social sciences

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Big Girls Don't Cry: An Assessment of Research Units' Leadership and Gender Distribution in Higher Education Institutions

Ricardo Morais [1,*], Clara E. Fernandes [2,3] and Valeriano Piñeiro-Naval [4]

1 LabCom—Communication and Arts, University of Beira Interior, 6201-001 Covilhã, Portugal
2 LASALLE College of the Arts, 1 McNally Street, Singapore 187940, Singapore
3 UNIDCOM-IADE, Av. Dom Carlos I 4, 1200-649 Lisbon, Portugal
4 Observatorio de los Contenidos Audiovisuales, Universidad de Salamanca, 37008 Salamanca, Spain
* Correspondence: ricardo.morais@labcom.ubi.pt

Abstract: Academia is often pointed out as a challenging environment to evolve in, especially for women. Whilst women perform in multidisciplinary settings, studies point out still-existing gender gaps in academia, especially in positions of power. This study looks at decision-making positions in Higher Education Institutions (HEIs), specifically in Portuguese academic research. Furthermore, we seek to understand if research roles are distributed equally gender-wise among cohorts in research units, as well as if deans' genders are a factor of influence in such role attributions. We will look at the research roles in academia, particularly research units fostered by HEIs, to observe gender distribution based on total cohorts. Using univariate and bivariate tests, our research aims to assess gender distribution in leading research roles in public and private institutions. We take the specific case of Portugal; therefore, we cannot extrapolate the results to other countries. However, outcomes point out resisting differences in fields of research and coordination and role distribution among R&D units, as well as in fundamental relations between power positions in academia and research.

Keywords: higher education; gender equality; research units; gender distribution; leadership

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Citation: Morais, Ricardo, Clara E. Fernandes, and Valeriano Piñeiro-Naval. 2022. Big Girls Don't Cry: An Assessment of Research Units' Leadership and Gender Distribution in Higher Education Institutions. *Social Sciences* 11: 345. https://doi.org/10.3390/socsci11080345

Academic Editor: Nigel Parton

Received: 15 July 2022
Accepted: 2 August 2022
Published: 4 August 2022

1. Introduction

Recent reports point out the efforts made by Higher Education Institutions (HEIs) to implement quotas and attain more equity in cohort distribution among universities (O'Connor and Irvine 2020; Strid and Husu 2013; Verge 2013). However, studies on gender distribution and equality still point out significant inequalities, such as the lack of women in decision-making positions in academia, even in "women-dominated" faculties or departments (Bothwell 2022a, 2022b; O'Connor and Irvine 2020; O'Connor and White 2021). A recent Analytical Services report published by Elsevier elevates Portugal as a European pioneer and model for other countries regarding gender equality in research (Analytical Services 2021). However, the report is based on two main axes: the total number of cohorts and publication counts for female and male researchers. The main struggle for women is not to assert themselves as researchers but as leaders of research institutions.

In Portugal, the Foundation for Science and Technology (FCT) evaluates the R&D units and distributes grants and allowances to research units until the next evaluation period. Research is a pillar of the growth and prosperity of HEIs, whose dependence on research grants and public funding is high. Therefore, institutions count on the teams of researchers who contribute directly to the funding by publishing, but most importantly, by gaining visibility with patents, news, significant discoveries, and multidisciplinary research projects. Thus, publication count is not the only factor to consider when assessing women's assertion in research; whether or not coordination positions of such research units are held equally should also be assessed. According to FCT's guidelines for R&D units, the scientific coordinator is designated under the unit's internal regulations or statutes. Therefore, any integrated member of the team can assume its leadership, but the role depends on the rules and statuses imposed in each R&D unit.

A Portuguese study collecting data from researchers and coordinators of research units highlights that "one of the clear aspects is precisely related to the importance that publications have acquired, but above all with the motive that leads investigators to communicate the results of their investigations. Suppose it is true that half of the researchers indicate that the main motivation is to make known the work developed to their peers (50%). In that case, we cannot ignore that the fulfilment of the evaluation requirements is an aspect indicated by almost another half of the researchers. (49%)" (Gradim and Morais 2016, p. 87). The authors also add that "research is, therefore, associated, almost exclusively, with scientific productivity indicators, namely the number of publications, which in many situations ends up being reductive, given the work developed by researchers in different areas, not always likely to result in a publication" (Gradim and Morais 2016, p. 87).

In the case of gender parity in academia, signs still point to the road ahead: "Despite efforts, the under-representation of women in senior academic and decision-making positions in the EU continues to be a significant issue, thus hindering the growth of the European Research Area (ERA) (European Commission 2020)" (European Commission, Directorate-General for Research and Innovation 2021, p. 7).

Moreover, it is also considered that "while some progress has been achieved in gender equality in R&I, progress has been particularly slow and insufficient in the area of gender equality in leadership positions" (European Commission, Directorate-General for Research and Innovation 2021, p. 176). In the same report, data presented show improvements in women-led higher education institutions, though it is unequal among countries. The report also points out the lack of women's representation in board memberships and leadership positions. Finally, and notwithstanding the existing measures to increase women's representation in leading research positions, women are still underrepresented (European Commission, Directorate-General for Research and Innovation 2021). Therefore, our study seeks to understand the following:

- Are research roles distributed equally gender-wise among cohorts in research units?
- Are deans' genders a factor of influence in such role attributions?

Considering the results of the available reports and regarding these two questions, which will lead our research, we will tackle two main axes:

- The gender distribution in research roles (Head of research centers vs. the whole cohort of researchers)
- The composition of these research units, as well as their most recent evaluation by the FCT (Portuguese Foundation for Sciences and Technology).

Although the results only concern Portugal, we seek to understand whether we can continue to talk about gender inequality at the leadership level, both in research units and in higher education institutions, because we believe that despite the efforts, there is still a long way to go. It is necessary to identify the problems to act as quickly as possible.

2. Literature Review

Gender gaps vary in terms of cultural and societal roles and changes, as reasons range from discrimination, sexism, leadership skills, or even the level of scrutiny of physical and general appearance women face in the workplace (Ilie and Schnurr 2017; Yousaf and Schmiede 2017; Maheshwari 2021; O'Connor and White 2021). The imposter phenomenon is also pointed out as a possible culprit for women's decisiveness to operate in high-level positions (Cox and Salsberry 2012; Bagilhole and White 2011). Yet, scientific research careers may be even more complex for women to develop, considering the number of stereotypes still present for women in academia (Ilie and Schnurr 2017; Izquierdo-Iranzo et al. 2021; O'Connor and White 2021). Moreover, the only metric that seems to be shown as relevant is the number of publications. This is due to the fact that: "career progression in academia depends largely on how much you get published in peer-reviewed journals, but getting published is not the same feat for men as it is for women. A number of studies have found that female-authored papers are accepted more often or rated higher under double-blind review (when neither author nor reviewer are identifiable)" (Perez 2019, p. 96). However, if such a metric is considered as relevant, publications and authorship present other perversities for women. If female researchers are published, "that's only half the battle. Citation is often a key metric in determining research impact, which in turn determines career progression, and several studies have found that women are systematically cited less than men" (Perez 2019, p. 96). Studies point out several reasons why women are less cited than men. Among those, research suggests differences in productivity, but also that women's contributions are not taken into account or put as a second or third author (Ross et al. 2022). Moreover, Perez also adds: "The lack of meritocracy in academia is a problem that should concern all of us if we care about the quality of the research that comes out of the academy because studies show that female academics are more likely than men to challenge male-default analysis in their work" (Perez 2019, p. 103). However, scientific research even goes well beyond publication, and many other factors should be considered when funding research units and granting projects.

Higher education institutions have been either forced or are forcing themselves to build rules and systems for more equality in their human resources (Ilagan 2019). This is because "most academic systems and structures, as they exist today, are based on models which were designed centuries ago, at a time when men exclusively predominated in universities" (Sidlauskienė and Butasova 2013, p. 50). However, there are still many challenges women face in such institutions, such as "Resistance to recognising women's competencies persists regardless of available evidence" (Masanja 2010, p. 10). Moreover, a recent study by Times Higher Education and UNESCO reported that some HEIs have several policies in place to support women's careers but do not have evidence supporting such claims, suggesting a general lack of transparency. HEIs have also felt the pressure to respond to recent social and cultural paradigmatic shifts while attending to political pressure (Sidlauskienė and Butasova 2013). Unfortunately, policies are very different from one country to another, and agendas differ from gender equality to immediate parity ratio objectives. Some even consider social, ethical, and health questions, or more horizontal objectives, considering not only the female/male ratio but equality in gender and transgender matters as well.

Additionally, a report on gender equality published in March 2022 by Times Higher Education and UNESCO finds that, globally, the number of female students is higher than male students, even more so in Arts, Humanities, and Social Sciences. However, the Science, Technology, Engineering, and Mathematics field still lacks women's presence (Bothwell 2022a, 2022b). It is also found that, worldwide, male researchers surpass female researchers in all fields, as female authors only represent less than a third in all areas and less than two-fifths of senior academics. Moreover, there is also a gap in measuring the success rates of females in academia, as the report finds that studies focus solely on women's access to higher education. On another note, the inequalities between researchers start as early as education itself: "though nearly equal numbers of men and women pursue bachelor's and master's degrees in the STEM fields, the loss of women from the research career path begins at the PhD stage and continues through the highest organizational levels—a phenomenon somewhat controversially described as a 'leaky pipeline'" (Elsevier 2019, p. 10).

Such gaps even go further and are embedded in the bias that comes with having a male's name associated with a publication: "In one study of more than 25,000 researchers, being a man is found to be a positive predictor of becoming a Principal Investigator (PI), even after correcting for all other publication and non-publication factors" (Elsevier 2019, p. 11). Moreover, the same report also highlights that women are proven to experience a slower pace of advancement than their male counterparts, as women stay at assistant professor rank for longer than men (Elsevier 2019).

Unfortunately, another report also finds that transgender rights are still ignored in many countries worldwide, with little to no policies, even with 70 percent of universities reporting such procedures. Finally, the report finds that leading universities are globally engaging in approaches to punish the harassment of women as well as enforcing measures to promote gender equity with their surrounding communities (Bothwell 2022a, 2022b).

According to Perez, "the upper ranks of academia—particularly those of science, technology, engineering, and maths (STEM)—are dominated by white, middle- and upper-class men. It is a perfect Petri dish for the myth of meritocracy to flourish. Accordingly, a recent study found that male academics—particularly those in STEM—rated fake research claiming that academia had no gender bias higher than real research, which showed it did" (Perez 2019, p. 95). Though data show the unmeritocratic state of their careers, higher education institutions are responsible for ignoring the facts and continue to act as if there is no gender gap at any step of the ladder (Perez 2019).

As those questions need to be addressed globally and locally, our study will focus on the case of Portugal, specifically in terms of R&D units linked to public and private universities. The country is arguably an interesting case, with a culturally patriarchal side (da Silva Ribeiro Ferreira 2021). This is visible in leadership settings such as politics, general leadership, and moreover, academic leadership.

In Portugal, female staff numbers are not an issue, as studies find that most universities present similar numbers of female and male academic staff (da Silva Ribeiro Ferreira 2021; Bothwell 2022a, 2022b). However, differences grow stronger as the careers evolve, and the higher the position, the higher the gap between male and female workers (Machado-Taylor et al. 2014).

Academic teaching and research careers are victims of the already high scarcity of positions in a pool of uncertain and precarious options. Moreover, as per Machado-Taylor et al. (2014): "There have been some improvements in recent years in academic careers in Portuguese higher education. However, unless HEIs address dual careers, flexible working arrangements and part-time work, they will not be able to attract and retain top academics that will increasingly move to institutions—and countries—that provide the working conditions they require" (p. 380). Studies point to the fact that a smaller number of women are in decision-making positions in higher education institutions (namely deans) because of how this choice is made, whether by nomination or by vote (Diogo et al. 2021, p. 895). Nevertheless, this cannot be considered the only reason because the studies point to aspects related to the institutional culture, the recognition related to gender issues, and the lack of awareness concerning the systemic male domain of these institutions. Other aspects could be added to these reasons, such as the fact that there is a more significant distribution of men in the higher categories, mainly in the categories of chair professor, leading coordinator professor, and associate professor (CIG 2021).

In the country, it seems that little to nothing has been done to promote gender equality in the workplace (Santos and Pereira 2013; Machado-Taylor et al. 2014), in terms of policies, whilst many other European countries have created and have been implementing such policies for years. However, encouraging numbers have emerged, and a recent Analytical Services report published by Elsevier points out that Portugal is a European pioneer and model for other countries regarding gender equality in research (Analytical Services 2021). Nevertheless, the report considered the parity of male and female researchers and the number of publications in each gender. Our study aims to go further on this point and explore Portuguese R&D units' funding, cohort parity, and the coordination and leadership of the universities to which these research units are linked. As per Machado-Taylor et al. (2014): "Portugal has a relatively high proportion of researchers in the higher education sector compared with other European countries [...] This high representation of women researchers in Portugal reflects the high percentage of women as academics in higher education when compared with other European countries" (p. 366).

However, the authors also point out that looking closely at power positions in research is crucial, as more can be explored than the numbers of cohorts in research units and authorship of papers. According to Morais, "despite the changes and developments that have taken place in recent years, inequality between men and women in science continues to be a concern. The main reports on the subject draw attention to the low percentage of women in academic and decision-making positions, but also to different imbalances in terms of working conditions" (Morais 2020, p. 138).

Thus, considering that "EU policies such as the Gender Equality Strategy 2020–2025 (European Commission 2020) have emphasised the importance of increasing women's representation in decision-making and leadership positions" (European Commission, Directorate-General for Research and Innovation 2021, p. 176), we decided to take a closer look at the nature of each research unit and the potential relationship between their success rate, funding, and their corresponding universities in Portugal.

3. Methods/Tools

After briefly addressing some of the main concerns regarding gender gaps in research, publication, and leadership and focusing on the reality of Portuguese higher education and research units, we dive into the quantitative approach of our study. We determine gender distribution across research units and their corresponding gender leadership, comparing it to the university's administration to which they are attached.

In the following points, we present the methodological procedures we adopted to identify the analysis categories and the data collection and codification. The study is essentially quantitative and therefore uses content analysis through a cross between the information available in public databases and the collection of new data on the websites of research units and higher education institutions.

3.1. Categories of Analysis

We analyze 300 research units based on the last evaluation made by FCT in 2017/2018. Our sample only considers units that have been granted funding after the assessment. FCT evaluates on the following scale: excellent, very good, good, weak, and insufficient. We therefore only considered the units deemed "good" to "excellent" and disregarded "weak" and "insufficient" units. It is important to note that 312 is the total number of units evaluated, but it was impossible to access data from 12 units in the FCT database, which led us to consider a total number of 300 R&D units.

We then counted each member of these 300 units, only considering integrated members and doctoral, masters, and bachelor students, disregarding the collaborators, visitors, and technical staff of such units. We assessed their gender, the gender of the unit's director, and the gender of the dean of the university to which the unit is attached. The following table encompasses the direction in methodology (Table 1):

Table 1. Data collection description.

Sample	300 Portuguese research units that obtained funding from FCT's last 2017/2018 evaluation.
Excluded from sample	Units with an evaluation of "weak" or "insufficient"
Collection	Based on FCT's final classification results after the mandatory appeal period, analysis of each unit's website or information made available by the university to which the unit is attached.
Analysis type	Univariate (M, SD, %) and bivariate tests (Pearson's r and χ^2, Student's t, ANOVA)
Tool used	SPSS (v. 28)

It is also important to note that we obtained the primary data through FCT's evaluation results and retrieved the units' information online. We therefore highly depended on the information available on such pages to count the number of female and male researchers.

Additionally, the data obtained from FCT's evaluation result was used as a base for the variables analyzed in our study, as we used eight categories already present in the results. We also obtained additional information through the websites of the selected R&D units. We added six other categories to our analysis, analyzing fourteen different categories for each of the 300 Portuguese research units chosen previously. The categories in question are presented in the following table (Table 2).

Table 2. Categories in the data analysis.

FCT's categories	FCT attributed code Name of the R&D Unit Main managing institution Scientific domain of the evaluation board members Scientific areas/sub-areas of R&D unit Final rating obtained by the R&D unit Final base funding obtained by R&D unit (2020–2023) Total number of integrated members with Ph.D.
Other categories created for the study	Institution(s) attached to the R&D unit Total number of researchers on the website Number of male researchers on the website Number of female researchers on the website Gender of the R&D unit's coordinator Gender of the related university's dean

3.2. Coding and Reliability

The data collection, which ran from 12 June to 19 June 2022, involved a team of two coders. After this process, and to check the reliability of their work, a random subsample was selected from ~10% of the cases (31 cases out of a total of 300), which both coders analyzed. The statistical parameter used for the reliability calculation was the Krippendorff's alpha (Krippendorff 2004, 2011, 2017), found by using the "Kalpha macro" (for further information about how the "Kalpha macro" works, see: Hayes and Krippendorff (2007) for SPSS (version 28). Following Hayes and Krippendorff (2007), this statistical parameter (αk) is the most suitable because "it generalizes across scales of measurement, can be used with any number of observers, with or without missing data, and it satisfies all of the important criteria for a good measure of reliability" (p. 78).

As seen above (Table 3), the reliability of the eight variables was very satisfactory, as the average rose to M (αk) = 0.99.

Table 3. Reliability of the categories in the data analysis.

Categories	Kalpha
Scientific domain of the evaluation board members	1
Scientific areas/sub-areas of R&D unit	1
Final rating obtained by the R&D unit	1
Final base funding obtained by R&D unit (2020–2023)	1
Total number of integrated members with Ph.D.	1
Institution(s) attached to the R&D unit	1
Total number of researchers on the website	0.97
Number of male researchers on the website	0.99
Number of female researchers on the website	0.96
Gender of the R&D unit's coordinator	1
Gender of the related university's dean	1
Mean	**0.99**

The reliability guarantees objectivity and transparency of the coding process (Neuendorf 2017; Piñeiro-Naval 2020), stability in the analysis, replicability, and rigor, highlighting that the main differences were registered in terms of the number of researchers. The differences between coders were minor, therefore not affecting the results and conclusions obtained.

4. Results

Starting with the absolute data under study here, the following table shows the total numbers of males and females in each category considered in our research.

As we can observe in Table 4, the second highest rating given to R&D units is also the most attributed with a total of 118 units obtaining "very good" out of the 300 units under scrutiny. On average, units have been granted a base funding of EUR 891.140,47 per unit for a three-year period.

Table 4. Absolute values for each category of the study.

Funding	**Total**	**Average per Unit**		
	EUR 267.342.140,00	EUR 891.140,47		
Rating	**Good** 74 units	**Very Good** 118 units	**Excellent** 108 units	
From FCT-provided data	18.133 researchers total			
Researchers' category				
Number of researchers	**Male**	**Female**	**Unknown**	**Total**
(From R&D units' Websites)	14.938 (46.6%)	17.139 (53.4%)	-	32.077
Average number of researchers (From R&D units' Websites)	55 (47.0%)	63 (53.0%)	-	117
Total Coordinators	190 (63.3%)	90 (30.0%)	20 (6.7%)	300
Deans	25 (62.5%)	7 (17.5%)	8 (20.0%)	40

FCT's numbers elevated at 18.133 total integrated researchers, but the data obtained on the units' webpages elevates this number to 32.077, for an average of 117 members per unit. This difference in totals between FCT and the R&D units' websites can be explained by the fact that FCT's evaluation only counts integrated members with PhD levels. In this case, we also considered non-integrated researchers, according to FCT's definition, where PhD students can also be considered. Moreover, it is worth noting that some units' websites can also provide information that is not up-to-date, therefore explaining these discrepancies.

Table 4 also shows a higher number of female researchers (17.139) for an average of 63 female researchers per unit, whilst male researchers attain the number of 14.938, for an average of 55 male researchers per unit. Although there are more female researchers, R&D units are more male-coordinated, with a total of 190 male coordinators for only 90 female coordinators. As for the total of Deans, the difference is even more staggering, with a total of 25 male deans and only 7 female deans, out of the total of 40 institutions, of which 8 could not be considered, mainly because these were not higher education institutions. We will now tackle the results obtained through the data gathered in the 300 research units, considering the variables under scrutiny for this particular study.

4.1. Relationship between the Number of Female/Male Researchers and the Gender of the Coordinator of the R&D Unit

After having presented the total data collected concerning each category of the study, we now highlight the gender of the coordinators of each research unit. The differences in means are statistically trending in the case of the number of male researchers who are part of the team depending on the coordinator's gender, so that when the coordinator is male, there are more male researchers than female researchers on average (Table 5). However, when the coordinator is a woman, there are no statistically significant differences in the composition of the R&D Unit. This also implies that male coordinators end up having more men in their research teams, whereas the same cannot be inferred for female coordinators. This leads to the fact that women coordinators can have more diverse and gender-inclusive teams than their male counterparts.

Table 5. Mean differences (standard deviations in parentheses) in the composition of R&D Units as a function of coordination (Student's *t*).

Team	Total	Research Unit Coordination		Student's t
		Male Coordinator	Female Coordinator	
Male Researchers	54.16 (50.98)	58.07 (56.66)	46.52 (36.81)	t (270) = 1.74, p = 0.084, d = 0.242
Female Researchers	62.03 (77.74)	57.7 (85.93)	73.53 (58.89)	t (270) = −1.55, p = 0.121, d = −0.215
n	280	185	87	

This is also highlighted in a recent study by Pereira (2020), highlighting that women represent only 30% of coordinators in all 307 units funded by FCT, considering that women's "greatest representation being in the centres for Natural Sciences and the Environment, followed by centres for Social Sciences and Humanities" (Pereira 2020, pp. 158–59). As is the case for most studies on the subject: "the difficulty of reconciling private and public life, which translates into the greater number of hours that women dedicate to their family obligations, has been the recurring argument when, year after year, some of the discrepancies mentioned above are discussed" (Pereira 2020, p. 160).

On the other hand, if we cross the scientific areas with the gender of directors, we can see that despite the higher number of male directors, it is in the area of Natural Sciences that we register the most significant approximation, with a difference of only 4 points (48% male directors vs. 44% female directors). Then comes the Social Sciences area, with a difference of 6 percentage points (44% male directors vs. 38% female directors), and the Arts and Humanities scientific area, where we have the closest approximation, with a difference of only 16 percentage points, (56% male directors vs. 40% female directors). The most significant differences are found in Engineering Sciences and Technologies (female directors are only 10%) and in Exact Sciences (female directors are only 11%). These data retake us to accentuate inequalities in the STEM areas, confirming data from previous studies (Elsevier 2019).

4.2. Relationship between Genders of the Dean of the Institution and the Corresponding R&D Unit Coordinator

After identifying the gender of the coordinators of the research units, we sought to assess whether there is a relationship with the directors of educational institutions, that is if the propensity to have men in the leadership of R&D units is greater in institutions where a dean is a man (Table 6).

The table indicates, first of all, that there are many more male coordinators and deans than female coordinators and deans. However, there are no statistically significant differences in the gender of coordinators as a function of the gender of the deans (χ^2 (1, n = 272) = 2.65, p = 0.103; v = 0.099).

Although there is no direct relationship between the gender of the deans of higher education institutions and the presidents of research units, it is essential to note that, in both cases, the number of women is lower than that of men, contributing to accentuating inequalities in leadership positions and committing to changes in the future, because many of the candidates for president of the institutions first go through the leadership of the research units. Now, if men mostly hold these positions, the tendency will be that they will also occupy the leadership of higher education institutions in the future.

Table 6. Association between the Dean of the Institution and the Coordination of the R&D Unit according to gender (% column).

Research Unit Coordination	% Total	Institution Leadership	
		Male Dean	Female Dean
Male coordinator	68	69.5	53.8
Female coordinator	32	30.5	46.2
n	**272**	**246**	**26**

4.3. Relationship between Evaluation/Funding and the Number of Male/Female Researchers

Having identified the gender of the coordinators of R&D units and the Deans of Higher Education Institutions, we tried to understand whether there was a relationship between evaluations, funding, and the gender of researchers (Table 7). The hypothesis we considered was that there is a greater proneness to allocate funding to units with a more significant number of male researchers.

Table 7. Correlations between evaluation and funding with the number of researchers in the team (Pearson's *r*).

Parameters of the R&D Units	Number of Male Researchers	Number of Female Researchers	Total of Integrated Members
Evaluation	0.336 ***	0.256 ***	0.294 ***
Funding	0.660 ***	0.765 ***	0.980 ***

*** $p < 0.001$.

Clearly, the greater the total number of team members, the better rating it has (r (298) = 0.294, $p < 0.001$) and the more funding it gets (r (298) = 0.980, $p < 0.001$). Depending on the gender of the researchers, the strongest correlations are between the evaluation and the number of male researchers (r (278) = 0.336, $p < 0.001$), on the one hand, and between funding and the number of female researchers (r (278) = 0.765, $p < 0.001$), on the other hand. The data allow us to understand that teams with more male members obtain higher evaluation scores. However, if we add funding to the equation, we can infer that teams with more female members receive significant funding. Therefore, we understand that the more heterogeneous research teams are, the higher they would benefit from funding and evaluation scores. Likewise, the correlation between evaluation and funding is also very significant (r (310) = 0.403, $p < 0.001$), so the better the research unit's rating, the greater its budget is.

The data help to reinforce the idea that we may also be facing a gender bias in the funding itself, to the extent that if we look at the ten highest budgets, that is, the research units that received the most money, in nine cases, they are led by men. Looking closer at these 10 specific cases, we can observe that all belong to STEM (Sciences, Technology, Engineering, Mathematics) research fields. These research areas have been pointed out as male-dominated fields (Elsevier 2019); therefore, this could be why research units led by women have had a more challenging job at obtaining higher funding. These data confirm "that gender differences persist in access to funding" (European Commission, Directorate-General for Research and Innovation 2021, p. 257). The data also support the idea that "at European level, in all fields of R&D except Agricultural Sciences and Humanities & Arts, women were less successful than men when applying for research funds" (p. 257). The data are worrying because, as highlighted by the European Commission, "it may lead to a vicious cycle where lower funding leads to lower publication and innovation output, which further reduces the chances of being funded" (p. 257).

4.4. Number of Men/Women by Scientific Domains and Classification of Units

Finally, we present data on the distribution of female and male researchers by scientific domains, as well as data from the evaluations of the R&D units. We try to confirm which scientific areas the Portuguese units of R&D have more men than women and confirm some data from international reports that stress "several factors that underlie the observed gender inequities in STEM" (Elsevier 2019, p. 11; Huyer 2015). Table 8 allows us to state that male researchers are more significant in Engineering Sciences and Technologies and female researchers are more present in Health Sciences. On the other hand, the R&D units whose classification is excellent are the ones with the most significant presence of both male and female researchers.

Table 8. Differences in means by scientific domains and classification of units according to the number of men and women in the teams (ANOVA).

Comparison Parameters	Male Researchers			ANOVA	Female Researchers			ANOVA
	M	*SD*	*n*		*M*	*SD*	*n*	
				Scientific Domains				
Thematic fields	50.52	47.34	25	F (6, 273) = 2.74, $p < 0.05$, η^2 = 0.057	59.16	73.62	25	F (6, 273) = 2.71, $p < 0.05$, η^2 = 0.056
Exact sciences	54.15	44.4	34		48.24	76.20	34	
Engineering Sciences and Technologies	75.28	73.64	47		44.21	48.73	47	
Arts & Humanities	50.60	37.86	52		53.13	45.52	52	
Health Sciences	61.38	62.75	24		109.67	139.39	24	
Social Sciences	39.34	35.17	74		63.43	81.71	74	
Natural Sciences	62.88	51.71	24		86.71	72.26	24	
Total	54.16	50.98	280		62.03	77.73	280	
				R&D Unit's rating				
Excellent	76.83	68.21	100	F (2, 277) = 18.85, $p < 0.001$, η^2 = 0.12	88.92	109.99	100	F (2, 277) = 10.6, $p < 0.001$, η^2 = 0.071
Very good	46.53	29.79	110		52.18	45.13	110	
Good	33.79	34.25	70		39.07	46.06	70	
Total	54.16	50.98	280		62.03	77.74	280	

Even if we cannot identify the reasons for this inequality, we can confirm that the "representation by women is highest in health and life sciences and lowest in engineering and computer science" (Elsevier 2019, p. 10; Huyer 2015), believing that some of the factors that help to explain the results were related to "bias in hiring, authorship, recognition, and promotion" (Elsevier 2019, p. 11). There are many possible reasons for this inequality, such as stereotypes and occupational gender segregation. However, the data observed in our study cannot allow us to identify a specific cause. The relationship established here is merely based on previous studies (Elsevier 2019). We can also consider that the differences between the number of male and female researchers by area and the position they occupy in R&D units may later condition access to management positions in Higher Education Institutions. In this context, of the seven women who lead Higher Education Institutions, only one came from the STEM areas, which helps us to understand how difficult it is for women to assume leadership roles in these scientific areas. We can confirm, once again, that "the imbalance in opportunities for women in STEM is a global reality" (Elsevier 2019, p. 10), and therefore it is imperative to examine gender representation, particularly in STEM.

5. Discussion and Conclusions

We understand that gender equality goes beyond numbers and quotas and that such issues are much more than the primary equal gender distribution of academic roles among research units and universities. However, observing the numbers in such a simple way is nonetheless relevant. The purpose of this study was merely to determine gender gaps in cohorts, and we cannot extrapolate the results into more than what they represent. Having more women than men in a research group does not necessarily mean equality and less discrimination in the workplace for women. Discrimination against women and men can come in many forms, and policies must comprehend these nuances. On the other hand, positive discrimination by imposing quotas is still to be proven to be an effective method and can lead to other issues in the workplace, ending in other forms of discrimination.

Through the data we collected and the cross-references we made with the FCT database, we could conclude that although there are more female researchers in the Portuguese R&D units analyzed, they are more male-coordinated. On the other hand, we realize that when the coordinator is male, there are more male researchers than female researchers. However, when the coordinator is a woman, there are no statistically significant differences in the composition of the R&D Unit. The data also showed us that the number of female Deans in Higher Education Institutions is reduced. Although there is no direct relationship with the researchers who assume the coordination functions in the R&D units, the number of female coordinators is also smaller, affecting their progression into leadership roles. As for the scientific areas, the data obtained confirm that the inequalities are more pronounced in science, technology, engineering, and mathematics. The results allow us to establish a relationship with the literature review, namely considering the lack of women in decision-making positions, even in "women-dominated" research units, as previously observed in faculties or departments (Bothwell 2022a, 2022b; O'Connor and Irvine 2020; O'Connor and White 2021). On the other hand, they also allow us to understand the 'leaky pipeline' (Elsevier 2019), in this case, between the number of women researchers in R&D units and the number of female coordinators in these research units.

Data from European institutions "suggest that some progress has been made in improving women's representation in decision-making and leadership positions" (European Commission, Directorate-General for Research and Innovation 2021, p. 176). Nevertheless, we should also consider the importance of more policies, such as those from the Gender Equality Strategy 2020–2025, to change gender equality in leadership positions.

In this work, we try to demonstrate, through data, how essential it is to promote gender equality in leadership positions in research because, assuming the coordination of R&D units is, most of the time, the first step to achieving other places, namely in HEIs. In this sense, it is crucial to understand the reasons for such a slow progression, not letting the reasons usually mentioned, such as the multiple obligations of women, justify everything. It is essential to understand what obstacles exist internally and how they contribute to the fact that women no longer assume leadership positions despite their investigative work.

We understand that, although many of the studies and reports present similar data, identifying many of the problems that are already known, it is essential to continue to show that despite some progress, namely in Portugal, there is still much to study so that the future answers and strategies are the result of a practical analysis of reality. This is why we consider, as has already been indicated by other authors regarding the Portuguese situation (Diogo et al. 2021), that it is necessary to consider the "institutional culture, gender awareness and even the lack of both self and institutional empowerment" (p. 895), to understand the phenomenon. We believe that this study contributes to the discussion of a problem that, although not new, and being addressed recurrently in several investigations, remains unsolved. By comparison with the studies already carried out, it is shown that the presence of women is dominant in research but that there are still imbalances in leadership positions in research units. These positions, which are often understood as a first step towards assuming other responsibilities in higher education institutions, continue to be dominated by men. Therefore, we understand that opportunities for recognition and advancement may be threatened. One of the reasons may be the lack of awareness of gender inequalities in our society, which higher education and research units have been reproducing.

There is a need for a more significant discussion of issues related to gender inequalities within universities and research units. Moreover, it is essential to create regulations for institutions to apply, as such decisions cannot be at the discretion of each establishment but should instead be applied fairly and adapted to faculty compositions and research areas.

As this study is merely based on the information available on the organizations' websites, we depend on their veracity, and therefore, we cannot forget that the numbers disclosed here might be different from the actuality of such organizations. We also understand that our research focuses on a moment in our current history where gender equality matters are prominent in discussions on social roles yet highly divisive. However, looking back at the same positions in the past decades was not achievable in our study, considering time constraints. Moreover, and perhaps, more importantly, gender representation goes far beyond female versus male presence, and all genders should be represented in further studies. In our case, both cisgender and transgender people were considered in the same group (male or female) without distinction.

This study is very exhaustive in terms of research to present such numbers in an orderly way. We hope to carry on by applying our methodology to other countries in the future and keep on updating the current governments and organizations observed in this study to reassess potential shifts, rather than focusing on past versus present paradigms. We also hope that more studies can shed light on other gender representations in academia, such as non-binary and transgender academics, to go beyond the binary female/male ratio presented here.

Author Contributions: Conceptualization, C.E.F. and R.M.; methodology, C.E.F., R.M. and V.P.-N.; software, V.P.-N. and R.M.; validation, C.E.F., R.M. and V.P.-N.; formal analysis, R.M., C.E.F. and V.P.-N.; investigation, C.E.F., R.M. and V.P.-N.; writing—original draft preparation, C.E.F. and R.M.; writing—review and editing, C.E.F., R.M. and V.P.-N.; supervision, C.E.F. and R.M.; project administration, R.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Some of the data used to support reported results can be found here: https://www.fct.pt/apoios/unidades/docs/Financiamento_Plurianual_Unidades_2020_2023.xlsx (accessed on 20 June 2022).

Conflicts of Interest: The authors declare no conflict of interest.

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