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Gender earnings gap and glass ceiling at Spanish universities

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ABSTRACT

This study aims at analyzing the gender gap in salaries observed in Spanish public universities. It focuses on the glass ceiling problem and quantifies its importance in the gender earnings gap. This article shows that most of the gender earnings gap observed among the faculty of the University of Murcia is due to a glass ceiling problem in accessing the rank of Full Professor, and it includes a measure of research productivity in the analysis. Despite increases in the number of women promoted to the level of Full Professor has increased in recent years, women still comprise less than 30% of the total faculty at this academic rank. The second most important variable that explains most of the earnings gap is research productivity.

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1. Introduction

The motivation for this study stems from the need to know why a gender earnings gap is observed in a group such as public university faculty with administrative salaries. And the answer or main objective of this article is to demonstrate that most of the gender earnings gap observed among the faculty of the University of Murcia is due to a glass ceiling problem in accessing the rank of Full Professor.

This article quantifies the importance of gender differences in faculty rank in the gender earnings gap and includes a measure of research productivity of university faculty, the six-year research period, that is an academic recognition granted to university teachers in Spain for their research. It is an arrangement specific to Spain and is something that researchers need to apply for.¹

Universities, as institutions of higher education, are often considered leaders in shaping values and practices that are later reflected in society at large. If universities take measures to address and reduce gender wage gaps among their academic staff, they are sending a strong message about the importance of gender equality. Actions taken in the academic setting to reduce gender wage differences not only directly benefit the academic community but also set a standard and model for other sectors. This leadership can be instrumental in advancing toward a more just and equitable society in terms of remuneration and opportunities for both men and women.

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Table 1. Total faculty and female percentages in different ranks of full-time faculty.

	Spanish public universities ¹				University of Murcia ²			
	2005–2006		2018–2019		2005		2018	
	Teachers	Female percentage	Teachers	Female percentage	Teachers	Female percentage	Teachers	Female percentage
Full Professor	8,619	13.7%	11,354	23.9%	242	12.0%	356	28.9%
Associate Professor A	20,009	35.9%	26,959	41.1%	732	39.2%	692	42.3%
Associate Professor B			10,916	49.8%	13	38.5%	270	58.0%
Associate Professor C	11,562	40.8%	3,226	40.3%	204	50.5%	56	46.4%
Assistant Professor			4,539	50.5%	25	52.0%	39	46.1%
Total Faculty ³	93,033	33.1%	99,440	41.6%	2,044	35.1%	2,640	42.8%

¹Data and numbers of the Spanish University System, Ministry of Universities (<https://www.universidades.gob.es/publicaciones-e-informes/>).

²Unit for the Equality of Women and Men of the University of Murcia (<https://igualdad.um.es>). data as of December 1.

³Total faculty includes all full-time and part-time faculty members.

Associate Professor A (*Profesor Titular de Universidad* in Spanish university faculty): tenured, civil servant, PhD needed, accreditation needed.

Associate Professor B (*Profesor Contratado Doctor* in Spanish university faculty): tenured, not a civil servant, PhD needed, accreditation needed.

Associate Professor C (*Profesor Titular de Escuelas Universitarias* in Spanish university faculty): tenured, civil servant, PhD not needed, to be eliminated.

Assistant Professor (*Ayudante Doctor* in Spanish university faculty): no tenured, not a civil servant, PhD needed, accreditation needed.

Public university faculty is a very interesting group for the study of these earnings gaps. On the one hand, they have administrative salaries, so it is impossible to find direct discrimination; on the other hand, because of the great homogeneity among faculty members, the part of the earnings difference explained by different levels of studies, occupations or economic activities practically disappears, allowing for a greater understanding of this problem by reducing the number of variables that might account for these differences. Basically, this is a problem of vertical segregation between different categories or ranks, popularly known as the glass ceiling.

The Ministry of Universities of the Government of Spain quantified the gender earnings gap in Spanish universities at 10.9% in 2020 and at 12.7% in 2021, stating that most of this earnings gap is due to the difference observed in salary supplements (Massó et al., 2021; De la Cal et al., 2023). The University of Murcia did not participate in the first pilot report, but the data used in this paper put the gender earnings gap at this university at 10.02% for the period January 2017 to September 2020, similar to the Spanish university average. Díaz et al. (2017) obtained a wage gap of 10.97% in 2015 using a database from the University of Valencia, and the University of the Basque Country quantifies the gender earnings gap at 13% in 2015 (University of the Basque Country, 2015).²

Female percentages in the different categories or ranks of full-time faculty shown in Table 1 highlight that only in the rank of Full Professor (*Catedrático de Universidad* in Spanish university faculty) is there no agreement with the percentages of total university faculty, both for the average of Spanish universities and in the University of Murcia. An Associate Professor A (*Profesor Titular de Universidad* in Spanish university faculty) is a tenured civil servant with a PhD and required accreditation. An Associate Professor B (*Profesor Contratado Doctor* in Spanish university faculty) is also tenured with a PhD and required accreditation, but is not a civil servant. An Associate Professor C (*Profesor Titular de Escuelas Universitarias* in Spanish university faculty) is a tenured civil servant, but a PhD is not required; this rank is expected to be eliminated because it is no longer included in the new university faculty. An Assistant Professor (*Ayudante Doctor* in Spanish university faculty) is not tenured, with a PhD and required accreditation, but is not a civil servant. There are no differences between the role of civil servant and non-civil servant teachers, but job stability and salary are higher in the former, so that non-civil servants progress towards civil servants.³

The percentage of female Associate Professors A is very similar to the percentage of women of the total faculty and showed growth from 2005 to 2018. The percentage of female Assistant Professors is even higher, but the female percentage of Full Professors, despite having grown at a higher rate during that period (especially at the University of Murcia), continue to be much lower than the percentage observed for the total faculty. In Spanish universities, on average, while the percentage of women of the total faculty stands at 41.6% in 2018, the percentage of women Full Professors is only 23.9%. At the University of Murcia, these percentages are 42.8% and 28.9%, respectively.

In Spain, an independent agency called ANECA (Spanish acronym for the National Agency for Quality Assurance and Accreditation) is in charge of providing certification of the merits that allow for different

Table 2. Percentage of applications that are from women and success rate.

	Percentage of applications that are from women	Percentage of successful applications	
		Men	Women
2016–2017	29.02%	74.03%	75.35%
2018–2019	31.62%	75.13%	76.66%
2020	35.44%	83.37%	82.23%
2021	34.18%	82.99%	82.15%

Source: <https://www.aneca.es/informes-de-resultados-personal-funcionario>.

types of promotion in Spanish universities (e.g. from Assistant to Associate Professor, or from Associate Professor to Full Professor). Some evidence of the glass ceiling problem mentioned above can be found in Table 2 below. In this table, we can observe both the percentage of women that submitted applications to ANECA for Full Professor certification and also the success rate of these applications, as compared with those submitted by men, during the period 2016–2021. As shown in the table, the percentage of successful applications is similar for men and women. However, we can also observe that women apply comparatively less for ANECA certifications than men do (i.e. the percentage of applications from women is significantly lower than the percentage of women that belong to the faculty, and this percentage is also lower than the percentage of women within the category of Associate Professor A). From this data, we conclude that the low female percentage of Full Professor certification finally achieved does not seem to be caused by a lower success rate in their applications, but rather by a low rate of applications.⁴

After obtaining ANECA certification, each university announces university faculty positions for which teachers can apply. Exploiting the panel nature of the data, it is possible to study the promotion to different ranks during the period analyzed (January 2017–September 2020), and only in the case of full professors is the rate of female promotion significantly lower.

The structure of the article is as follows: the second section presents the literature review and the third section describes the econometric specification; the database of the payroll register of the University of Murcia is described in the fourth section; the fifth section presents the results, where the observed earnings gaps are accounted for and decomposed. Finally, the sixth section summarizes the results obtained.

2. Literature review

Gender inequalities have long been studied in the field of economics. Sevilla (2020) reviews the theoretical foundations that can explain existing inequalities, and documents the empirical findings supported by the theories. In the context of these inequalities, the gender earnings gap has received special attention. Blau and Kahn (2017) provide new empirical evidence on the extent of and trends in the gender earnings gap. They survey the literature to identify what has been learned about the explanations for the gap and conclude that many of the traditional explanations continue to have salience. Although human-capital factors are now relatively unimportant in the aggregate, women's work force interruptions and shorter hours remain significant in high-skilled occupations. They found that whereas marriage represents a premium for men when it comes to caring for children, as women are the ones who are the most likely caregivers.

Kleven et al. (2018), using data from heterosexual couples, show that motherhood leads to a significant drop in women's earnings compared to those without children, while in the male case, there is hardly any difference in earnings between men with and without children. Ten years after having the first child, there is a 19% gender wage gap within couples, and the overall income of the couple has not yet reached the level obtained before the birth of the first child. The gender wage gap in Denmark is calculated and decomposed from 1980 to 2013, with the conclusion that the overall gender wage gap decreased during this period, but the part attributable to the child penalty remained constant; that is, in recent years, virtually the entire gender wage gap is due to the child penalty. De Quinto et al. (2021) obtain similar conclusions for Spain, but with even larger wage gaps, which, as in the case of Denmark, are because after maternity, women work fewer days than their partners and experience an increase in the probability of having a part-time job, which does not happen to their partners, and the probability

of having a permanent contract decrease, which is the opposite of what happens to their partners, who experience an increase in the probability of having a permanent contract.

It should be noted that the child penalty of lower income for women after childbirth, while the father's income is not affected, is greater in heterosexual couples. Andresen and Nix (2022), using Norwegian data, show that in lesbian couples, the birth mother's penalty is lower and, moreover, that her partner also experiences a reduced penalty, but both soon disappear, and after 5 years, the couple's overall income returns to its initial level. In heterosexual couples, however, the child penalty is so large that, even if the father does not suffer any wage reduction, at five years after childbirth, the overall income of the couple is still below the initial level. This suggests that the wage reduction associated with childbearing cannot be explained solely by the impact of childbirth and breastfeeding.

Goldin (2021) shows how many professions are 'greedy', paying disproportionately more for long hours and weekend work, and how this perpetuates disparities between women and men because women work fewer hours due to childcare. Sevilla-Sanz et al. (2011) show that the relative share of housework that corresponds to women does not decrease in couples where the woman earns a higher wage than the man, despite the fact that higher educated mothers report lower levels of happiness when engaging in child-related activities than mothers with lower educational attainment (Giménez-Nadal & Sevilla, 2016).

In the specific case of university faculty, Ginther and Hayes (2003), Ginther and Khan (2009) and Perna (2005) found lower promotion rates among female professors with children than their childless counterparts.

There have been documented gender wage gaps among university faculty in different universities since the early 1970s (Barbezat & Hughes, 2005). Blackaby et al. (2005) found an 18% pay gap in British universities in 1999. Chen and Crown (2019) document wage gaps of 15% in US universities in 2014 and 10.5% in the British case during 2015–2016; in the same academic year, the University and College Union (2020) found a 12% wage gap in British universities. Warman et al. (2010) show a reduction in the gender earnings gap in Canadian universities in recent years, especially the amount of the gender earnings gap that is not explained by different characteristics between men and women. Koedel and Pham (2023) also document a reduction in the gender earnings gap in the United States.

Selma (2019) points out the problems caused by maternity leave in the promotion to a higher professional category, as well as the difficulty of balancing work and family in cases of national and international mobility of university faculty. Gallardo (2021) conducted a perception survey of the faculty of the University of Murcia, where it is clear that female faculty feel that motherhood has meant a delay in their professional promotion, while among males, there is no such perception. These obstacles that make it difficult for women to access the best-paid ranks are behind the wage gaps in universities, as is also shown by the papers of Doucet et al. (2012) and Warman et al. (2010) in Canada; Galligan et al. (2020) and Ward (2001) in United Kingdom; Ginther and Hayes (1999, 2003) and Humphries et al. (2021) in USA; Kaszubowski and Wolszczak-Derlacz (2014) in Poland; and Rudakov and Prakhov (2019) in Russia.

Other glass ceiling problems are shown in Solera and Musumeci (2017) in several European Union countries; Picardi (2019) in Italy; and Bülbül (2021) and Öztürk and Simsek (2019) in Turkey.

3. Econometric specification

The analysis of the gender earnings gap begins with the estimation of the following wage equation:

$$\ln w_{it} = \beta_0 + \beta_1 \text{Gender}_i + \beta_2 \text{Age}_{it} + \beta_3 \text{Age}_{it}^2 + \sum_{n=1}^6 \gamma_n \text{Research}_{itn} + \sum_{j=1}^5 \alpha_j \text{Field}_{itj} + \sum_{k=1}^4 \delta_k \text{Rank}_{itk} + \sum_{t=2}^{45} \theta_t + u_{it} \quad (1)$$

where $\ln w_{it}$ is the natural logarithm of the monthly gross payroll of teacher i in month t , where t varies from 1 to 45 (months between January 2017 and September 2020) and its effect on wage is captured in the coefficient vector θ_t . *Gender* is a dummy variable that takes the value 1 in the case of female status, and a second-degree polynomial is included for age.

The research productivity measure is *Research*, and it is the number of 6-year research period obtained. There is a maximum of 6 so six dummies are included. The 6-year research period is an academic recognition granted to university teachers in Spain for their research activity and is accompanied by a salary supplement for university teachers. This economic complement is granted in recognition of the research work carried out over a period of six years and is added to the teacher's base salary. The evaluation of the research merits provided by the teacher is carried out by ANECA. *Field* indicates the field of scientific knowledge and *ranks* the different faculty ranks. A set of dummies is also included for the different months between January 2017 and September 2020. Finally, u_{it} is the random disturbance term.

To better quantify the effects of the different variables on the earnings gap, the Oaxaca–Blinder wage decomposition (Blinder, 1973; Oaxaca, 1973) has been estimated, which can be summarized as follows:

$$\ln w_m - \ln w_f = (\bar{X}_m - \bar{X}_f)' \partial + \{ \bar{X}_m'(\partial_m - \partial) - \bar{X}_f'(\partial_f - \partial) \} \quad (2)$$

where the subscript m indicates the male sample and f the female sample; ∂ is the vector of all the coefficients included in Equation (1); and X is the vector of all the explanatory variables included in Equation (1). The first summand indicates the part of the earnings gap explained by different average characteristics between men and women, and the second summand is the unexplained part attributed to labor discrimination because it involves paying for the same characteristic differently depending on the gender of the worker. To avoid the problem of identifying the constant when decomposing this second summand of different remunerations according to the different characteristics included—because the choice of the omitted dummy in each group of dummies can alter these results—the normalization of Yun (2005) has been used.

This decomposition will be used to quantify the percentage of the gender earnings gap explained by the different weights of men and women in the different faculty ranks.

4. Data

This article uses data from the payroll register of the University of Murcia that the Data Office has made available to the Unit for the Equality of Women and Men of the University of Murcia (UMU). It is a database where each observation is given by a component of the monthly payroll for a particular worker in a particular month of 2017, 2018, 2019, and until September 2020. In addition to the salary amounts, this database contains the employment relationship (teachers or administrative and services staff), the type of dedication (full and part time), the number of weekly hours, the rank and the field of knowledge (only five major fields) of each of these payroll concepts. In the case of full-time faculty, they all have the same dedication of 37.5 hours per week. Therefore, it is not used in this work, since it does not correspond to the actual hours worked. For part-time faculty, given that they do not all work the same hours, the hourly wage obtained in each month has been calculated by dividing their monthly wage by the number of hours worked. Because no significant gender earnings gap has been detected in this group, we will only analyze the earnings differences among full-time faculty in the following pages.⁵

Regarding individual variables, sex, age and the 6-year research period are known. Unlike the database of the University of Valencia, neither the center nor faculty to which they belong nor information on the number of children is included. The salary items included in the expenses section (income from the perspective of the faculty) are all those belonging to Chapter I of the budget devoted to Personnel Expenses and some of Chapter VI of Real Investments, especially those research projects that generate salary income; unfortunately, the income derived from research contracts of faculty members with different institutions or firms does not appear. However, all the salary components of the faculty linked to the Health System of Murcia (SMS) appear, both those paid by the UMU and those financed by the SMS.

The calculation of the monthly payroll of the faculty is made by adding, for each professor and for each specific month, all the gross amounts (before taxes) of the income components (expenses for the UMU) of the payroll. Therefore, the UMU's social security contribution is not included.

Table 3 shows a gender earnings gap of 10.1% (9% if the salary supplements of the SMS are excluded). The average age of men is almost 3 years higher than that of women. The fields of social sciences and law are the most represented at UMU, including 32% of the male faculty and 36% of the

Table 3. Descriptive statistics: averages (standard deviations).

		Males		Females	
Monthly payroll (€)		5,209.96 (2,351.51) ¹		4,688.09 (2,040.09) ¹	
		5,127.47 (2,053.78) ²		4,664.85 (2,025.04) ²	
Age		53.36 (8.96)		50.69 (9.04)	
Number of 6-year research period		2.24 (1.84)		1.69 (1.68)	
		Teachers	Percentage	Teachers	Percentage
Fields	Arts and Humanities	4,822	13.15%	4,261	16.00%
	Sciences	7,815	21.31%	4,090	15.36%
	Social Sciences and Law	11,695	31.89%	9,681	36.35%
	Health Sciences	8,893	24.25%	7,322	27.49%
	Health Sciences and Health Service of Murcia	502	1.37%	226	0.85%
Ranks	Engineering	2,945	8.03%	1,052	3.95%
	Full Professor	11,141	30.38%	4,272	16.04%
	Associate Professor A	18,322	49.96%	13,431	50.43%
	Associate Professor B	4,925	13.43%	6,597	24.77%
	Associate Professor C	1,310	3.57%	1,221	4.58%
Assistant Professor		972	2.65%	1,111	4.17%
Observations		36,672		26,632	

¹Include wage complements of Health Service of Murcia.

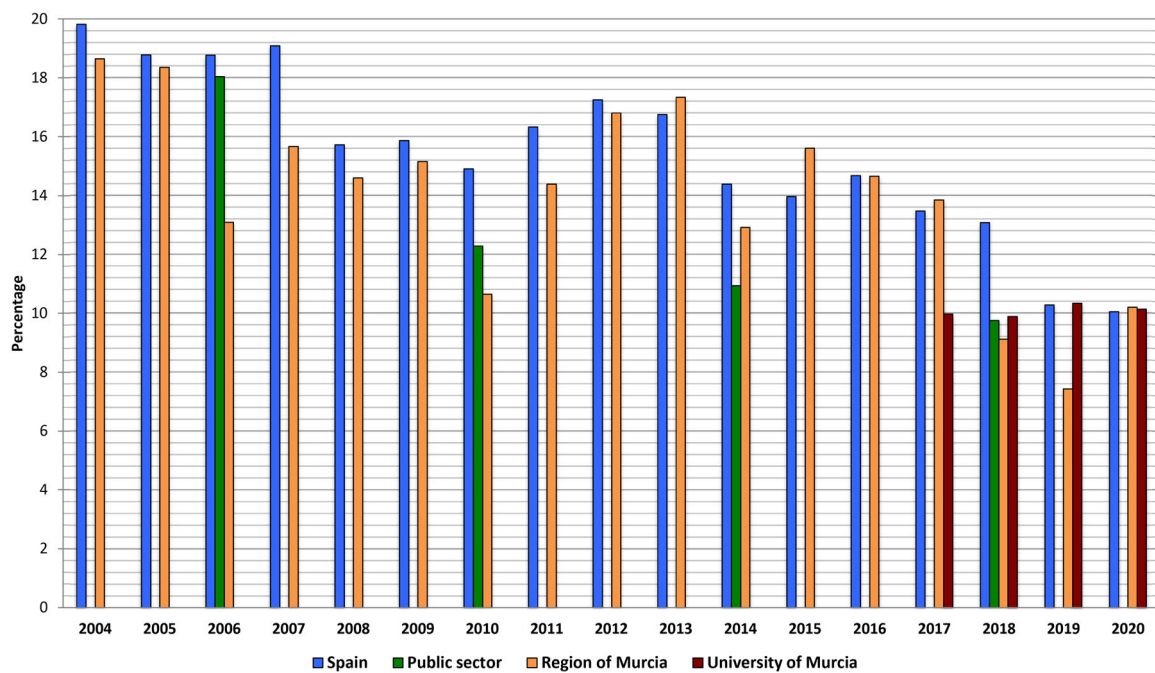
²Exclude wage complements of the Health Service of Murcia.

Associate Professor A: tenured, civil servant, PhD needed, accreditation needed.

Associate Professor B: tenured, not a civil servant, PhD needed, accreditation needed.

Associate Professor C: tenured, civil servant, PhD not needed, to be eliminated.

Assistant Professor: no tenured, not a civil servant, PhD needed, accreditation needed.

**Graph 1.** Gender earnings gaps (%) in Spain, in the Region of Murcia, in the public sector in Spain and at the University of Murcia.

Note: The gender earnings gap is defined as the difference between the average earnings of men and women expressed as percentage of the average earnings of men. All gender earnings gaps are significant at the 1% level. The gender earnings gaps in Spain and in the Region of Murcia are calculated from the hourly earnings based on the Annual Wage Structure Survey (Spanish National Institute of Statistics), the gender earnings gap in the public sector in Spain is calculated from the Four-yearly Wage Structure Survey (Spanish National Institute of Statistics) and the gender earnings gap at the University of Murcia is calculated from the monthly payroll of the University among full-time faculty.

female faculty. Thirty percent of men are full professors, while only 16% of women are full professors. However, the percentages of Associate Professors A who are men and women are almost identical. In the case of Associate Professors B, women account for 25% while the male percentage is 13%. The average of number of 6-year research period obtained is 2.24 for male faculty and 1.69 for female faculty.

Table 4. Average monthly payrolls (standard deviations) at University of Murcia. Full-time faculty.

		Males	Females	Gender wage gap
Fields	Arts and Humanities	5,085.85 (1,654.96)	4,576.83 (1,553.46)	10.00**
	Sciences	5,449.08 (1,800.44)	5,174.77 (1,616.40)	5.03**
	Social Sciences and Law	4,671.33 (1,585.76)	4,307.91 (2,646.26)	7.78**
	Health Sciences	5,572.28 (2,865.45)	4,891.93 (1,786.15)	12.21**
	Health Sciences and Health Service of Murcia	11,165.64 (8,024.20)	7,480.15 (1,854.06)	33.01**
	Engineering	4,810.36 (1,463.56)	4,742.29 (1,531.792)	1.41**
Ranks	Full Professor	6,584.83 (3,013.08) ¹	6,186.62 (1,469.65) ¹	6.05**
		6,425.06 (2,352.40) ²	6,168.57 (1,453.70) ²	3.99**
	Associate Professor A	4,856.76 (1,588.06) ¹	4,790.69 (1,404.50) ¹	1.36**
		4,813.11 (1,531.79) ²	4,758.99 (1,370.43) ²	1.12**
	Associate Professor B	4,116.11 (1,872.02) ¹	3,927.82 (2,889.07) ¹	4.57**
		4,039.67 (1,776.20) ²	3,911.44 (2,886.13) ²	3.17**
	Associate Professor C	4,112.14 (1,183.90)	3,958.87 (1,227.49)	3.73**
	Assistant Professor	2,737.30 (822.98)	2,704.49 (789.04)	1.20
Total faculty		5,199.15 (2,357.61) ¹	4,675.30 (2,048.20) ¹	10.08**
		5,127.47 (2,053.78) ²	4,664.85 (2,025.04) ²	9.02**

¹Include wage complements of Health Service of Murcia.

²Exclude wage complements of the Health Service of Murcia.

Associate Professor A: tenured civil servant, PhD needed, accreditation needed.

Associate Professor B: tenured, not a civil servant, PhD needed, accreditation needed.

Associate Professor C: tenured, civil servant, PhD not needed, to be eliminated.

**Significant at the 1% level.

The gender earnings gap is defined as the difference between the average earnings of men and women expressed as percentage of the average earnings of men. [Graph 1](#) show the gender earnings gaps for Spain and the Region of Murcia since 2004, according to the Annual Wage Structure Survey of the Spanish National Statistics Institute. Both show a decreasing trend following the pattern observed at the international level. The regional gaps are lower than national gaps. The gender earnings gap in the Spanish public sector is also included from the Four-yearly Wage Structure Survey. If we compare them with the gaps obtained with the UMU payroll data from 2017 to 2020, it is observed that because these are lower than the three previous gaps in 2017, as they have remained almost constant during these four years (even with a slight increase in 2019), the gap in UMU is similar to the gap registered in the Region of Murcia, in the Spanish public sector and in the country as a whole.

[Table 4](#) shows the average payrolls by scientific fields and faculty ranks. An additional field has been defined, consisting of the faculty of health sciences, which also belongs to the SMS. In these last two fields, the largest earnings gaps are observed, higher than the average for the whole UMU, while in engineering, the gap is only 1.4%. The gaps in the Sciences, Social Sciences and Law are also below the global average, while in the Arts and Humanities, a gap similar to the total of the UMU is obtained. All these gaps by different scientific fields are statistically significant at the 1% level.

In the ranks of faculty where professors both belong and do not belong to the SMS (Full Professors, Associate Professors A and B), it is observed that the earnings gaps are higher in the first case. The widest gaps are observed in Full Professors and in Associate Professors B. The gap in Assistants Professors is the only gap that is not statistically significant, while the rest are significant at the 1% level.

5. Results

The estimates of the relevant coefficients of [Equation \(1\)](#) are presented in [Table 5](#). Robust standard errors corrected for the clustered sampling scheme are in parenthesis, since there are multiple observations for individuals. Model 1 only includes the gender dummy and the rest of the variables are alternately added until reaching Model 6, which includes them all.

According to Model 1, the gender earnings gap is 9.5% ($(e^{\beta_1} - 1) * 100$) for the whole period considered. The inclusion of fields of knowledge reduces the gap very little, to 9.2%. If only age and its square are included this gap is reduced to 5.5% because the greater male seniority generates wage complements linked to it that are higher in the male group. The only inclusion of the productivity measure significantly reduces the gap to 4.3%, but the variable that achieves the greatest reduction in the earnings

Table 5. Estimates of the wage equation (1).

	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.0997** (0.012)	-0.0884** (0.011)	-0.0533** (0.009)	-0.0424** (0.008)	-0.0247** (0.007)	-0.0143** (0.005)
Arts and Humanities		0.0770** (0.016)				0.0065 (0.006)
Sciences		0.1724** (0.014)				0.0631** (0.009)
Health Sciences		0.1355** (0.015)				0.6036** (0.050)
Health Sciences and Health Service of Murcia		0.7370** (0.058)				0.0310** (0.007)
Engineering		0.0590** (0.019)				0.0281** (0.006)
Social Sciences and Law			0.0545** (0.004)			0.0164** (0.003)
Age			-0.0358** (0.004)			-0.0081** (0.003)
(Age) ² /100				0.1537** (0.012)		0.0831** (0.007)
One six-year research				0.2128** (0.011)		0.1148** (0.007)
Two six-year research				0.3089** (0.012)		0.1513** (0.009)
Three six-year research				0.4570** (0.015)		0.2100** (0.012)
Four six-year research				0.5478** (0.016)		0.2619** (0.014)
Five six-year research				0.5839** (0.013)		0.3375** (0.014)
Six six-year research					0.8487** (0.012)	0.4534** (0.015)
Full Professor					0.5664** (0.009)	0.3423** (0.011)
Associate Professor A					0.3546** (0.011)	0.2415** (0.010)
Associate Professor B					0.3874** (0.015)	0.2624** (0.017)
Associate Professor C						
Observations	63,527	63,304	63,527	63,527	63,527	63,304
Adj R ²	0.318	0.421	0.612	0.595	0.625	0.774

All estimates include time controls (45 months). Robust standard errors are in parentheses. They are corrected for heteroskedasticity and for the clustered sampling scheme. **Means significant at the 1% level. The reference faculty rank is Assistant Professor and no six-year research period.

Table 6. Oaxaca–Blinder decomposition of monthly payroll of the University of Murcia.

Average male payroll (in logarithms)	8.4936** (0.0018)
Average female payroll (in logarithms)	8.3962** (0.0020)
Difference	0.0974** (0.0027)
Explained difference	0.0831** (0.0024)
Ranks	0.0333** (0.0009)
Six-year research	0.0280** (0.0009)
Age	0.0215** (0.0006)
Field	0.0009+ (0.0005)
Time	−0.0006 (0.0015)
Unexplained difference	0.0143** (0.0013)
Ranks	−0.0043* (0.0022)
Age	−0.1262** (0.0476)
Six-year research	0.0074** (0.002)
Field	−0.0286** (0.0035)
Time	−0.0000 (0.0001)
Constant	0.1660** (0.0473)

**Means significant at the 1% level; * means significant at the 5% level; + means significant at the 10% level. Robust standard errors are in parentheses.

Table 7. Promotions at the University of Murcia (February 2017–September 2020).

	Males	Females
Full Professors	86	36
Associate Professors A	90	80
Associate Professors B	66	72
Assistant Professors	39	57

Associate Professor C to be eliminated.

gap is the different faculty ranks, as it lowers the gap to 2.5%. The inclusion of all variables in Model 6 brings the gap down to 1.4%. Therefore, the variation of the distribution of men and women in the different faculty ranks explains most of the gender earnings gap.

Table 6 shows the results of wage decomposition (2), where it can be seen that almost the entire earnings gap is given by the explained difference, accounting for 85%.⁶ Within this difference, faculty rank is the variable that explains most of the earnings gap, accounting for 34.2% of the total gap. The second most important variable is the measure of research productivity, which explains 28.7% of the total difference. The third is age, which explains 22.1% of the total difference. The different scientific fields to which faculty belong explain only 0.9% of the total gap, while the contribution of time controls is not statistically significant. The unexplained part only represents 15% of the total gap and is given by the differences between the constants estimated in the male and female equations.

As has already been pointed out, the imbalance in the percentages by ranks of both sexes occurs fundamentally for Full Professors, where male representation is more than 14 percentage points higher than female representation. Associate Professors A is the only category where the presence of males and females is equal. Therefore, the previous 14 points are compensated by higher percentages of women in the rank of Associate Professors B (more than 11 points), Associate Professors C (1 point) and Assistant Professors (1.5 points). In other words, men predominate in the ranks with the highest wages and women in those with the lowest wages.

This imbalance can also be analyzed from the time perspective covering the period studied (January 2017–September 2020). Given the panel structure of the data, we can analyze the promotions carried out during the period under study by analyzing the rank changes experienced by a teacher from one month to the next.⁷

Table 7 shows the promotions to the different ranks that have taken place during that period. It can be observed that the previous imbalance is perpetuated, with 70% of the promotions to Full Professors have been obtained by men, while women continue to predominate in the ranks of Associate Professors B (54%) and Assistant Professors (59%). The percentages are more balanced in Associate Professors A: 47% women compared with 53% men.

Table 8. Oaxaca–Blinder decomposition of monthly payroll components of the University of Murcia.

	Basic salary	Research salary supplements (six-year period) ¹	Seniority bonuses (five-year period) ¹	Seniority bonuses (three-year period) ¹	Salary supplements by academic position	Regional salary supplements
Males	7.8730** (0.0008)	5.8290** (0.0039)	6.2804** (0.0028)	5.7855** (0.0029)	5.7642** (0.0045)	6.2245** (0.0014)
Females	7.8229** (0.0010)	5.6324** (0.0050)	6.1491** (0.0037)	5.5932** (0.0038)	5.6652** (0.0046)	6.1784** (0.0019)
Difference	0.0501** (0.0013)	0.1966** (0.0064)	0.1313** (0.0047)	0.1923** (0.0047)	0.0990** (0.0065)	0.0461** (0.0024)
Explained difference	0.0414** (0.0010)	0.1914** (0.0061)	0.1625** (0.0038)	0.1761** (0.0042)	0.0300** (0.0025)	0.0479** (0.0022)
Ranks	0.0358** (0.0009)	0.0012* (0.0006)	0.0535** (0.0019)	0.0478** (0.0014)	0.0363** (0.0024)	0.0366** (0.0011)
Age	0.0010** (0.0002)	-0.0021** (0.0003)	0.0735** (0.0024)	0.1213** (0.0034)	0.0011+ (0.0007)	0.0079** (0.0003)
Six-year research	0.0045** (0.0003)	0.1939** (0.0062)	0.0299** (0.0013)	0.0019** (0.0005)	-0.0017 (0.0013)	0.0037** (0.0003)
Fields	0.0003 (0.0002)	-0.0010** (0.0001)	0.0050** (0.0004)	0.0053** (0.0004)	-0.0053** (0.0015)	-0.0001 (0.0001)
Time	-0.0003 (0.0002)	-0.0006 (0.0005)	0.0001 (0.0006)	-0.0002 (0.0042)	-0.0003 (0.0009)	-0.0003 (0.0018)
Unexplained difference	0.0087** (0.0002)	0.0052** (0.0014)	-0.0312** (0.0030)	0.0162** (0.0022)	0.0690** (0.0063)	-0.0018+ (0.0010)
Ranks	-0.0061** (0.0018)	0.0180 (0.0191)	0.0152** (0.0035)	-0.0334** (0.0048)	0.0384** (0.0110)	0.0044** (0.0019)
Age	-0.0079 (0.0336)	-0.1454+ (0.0772)	-0.3676** (0.1288)	0.7566** (0.0926)	0.6897** (0.2062)	-0.0673 (0.0485)
Six-year research	0.0025** (0.0012)	0.0130** (0.0026)	0.0195** (0.0045)	0.0060** (0.0019)	0.0110 (0.0092)	0.0027** (0.0011)
Fields	-0.0018 (0.0014)	-0.0042** (0.0017)	0.0032 (0.0052)	-0.0061** (0.0030)	0.0205** (0.0101)	-0.0038** (0.0013)
Time	0.0000 (0.0000)	0.0002 (0.0001)	-0.0001 (0.0003)	-0.0000 (0.0000)	-0.0001 (0.0004)	-0.0006 (0.0061)
Constant	0.0221** (0.0334)	0.1235 (0.0783)	0.2985** (0.1281)	-0.7069** (0.0911)	-0.6905** (0.2053)	0.0628 (0.0481)

**Significant at the 1% level; *Significant at the 5% level; + means significant at the 10% level. Robust standard errors are in parentheses.

¹Assistant Professors are excluded because in the Region of Murcia they cannot receive these wage supplements.

Finally, [Table 8](#) presents the results of the Oaxaca–Blinder decomposition for the different wage components of the monthly payroll. The interpretation of each column is similar to the column in [Table 6](#). Each column includes the decomposition for each wage component of the monthly payroll: basic salary, research salary supplements, seniority bonuses, salary supplements by academic position, and regional salary supplements. In all items, there is a positive gender gap, which is smaller in the case of basic salary and regional salary supplements and larger in the case of seniority bonuses (5-year and 3-year periods) and research salary supplements (6-year periods). In this last case, the largest gap is obtained, with almost 20 logarithmic points. The gap obtained in salary supplements by academic position is similar to the gap observed in the total payroll.

The patterns observed for basic salary and regional salary complements are the same as for the total payroll: the gap is explained almost entirely by the imbalance in the percentages of men and women among the different faculty ranks. Obviously, the differences in research salary supplements are explained by the differences in the number of 6-year research periods. In the case of seniority bonuses in the 5-year period, the importance is divided between the different weights in the faculty ranks and the greater male seniority, since seniority bonuses are obtained automatically with seniority but are of greater amounts in the higher faculty ranks. In the case of seniority bonuses in the 3-year period, most of the earning gap is explained by the greater age of the male faculty, since the amount is the same in all faculty ranks. In the latter case, the gap observed in supplements for academic positions is mostly due to differences not explained or attributed to gender discrimination, especially in the age coefficients, which indicate that, for the same age, the supplements received by men are higher than those received by women, either because men hold higher academic positions or because there are more men than women holding such positions.

6. Conclusions

The gender earnings gap identified using UMU payroll data in the years 2017–2020 (until September) for full-time faculty is similar to that obtained in the average of Spanish public universities and is approximately 10%. The gap is explained by the well-known phenomenon of the glass ceiling, which involves a vertical segregation in jobs which women do not reach in the same percentages as men and that have the highest remunerations. This is what happens in the case of the rank of Full Professor, where women do not even account for 30% of the total. However, the faculty ranks with the lowest average earnings (Associate Professors B, Associate Professors C and Assistant Professors) have a greater relative presence of women.

The low female percentage of Full Professors does not seem to be caused by a lower success rate in their applications submitted to ANECA, but rather by a low rate of applications. The absence of data on children is one of the main limitations of the analysis and could explain this result, as Selma (2019) and Gallardo (2021) indicate in their studies on the University of Murcia. However, the absence of data on research contracts could increase the gender earnings gap, since the percentage of men with research contracts is higher than that of women (Hernández et al., 2021).

The second most important variable that explains most of the earnings gap is research productivity, and the third is age. Male faculty receive higher amounts in the salary complements that depend positively on their seniority. The analysis of the different components that make up the payroll has allowed us to determine that the largest gender gaps occur in the research salary supplements (6-year period), which are independent of seniority, and in the seniority bonuses (5-year and 3-year periods).

The imbalance between the percentage of female and male Full Professors is the greatest of the different faculty ranks and is the main determinant of the observed earnings gap. The gap does not appear to have narrowed in recent years, as has happened with the gender salary gaps observed in the economy as a whole (national or regional). The results of the faculty promotions carried out during the period studied (February 2017 to September 2020) could explain this phenomenon, since not only is the previous imbalance not being addressed, but it is even worsening, because 70% of the promotions to Full Professors have been obtained by men.

The gender gap detected in the access to the position of Full Professor has called for intervention from the Spanish Ministry of Universities and the universities themselves. Positive discrimination

measures have been proposed that include policies that guarantee equal opportunities and a gender wage register (De la Cal et al., 2023; Massó et al., 2021), and a gender salary audit (Galligan et al., 2020). Taking into account that academic careers are long, and given the unbalanced proportion of men occupying a full professor position in universities, it has also been proposed to compress salaries across the range of academic positions in order to mitigate the gender earnings gap due to the glass ceiling problem (Brown & Troutt, 2020).

Statements and declarations

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Notes

1. Chen and Crown (2019) quantifies this problem for The Ohio State University, but they do not have measures of research productivity of university faculty.
2. In Spain, the pioneering econometric study of the gender pay gap used data from a small sample of faculty at the University of Valencia, which revealed a wage gap of 16.9% (Moltó, 1984).
3. There is a rank with a very small weight called *Catedrático de Escuelas Universitarias* in Spanish university faculty that is expected to be eliminated as well, and is assimilated to Associate Professor A.
4. Bosquet et al. (2019) obtain a similar result for academic economists in France.
5. Part-time faculty in this dataset is a specific rank apart from the rest; they do not receive research salary supplements or seniority bonuses and are hired on a temporary basis.
6. The wage equations can yield separate estimates for men and women, which are available upon request.
7. The promotion is a double process: first you have to obtain the ANECA certification and then win the competitive examination for the position created by each university. The University of Murcia creates these positions according to its budget and the teachers with ANECA certification.

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