

<b>Title</b>	Wage Premium and Master's Degrees: Some Empirical Evidence from Spain
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<b>Abstract</b>	<p>The current expansion of the knowledge economy and its requirements of highly educated workers make interesting to analyse the effects on the labour market outcomes of completing a master's degree. This study examines the factors determining the probability of pursuing a postgraduate programme, and observes whether workers reaching this educational attainment reap the benefits of their human capital investment through better paid jobs compared to college-only degree holders. On the other hand, it analyses whether individuals with a master's degree are more prone to upward wage mobility.</p> <p>The study relies on data obtained from the second Survey on the Labour Insertion of University Graduates conducted by the National Statistics Institute (INE, 2019). This survey allows us to observe labour market transitions of the first group of Spanish university graduates under the European Higher Education Area (EHEA) and their earnings. The methodological procedure consists of the estimation of wage models controlling for the unobservable differences between workers who have or have not completed a master's degree.</p> <p>The results indicate a significant positive impact of master's degree on salaries. Furthermore, individuals with postgraduate studies are more prone to upward wage mobility in comparison to college-only degree holders.</p> <p>Data used does not allow us to identify which competences associated with the completion of a master's degree are more remunerated by employers.</p> <p>The econometric specification applied allows us to compute the direct effect of a master's degree on wages, and predict the average probability that an individual is in a determined wage interval according to the knowledge area and controlling by the rest of characteristics.</p> <p>The findings are helpful to diagnose and understand how the knowledge acquired through postgraduate studies are rewarded by the labour market, which is essential to evaluate the return on educational investments when making decisions about whether or not to continue postgraduate studies.</p> <p>This research addresses novelty aspects on tertiary education in Spain and its effects on workers' careers.</p>
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## 1. Introduction

Postgraduate education is considered an additional and important source of human resources, which is useful for specialising and increasing an individual's competences and skills for the labour market. It is expected to generate a positive effect on employability, which would redound auspiciously on innovation, development, competitiveness and, as a consequence, on knowledge-based economic growth. A priori, its contribution to the educational background of individuals could represent a boost to their upward career paths since it would mean a bridge between the training acquired during undergraduate studies and the complementary knowledge required to achieve successful labour market insertion. In fact, its impact on an individual's curricular competencies is a way to improve the quality of job matching between employees and employers, and overcome the labour market risks and uncertainty of being in non-standard, temporary, atypical or low-paid jobs. Increasingly, medium-educated workers and graduates face labour market instability and precarious employment characterised by low wages, low training and few prospects for promotion that can even lead to downward occupational mobility. This job insecurity often results in a loss of human capital, layoffs followed by long spells of unemployment and the subsequent stigmatization of workers, which happens particularly if they are at the beginning of their careers or close to retirement. Apart from the influence of macroeconomic trends and the worrying current socio-economic instability, these facts are partly caused by structural reasons such as persistent educational mismatch, the excess supply of graduates with little specialization and job polarization generated by the rapid expansion of technological change. In this economic environment, postgraduate studies have emerged as a solution, which explains their positive reception by the university community and rapid expansion during recent years. According to the International Standard Classification of Education (ISCED), tertiary education consists of four levels: short-cycle tertiary education, bachelor's degrees, master's degrees and doctoral studies. Focusing on master's degrees, more than 5.5 million people were enrolled on master's degree courses in the EU-28 in 2019, which represented 29% of tertiary education students in Europe. However, the distribution of individuals enrolled on master's studies in relation to the total number of students in tertiary education is not homogenous among the different EU-28 countries, ranging between the lowest rate of 10% observed for Greece and the highest percentage of 39% for Croatia, Cyprus or Slovakia. In Spain, this ratio stands at 17% in 2019, which implies that more than 350,000 people were pursuing this educational level; this figure is about a third of the number for Germany or France. The expansion of postgraduate education has also been accelerated by the implementation of the Bologna Process and the creation of the European Higher Education Area (EHEA). The EHEA ensures the compatibility of the higher education systems across

Europe, and improves equal opportunities for European graduates. In some countries like Spain, the EHEA entailed the reduction of the time required to complete a university degree. This has also encouraged students to enrol in postgraduate studies to improve their job opportunities and employability and/or enable them to access doctorate studies.

Nowadays, there is consensus about the crucial effectiveness of postgraduate studies to improve the labour productivity of recent graduates, and cover the new needs of highly educated employees required by the productive system. This has been reinforced by the irruption of new technologies associated with the COVID-19 pandemic, which has seen a high demand for ICT professionals to underpin the transition to a modernised economy. Thus, the European Centre for the Development of Vocational Training (CEDEFOP) predicts that 1.6 million ICT professional jobs must be filled by 2030. This fact has accelerated the arrival and imminent expansion of new economic megatrends such as Industry 4.0 (I4.0), artificial intelligence, digitalisation, robotics and teleworking. As noted by Dolado et al. (2021), the economy may be entering the “Great Reallocation” phase, in which workers are pushed into sectors dominated by these megatrends. In this setting, postgraduate studies could help in the transition to a digital-based society, the modernisation of the economy and the implementation of the EU Recovery Plan. This policy instrument was launched to mitigate the damage caused by the COVID-19 recession (Great Contagion), and to deal with job reallocation induced by technological changes and the new labour market drivers.

These facts - together with the current expansion of the digital and knowledge economy - make it interesting to continue with an analysis of the effects on the labour market outcomes of completing a master’s degree, and provide new empirical evidence that enriches the findings obtained by the economic literature regarding the impact of a master’s degree on workers’ careers. We approach this in several ways. First, this study analyses the factors determining the probability of pursuing a postgraduate programme, and examines whether workers reaching this educational attainment reap the benefits of their human capital investment through better paid jobs compared to those workers with only a college degree. Furthermore, we will obtain the probability of being at the top of the wage distribution according to the knowledge area of the degree. Second, we will examine whether individuals with a master’s degree are more prone to upward wage mobility. The study relies on data obtained from the second Survey on the Labour Insertion of University Graduates conducted by the National Statistics Institute (INE, 2019). This survey allows us to observe the labour market transitions of the first group of Spanish university graduates under the EHEA and their earnings. The methodological procedure consists of the estimation of wage models controlling for the unobservable

differences between workers who have or have not earned a master's degree. To the best of our knowledge, this research addresses a novelty aspect that could contribute to the economic literature discussing the Spanish case, as it focuses on unexplored issues that offer accurate information to policymakers and stakeholders. In fact, the findings are helpful to diagnose and understand how the knowledge acquired through postgraduate studies are rewarded by the labour market, which is essential to evaluate the return on educational investment when making decisions about whether or not to continue postgraduate studies. In fact, obtaining a master's degree could be considered an investment and its wage premium an indicator of its profitability.

The rest of the article is organised as follows. Section 2 reviews the contributions made by the economic literature on the returns of postgraduate education. Section 3 and 4 are dedicated to describing the data set and introduce the methodological approach proposed to reach the primary objectives, respectively. Section 5 presents and discusses the main results. Some concluding remarks are provided in section 6 as well as some implications and recommendations.

## **2. Related research and theoretical background**

The economic literature has documented widespread evidence on the positive effects of postgraduate education on labour market performance. Some examples are the studies of Autor et al. (2008), Lindley and Machin (2016), Almeida et al. (2017), Kong et al. (2018) and Altonji and Zhong (2021). Autor et al. (2008) analyse the rise of wage inequality in the USA between 1990 and 2005. They suggest that the labour demand shift towards highly skilled employees has increased the relative wage of workers with postgraduate education. Likewise, Lindley and Machin (2016) for the USA and the UK find that the postgraduate wage premium for post-college degree holders has increased significantly, as their more specialised competences allow them to reach higher occupational status. They consider that the labour demand shift arose because these workers are more able to perform complex job tasks in non-routine occupations. This job displacement has been fostered by the increasing computerisation of the workplace. Cunha et al. (2006) indicate that this comparative advantage could also be intensified because postgraduate studies could increase the probability of receiving firm-specific investments. In this line, graduates and postgraduates could follow different earning paths and increase their wage gap because of the different options available to access training and promotion. Hisanobu et al. (2014) provided more empirical evidence in their observation that Japanese postgraduates rise their wages even when they are older, which would contribute to expand their lifetime wage income in comparison to college-only degree holders. In this vein, Almeida et al. (2017) draw

on a large employee-employer data set in their aim to decompose the pay gap between postgraduates and graduates in Portugal, and the assignment of both collectives across the occupational scale. The authors find two channels causing the postgraduates' wage premium. First, they receive higher wages even in the same occupations shared with lower qualified graduates, which could be due to their higher productivity. Second, they are better paid as they have easier access to jobs more demanding in terms of skill utilisation. Furthermore, as with the previous studies, they also document that postgraduates have displaced college-only graduates from their traditional jobs. On the other hand, Kong et al. (2018) focused on the wage premium obtained by workers in Chinese exporting companies. In this context, they indicate that the massification of higher education in China has generated the need to acquire postgraduate qualifications in order to access the top of the occupational scale, and this pattern has been detected mainly in companies trading abroad.

Recent research includes the works of Suleman and Figueiredo (2020), Altonji and Zhong (2021), and Stokke (2021). The first study uses a Portuguese employer-employee data set to observe school-to-work transitions in the context of the Bologna Process and distinguishes between college-only graduates and master's degree graduates. Their results show that new labour market entrants with postgraduate studies receive a wage benefit in comparison to those with undergraduate degrees, and have a lower probability of being in atypical jobs. These benefits are appreciated only four years after the implementation of the Bologna Process in Portugal, which reveals the positive impact of the harmonisation of the European higher education system on individuals located at the top of the educational pyramid. Second, Altonji and Zhong (2021) provide return estimations on a broad set of postgraduate qualifications in the US distinguished by occupation type. They find substantial wage differences across the different fields of study that increase with work experience. Finally, from a gender perspective, Stokke (2021) uses matched employer-employee register data for Norway and finds that the gender wage gap among highly educated workers is largely heterogeneous, especially when they divided the sample between college-only graduates and postgraduates. Thus, for workers with only a bachelor's degree, there is a rapid increase in the male wage premium in relation to their female counterparts during their early careers. This is almost twice the amount registered for postgraduates, which proves that the gender wage gap is more intense for the first collective.

Regarding the literature discussing the Spanish case, the effect of postgraduate education on the labour market has not received much attention, despite its importance. This is due to the existence of methodological limitations to analyse this topic. In particular, the sparsity of suitable and relevant data, and the scarcity of information about wages have hampered the

development of more research. Notwithstanding, it is possible to highlight the studies of Llorens et al. (2013), Caparrós (2019a, 2019b) and Salas-Velasco (2021). Llorens et al. (2013) explore which competences are demanded most in the ICT sector, and detect that for individuals with master's degrees in engineering, the most valuable competences for employers are the ability to motivate co-workers, being-target oriented, creativity, and a capacity for planning and leadership. As pointed out by López-Catalan and Bañuls (2017), these competences are acquired in a technological environment where the main learnings trends are gamification, mobile learning, open education and social media.

Focusing on individuals undertaking PhD programmes, Caparrós (2019a) finds that completing doctoral studies over a prolonged period decreases the probability of pursuing a research career. Several reasons could explain this result. On the one hand, taking a long time to finish doctoral studies could be considered a negative reflection on the individuals' research skills. On the other hand, these individuals may use the doctorate to obtain promotion or find a better job, that is, for purposes other than pursuing a research career. In the same vein, Caparrós (2019b) analyses the influence a doctorate has on holders' careers when working abroad. In particular, the author observes that international mobility exerts a positive effect on wages and pushes individuals to the top of the wage distribution. Finally, Salas-Velasco (2021) examines how the skills of master's degree graduates are related to the needs of the labour market. He observes that the probability of obtaining good education-job match increases for postgraduates compared to college-only graduates.

This paper builds on the growing literature, and its main contribution is to provide new empirical evidence for Spain regarding postgraduates' wage premium compared to workers holding an undergraduate degree. In addition, we will verify whether having a master's degree influences upward wage mobility. The main hypotheses to be tested is that in the current knowledge economy companies place high value on postgraduate qualifications and this positively influences workers' careers.

### **3. Data**

The data are obtained from the second Survey on the Labour Insertion of University Graduates (SLIU) conducted by the National Statistics Institute. This survey has a four-year periodicity and is nationally representative of Spanish university graduates. To date, only two surveys have been released for the years 2014 and 2019. We use the information corresponding to the second survey, which analyses individuals completing their university degree in the 2013-2014 academic year. This is the first group of students who graduated under the EHEA in Spain. The

sample is restricted to individuals who hold a college-only degree or a master's degree completed between 2014 and 2019. Table 1 shows their distribution according to their labour market status in 2019.

[Insert table 1]

The focus is on wage earners, which is the prevailing professional situation with a percentage of around 76%. It is noteworthy that the unemployment rate is around 10%, which contrasts with the 14% registered in Spain for the entire active population in 2019. In order to homogenise the sample, an additional limitation is applied; in particular, we consider wage earners with a maximum tenure of five years, that is, the period between the completion of the degree and the carrying out of the survey. This generates a sample of 14982 individuals of which 42% took a master's degree between 2014 and 2019.

The econometric procedure developed in the next section to compute the effect of completing a master's degree on wages considers this dummy variable as an endogenous regressor. Table 2 displays the explanatory variables chosen to determine the propensity of pursuing a master's degree. The selection takes into account personal characteristics and the type of degree studies carried out. In particular, the explanatory variables are all expressed as dummy variables and collect information such as age, gender, knowledge area of the degree, type of university, and whether the maximum parental educational level is higher education or not. The statistical analysis is accompanied by the application of the Pearson's test to verify whether the distributions of variables differ by educational attainment and, therefore, they are suitable to be part of the set of regressors. For all variables, the results show the existence of differences between the two collectives considered. However, as it is known, this basic statistical approach must be reinforced with an econometric analysis that will be set out in section 5. In this way, we will be able to know the individual effect of each variable once the influence of the other covariates is controlled.

[Insert table 2]

Regarding labour earnings, the SLIU tabulates wages in intervals that are sorted from less than €700 (first interval) to more than €3000 (last interval). Table 3 shows, for the sample selected, the wage distributions for the two collectives considered. Once again, the statistic corresponding to the Pearson's test reveals statistically significant differences. It is noteworthy that the proportion of individuals in the central intervals (from €1000 to €2999) is slightly higher for wage earners with a master's degree (78% versus 75%). On the other hand, 17% of

individuals with a college-only degree receive a wage located in the first two intervals (from less than €700 to €999), two percentage points (p.p.) higher than that of the other collective.

[Insert table 3]

The wage model specified in the next section includes as regressors personal and degree-related characteristics such as gender, type of university, knowledge area, and whether the individual participated in the Erasmus programme. Second, we consider some labour characteristics such as firm size, type of working day, job occupation, and the existence of some useful and highly valued competences to find the current job. These competences are self-reported, and include theoretical knowledge, practical skills, ICT knowledge, social and teamwork skills, management, planning and entrepreneurship skills. Furthermore, the analysis takes into account two additional explanatory variables. The first is geographical mobility to another province once the graduate studies have been completed, and the second is whether the individual is overeducated in their current job.

Table 4 shows the mean values for these variables. Focusing on job characteristics, the most represented corresponds to individuals working full-time as technicians in firms with more 249 employees. Regarding competences, the highest percentages are reported for practical skills, and personal and social competences, with 70% and 82% of wage earners reporting that they were useful in finding their current jobs. Furthermore, it can be highlighted that 34% of individuals moved to another province once they finished their studies. Finally, 18% of individuals with a master's degree state that they are in a job with an educational requirement lower than higher education (9 p.p. lower than college-only graduates').

[Insert table 4]

The second primary objective of this study is to present an overview of the evolution of wages over the period 2015-2019, and verify whether completing a master's degree after the 2013-2014 academic year exerts a positive influence on upward wage mobility. The empirical strategy consists of selecting a restricted sample containing full-time workers who were wage earners in both 2015 and 2019. The SLIU allows us to know which quintile of the social security contribution base the individual is in. The social security contribution bases for 2015 and 2019 are observed in the month of March, and include the monthly gross remuneration with prorated extraordinary payments. Wage mobility is defined as movements of individuals between the different quintiles of the social security contribution base. Thus, an individual registers an upward (downward) wage mobility if they are located in a higher (lower) quintile of the social



security contribution base in 2019 compared to 2015. Table 5 shows the distribution of individuals according to their wage mobility. It is noteworthy that 16% of individuals with master's degrees who were in the first quintile in 2015, transit to the fifth in 2019; while for individuals with a college-only degree, this percentage is 3 p.p. lower. On the other hand, the highest percentage of upward wage mobility is observed for the transition from the fourth quintile (2015) to the fifth (2019), 33% for individuals with postgraduate qualifications and 30% for college-only degree holders. Finally, the mean values of regressors included in the wage mobility model appears in table A of the appendix. In particular, the set of explanatory variables is composed of the following dummy variables: completing or not a master's degree, gender, the knowledge area of the degree, whether or not the individual has participated in the Erasmus programme, and the type of university.

[Insert table 5]

#### 4. Methodology

This section presents the econometric techniques used to analyse the effect of getting a master's degree on wage dynamics. The first primary objective is to quantify the influence of the postgraduate studies investment on the current wage.

Bearing this in mind, the wage econometric model is specified in equation 1:

$$y_{1i}^* = x_{1i}'\beta_1 + \alpha_1 y_{2i} + \varepsilon_{1i} \quad (1)$$

$y_{1i}^*$  is the log wage for an individual in 2019,  $x_{1i}$  is a vector of regressors,  $y_{2i}$  is a dummy endogenous regressor indicating whether or not the individual has completed a master's degree between 2014 and 2019. The inclusion of this variable allows for the estimation of the average treatment effect of receiving these studies. Finally,  $\varepsilon_{1i}$  is an error term distributed as  $N(0, \sigma_1^2)$ .

This specification is a reduced-form wage model drawn from the Human Capital Theory (Becker, 1993) that posits wages as a function of an individual's labour productivity, which is related to personal and labour characteristics (vector  $x_{1i}$ ) and educational investments. In particular, the wage model arises as a maximization of human capital investments where individuals compare their monetary and non-monetary expected benefits with the opportunity costs, mainly loss of income, derived from not participating in the labour market.

The variable  $y_{2i}$  is formulated in equation 2:

$$y_{2i} = \begin{cases} 1 & \text{if } y_{2i}^* > 0 \\ 0 & \text{if } y_{2i}^* \leq 0 \end{cases} \quad (2)$$

$y_{2i}^*$  could be considered as the latent process showing the unobserved propensity of completing a master's degree, and is specified in equation 3:

$$y_{2i}^* = z_i' \delta + \varepsilon_{2i} \quad (3)$$

$z_i$  is a vector containing variables influencing the decision to complete or not a master's degree, and whose composition has been set out in section 3. Finally,  $\varepsilon_{2i}$  is an error term distributed as  $N(0, \sigma_2^2)$ .

For identification reasons, at least one regressor in  $z_i$  must not be included in  $x_i$ . This is met since the variable showing parental education, in particular whether the father and/or mother has higher education, appears in  $z_i$  but not in  $x_i$ . In this way, we take into account the effect on the intergenerational transmission of education, and the parents' aspiration that their children reach a higher educational level than their own (e.g. Fleury and Gilles, 2018). In relation to this issue, some scholars have criticised the use of family background to address the education's endogeneity, as it could also influence on the individuals' preferences to certain firms or industries (Trostel et al., 2002; Psacharopoulos and Patrinos, 2004). However, from an empirical point of view, the effectiveness of using family background to identify a wage model has been proven in the economic literature. For example, Hoogerheide et al. (2011) with data from the 2004 German Socio-Economic Panel verified through a Bayesian analysis the suitability of using father's educational to solve the education's endogeneity.

To estimate this system of equations, an additional issue must be considered. As we have pointed out in the previous section, the wage observed in 2019 is tabulated into intervals in the SLIU; that is, the ordered category into which each wage falls is known, but its exact value is unknown. An initial approach would be to take a value of the interval, for example the midpoint, and create a pseudo-continuous wage to estimate equation (6). However, from the literature it is known that this procedure would produce inconsistent estimates (Stewart, 1983). Furthermore, this econometric practice would not be possible in this case as the first and last wage interval are left-censored and right-censored, respectively. To overcome these drawbacks, we estimate the coefficients of equation (6) using interval regression. This econometric technique is a generalisation of the Tobit model where the dependent variable is expressed as a data point or as interval data (e.g. Daniels and Rospabe, 2005). In particular, the coefficients of equation 1 and 3 are estimated by maximum likelihood using the extended interval regression

modes implemented by Stata software (Statacorp, 2019), and taking into account the endogeneity of having or not completed a master's degree with a probit model.

The second primary objective is to estimate the effect of holding a master's degree on wage mobility. In the statistical section, we have defined individual wage mobility as changes in the quintile ranking of the social security contribution base, and it has been analysed from a statistical point of view through transition matrices. Now, in order to explore the influence of the explanatory variables on wage mobility, the dependent variable  $y_3$  is generated to capture the movements between quintiles: downward wage mobility ( $y_3 = 0$ ), no wage mobility ( $y_3 = 1$ ) and upward wage mobility ( $y_3 = 2$ ). Given that  $y_3$  is an ordered and categorical variable, an ordered probit model is proposed. Its formulation can be expressed as:

$$\Pr(y_{3i} = 0|x_{2i}, y_{2i}) = \Phi(\alpha_1 - x'_{2i}\beta_2 - \alpha_2 y_{2i})$$

$$\Pr(y_{3i} = 1|x_{2i}, y_{2i}) = \Phi(\alpha_2 - x'_{2i}\beta_2 - \alpha_2 y_{2i}) - \Phi(\alpha_1 - x'_{2i}\beta_2 - \alpha_2 y_{2i}) \quad (4)$$

$$\Pr(y_{3i} = 2|x_{2i}, y_{2i}) = 1 - \Phi(\alpha_2 - x'_{2i}\beta_2 - \alpha_2 y_{2i})$$

$\Phi$  is the cumulative normal distribution function,  $\alpha_1$  and  $\alpha_2$  are the threshold parameters,  $\beta_2$  is the vector of parameters associated with the vector of regressors  $x_{2i}$ . As in the interval wage model, completing a master's degree ( $y_{2i}$ ) is considered as an endogenous regressor.

## 5. Results

This section presents the results obtained once the econometric specifications formulated in the previous section have been estimated. First, we focus on the estimation of the wage model. As pointed out, a probit model is used to evaluate the probability of completing a master's degree. Its marginal effects are reported in table 6, and they show a significant heterogeneity. For example, females report a probability 2 p.p. higher than their male counterparts, which is indicative of the educational investment effort made by this collective to equalise their opportunities in the Spanish labour market which is characterised by the existence of gender barriers with regards accessing jobs, especially for women with children (e.g. Hupkau and Ruiz-Valenzuela, 2021). Second, the probability of completing postgraduate studies decreases with age. More specifically, the likelihood of individuals over 34 years old pursuing a master's degree is 18 p.p. lower than that corresponding to individuals under 30. This result is consistent with the theoretical predictions, as investment in human capital is less profitable as the length of the working life diminishes. Regarding knowledge areas, individuals with a degree in

“Natural Sciences” or “Arts and Humanities” are more prone to pursuing a master’s degree with probabilities 20 p.p. and 15 p.p. higher than the category of reference (“Services”). Concerning family background, there is an intergenerational transmission of preferences for the accumulation of human capital as an individual with a father and/or mother with higher education has a 6 p.p. higher probability of having undertaken postgraduate studies than the rest. This is a common result in the literature (e.g. Stella, 2013) and shows how the positive effect of education transcends across generations.

[Insert table 6]

Once considered the endogeneity of completing or not a master’s degree, the estimates of the wage equation appear in table 7 where it is possible to highlight that most coefficients are significant. The model is semilogarithmic, which implies that the effects of the dummy variables are obtained calculating the exponential of the coefficient and subtracting 1 (Halvorsen and Palmquist, 1980).

[Insert table 7]

First, a positive difference can be observed between the master degree’s effect estimated with the model correcting endogeneity bias and that obtained with the benchmark model without correcting endogeneity. In particular, those individuals with a master’s degree increase their wages by 16% compared to individuals with a college-only degree. This result reveals the importance of postgraduate studies for a successful career, and the quantification for the Spanish case is higher than that obtained in other studies. For example, Conlon and Patrignani (2011) for the UK or Suleman and Figueiredo (2020) for Portugal estimated an earnings wage premium of 9% for master’s graduates. In relation to other characteristics, first, male graduates earn 9% more than their female counterparts, which is indicative that gender wage gap in the Spanish labour market persists even for individuals with higher education. Second, graduates who participated in the Erasmus programme receive a wage premium of 4%. The high internationalisation of companies makes these type of experiences attractive for employers, and can act as a positive sign of the employees’ quality according to the Filter Theory (Spence, 1973). This is complemented by the favourable effect (11%) associated with the variable showing that a good knowledge of languages had a positive influence on finding a job. Moreover, it is noteworthy that the highest effect on earnings corresponds to individuals working as company managers or in public administration (23%). On the other hand, the size of the firm exerts a positive influence on wages. In particular, workers in firms with more than 249 rise their wages by 22% compared to reference category (workers in firms with less than

10 employees). Firm size allows us to proxy some firms' characteristics influencing on wages such as type of wage bargaining, union density, proportion of insiders and outsiders or product market orientation. However, it would have been interesting to observe the direct impact of these variables on wages but it was not possible, as this information is not collected in the survey. In relation to other aspects, it is found that changing province once studies had been completed has a positive influence on wages (3%). This result shows that interprovincial migration follows the expected patterns of wage maximization. Finally, overeducated wage earners suffer a wage penalty (-16%) compared to other workers.

The other derivation we obtained from the estimation of the labour earnings wage model is the predicted probability that an individual is in a determined wage interval. To simplify the explanation and draw some general conclusions, we obtain the average of these probabilities for each knowledge area compressing the wage intervals into three other intervals: less than €1499; €1500 - €1999; and more than €1999 (table 8). The main findings show that, for the whole sample, wage earners with an undergraduate degree in the knowledge areas of "Computing" and "Engineering and Technology" have the highest probability of being in the wage interval of "more than €1999" (around 19% and 15%, respectively). Secondly, for most knowledge areas, individuals with a master's degree have more probability of being in the wage intervals "€1500 - €1999" or "more than €1999" than those with a college-only degree. For the first salary range, the positive difference reaches its maximum for "Business Administration and Law", 3.4 p.p. However, for the second range, the positive gap does not exceed 1 p.p., also registering its maximum value for "Business Administration and Law" (0.68 p.p.). Overall, these results reflect that earning a master's degree implies a wage premium since it decreases an individual's likelihood of being located at the bottom of the wage distribution compared to individuals with a college-only degree.

[Insert table 8]

The second primary objective focuses on wage mobility. As pointed out in section 3, wage mobility is defined as changes between quintiles of the social security contribution base for wage earners between 2015 and 2019. The estimated marginal effects of the ordered probit model (table 9) reveal that individuals with a master's degree have a probability of upward wage mobility that is 75 p.p. higher than the rest of wage earners with higher education. This verifies the hypothesis that the competences acquired through postgraduate studies provide a complementary specialisation that is rewarded with better employment opportunities such as an increased probability of job promotion or the likelihood of getting better remunerated jobs

in other companies. Undoubtedly, employees with higher skills experience a steeper career path characterised by higher wage growth. Further interesting conclusions are, first, the knowledge area more prone to upward mobility is “Engineering and Technology” with a probability 13 p.p. higher than “Services”. Second, having completed university studies at a face-to-face institution exerts a high positive influence on careers. More specifically, it increases the probability of upward wage mobility by 9 p.p. This adds value to face-to-face university studies compared to other teaching methods such as distance university studies. This result also suggests that it would be interesting to assess the impact on workers’ careers of having face-to-face classes or online classes, which experienced a great boom during the COVID-19 pandemic. Obviously, the period this study covers does not allow for such a distinction. Finally, having participated in the Erasmus programme raises the options of transiting to a higher quintile between 2015 and 2019 by 3 p.p.

[Insert Table 9]

Apart from the marginal effects, the econometric analysis allows us to compute an additional result. More specifically, we calculate the average predicted probabilities of upward mobility by knowledge area for individuals with a master’s degree. The results show that the probability of having experienced upward wage mobility surpasses 75% in all knowledge areas and, specifically, is around 88% for “Computing”, “Education” and “Engineering and Technology”.

[Insert figure 1]

## 6. Conclusions

This study provides empirical evidence regarding some aspects of tertiary education in Spain and its effects on workers’ careers. The focus is on the influence of earning a master’s degree on labour earnings. The analysis is developed in the context of the European Higher Education Area (EHEA) as it uses data from the second Survey on the Labour Insertion of University Graduates (SLIU) conducted by the National Statistics Institute (INE, 2019). In particular, it observes some aspects related to wages between 2015 and 2019, which allows us to make visible whether the Bologna Process could consolidate postgraduate studies as a means of improving labour market insertion. The first primary objective was to compute the direct effect of a master’s degree on wages in 2019, and the results indicate a significant positive impact as it increases salaries by 16% compared to those of college-only graduates. This verifies the positive effect of the European higher education harmonisation on individuals with postgraduate studies, which has been already confirmed by other studies such as Suleman and

Figueiredo (2020) in Portugal. Furthermore, the second primary purpose was to evaluate whether postgraduate studies exert a positive effect on upward wage mobility, which has been verified as it raises it by 75 p.p. These findings corroborate that, in the current knowledge economy, a master's degree is a human capital investment necessary to guarantee successful careers in a Spanish labour market and improve job matching. The new megatrends in economics and the growing demand for labour in emerging sectors associated with the digital economy has increased the need for a flexible and highly skilled workforce.

Despite these monetary benefits, there are some issues where improvement represents some of the challenges facing the current educational system. For example, the econometric analysis has also revealed that there are inequalities in terms of accessing a master's degree for individuals with parents with an educational attainment lower than higher education, which is not a desirable result as socioeconomic origin should not present an obstacle to acquiring human capital in an advanced and meritocratic society. Nevertheless, these conclusions could hide other underlying reasons such as the different cost of opportunity or the financial difficulties facing individuals when deciding to continue their studies. These barriers could partly explain the gap between Spain and the EU-28 in relation to people who were enrolled on a master's degree course in 2019 (12 p.p. in favour of the EU-28). Another important aspect is that the probability of completing a master's degree is not homogenous by knowledge area. These findings indicate the need to follow this research line and shed more light on the difficulties faced when pursuing postgraduate studies. Carrying out nationally representative surveys identifying the individual preferences about educational investment decisions would be a starting point to advance in the knowledge about this interesting topic and about the effectiveness of the Bologna Process to adapt higher education to future economic challenges. Moreover, from our point of view, another element that should be enhanced is to improve the two-way flow of information between universities and companies in order to achieve communication channels between scientific knowledge, professional orientation and specialisation.

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## **Appendix**

[Insert table A]

**Table 1. Distribution of individuals according to their labour market situation in 2019**

<b>Labour market situation</b>	<b>College-only degree</b>		<b>Master's degree</b>	
	<b>Obs.</b>	<b>%</b>	<b>Obs.</b>	<b>%</b>
Wage-earner	10323	75.54	6761	76.92
Self-employed	1116	8.16	645	7.34
Unemployed	1189	8.70	763	8.68
Inactive	1038	7.60	621	7.06
All	13666	100	8790	100

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE)

**Table 2. Mean values of the regressors explaining the probability of completing a master's degree<sup>a</sup>**

<b>Regressors</b>	<b>College-only degree</b>	<b>Master's degree</b>	<b>Pearson's <math>\chi^2</math></b>	
<b>Age (years)</b>				
Under 30	0.55	0.72		
Between 30 and 34	0.33	0.22	452.58	***
Over 34	0.12	0.06		
<b>Gender</b>				
Male	0.43	0.40	10.59	**
Female	0.57	0.60		
<b>Knowledge area</b>				
Agricultural Sciences	0.05	0.03		
Arts and Humanities	0.08	0.14		
Business Administration and Law	0.15	0.14		
Computing	0.05	0.02	626.64	***
Education	0.13	0.07		
Engineering and Technology	0.16	0.14		
Medical Sciences	0.17	0.13		
Natural Sciences	0.07	0.14		
Services	0.05	0.04		
Social Sciences, Journalism and Documentation	0.09	0.13		
<b>Type of university</b>				
Face-to-face	0.97	0.98	8.75	**
Distance	0.03	0.02		
<b>Parents' maximum educational level</b>				
Less than higher education	0.63	0.57	63.18	**
Higher education	0.37	0.43		
<b>Observations</b>	8756	6266		

**Note:** (a) (\*\*\*) p-value less than 0.01, (\*\*) p-value between 0.05 and 0.01.

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 3. Distribution of individuals among wage intervals in 2019 (%)<sup>a</sup>**

<b>Interval wage (€)</b>	<b>College-only degree</b>	<b>Master's degree</b>
Less than 700	6.42	5.56
700-999	10.19	9.12
1000-1499	34.52	36.97
1500-1999	29.10	29.96
2000-2499	11.73	11.28
2500-2999	4.25	3.82
More than 3000	3.79	3.29
<b>Total</b>	100	100
<b>Observations</b>	8756	6226
<b>Pearson's <math>X^2</math></b>	38.97	***

**Note:** (\*\*\*) p-value less than 0.01.

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 4. Mean values of the regressors included in the wage equation**

<b>Regressors</b>	<b>College-only degree</b>	<b>Master's degree</b>	<b>All</b>
<b>Gender</b>			
Male	0.43	0.40	0.41
Female	0.57	0.60	0.59
<b>Knowledge area</b>			
Agricultural Sciences	0.05	0.03	0.04
Arts and Humanities	0.08	0.14	0.10
Business Administration and Law	0.15	0.14	0.15
Computing	0.05	0.02	0.04
Education	0.14	0.08	0.11
Engineering and Technology	0.16	0.14	0.15
Medical Sciences	0.16	0.14	0.15
Natural Sciences	0.06	0.14	0.10
Services	0.05	0.04	0.04
Social Sciences, Journalism and Documentation	0.10	0.13	0.11
<b>Type of university</b>			
Face-to-face	0.98	0.98	0.98
Distance	0.02	0.02	0.02
<b>Erasmus programme</b>			
Yes	0.12	0.14	0.13
No	0.88	0.86	0.87
<b>Firm size (number of workers)</b>			
Less than 10	0.16	0.14	0.16
Between 10 and 19	0.08	0.08	0.08
Between 20 and 49	0.15	0.14	0.14
Between 50 and 249	0.22	0.23	0.21
More than 249	0.39	0.41	0.40
<b>Type of working day</b>			
Full-time	0.84	0.85	0.84
Part-time	0.16	0.15	0.16
<b>Occupation</b>			
Management of companies or public administration	0.03	0.03	0.03
Scientific and intellectual professionals and technicians	0.54	0.59	0.55
Support technicians and professionals	0.16	0.16	0.16
Administrative type employees	0.14	0.11	0.13
Catering, personal services, security, and retail workers	0.08	0.07	0.08
Workers in agriculture and fishing	0.01	0.01	0.01
Craftsmen and skilled manufacturing	0.01	0.01	0.01
Installation and machinery operators	0.01	0.01	0.01
Unskilled workers	0.02	0.01	0.02
<b>Competences highly valued to find the current job</b>			
Theoretical knowledge	0.52	0.56	0.53
Practical skills	0.68	0.71	0.70
Knowledge of languages	0.39	0.45	0.42
ICT skills	0.50	0.51	0.51
Personal and social competences	0.82	0.82	0.82
Management, planning and entrepreneurship skills	0.38	0.39	0.39
<b>Geographical mobility</b>			
Yes	0.30	0.38	0.34
No	0.70	0.62	0.66
<b>Overeducated</b>			
Yes	0.27	0.18	0.23
No	0.73	0.73	0.77
<b>Observations</b>	<b>8756</b>	<b>6226</b>	<b>14982</b>

Source: Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 5. Wage mobility of employees: Transitions between quintiles (2015 versus 2019)**

<b>College-only degree</b>					
Quintile: 2015	I	II	III	IV	V
I	19.59	25.28	24.97	17.46	12.69
II	19.57	30.43	25.10	15.22	9.68
III	7.68	23.97	29.70	23.05	15.60
IV	4.70	9.14	27.28	28.49	30.38
V	3.47	5.49	13.29	28.32	49.42
<b>Master's degree</b>					
Quintile: 2015	I	II	III	IV	V
I	12.33	22.44	25.85	22.88	16.49
II	16.73	25.09	26.55	19.64	12.00
III	9.24	22.97	28.01	21.57	18.21
IV	4.14	12.41	24.81	25.94	32.71
V	4.58	7.19	24.18	31.37	32.68

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 6. Probit estimates of the probability of completing a master's degree<sup>a,b</sup>**

Regressors	Marginal effects	
<b>Gender</b>		
Male	-0.022	**
<b>Age (years)</b>		
Between 30 and 34	-0.140	***
Over 34	-0.180	***
<b>Knowledge area</b>		
Agriculture, Cattle raising, Veterinary	-0.009	
Arts and Humanities	0.151	***
Business Management and Law	-0.005	
Computing	-0.078	**
Education	-0.113	**
Engineering and Technology	0.014	
Medical Sciences	-0.039	*
Natural Sciences	0.199	***
Social Sciences, Journalism and Documentation	0.097	***
<b>Type of university</b>		
Face-to-face	-0.056	*
<b>Father and/or mother with higher education</b>		
Yes	0.056	***
<b>Observations</b>	14982	

**Note:**

(a) The reference category is female, under 30 years old, graduate from a distance university in a degree related to Services, and with parents without higher education.

(b) (\*\*\*) Significant at 1%, (\*\*) at 5%, (\*) at 10%.

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).



**Table 7. Regression wage equation estimation results<sup>a,b</sup>**

Regressors	Correcting endogeneity bias Coefficient		Without correcting endogeneity bias Coefficient	
<b>Holding a master's degree</b>				
Yes	0.151	***	-0.021	***
<b>Gender</b>				
Male	0.083	***	0.078	***
<b>Knowledge area</b>				
Agriculture, Cattle raising, Veterinary	0.024		0.014	
Arts and Humanities	-0.080	***	-0.053	**
Business Management and Law	0.025	*	0.024	*
Computing	0.161	***	0.140	***
Education	-0.054	***	-0.075	***
Engineering and Technology	0.095	***	0.093	***
Medical Sciences	0.109	***	0.101	***
Natural Sciences	-0.087	***	-0.052	**
Social Sciences, Journalism and Documentation	-0.039	**	-0.020	
<b>Erasmus programme</b>				
Yes	0.038	***	0.038	***
<b>Type of university</b>				
Face-to-face	-0.044	**	-0.035	**
<b>Labour characteristics</b>				
<b>Working day</b>				
Partial	-0.532	***	-0.522	***
<b>Size firm (number of workers)</b>				
Between 10 and 19	0.065	***	0.067	***
Between 20 and 49	0.107	***	0.103	***
Between 50 and 249	0.118	***	0.118	***
More than 249	0.202	***	0.204	***
<b>Occupation</b>				
Management of companies or public administration	0.209	***	0.207	***
Scientific and intellectual professionals and technicians	0.112	***	0.112	***
Support technicians and professionals	0.058	***	0.058	**
Administrative type employees	0.002		0.001	**
Catering, personal services, security and retail workers	0.005		0.006	
Skilled workers in agriculture and fishing	0.106	*	0.103	*
Craftsmen and skilled manufacturing	0.063	**	0.064	**
Installation and machinery operators	0.088	***	0.084	**
<b>Competences highly valued to find the current job</b>				
Theoretical knowledge	0.027	***	0.027	***
Practical skills	0.009	*	0.009	***
Knowledge of languages	0.103	***	0.106	***
ICT skills	0.001		-0.001	
Personal and social competences	0.001		0.003	
Management, planning and entrepreneurship skills	0.035	***	0.034	***
<b>Geographical mobility</b>				
Yes	0.034	***	0.031	***
<b>Overeducated</b>				
Yes	-0.152	***	-0.154	***
<b>Constant</b>	7.017	***	7.069	***
<b>Likelihood ratio test</b>	13370.02	***	9767.81	***
<b>Observations</b>	14982			

**Notes:**

(a) The reference is female, graduate from a distance university in a degree related to Services who has not participated in the Erasmus programme, and does not change province once completed her studies. She is not overeducated, in an unskilled occupation and working full-time in a firm with more than 249 employees.

(b) (\*\*\*) Significant at 1%, (\*\*) at 5%, (\*) at 10%.

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 8. Averaged predicted probability of being in a wage interval**

Area of Knowledge	Less than €1499			€1500 - €1999			More than €1999		
	Master's degree s	College-only degree	$\Delta$	Master's degree	College-only degree	$\Delta$	Master's degree	College-only degree	$\Delta$
<b>Agriculture</b>	51.58	52.81	-1.23	42.66	41.56	1.1	5.38	5.46	-0.08
<b>Arts and Humanities</b>	65.57	66.48	-0.91	30.76	30.10	0.66	3.38	3.28	0.10
<b>Business Administration, and Law</b>	47.21	52.14	-4.93	45.48	41.24	4.24	7.14	6.46	0.68
<b>Computing</b>	23.13	23.96	-0.83	58.05	56.88	1.17	18.63	18.97	-0.34
<b>Education</b>	65.94	70.26	-4.32	31.01	27.17	3.84	2.93	2.45	0.48
<b>Engineering and Technology</b>	29.91	30.90	-0.99	55.47	54.40	1.07	14.41	14.51	-0.10
<b>Medical Sciences</b>	40.23	41.59	-1.36	49.44	47.91	1.53	10.15	10.33	-0.18
<b>Natural Sciences</b>	54.84	58.36	-3.52	40.20	37.08	3.12	4.80	4.41	0.39
<b>Services</b>	59.91	58.13	1.78	35.19	36.60	-1.41	4.76	4.73	0.03
<b>Social Sciences, Journalism and Documentation</b>	58.13	58.84	-0.71	37.19	36.54	0.65	4.53	4.47	0.06

Source: Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Table 9. Ordered probit model explaining wage mobility: Marginal effects<sup>a</sup>**

Regressors	Downward mobility		No mobility		Upward mobility	
<b>Holding a master's degree</b>						
Yes	-0.425	****	-0.324	***	0.750	***
<b>Gender</b>						
Male	-0.013		-0.010		0.015	
<b>Knowledge area of the degree</b>						
Agriculture, Cattle raising, Veterinary	-0.008		-0.006		-0.054	
Arts and Humanities	-0.044		0.051		-0.025	
Business Management and Law	-0.038	*	-0.029	*	0.067	*
Computing	-0.061	**	-0.042	**	0.108	**
Education	-0.056	**	-0.020	**	0.112	**
Engineering and Technology	-0.073	***	-0.055	***	0.129	***
Medical Sciences	0.023		0.017		-0.041	
Natural Sciences	-0.011		-0.009		0.020	
Social Sciences, Journalism and Documentation	-0.017		-0.013		0.030	
<b>Erasmus programme</b>						
Yes	-0.019	**	-0.015	**	0.034	**
<b>Type of university</b>						
Face-to-face	-0.053	**	-0.040	**	0.093	**
<b>Likelihood ratio test</b>	410.55	***				
<b>Observations</b>	5177					

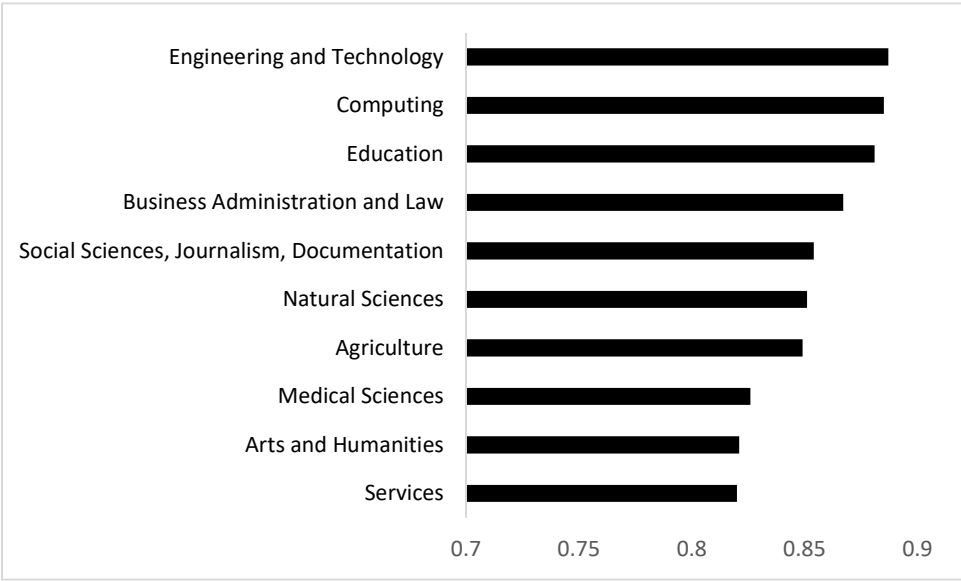
**Notes:**

(a) The reference is a female with an undergraduate degree in Services from a distance university, who has not participated in the Erasmus programme and who has not completed a master's degree.

(b) (\*\*\*) Significant at 1%, (\*\*) at 5%, (\*) at 10%.

**Source:** Own elaboration using the Survey on the Labour Insertion of University Graduates (INE, 2019).

**Figure 1. Predicted probabilities of upward wage mobility:  
Knowledge areas and having completed a master's degree**



**Source:** Own elaboration using the Survey on the Labour

Table A. Regressors' mean values included in the wage mobility' model<sup>a</sup>

Regressors	Downward mobility	Not mobility	Upward mobility	Pearson's $X^2$	
<b>Holding a master's degree</b>					
Yes	0.27	0.32	0.39	97.49	***
No	0.73	0.68	0.61		
<b>Gender</b>					
Male	0.46	0.45	0.45	56.23	***
Female	0.54	0.55	0.55		
<b>Knowledge area of the degree</b>					
Agriculture, Cattle raising, Veterinary	0.05	0.04	0.04	366.97	***
Arts and Humanities	0.05	0.05	0.04		
Business Management and Law	0.17	0.18	0.20		
Computing	0.09	0.09	0.08		
Education	0.10	0.07	0.10		
Engineering and Technology	0.20	0.23	0.19		
Medical Sciences	0.15	0.12	0.10		
Natural Sciences	0.05	0.07	0.07		
Services	0.05	0.05	0.04		
Social Sciences, Journalism and Documentation	0.09	0.10	0.11		
<b>Erasmus programme</b>					
Yes	0.12	0.13	0.15	46.79	***
No	0.88	0.88	0.85		
<b>Type of university</b>					
Face-to-face	0.97	0.98	0.98	30.39	***
Distance	0.03	0.02	0.02		
<b>Observations</b>	1360	1191	752		

Note: (\*\*\*) p-value less than 0.01.

Source: Own elaboration using the Survey of the Labour Insertion of University Graduates (INE, 2019).