0	1
Health	0.154	0.361	0.161	0.368	0.120	0.325	0.206	0.404	0	1
Public university	0.873	0.333	0.939	0.240	0.720	0.449	0.869	0.337	0	1
Parents education:										
None has university education	0.576	0.494	0.464	0.499	0.600	0.490	0.554	0.497	0	1
At least one has university education	0.220	0.414	0.262	0.440	0.214	0.410	0.231	0.422	0	1
Both with university education	0.205	0.403	0.274	0.446	0.186	0.389	0.214	0.410	0	1
Scholarship excellence	0.050	0.219	0.117	0.321	0.017	0.128	0.045	0.206	0	1
Scholarship general	0.437	0.496	0.454	0.498	0.230	0.421	0.255	0.436	0	1
Observations	21534		1619		8681		2199			

5. Results

Parental education effects

We first analyze the decision to enroll in a master program after bachelor studies. Table 3 reports the average partial effects of parental education variable on the probability of studying a master program. We consider that parental education may affect the likelihood of enrolling in a master program through the following past decisions: the field of studies of the bachelor program, whether the individual studied a bachelor in a public university, and whether the individual enjoyed a general scholarship or a scholarship of excellence during bachelor studies. The KHB method computes the change in the coefficient that is due to confounding (indirect effect). The direct effect measures how much parental education affects the probability of graduating from a master after controlling for these confounding effects. We include controls for gender and age group in all the estimations as concomitant variables.

Table 3. Parental education effects on the probability to enroll in a master degree. Bachelor graduate's sample. KHB method applied.

	All		Females		Males	
At least one parent with university education						
Total Effect	0.059***	(0.01)	0.072***	(0.01)	0.058***	(0.02)
Direct Effect	0.044***	(0.01)	0.050***	(0.01)	0.050***	(0.02)
Indirect Effect	0.016	(.)	0.022	(.)	0.008	(.)
Contribution percentage:						
Fields of study	84.54		89.53		68.10	
public university	1.34		-2.70		22.29	
general scholarship	12.92		12.66		9.01	
excellence scholarship	0.39		-0.29		0.18	
Both parents with university education						
Total Effect	0.090***	(0.01)	0.096***	(0.01)	0.086***	(0.02)
Direct Effect	0.069***	(0.01)	0.067***	(0.01)	0.074***	(0.02)
Indirect Effect	0.021	(.)	0.03	(.)	0.013	(.)
Contribution percentage:						
Fields of study	82.69		89.00		64.17	
public university	1.94		-4.21		24.90	
general scholarship	14.76		15.32		8.20	
excellence scholarship	0.49		-0.25		2.21	
	23153		13694		9459	

Dependent variable: Whether individuals have enrolled in a master degree after 2013/2014.
Average partial effects. Robust standard errors in parentheses. Weighted observations.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Estimation (1) in Table 3 uses the whole sample, while estimations (2) and (3) split the sample into females and males, respectively. The results tell us that the probability of enrolling in a

master program is 6 percentage points higher if at least one parent has a university education and 9 percentage points higher if both parents have a university education. This confirms our Hypothesis 1. Therefore, parental background matters in the decision to study for a master degree in Spain, even when we are considering only those who graduated with a bachelor degree. Our results show smaller effects than in Ortiz-Gervasi (2023), most likely due to the fact that he studies the expectation of master's enrolment and we use actual enrolment in the dependent variable. We find that around two thirds of the influence of parental education on the probability of enrolling in a master program is a direct effect, while one third is an indirect effect. The field of study of the bachelor degree and type of university are the main mediators as we explain below. When we split the sample by gender, we find that parental background effects are slightly larger for females mostly due to higher indirect effects for females than for males.

We look at the contribution of each cofounder on the indirect effects. The field of study of the bachelor degree accounts for more than 80% of the total indirect effect. Law, engineering, teacher training in kinder garden, medicine, and architecture, ordered by importance, have a mediation effect. Humanities have a negative coefficient, indicating that it has a suppression effect on parental background. When controlling for humanities, the parental direct effect is larger. This occurs because those students with parents with higher levels of education have a lower likelihood of studying a bachelor in humanities, while having studied a bachelor degree in humanities increases the probability of studying a master degree. There are interesting gender differences in the contributors to the indirect effect. For females, nearly 90% of the effect comes from fields of study mentioned above, while for males they contribute less than 70% to the indirect effect. Moreover, the field that mediates most parental background for males is law, while philology and sports sciences are found to have suppression effects when both parents have higher education. One fourth of the indirect effect in the male sample is mediated via having studied in a public university. We conclude that hypothesis 2 cannot be rejected and it is more important for females than for males. That is, parents influence the choice of study of the bachelor studies, and this indirectly affects the likelihood to study for a master degree.

In the rest of the paper, we analyze the transition to PhD studies. Tables 4 and 5 report the average partial effects of parental background on the probability of enrollment into PhD studies using the bachelor graduates and master graduates' samples respectively. In the case of the bachelor graduates' sample, the results are positive and statistically significant (see Table 4). Having at least one parent with a university education increases the probability of enrolling in a PhD by 1.5 percentage points. A similar effect is observed if both parents have a university education. Moreover, the indirect effects are small. These results are consistent with Hypothesis 3.

Estimations (2) and (3) in Table 4 split the sample by gender. Results reveal that having at least one parent with a university education increases the probability of being a PhD student for girls, while it does not seem to influence boys. In contrast, having both parents with a university education increases the chances of being a PhD student for both genders. Gender differences are larger for the indirect effects, but since their magnitudes are below 1 percentage points, we do not consider them significant.

Table 4. Parental education effects on being a PhD student (bachelor sample).

	(1) All		(2) Females		(3) Males	
At least one parent with university education						
Total Effect	0.015***	(0.004)	0.018***	(0.005)	0.010	(0.007)
Direct Effect	0.013***	(0.004)	0.014***	(0.005)	0.011	(0.007)
Indirect Effect	0.002	(.)	0.004	(.)	-0.001	(.)
Both parents with university education						
Total Effect	0.017***	(0.004)	0.021***	(0.005)	0.011*	(0.006)
Direct Effect	0.015***	(0.004)	0.015***	(0.005)	0.015**	(0.007)
Indirect Effect	0.002	(.)	0.007	(.)	-0.004	(.)
Observations	23153		13694		9459	

Dependent variable: Whether individuals enrolled into a PhD program. Bachelor graduates' sample.
Average partial effects. Robust standard errors in parentheses. Weighted observations.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Parental education effects on being a PhD student after being a master graduate.

	(1) All		(2) Females		(3) Males	
At least one parent with university education						
Total Effect	0.005	(0.011)	-0.010	(0.014)	0.024	(0.017)
Direct Effect	0.002	(0.011)	-0.014	(0.014)	0.025	(0.018)
Indirect Effect	0.002	(.)	0.004	(.)	-0.002	(.)
Both parents with university education						
Total Effect	0.022*	(0.012)	0.019	(0.017)	0.024	(0.017)
Direct Effect	0.022*	(0.013)	0.016	(0.018)	0.026	(0.018)
Indirect Effect	0.000	(.)	0.003	(.)	-0.002	(.)
Observations	10880		5715		5165	

Dependent variable: Whether individuals enrolled into a PhD program. Master graduates' sample.
Average partial effects. Robust standard errors in parentheses. Weighted observations.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Table 5 we report the results for the master graduates' sample. In this case, we observe that the effects of parental education on the probability of enrolling in a PhD program after graduating from a master degree are rather small and statistically insignificant. Only having both parents with university education has a significant effect at the 10% significance level. The effect is all through the direct effect and it increases the probability of studying for a PhD by 2.2 percentage points. When we distinguish between females and males, none of the effects is statistically significant. Our results for this sample suggest that parental background has a negligible effect on the transition from master to PhD studies in Spain. These results seem contradictory to those in Table 4. A possible explanation is that the decision to follow PhD studies is conditioned by the type of master achieved (official or non-official, research-oriented or vocational-oriented) and it might be taken after bachelor graduation when individuals must decide whether to continue higher education and which direction to take. In case of having an interest in pursuing a PhD, individuals tend to pursue a research oriented official master rather than a professional or non-official master. Thus, if parental background

influences the decision to study for a PhD, the effect will be visible in the bachelor graduates' sample.

Table 6. Parental education effects on being a PhD student after being a master graduate.

	(1) All		(2) Females		(3) Males	
At least one parent with university education						
Total Effect	0.007	(0.007)	0.014	(0.009)	-0.002	(0.012)
Direct Effect	0.011	(0.007)	0.015*	(0.009)	0.006	(0.013)
Indirect Effect	-0.004	(.)	-0.001	(.)	-0.008	(.)
Both parents with university education						
Total Effect	0.003	(0.007)	0.008	(0.009)	-0.005	(0.011)
Direct Effect	0.012	(0.008)	0.010	(0.009)	0.016	(0.013)
Indirect Effect	-0.009	(.)	-0.001	(.)	-0.021	(.)
Observations	11933		7039		4894	

Dependent variable: Whether individuals enrolled into a PhD program. Master graduates from the Bachelor graduates' sample. Average partial effects. Robust standard errors in parentheses. Weighted observations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

To corroborate the results in Table 5, we select individuals from the bachelor graduates' sample who report that they graduated from a master program between 2014 and 2019. Since we also know whether they enrolled in a PhD program, we redo the analysis in Table 5 for this subsample. Table 6 reports the results. The average partial effects are small and mostly insignificant for all the estimations, corroborating the previous results. Therefore, we conclude that the influence of parental background on the likelihood of studying for a PhD occurs at the transition to master studies, by choosing an official research-oriented master.

Other results

In the previous section, we reported the results related to the parental background effect. In this section, we present the probit estimations with all the controls to see how each variable affects the probability of being a master and a PhD student in Spain.

Table 7 reports the results of the estimations using the bachelor graduate's sample. We study the likelihood of enrolling in a master program and the likelihood of enrolling in a PhD program in estimations (1) and (2) respectively. As has been extensively discussed above, parental education matters positively in both cases.

There are also significant differences across fields of study. The likelihood of studying for a master degree is more than 25 percentage points higher for fields such as humanities, philology, psychology, life and environmental sciences, physics and chemistry, mathematics and sports sciences than for business management. Those graduates in the education field have the lowest likelihood of studying for a master degree. In this field, it is very common for people to devote their time to preparing for the public exams that will give them access to jobs in public schools. Informatics is the other field that gives their graduates a lower likelihood of studying for a master degree than management administration. The availability of well-paid jobs immediately after graduation disincentivizes graduates in informatics to pursue further education. Having studied for the bachelor degree in a public university does not significantly affect the likelihood of continuing higher education with a master

degree. The variables referring to having enjoyed either a general or an excellence scholarship do not have a significant effect on the probability of studying for a master degree either. This could be explained by the high proportion of bachelor students that within five years after graduation enroll in a master degree (close to 50%). Another interesting result is that females are more likely of enrolling in a master degree than males by 1.7 percentage points. Individuals above 30 are around 17 percentage points less likely to enroll in a master degree. In this study, since the sample is representative of students who graduated with a bachelor degree in 2013/2014, being older means that you started the studies later than usual or took longer to complete your studies, indicating lower academic ability. This could explain our results with age.

Estimation (2) in Table 7 reports the probability of becoming a PhD student using the bachelor graduates' sample. As discussed earlier, parental background has a positive and significant effect. The likelihood of pursuing a PhD degree is the highest for life sciences and physics and chemistry, with around 30 percentage points larger probability than for management administration. Humanities and mathematics graduates are around 15 percentage points more likely to pursue a PhD degree than management administration graduates. The differences with other fields are less than 10 percentage points. Graduating from a public university in 2013/2014 increases the probability of doing a PhD by around 2 percentage points. In this case, the general scholarship does not have a significant effect, while having enjoyed a scholarship of excellence in the bachelor studies increases the probability of studying for a PhD by 2.7 percentage points. This fact is consistent with the scholarship of excellence being a proxy for academic ability. Finally, females and older students are less likely to study for a PhD, although the effect is much smaller than in the case of enrolling into a master program. As commented above, age may represent low academic ability in this sample.

Table 7. Probit estimations on the probability of being a master or PhD student

	(1) Master student		(2) Phd student	
Parental education:				
At least one parent w/ univ. studies	0.044***	(0.010)	0.013***	(0.004)
Both parents w/ univ studies	0.069***	(0.011)	0.015***	(0.004)
Field of study bachelor degree (ref: Business management):				
Education other	-0.042*	(0.024)	0.011*	(0.006)
Arts other	0.125***	(0.027)	0.043***	(0.009)
Humanities	0.358***	(0.024)	0.133***	(0.015)
Philology	0.370***	(0.022)	0.066***	(0.010)
Social sciences other	0.118***	(0.034)	0.049***	(0.016)
Journalism	0.113***	(0.027)	0.011**	(0.005)
Business management other	-0.043	(0.026)	0.007	(0.007)
Law	0.134***	(0.019)	0.015***	(0.005)
Life sciences	0.378***	(0.021)	0.310***	(0.019)
Environmental sciences	0.248***	(0.028)	0.084***	(0.016)
Physics and chemistry	0.322***	(0.023)	0.299***	(0.020)
Mathematics	0.311***	(0.029)	0.154***	(0.022)
Informatics	-0.108***	(0.028)	0.047***	(0.011)
Engineering	0.098***	(0.018)	0.054***	(0.007)
Manufacturing	0.181***	(0.031)	0.097***	(0.016)
Architecture	0.051**	(0.022)	0.028***	(0.008)
Agriculture and farming	0.091***	(0.035)	0.076***	(0.023)
Forestry	0.092**	(0.043)	0.047**	(0.020)
Vet	0.020	(0.032)	0.056***	(0.020)
Health other	0.084***	(0.023)	0.051***	(0.008)
Social services	-0.036	(0.022)	0.009*	(0.004)
Teacher training kindergarten	-0.151***	(0.020)	0.008	(0.005)
Teacher training primary	-0.093***	(0.019)	0.004	(0.004)
Communication sciences	0.068**	(0.032)	0.006	(0.005)
Economics	0.155***	(0.028)	0.028**	(0.011)
Psychology	0.333***	(0.022)	0.036***	(0.009)
Medicine	0.049*	(0.027)	0.094***	(0.013)
Nursing	0.052**	(0.023)	0.016**	(0.006)
Sports sciences	0.258***	(0.025)	0.038***	(0.010)
Public university	-0.003	(0.012)	0.020***	(0.006)
General Scholarship	-0.007	(0.008)	0.005	(0.004)
Excellence Scholarship	0.006	(0.017)	0.027***	(0.006)
Female	0.017**	(0.008)	-0.008**	(0.003)
Age group: 30-34	-0.174***	(0.008)	-0.033***	(0.003)
Observations	23153		23153	
Pseudo R^2	0.096		0.190	

Bachelor graduates' sample. Average partial effects. All variables refer to characteristics of bachelor studies. Robust standard errors in parentheses. Weighted observations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Estimation (1) in Table 8 reports the probability of becoming a PhD student using the master graduates' sample. Parental background has a hardly significant effect. We observe differences across fields of study of the master degree. Those master graduates in sciences have 37 percentage points higher probability to enroll in PhD studies than those who graduated with a master in social sciences. Those that graduated with a master degree in arts and humanities are 16 percentage points more likely to enroll in PhD studies than those who graduated from a master in social sciences. The fields that reveal a lower likelihood of studying for a PhD than social sciences are education, business and law and services. Having graduated from a master in a public university increases the probability of enrolling in a PhD program by 6 percentage points. This fact may be explained by public universities being more research oriented than private ones, and they may provide more research-oriented master programs. We do not observe a significant effect of having enjoyed a general scholarship, which implies no significant financial barriers to studying for a PhD. Having enjoyed a scholarship of excellence increases the probability of studying for a PhD by 12.4 percentage points. This result highlights the importance of academic ability to have access to such studies. The negative effect of age can be interpreted similarly. Finally, females are, on average, four percentage points less likely to study a PhD than males.

Table 8. Probit estimations on the probability of being a PhD student

	(1) Phd student	
Parental education:		
At least one parent with univ studies	0.002	(0.011)
Both parents with univ studies	0.022*	(0.013)
Field of studies (ref. Social Sciences):		
Education	-0.067***	(0.017)
Arts and humanities	0.158***	(0.028)
Business and law	-0.086***	(0.019)
Sciences	0.366***	(0.026)
Informatics	0.070**	(0.036)
Engineering	0.004	(0.020)
Agriculture	0.067**	(0.030)
Health and welfare	0.085***	(0.023)
Services	-0.081***	(0.018)
Public university	0.061***	(0.012)
General Scholarship	-0.005	(0.011)
Excellence Scholarship	0.124***	(0.025)
Female	-0.040***	(0.009)
Age group: 30-34	-0.031***	(0.011)
Age group: >34	-0.009	(0.012)
Observations	10880	
Pseudo R^2	0.134	

Master graduates' sample. Average partial effects. All variables refer to characteristics of master studies. Robust standard errors in parentheses. Weighted observations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6. Conclusions

Equality of opportunity in education requires that individuals choose their studies independently of their parental background. Studies on the transition into master and PhD programs are scarce due to limited data availability. In this paper, we examine these transitions using the EILU survey from Spain. Despite some data limitations, we can identify the effect of parental education on the likelihood of pursuing a master or a PhD in Spain. We apply the KHB method to disentangle the direct effect from the confounding effects of variables such as previous study choices.

Our findings indicate that parental background significantly influences the transition from bachelor to master studies, suggesting that equality of opportunity can be improved in Spain. According to our results, the transition to master studies suffers more from inequality of opportunity than the transition to PhD studies. This may be because the transition to a PhD is conditioned by the type of master study undertaken. Therefore, to improve equality of opportunity, the focus should be on the transition to master studies.

Providing information and promoting master and PhD study paths during bachelor studies to all students should help enhance equality of opportunity in Spain. Our results suggest that particular emphasis should be placed on supporting females and those students with parents without university education, as they are the least likely to pursue further education after completing their bachelor degree. Conducting this analysis again with the next wave of the EILU survey will allow to check for the evolution of equality of education in the transition to master and PhD studies in Spain.

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