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# Message from the Organizing Committee

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We are thrilled to announce the Proceedings of the 1st Precarity and Instability in Academia Symposium (PIAS). PIAS is a new event dedicated to exploring the (not so) subtle precariousness of the academic environment, delving into topics that usually go unnoticed or are quietly banned from other venues. These topics include quantifying economic instability (such as the adequacy of Ph.D. salaries), perceptions of pursuing a research career as told by the students themselves, and the existence of gender disparities in universities from early to senior positions. We created PIAS in response to the difficult conditions that many researchers face in academia, especially within Spanish public institutions, and the lack of spaces dedicated to addressing issues that affect the academic environment. With this initiative, we aim to create a collaborative space where we can openly discuss the current challenges in research, identify underlying causes, and explore practical solutions for meaningful progress. For the peer review process, we decided to follow best community practices from other conferences and use a double-blind approach. Given the interdisciplinary nature of this symposium, we opened a self-nomination form to involve reviewers from diverse backgrounds—such as life scientists, humanities scholars, engineers, and historians—, while also aiming to include representatives from a broad range of national institutions, including both early-career researchers (i.e., Ph.D. students) and established professors. Our main goal was to be as rigorous as possible, whilst accepting the implicit somewhat cynical nature of the symposium. For each submission, we assign at least 3 reviewers, with one or more being a senior reviewer. Each submission is then given a tentative decision, which can be "Reject", "Accept with Minor Revision", or "Accept with Major Revision". Major Revisions are assigned a shepherd to help authors shape the final version of the paper before the Camera-Ready deadline. For tentatively accepted submissions, authors receive the reviewers' comments and are asked to make appropriate changes for the final version. Submissions that fail to meet the expectations are rejected. Following this process, we received 9 submissions. Of these, 1 was desk-rejected for not being even remotely related to the topic of the symposium, 1 was rejected, and 7 papers were accepted into the program.

We contacted the authors of accepted papers to invite them to present their works at the venue in December 2024. Although not mandatory, all agreed to make a presentation in person, followed by a short time for questions from the audience. We are grateful to the Universidad Carlos III de Madrid, and in particular its campus in Leganés, for generously hosting this first edition of PIAS.

Last but not least, we would like to thank all the people who made the first issue of PIAS possible. It is because of their work, trust and support that this symposium exists today:

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We hope that this symposium will be the first of many where we can openly discuss the precarity and instability in academia, and hopefully contribute to fixing it one paper at a time.

Sincerely,
Caterina, José Miguel and Alejandro
Co-General Chairs of PIAS 2024 and Program Chair of PIAS 2024

# Publish and Perish: When the FPU Grant Does Not Meet the Cost of Living

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## Abstract

This paper explores the persistent economic precarity experienced by first year's PhD students in Spain, despite government efforts to improve their working conditions. Using the FPU (Formación de Personal Universitario) grant as a case study, we analyze the evolution of PhD students salaries in relation to the cost of living, measured by the Consumer Price Index (CPI), and compare them to the Average salary and the Minimum Professional Wage (SMI). Our results reveal that, although PhD students are now legally classified as employees rather than grant holders, their financial situation remains precarious, with salaries more closely aligned to the minimum wage than the national average. We argue that without significant salary improvements, Spain risks losing talented students to other professions, undermining its academic and research potential.

## 1 Introduction

Debates surrounding low salaries are common in society, as individuals often feel they are underpaid relative to their worth. This sentiment is particularly prevalent among PhD students, many of whom believe their quality of life has deteriorated over the years. In this study, we aim to address the recurring question: "Are PhD students better off financially compared to their predecessors?" To explore this, we conducted a comparative analysis of wage evolution and cost of living, using the salary of the Spanish FPU scholarship as a reference point. This analysis incorporates changes over time in the Spanish Consumer Price Index, the Averaged Salary, and the Minimum Professional Wage to evaluate shifts in the cost of living.

## 2 Background

There are four key concepts essential to understanding this paper: FPU grants, the Consumer Price Index, the Averaged Salary, and the Minimum Professional Wage.

*FPU* (Formación de Personal Universitario) grants are awarded by the Spanish government to students for a period of four years to conduct research and pursue a PhD. The eligibility criteria for these grants are highly competitive, with only the top students based on academic performance qualifying for them.

Until 2014, the FPU was classified as a scholarship; however, it is now considered an employment contract, with all the legal implications that this change entails, such as social security contributions. This shift was the result of pressure from many research organizations, which led to the Spanish government improving the working conditions of PhD students [7].

The *Consumer Price Index* (CPI), as defined by the Spanish National Statistics Institute (INE) [25], measures the average change over time in the prices paid by consumers for a basket of goods and services. It serves as a key indicator of inflation, reflecting the variation in the cost of living for households. The CPI tracks changes in categories like food, energy, transportation, and housing, and is crucial for economists in adjusting economic policies in line with inflation trends.

Other key indicator employed in the paper is the *Averaged Salary* in Spain, this indicator is calculated with the Annual Wage Structure Survey [21] which provides detailed insights into the distribution of wages, analyzing factors such as gender, occupation, industry, and region. Conducted by the INE, this survey helps in understanding wage inequalities and labor market trends, giving a comprehensive picture of how wages evolve across different sectors of the economy.

Both the CPI and the Annual Wage Structure Survey are essential tools for evaluating Spain's economic health, and guiding fiscal policies.

The last concept needed is the Spanish *Minimum Professional Wage*, known as Salario Mínimo Interprofesional (SMI) [22], is the legally mandated minimum amount that workers in Spain must be paid for their labor, regardless of the industry or type of employment. The SMI is set annually by the Spanish government and serves as a tool to protect workers, ensuring they receive a minimum income that is considered necessary for basic living standards.

## 3 Methodology

The CPI data were sourced from the Spanish (INE) [24], along with the average salary for individuals aged 25 to 34 [23]. This age range was chosen as it is the most representative of FPU-funded PhD students based on the available data. According to FPU eligibility criteria [19], only students who graduated within the previous three years are eligible. Considering national statistics of graduates [26], enrolled students [27], and the age group classifications available in the average salary data [23], from our perspective, the 25 to 34 age range is the most suitable for this analysis.

As it will be shown in Section 4, we have calculated the salary evolution in accordance with the CPI using the following recursive formula, where the subscript $t$ represents the year index:

$$salary_{t+1} = salary_t \cdot \left(1 + \frac{cpi_{t+1} - cpi_t}{cpi_t}\right) \tag{1}$$

Note that the fraction in the formula, when multiplied by 100, represents the percentage change in the CPI. Therefore, it applies the same percentage variation in the CPI to the salary.


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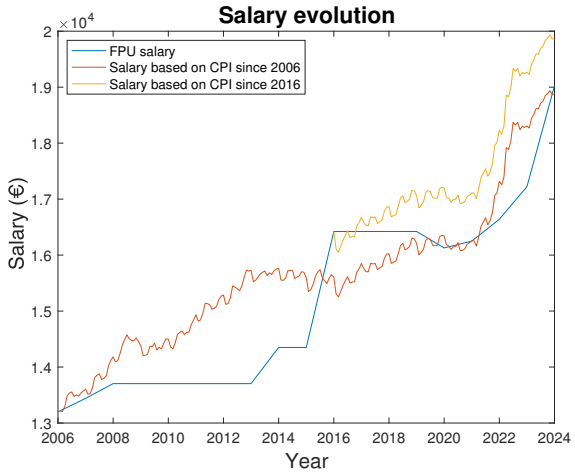


**Figure 1: Annual FPU salary and the hypothetical FPU salary based on CPI (in euros).**

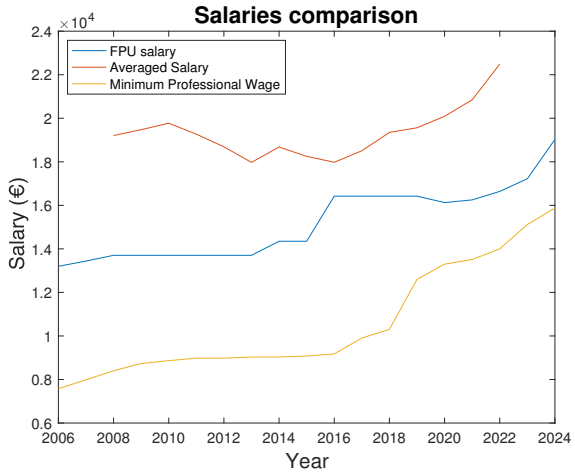


**Figure 2: Evolution of annual salaries compared to general population average.**

For the Minimum Professional Wage, we referenced the data from the Ministry of Labour and Social Economy [28]. And finally, the salary of the FPU grant was obtained from the Spanish BOE of each year [1–6, 8–20]. In this paper, we focus exclusively on the salary awarded during the first year of the grant. The distribution of the total grant amount over the four years varies depending on the year of award. We have chosen to examine the first-year salary, as it is typically the lowest and the period in which students are most vulnerable to precarity. Additionally, students who are required to relocate to another city face significant economic burdens during this initial phase as they settle into their new environment.

## 4 Results

Figure 1 shows the evolution of the first year's FPU salary from 2006 to 2024, along with its expected change based on the CPI. That is, how the FPU salary should have evolved according to the CPI (red curve) and how it actually has evolved (in blue). For future grantees to maintain the standard of living of their predecessors, the evolution of the salary should match that of the CPI. We see that in 2007, the increase in the grant is adjusted to the CPI. However, from 2008, with the arrival of the financial crisis, it is no longer equalized. This results in a loss of purchasing power for doctoral students.

In 2014, six years after the start of the series, we observe the first increase in the grant amount. This moment is significant due to a change in the FPU, as mentioned in Section 2, where grantees began to be treated as employees rather than scholarship holders [7]. This may be the reason for the larger salary increase in 2016, where the FPU salary curve exceeded that based on the CPI. That is, the salary that a contract employee earns is, at this point, higher than what a scholar should earn. In fact, the position of the contracted graduate student improves with respect to that of the scholar. Both labor rights and economic amount have improved.

However, we see that the red and blue curves meet in 2024. The evolution that the salary of a grant holder would have had to follow is on a par with the salary of a contract student. In other words, despite having the status of hired staff, economically they are still treated as scholarship holders. Therefore, there has been no significant salary difference between being a grant holder in 2006 and being a contract staff in 2024. Even if the labour rights changed from trainee to contractual worker, the economic standard of living is still that of a precarious trainee.

In 2016, we see that an FPU grantee (now legally hired staff) earns €16,422 per year. The yellow curve from Figure 1 shows how this amount should have changed according to the CPI, reflecting the evolution of the salary of an actual employee. That is to say, in 2016, as previously mentioned, the FPU salary curve surpassed the CPI based curve, indicating a genuine improvement in real wages, there was a real difference between scholarship and contract. Therefore, the yellow curve represents the trajectory the salary should have maintained to preserve this improvement over time. We conclude that the amount of an FPU has increased slightly less than expected, as it amounts to €19,026 in 2024 instead of the projected €19,866.

### 4.1 Evolution of Salaries

An alternative perspective for assessing the precarity of first year's PhD students is to compare their salaries with those of the general population. Figure 2 presents the average salary in Spain for individuals aged 25 to 34, alongside the Minimum Professional Wage. As mentioned above, during the Spanish financial crisis from 2008 to 2014, PhD students maintained their incomes, in contrast to the rest of society, whose incomes fell. However, this also meant a loss of purchasing power due to the increase in the CPI, as shown in Figure 1.

In 2014, the salary of doctoral students came closer to the average general salary, as students moved from being grant holders to hired employees. However, in the following years, the salary appears to be moving away from the average and closer to the legally-allowed minimum wage. This suggests that there is a move towards cheaper labor, which is likely to lead to an exodus of students to other professions.

## 5 Conclusion

Despite the government's changes to improve the working conditions of PhD students, their economic precarity remains unchanged. Our analysis shows that there has been no significant salary improvement for FPU grant holders after the switch to employed staff in 2014. Moreover, the current salary for first year's PhD students seems to be closer to the Minimum Professional Wage than to the average national salary, highlighting the low remuneration of highly qualified individuals. Without a significant increase in salaries, Spain will face significant challenges in attracting and retaining talented students in academia, ultimately jeopardizing the country's academic and research competitiveness.

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# Can You Afford to Research? The Financial Strain of Ph.D. students in Spain

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## Abstract

This study examines the financial challenges affecting the decline in Ph.D. candidates and completions in Spain, focusing on Ph.D. scholarships and rising living costs. Using government data, we analyse FPU and PIF scholarships compared to national salaries, inflation, and housing affordability in recent years. We find that scholarships are significantly below national salary averages, with housing costs often unaffordable. Financial strain, worsened by limited scholarship increases, contributes to low doctoral completion rates and reduced interest in academic careers. We conclude that current funding is insufficient, pushing Ph.D. candidates towards better-paying jobs outside academia. Policy reforms are needed to provide adequate support and sustain the academic workforce.

## 1 Introduction and Background

Recent discourse within academia suggests a growing concern over the declining number of Ph.D. candidates and interest in pursuing long-term academic careers leading to positions such as Associate or Full Professors. According to the official statistics from the Spanish Government [4], there has been a significant decrease in the number of Ph.D. defenses in Spain annually—from 20,149 in 2016 to 11,259 in 2022 (detailed information in Appendix A). This trend raises critical questions about the factors influencing doctoral candidates' decisions to pursue and complete their studies. One potential factor is the increasing cost of living in Spain and its impact on Ph.D. students' financial well-being.

In Spain, two primary government-funded scholarships support Ph.D. studies: the Formación de Profesorado Universitario (FPU) and the Personal Investigador en Formación (PIF) [3] providing a four-year salary. The main distinction lies in their award processes: FPU scholarships are granted directly to students based on academic merit, while PIF scholarships are tied to specific research projects funded by the National Research Plan, with candidates selected by the project's Principal Investigator. The FPU scholarship is an annual funding program provided by the Ministerio de Universidades. To apply, a student must collaborate with a professor to jointly propose a Ph.D. project. Scholarships are awarded based on a competitive evaluation that allocates points to several criteria: project quality (0.5 points), the student's curriculum vitae (2 points), the professor's curriculum vitae (2.5 points), the research excellence of the research group (1 point), and the student's academic record (4 points). This scoring system places significant emphasis on academic grades, making the scholarships highly competitive. As depicted in the 2022 call [9], there were 2,614 valid applications for only 900 available scholarships considering that eligibility requires meeting challenging academic criteria. Previous studies have examined the impact of these funding programs on doctoral success rates. In [1], the authors analysed data from 2002 to 2005 involving 7,770 scholarships and found an average success rate of 40%. A notable proportion of fellows also renounced their scholarships due to better employment opportunities during their Ph.D. studies. Another study [13] further supported these findings by concluding that Ph.D. holders working outside academia had better working conditions, including contract type, working hours, and salary.

However, these studies have not analysed the role of economic precarity in Ph.D. success rates. Specifically, there is a lack of research on how FPU and PIF salaries compare to the inflation rates and housing costs in major university cities. This study aims to fill that gap by analysing the FPU and PIF salaries relative to the cost of living in Spain from 2013 to 2023, upon data availability.

## 2 Methodology

This study analysed data from authoritative sources, primarily the Data Catalogue of the Ministry of Science, Innovation, and Universities of Spain [5]. From this source, we obtained the gross annual salaries for the FPU and PIF scholarships for all relevant years. Notably, the FPU scholarship offers different salary amounts for each of the four years of the fellowship. To facilitate straightforward comparisons across years and between the two scholarship programs, we calculated the gross annual salary by averaging the salaries over the four-year duration of the fellowship. To analyse them in relation to the cost of living, we considered two key parameters: the Consumer Price Index (Índice de Precios al Consumo, IPC) and rental housing costs.

The IPC, an economic indicator measuring average changes in consumer prices over time and reflecting inflation, was extracted from the National Institute of Statistics (INE) [8]. Additionally, we included a comparison of Ph.D. scholarship salaries to the mode and mean salaries in Spain [7] which is limited to 2021.

To analyse rental housing costs, we utilised data from the Idealista [12], a widely used real-state platform in Spain. Idealista provides annual reports detailing monthly average rental costs per square meter in major Spanish cities. The methodology employed by this portal to generate these reports includes the following steps: i) Selection and cleaning of listings: Identifying relevant rental property listings and removing anomalous or out-of-market data


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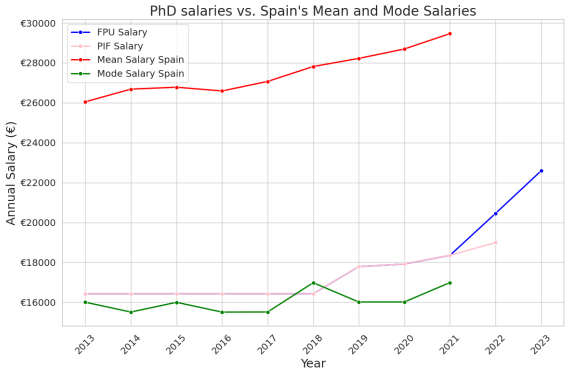


**Figure 1: FPU and PIF salaries evolution in comparison to mean and mode in Spain.**

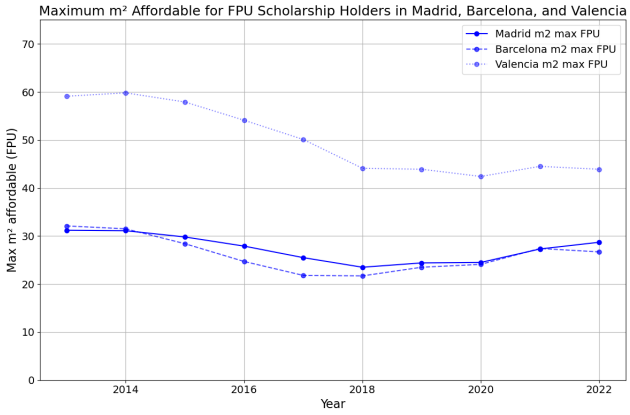


**Figure 2: Maximum affordable living space per city based on 30% of the FPU gross salary**

through statistical analysis; ii) Calculation of average prices: Computing average rental prices in both well-defined (final) and broader (non-final) geographic areas; iii) Data validation and correction: Assessing data robustness and correcting any remaining anomalies in the time series. We focused on rental prices in Madrid, Barcelona, and Valencia, which host the most universities in Spain according to the Ministry of Universities. In addition to housing prices, we considered that rent should not exceed 30% of one's salary, following standard financial guidelines in Spain. Rental insurance companies often decline rentals if the rent exceeds 30% of income.

By assessing Ph.D. salaries relative to living costs and national salary data, we evaluated the financial pressures faced by Ph.D. students in Spain.

## 3 Results

In this section, we present the findings on the financial situation of Ph.D. students in Spain, focusing on comparisons between scholarship salaries and various economic indicators such as national salaries, housing affordability, and inflation rates.

Fig. 1 compares FPU and PIF scholarship salaries to Spain's mean and mode salaries from 2013 to 2023. Both scholarships remain significantly below the mean salary, with a notable increase only starting in 2019. Despite gains, the gap against the mean salary remains large, indicating limited financial support for recipients. While FPU and PIF salaries are similar to the modal salary, it's important to consider that pursuing a Ph.D. requires higher education. However, in 2023, only 38.8% of men and 32.1% of women aged 25 to 64 in Spain have higher education qualifications [6] indicating that the majority of the population, whose salaries contribute to the calculation of the modal salary, do not possess higher education degrees.

In Fig. 2 the number of square meters an individual can afford to rent with the FPU scholarship in three major cities from 2013 to 2022 is shown (detailed analysis for PIF is available at Appendix A). This calculation is based on dedicating 30% of the salary to rent and utilising the average rental prices per square meter in each city. Fig. 2 reveals that, despite receiving the same salary across all three cities, the affordability of housing varies significantly due to regional differences in rental prices. Valencia's lower housing costs allow FPU recipients to afford a substantially larger living space compared to Madrid and Barcelona. In contrast, the higher rental prices in Madrid and Barcelona, which concentrate the number of universities in Spain, result in smaller affordable living areas for Ph.D. students.

Fig. 3 displays the annual percentage changes of both FPU and PIF salaries in comparison to the annual rate of change in the IPC. Between 2013 and 2015, the IPC decreased while the nominal salaries remained constant, resulting in an increase in real salaries. From 2016 to 2018, salaries remained unchanged, but the IPC increased significantly, leading to a reduction in the real salaries. From 2018 to 2023, the salaries increased at rates exceeding those of the IPC, indicating growth in real salaries during this period.

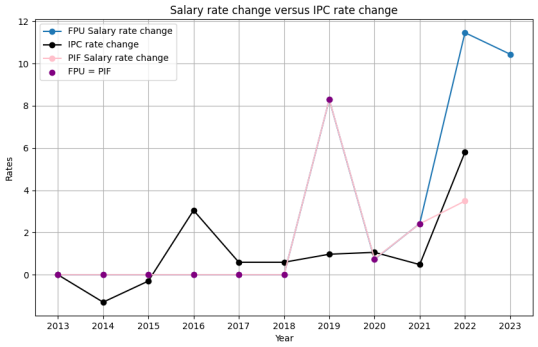


**Figure 3: Percentage rate changes in FPU and PIF salaries versus IPC over time**

These findings provide a detailed overview of the economic conditions affecting Ph.D. students in Spain. The analyses illustrate the disparities between scholarship salaries and national salary averages, the impact of regional housing costs on affordability, and the relationship between salary adjustments and inflation over the past decade.

## 4 Discussion and Conclusion

Figure 1 shows that Ph.D. salaries in Spain are nearly equivalent to the modal salary of the general population. While the INE does not provide modal salary data segmented by education level, a 2022 survey [1] indicates that individuals with at least a university education—a prerequisite for Ph.D. studies—reported a mean salary of €32,722.61. This amount exceeds any of the Ph.D. stipend figures presented in Figure 1. However, this average encompasses professionals across all levels of seniority, which may not accurately represent the earnings of recent graduates or early-career individuals comparable to Ph.D. students. Ideally, Ph.D. stipends should be compared to the salaries of individuals with higher education in their first one to two years of employment; unfortunately, such specific data is not readily available in the literature. This significant salary disparity may prompt candidates to leave academia for better-paying industry jobs.Although Figure 1 compares the FPU and PIF salaries with the mean and modal salaries in Spain—acknowledging that many of these salaries pertain to positions not requiring higher education—we want to emphasize that all occupations, regardless of educational requirements, are equally important. Our primary objective with this comparison is to demonstrate that the salaries offered in academia may not provide adequate working conditions, potentially causing individuals to seek employment outside the university setting.

Our analysis (Figs. 2) reveals that, given the legal minimum living spaces—25m² in Madrid [10], 36m² in Barcelona [2], and 24m² in Valencia [14]—only in Valencia could scholarship holders afford legal housing; in Barcelona and, during 2017–2020 in Madrid, they would be forced to share accommodations due to unaffordable rents.

While Ph.D. salaries remained static from 2013 to 2018 (Fig. 3) under the Partido Popular's government, they have increased since 2019 under the coalition of Partido Socialista Obrero Español (PSOE) with Podemos (2020-2023); however, these increases have not kept pace with substantial housing cost rises, leaving scholarships insufficient to cover living expenses regardless of the government.

A limitation of our study is its reliance on government data, which, while accessible in Spain, may not be available or comparable in other countries, potentially limiting the generalizability of our findings. Future research should explore how economic precarity affects later academic career stages and whether the decline in Ph.D. student numbers correlates with reduced university faculty, potentially impacting the quality of higher education.

Building on previous findings of high Ph.D. abandon rates due to candidates shifting to industry [1, 11, 13], our study may support that inadequate Ph.D. salaries and unaffordable housing make academia an unsustainable career path, rendering public scholarships insufficient to support research in Spain.

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# A Appendix: Additional Data

This appendix provides supplementary information on the economic context for Ph.D. students in Spain. The data presented here offers insights into the recent trends in doctoral completions and the financial constraints that students face, specifically regarding housing affordability and salary sufficiency.

## A.1 Analysis of the defended Ph.D. Thesis

The Table 1 shows a significant decline in the number of successfully defended Ph.D. theses in Spain from 2015 to 2022. After a peak of over 20,000 in 2016, there was a marked decrease in completions, hitting a minimum of 8,483 in 2018. Despite a slight recovery in subsequent years, the numbers remained below earlier levels, reflecting challenges in doctoral retention and completion. This trend may be influenced by financial constraints, as explored in the main document.

**Table 1: Number of Successfully Defended Ph.D. Theses in Spain (2015–2022)**

| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|
| #Thesis | 14,694 | 20,049 | 17,286 | 8,483 | 10,165 | 9,031 | 11,344 | 11,259 |

## A.2 Maximum affordable houses for PIF scholarships

Figure 4 provides insight into the regional variations in housing affordability for PIF scholarship holders. Based on a 30% rental budget allocation, the figure shows that students in Valencia could afford substantially more living space than those in Madrid and Barcelona. This difference is attributed to the lower average rental prices per square meter in Valencia. Over the years, housing affordability in all three cities has decreased, with the maximum affordable space for PIF recipients gradually shrinking, especially in Barcelona and Madrid. This highlights the economic constraints faced by Ph.D. students in high-rent cities, where most universities are concentrated, where limited affordable housing options may impact their quality of life and overall well-being.

A similar graphic for the FPU scholarship is presented in the main text. Given that FPU and PIF salaries were identical or nearly identical from 2013 to 2021, both follow similar patterns in terms of housing affordability. Therefore, we chose to analyse only one (FPU) in the main text, with the PIF data provided here for reference.

## A.3 Salary dedicated to the rent for FPU and PIF scholarships

Figure 5 illustrates the financial pressure placed on Ph.D. students by housing costs. The plot compares the FPU and PIF scholarship holders' rent budgets based on a 30% salary allocation. Up until 2018, both scholarships allowed for only minimal increases in rental spending, despite growing rental costs. From 2020 onward, the FPU salary saw a notable increase, providing a slightly higher budget for rent. However, the PIF scholarship lagged, leaving recipients with a more constrained budget for housing. This disparity underscores the limited flexibility Ph.D. students have in managing housing costs within their salaries.

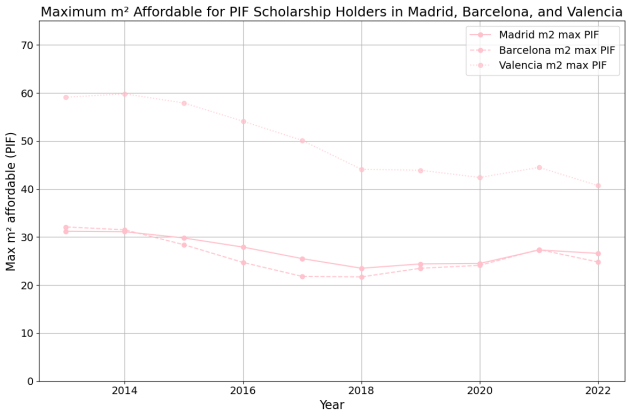


**Figure 4: Maximum affordable living space ($m^2$) per city based on 30% of the PIF salary**

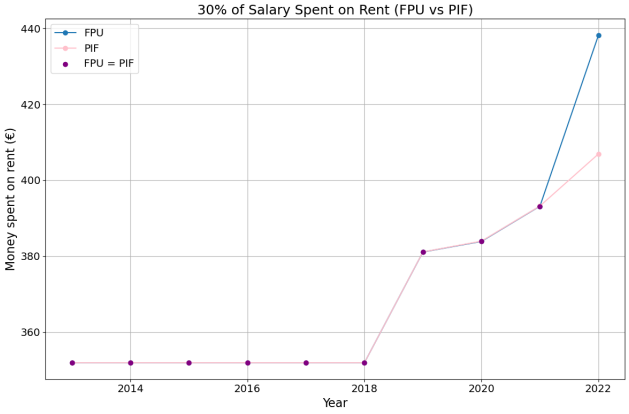


**Figure 5: Amount of salary dedicated to rent according to the 30% rule for FPU and PIF recipients.**

As of the last available data in 2022, the maximum amount that Ph.D. students on scholarships could allocate to rent under the 30% rule was under €440 for FPU and under €410 for PIF recipients. However, a recent search on the Idealista portal (taking into consideration that two years have passed and housing costs have risen further) shows no rental options in Madrid or Barcelona below €450. In Valencia, only two listings fall below this threshold: one at €400 per month for a 24-square-meter apartment, which is barely above the legal minimum, and another at €450 for a 15-square-meter apartment, which is not only unaffordable but also fails to meet legal size requirements.

# Living on a Diet: A Brief Study of the Daily Allowances of Public Workers in Spain

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## Abstract

Academic researchers in Spain are entitled to financial compensation to cover accommodation and meals when attending conferences. The amount of this compensation, known as *per diem* or daily allowance, varies with the destination country and is defined in an official table set by the government in 2002. This study examines the adequacy of these allowances by comparing them to current accommodation and meal costs, defining a score to find countries where researchers can attend conferences without incurring financial loss. Our results show that only 55 countries offer neutral or positive results, highlighting the need to update the official table to suit current cost of living conditions.

## 1 Introduction

When traveling outside their workplace, Spanish public workers (from Ph.D. students to civil servants) are entitled to receiving a monetary compensation for their travel expenses. This compensation is known as *per diem* or daily allowance and covers both accommodation and meals. The daily allowance amounts are officially defined in a royal decree published back in 2002 [1] and change depending on the country of destination, presumably to account for differences in the cost of living. Despite remaining unchanged for more than two decades, no previous research has studied the fairness of the *per diems* mandated by the Spanish government, neither their adequacy compared to current day prices. Looking at these amounts is of particular interest to academic researchers, who are known to work under precarious conditions and have to decide which foreign conferences to attend in order to avoid losing money.

In this paper we try to answer a simple yet so far ignored question: what are the best and worst countries to attend a conference as a researcher in Spain from a monetary point of view? To do so, we define a score per country based on its daily allowance and average price of accommodations and meals. Our findings show that only 55 out of 95 countries are neutral or net positive for researchers, who have to pay out of pocket for the remaining destinations. We also find that the official daily allowance table has miscalculated total amounts for 25 countries, which have remained unchanged for the past 20+ years.

**Artifacts.** For reproducibility and to encourage new research on this topic, we provide the whole dataset and results as Apache Parquet and CSV files at https://zenodo.org/uploads/13923674.


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## 2 Methodology

For this research, we build a thorough dataset comprising the following sources:

**Daily Allowance Table.** We use the Spanish government's official *per diem* table published in Annex III of the Royal Decree 462/2002 [1]. This table shows the maximum amount in euros that a Spanish public worker is allowed to spend per day on accommodation (lodging) and food (meals), which varies depending on the country of destination. Other expenses, such as transportation, are not subject to this table. This amount also varies with the body and scale of the public worker. All personnel are classified in 3 groups according to Annex I of the same document. We focus on prices from the 2nd group since close to all academic staff fall into it. To give some context, the 1st group is for senior officials such as the Prime Minister of Spain and university rectors, and the 3rd group consist of employees without a bachelor's degree.

**Accommodation Prices.** Due to the complexity of the hospitality sector, we could not find a current or public dataset that met our needs. As a compromise, we crawl the popular lodging reservation website Booking.com to get aggregated data on room rates per night [2]. We search for hotels and guesthouses in the capital of each of the countries listed in the previous daily allowance table, filtering out all locations more than 5 km away from the city center. We acknowledge that not all academic events take place in a nation's capital city. However, this serves as a nice compromise to keep the methodology simple for this brief preliminary study. We pick the same travel dates for all searches to consistently compare rates across cities.[1]

**Average Meal Prices.** We use Numbeo's to get the current average meal price in euros at an inexpensive restaurant per country [4]. Numbeo is the largest crowd-sourced, publicly available database of consumer prices, having been cited by several newspapers in the likes of The New York Times, the BBC and The Guardian [3].

### 2.1 Score Calculation

To assess the suitability of a country with regard to traveling to an event as a Spanish public worker, we define a metric called *Profit or Plummet Score* (PPS). The PPS is the daily amount of money in euros that a researcher gets to keep when returning from their trip (profit) or has to pay out of pocket to cover their expenses (plummet). This score is comprised of two parts:

$$\mathrm{PPS} = \mathrm{PPS}_{\mathrm{lodging}} + \mathrm{PPS}_{\mathrm{meals}} \tag{1}$$

[1] We chose Monday, March 10 through Friday, March 14, 2025 because they are far enough away from October 2024 when we did the searches, they span a work week, and they do not overlap with a major holiday.

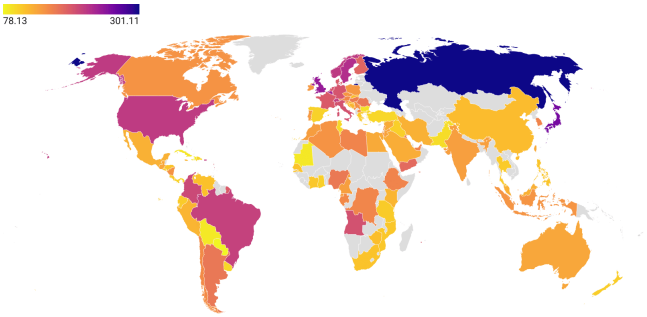


**Figure 1: Map of daily allowances for Spanish public workers.**

The lodging part is calculated as the difference between the maximum daily lodging allowance and the actual average room price. This amount is zero when the accommodation is cheaper than the allowance, and otherwise negative if the researcher has to bear the extra cost:

$$\text{PPS}_{\text{lodging}} = \min(\text{MaxLodging} - \text{AvgLodging}, 0) \tag{2}$$

Public workers always receive the full amount of the meals allowance and may keep any unspent funds. For simplicity, we assume that researchers eat two meals a day disregarding breakfast, which is usually provided by the venue. Therefore, the meals part is calculated as follows:

$$\text{PPS}_{\text{meals}} = \text{MaxMeals} - 2 \cdot \text{AvgMeals} \tag{3}$$

## 3 Dataset Overview

Figure 1 shows a worldwide map of the daily allowances adjured to Spanish public workers. In total, the official table lists 98 countries including Spain, plus an additional entry for diets that applies to the rest of the world. The average total diet is 142€, with Malta and Paraguay having the lowest amount at 78€, and Russia having the highest at 301€, followed by Japan at 256€. Spain sits slightly above the average at 103€ per day.

Given this table was elaborated in 2002 and has not been updated since, it still lists the Federal Republic of Yugoslavia, which broke up into Serbia and Montenegro in 2003. To account for this when dealing with current world borders, we use Yugoslavia's *per diems* for the former countries, and the unlisted North Macedonia and Slovenia. Also of interest is that the official total daily amount is miscalculated for 25 countries because the lodging and meals amounts do not add up to it, differing by exactly one cent. We suspect that this is due to a rounding error in the spreadsheet used by the Spanish government to produce the table, although we have no official confirmation.

**Excluded Countries.** While Numbeo has meal prices for all countries listed in the daily allowance table, Booking.com does not have data for Cuba, Iran, Libya, Russia, Syria and Yemen. Thus, we exclude the former countries from our analysis.

**Table 1: Most and least suitable countries to go to an event as a Spanish public worker. All amounts in euros (€) per day.**

| # | Country | Lodging | Meals | Score |
|---|---|---|---|---|
| 1 | Japan | -2.75 | 84.50 | 81.75 |
| 2 | Colombia | 0.00 | 69.47 | 69.47 |
| 3 | Brazil | 0.00 | 69.31 | 69.31 |
| 4 | Norway | 0.00 | 44.66 | 44.66 |
| 5 | Nicaragua | -2.74 | 45.57 | 42.83 |
| 6 | Nigeria | 0.00 | 42.70 | 42.70 |
| 7 | Ivory Coast | 0.00 | 42.42 | 42.42 |
| 8 | Belgium | -6.49 | 46.94 | 40.45 |
| 9 | Sweden | -12.54 | 52.29 | 39.75 |
| 10 | Cameroon | 0.00 | 39.54 | 39.54 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 86 | Australia | -81.91 | 20.03 | -61.88 |
| 87 | Andorra | -75.13 | 10.86 | -64.27 |
| 88 | Israel | -90.93 | 20.70 | -70.23 |
| 89 | South Africa | -108.11 | 32.38 | -75.73 |
| 90 | New Zealand | -100.37 | 12.23 | -88.14 |
| 91 | Ireland | -100.33 | 12.08 | -88.25 |
| 92 | Spain | -106.81 | 11.40 | -95.41 |
| 93 | Malta | -103.06 | 1.85 | -101.21 |
| 94 | Jamaica | -166.43 | 32.42 | -134.01 |
| 95 | United States of America | -222.95 | 33.30 | -189.65 |

## 4 Results

Table 1 shows the top countries with the highest and lowest PPS values (see Section 2.1). That is, the most and least suitable countries for Spanish public workers to attend a research conference or similar event in 2025 based on their daily allowance.

The best country for attending a conference is Japan, with a monetary gain of almost 82€ per day, followed by Colombia and Brazil. At the other end of the scale, the US is the worst performer, with a daily loss for the researcher of 190€. Interestingly, Spain is the 4th worst country to travel as a Spanish public worker, having a loss of 95€ per day. To put these numbers into perspective, researchers attending a 5-day event save 405€ when traveling to Japan, and lose 477€ and 948€ when traveling to Spain and the US, respectively. Looking at the PPS distribution, merely 55 countries (57%) have a neutral or positive value, meaning that visiting any of the remaining countries incurs in a loss for the public worker.

The $\text{PPS}_{\text{meals}}$ is always positive, thus we consider the meals allowance to be adequate for all countries in the table. However, its lodging counterpart is negative for 68% of countries and has an average value of -33€. As such, we conclude the accommodation *per diems* are not suitable for current market prices.

## 5 Discussion

Daily allowances for academic staff working in Spain are not commensurate with current prices, either nationally (for domestic venues) or globally. As shown in Section 4, this is particularly pronounced in the case of allowable accommodation costs. We argue that the main reason for the inadequacy of the official *per diem*

table is that it has not been updated for more than two decades. Therefore, it does not take account of inflation and other price index changes since then. We believe that these rates need to be updated to reflect current prices. Since the biggest difference is in lodging, we suggest using the accommodation prices from our dataset as a reference or starting point for setting new allowances, or obtaining more up-to-date values based on our methodology.

## 6 Conclusion

This paper presents the first study on the daily allowances granted to public workers in Spain. Specifically, we compare the official *per diem* amounts with the most recent average prices of accommodation and meals per country at the time of writing. Our study finds that the official list includes only 55 countries where researchers can attend a conference without incurring a personal financial loss. This is influenced by the high disparity between the current room rates and the outdated lodging allowances set in 2002, which should be updated to reflect the cost of living. Also in this list, we identify miscalculations for the totals of 25 countries. These errors have persisted for over two decades, suggesting that they have gone unnoticed or intentionally unaddressed by the Spanish government.

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# Preliminary results of the survey on the predoctoral researchers of the "Federación de Jóvenes Investigadores FJI-PRECARIOS" (Federation of Young Researchers FJI-PRECARIOS)

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## Abstract

Research careers in Spain have traditionally been characterized by precarious working conditions (low salaries, lack of stability, etc.). Numerous researcher associations and unions have denounced this situation and have promoted measures to reverse this situation. To document this setting, the Federation of Young Researchers (FJI-Precarios) has compiled information on the employment situation of people engaged in predoctoral research in public and private universities and public or private centers in Spain. This report discusses preliminary results of the data obtained in this survey.

## 1 Introduction

The precarious conditions faced by PhD students and young researchers in Spain have with significant impacts on their mental health and job prospects. Between 50-60% of doctoral researchers may experience psychological problems, with factors like gender, program duration, and work-life interference contributing to poor mental health outcomes [1], making PhD students more vulnerable to psychological disorders compared to the general population [5]. Young researchers often face job insecurity, low incomes, and high-stress levels, potentially compromising the future of research [3]. The Spanish labour market has seen increased employment precarization, affecting both temporary and permanent workers, with a strong association between precarious employment and poor mental health [2]. Austerity policies and labor reforms have intensified this trend, leading to a normalization of precarity in academia and beyond, with limited alternatives available for highly educated individuals [4]. These findings underscore the urgent need for measures to address mental health issues and improve working conditions for early-career researchers in Spain. The Federation of Young Predoctoral Researchers (FJI/Precarios) has launched a survey of the predoctoral collective to obtain updated data on working relationships and functions, concerns and what action they are taking to curb precariousness.

## 2 Methodology

A survey was designed and structured in four blocks: personal situation at the university; development of the predoctoral stage; teaching; and impact of research activity on daily life. It was answered online and the estimated time is 20-30 minutes. Questions are presented in different formats: single-answer, short-answer, multiple choice and rating panels. A sample of 1499 predoctoral researchers enrolled in a Spanish University was reached with a non-probabilistic convenience sample by social media dissemination since there is no official data on the universe to make a representative survey. Confirmation that they were predoctoral researchers was made with the question "When do you plan to read the doctoral thesis?". The fieldwork was developed between October and December 2023. The sample was collected by distributing the survey link through the FJI social networks (Twitter and Facebook). The data analysis was performed using R and involved descriptive statistics.

The objective was to pay special attention to issues such as working conditions (type of contracts and grants, availability of resources, financing of work), teaching activities, and repercussions of research activity on health, family life and leisure.

## 3 Results

The PhD candidates surveyed had a mean age of 29.1 years (Mdn = 28, SD = 5.47; min = 22; max = 64), with 2.5% aged between 46-64. Women made up 58.3% of the sample (n = 874). In terms


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https://pias.cc/2024/proceedings/predoctoral-survey

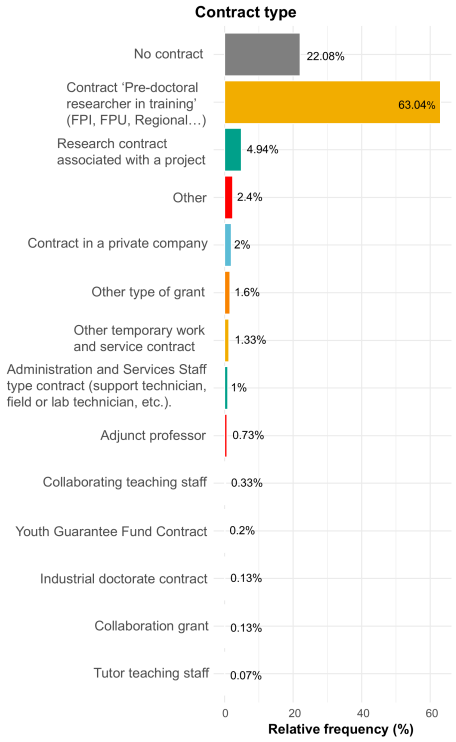


**Figure 1: Type of contract reported by the PhD candidates**

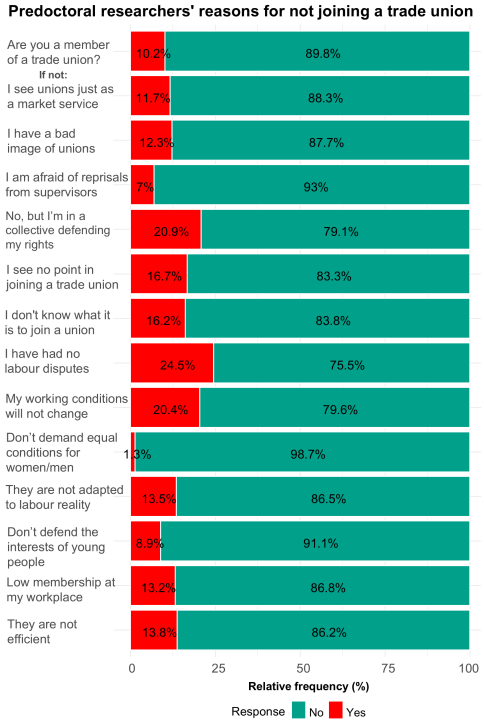


**Figure 2: Reasons to not be affiliated to a union**

of residence, 22% were from Catalonia, 14.3% from Madrid, 11.7% from Andalusia, 11% from Valencia, and the remainder from other regions, each below 7%. For field of study, 36.2% were in Life and Health Sciences, 21.2% in Exact and Natural Sciences, 30.5% in Social and Legal Sciences, 6.7% in Engineering and Architecture, and 5.3% in other fields. Regarding parents’ education, 36.9% of fathers and 39.4% of mothers had university degrees, while 14.1% of fathers and 12.2% of mothers had only primary education. Finally, 73.4% attended public schools, 17.6% attended charter schools, and 9% attended private schools.

## 3.1 Type of Contract

Figure 1 shows the different contracts that the PhD students reported having. A total of 77.9% of respondents hold a predoctoral contract, with 66.9% working at public universities and 26.5% at research centers. Other institutions (private companies, private universities, third sector, or self-employed) were selected less frequently. Predoctoral contracts are most common in Life and Health Sciences, Exact and Natural Sciences, and Social and Legal Sciences. The latter has the highest percentage of predoctoral researchers without a contract. The most common type of contract is the ’predoctoral researcher in training’ contract. Nearly all respondents (96.8%) work on their thesis full-time, with only 3.2% part-time. Predoctoral contracts are the main funding source for 69.5%, followed by training or professional collaboration grants, private employment, and other options.

## 3.2 Union Membership

Figure 2 shows the reasons not to be affiliated to a union. Only 10.2% of the sample reported being union members, while 18.7% indicated they were part of a research organisation or collective. Most respondents did not express negative attitudes toward unions; in open-ended responses, they cited lack of time, uncertainty about how to participate, unfamiliarity with unions representing their rights, or simply not considering that option. Some also mentioned challenges related to joining a union without a predoctoral contract.

## 3.3 Knowledge and Perceptions of Working Conditions

A 59.6% majority reported not knowing about the “**Estatuto del Personal Investigador en Formación**” (EPIF), while 40.4% were familiar with it (35.7% with a predoctoral contract and 4.7% without one). Of those aware of the EPIF, 51.8% felt it was properly applied, 25.9% were unsure, and 22.3% believed it was misapplied. Regarding their workplace’s collective agreement, 64.2% were unfamiliar; 27.4% had limited knowledge, 6.8% knew it well, and 1.5% knew it thoroughly. On salary adequacy, 32.5% found their earnings insufficient for basic expenses, with only 7.5% able to save. Additionally, 56.8% had received at least occasional financial support from family, with 18.5% receiving it regularly.

Figure 3 shows the distribution of responses of hours spent on research per week per contract versus hours actually spent. Research contracts stipulate an average workload of 36.9 hours per


**Figure 3: Hours spent working in research per week (per contract vs. actually employed**

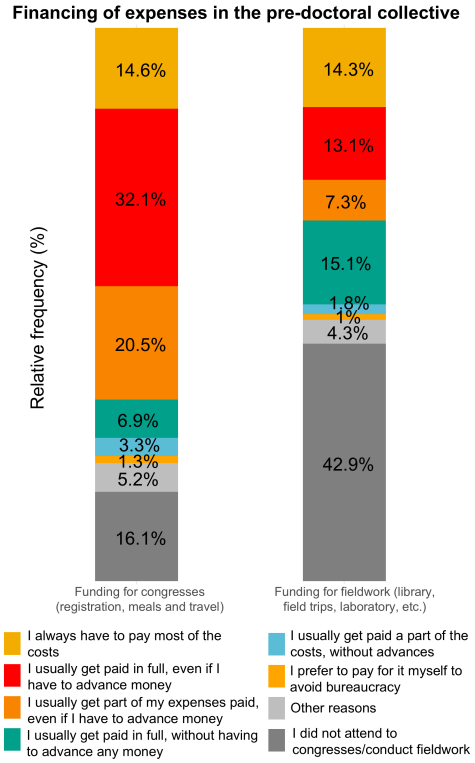


**Figure 4: Financing of expenses in the predoctoral researchers - attendance at conferences and field work**

week (Mdn = 37, SD = 5.14; range = 0–60). However, the actual average weekly hours worked is 44.6 (Mdn = 45, SD = 10.04; range = 7–95).

45.2% reported working weekends, while 32.8% did not. Unrecognized teaching was performed by 29.3%, with women twice as likely as men to undertake it. Overall, 62.2% were asked to teach without recognition at least once, with 7.9% experiencing frequent requests. Women received these requests more often than men (37.3% vs. 24.9%).

## 3.4 Economic Costs Incurred

83.9% of predoctoral researchers surveyed reported attending conferences. Of these, 1.5% prefer to cover costs themselves to avoid bureaucratic processes, but 84% reported needing to advance conference expenses, with only 8.3% able to avoid upfront payments (see Figure 4). Fieldwork was required for 57.1% of respondents, with 64.2% needing to advance some expenses (whether reimbursed or not), while 26.5% did not need to advance funds (see Figure 5). Additionally, 38.9% completed research stays. Among these, 44.1% received travel funding, while 55.9% did not. For accommodation, 74.6% received no support, and only 25% had housing expenses partially covered. A total of 5.5% reported no funding for any costs related to research stays (see Figure 5).

## 3.5 Occupational Health

Figure 6 shows the percentages of respondents that have attended psychological care service for work-related reasons and the type of service that they used. 36.5% of respondents reported seeking psychological support for work-related issues, with women more

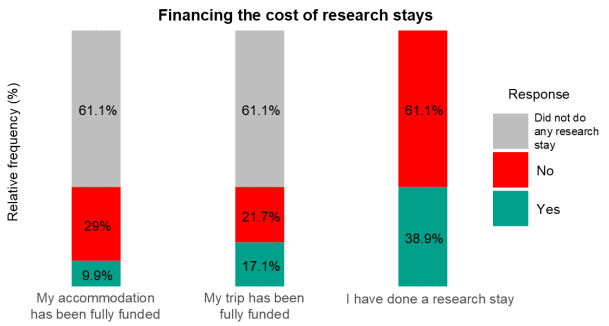


**Figure 5: Financing of expenses in the predoctoral researchers - research stays**

likely to use private services. Additionally, 94.7% stated that research work had affected their health to some degree, with 38.8% reporting a "significant" impact (see Figure 7). In terms of work-life balance, 36.4% found research work fairly compatible, 32% somewhat compatible, 9.4% very compatible, and 22.2% reported low to no compatibility (see Figure 8).

## 4 Conclusion

The preliminary results of the survey reveals a high prevalence of precarious conditions among PhD candidates in Spain with substantial impacts on both occupation health and quality of life. A

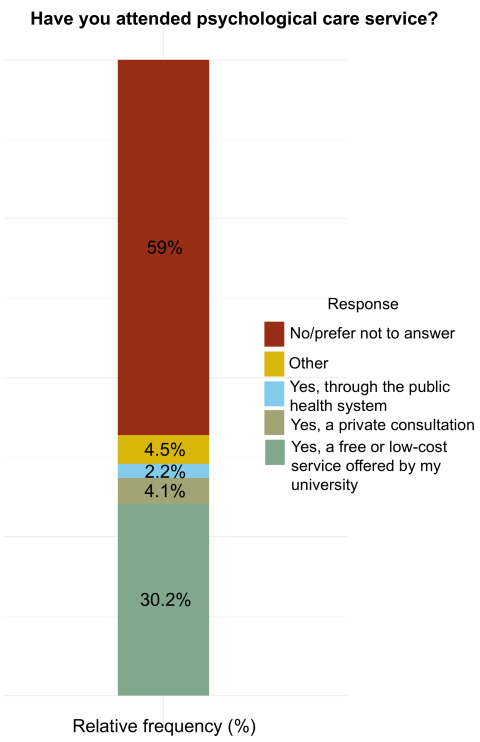


**Figure 6: Relative frequencies of attendance at a psychological care service for work-related reasons.**

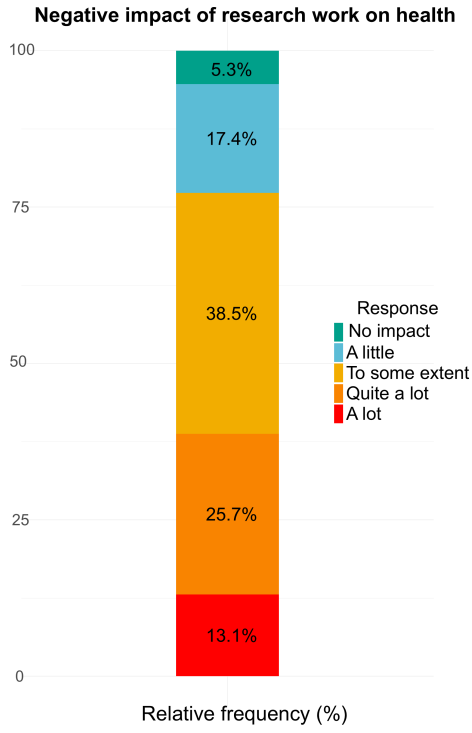


**Figure 7: Relative frequencies of negative impact of research work on health**

vast majority of respondents face issues like inadequate pay, often requiring financial support from family, the need to advance work-related expenses—many of which are not fully reimbursed—, and excessive workloads that frequently exceed contractual hours, averaging nearly 45 hours weekly despite a standard of 37 hours per week. Awareness of labor protections is limited; many respondents are unaware of both the EPIF statute and their institutions' collective agreements, underscoring an information gap in labor rights education for early-career researchers. Union membership remains low, partially due to time constraints and limited understanding of unions' relevance to researchers' challenges, but especially due to the difficulty of joining a union without an employment contract (e.g., conducting a thesis without funding). However, it is notable that nearly 20% expressed interest in participating in non-union collectives that advocate for their labor rights. A significant number of researchers report negative health outcomes linked to job stress, with nearly all respondents indicating some degree of impact on their occupational health, and over a third experiencing serious effects. Gender disparities are also notable: women face higher demands for unrecognized teaching duties and psychological support, highlighting a need for gender-sensitive policies in academia. Nearly 40% of respondents highlight academic schedule flexibility as beneficial for balancing work with personal life, while 60% find it problematic. This underscores the need to establish clear boundaries for working hours to achieve a balance that accommodates flexible scheduling while preventing overwork. Overall, these findings underscore the urgent need for systemic reforms to address working conditions, financial stability, and mental health support for early-career researchers in Spain, as well as improved communication of labor protections and increased institutional support.

## 4.1 Future Work

Further data analysis of this survey is essential to statistically assess whether significant differences exist across various demographic factors, such as research areas, as funding levels vary significantly among fields. Given the non-probabilistic convenience sample method, it would be valuable to administer this questionnaire to individuals pursuing their thesis without a predoctoral contract, as they have less protection compared to those with research-related contracts. It would also be valuable to analyze and compare these variables with the data collected from the postdoctoral collective—a group with even less regulatory protection than predoctoral researchers—to better understand career trajectories and assess levels of precariousness across research stages.

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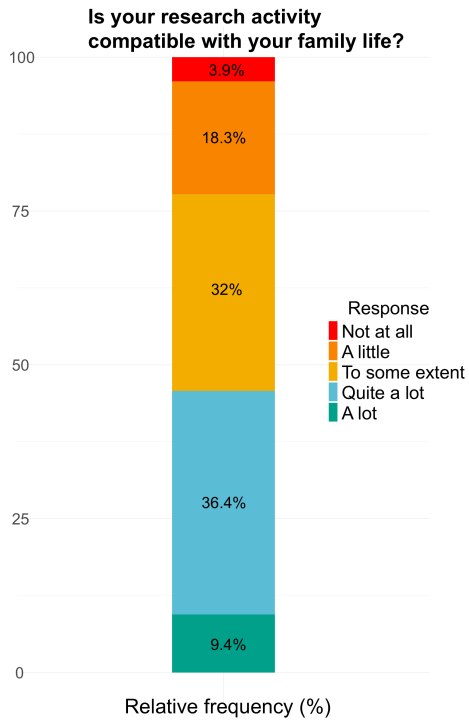


**Figure 8: Relative frequencies of work-life balance**

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# The Glass Ceiling Academy: Where Women Can Look, But Not Touch

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## Abstract

This review paper explores persistent gender inequality in academia, with a focus on STEM fields, where women encounter systematic barriers hindering their career advancement. By synthesizing findings from existing literature and data, we analyze key factors such as citation bias, peer review challenges, the *leaky pipeline* phenomenon, and the impact of motherhood on career trajectories. The reviewed studies highlight that, despite increased participation by women in the early stages of academia, they remain significantly underrepresented in senior roles, primarily due to biases in evaluation, funding allocation, and institutional support. These results underscore the urgent need for policy and cultural shifts to support women's equal participation in academic and scientific careers.

## 1 Introduction

Gender inequality is often dismissed or even *"joked about"* as a relic of the past, as if society has completely moved beyond it. However, significant barriers for women persist today in nearly every domain, limiting their opportunities for advancement and recognition. Historically, women were denied access to education, professional opportunities, and basic political rights—such as the right to vote, granted in Spain only in 1931 [20]. It was not until the early 20th century that women could access higher education and enroll in universities, with pioneers like Concepción Arenal leading the way. Despite these advances, systemic barriers remain pervasive in academia, including underrepresentation, unequal access to resources, and limited recognition for women's contributions [26]. Issues like the *Matilda Effect* and the *leaky pipeline* continue to hinder women's progress and advancement in academic and scientific fields [16], underscoring that gender inequality is far from resolved.

Education is a striking example of gender inequality, especially when examining the clear contrast in women's representation at different teaching levels. In Spain, women constitute over 72% of the workforce in lower-level educational institutions, but this drops significantly to about 43% at universities [9]. This disparity suggests that women are more frequently funneled into roles traditionally associated with caregiving, such as early childhood education (97% of women in *Educación Infantil*) and primary education (82%). Similarly, women are overrepresented in special-needs education (81%), yet underrepresented in higher-level positions, with only 37% of women securing an Associate Professor position or higher at public universities [9]. This highlights how deeply entrenched gendered expectations and societal roles still influence women's career paths.

These challenges extend into research and science, with systematic exclusion persisting well into the 20th century. Historically, female scientists were rarely recognized, and many were forced to conduct research through unofficial channels or attribute their work to male colleagues. This phenomenon is known as the *Matilda Effect*, named after Matilda Joselyn Gage, the first woman to raise awareness about the systematic ignorance of female contributions in science throughout history [16].

This has left female scientific talent forgotten, unable to become role models for future generations who have been let to think that science is a man's matter, evidently through the fact that the presence of female scientists in school textbooks is around 7% [18]. Such statistics perpetuate stereotypes and explain why only 36% of students in STEM (Science, Technology, Engineering, Mathematics) majors are women [6]. Another well-known phenomenon is the *leaky pipeline* [5], which refers to the progressive reduction of women's participation in academia and research, often due to a lack of institutional support, family-related pressures, and implicit biases in hiring and promotion processes (see Fig. 1).

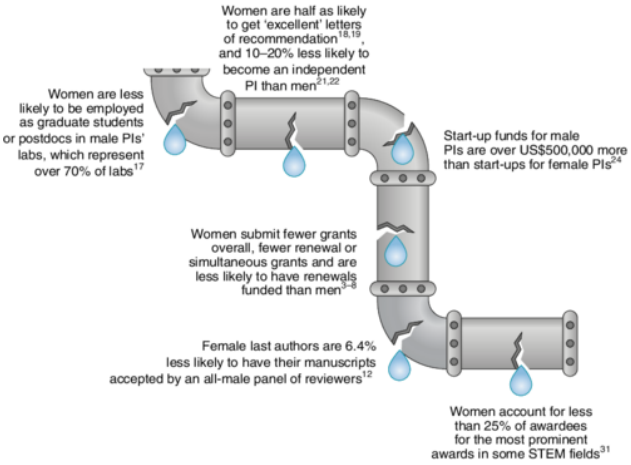


**Figure 1: The STEM *leaky pipeline* [13].**

This study aims to provide a comprehensive analysis of gender disparities in academia, focusing on the systemic barriers that hinder women's progress, particularly in STEM fields. While the review addresses the global challenges of gender inequality, recognizing


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it as a pervasive issue across academic systems worldwide, it also incorporates select examples from the Spanish academic context to illustrate specific phenomena. By emphasizing the global scope while including these Spanish cases, we aim to provide a comprehensive understanding of the universal nature of these barriers, complemented by insights into regional contexts. This approach enables us to draw general conclusions while offering nuanced perspectives on how cultural and institutional factors can influence gender disparities in specific settings.

## 2 Methodology

This study analyzes gender inequality in academia through a literature review, focusing on sources that address systemic barriers affecting women's progression in academic careers. We surveyed major databases like Web of Science, Scopus, and Google Scholar to collect recent, peer-reviewed studies.

Inclusion criteria required studies to focus on publishing, citation practices, research funding, and gender representation within STEM fields [9, 21]. Studies were prioritized based on whether they provided empirical data, robust statistical analyses, or theoretical insights with practical implications. Exclusion criteria involved studies lacking peer review, those based on anecdotal evidence, or with limited generalizability due to small sample sizes or methodological flaws.

To enhance validity, we included studies with realistic and representative experimental designs [8], defined as those that accurately reflect the population and contextual dynamics under investigation. These designs typically employed large, diverse samples, longitudinal data, or field experiments that account for institutional and cultural variability. This approach ensures a broad yet reliable overview of persistent structural inequalities in academia, enriching the analysis of factors influencing gender disparities.

## 3 Results and discussion

### 3.1 Climbing the Academic Ladder

Despite progress, a significant gender gap persists in academia, with men still more likely to achieve tenure than women [24]. Key indicators of academic success—such as publishing, funding, and promotion—shape career advancement, yet women remain underrepresented in each area. For instance, women comprise only 37% of authors, 28% of reviewers, and 26% of editors, highlighting their limited presence in influential academic roles [15].

Research shows that articles authored by men not only receive more citations but are often perceived as higher quality, particularly in male-dominated fields, creating a citation bias that bolsters men's reputations as experts [3, 17, 19, 25]. This disparity in citations undermines women's professional visibility and impacts their career advancement in areas where citations are crucial, such as hiring and tenure evaluations.

Gender bias extends into peer review and publishing, where women, particularly in fields like neuroscience [10] and communication science [23], receive harsher critiques and lower evaluations, reducing their opportunities for publication in high-impact journals. Similar biases in medicine show a preference for male-authored work, further entrenching male advantage in high-profile publications [4].

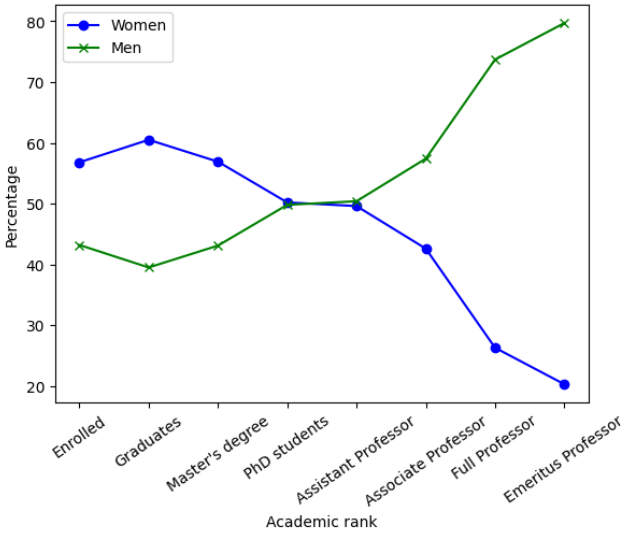


**Figure 2: The *leaky pipeline* effect at Spanish universities (2021-2022) [21].**

Funding inequalities compound these challenges, as early-stage research grants frequently go to male researchers. For example, the *League of European Research Universities* and the EU project *GRANteD* both indicate that female applicants experience more scrutiny and rejection, with a 75% initial rejection rate despite often stronger performance in later funding stages [12, 14]. Male-dominated review panels have also been shown to score female applicants lower, perpetuating underrepresentation in major research funding.

In Spain, career progression in academia involves completing six-year research periods, or *sexenios*, to meet benchmarks in productivity and impact. For accreditation, the maximum score that can be achieved for Assistant Professors and Full Professors is two and four years, respectively [2]. Data from the University of Granada shows that 611 women hold more than one *sexenio* compared to 1,087 men [8], a gap reflecting additional barriers faced by women, particularly those with children. These findings underscore the dual challenges of career advancement and balancing motherhood, which disproportionately impact women's academic trajectories.

### 3.2 The *Leaky Pipeline* in Academia

The *leaky pipeline* metaphor captures the progressive attrition of women as they advance through academic stages, illustrating how gender disparities deepen along the academic career path [5]. Although women often enter academic programs in equal or even higher numbers than men, particularly at the undergraduate and doctoral levels, their representation sharply declines in senior positions [7]. As they progress toward roles such as associate professor, full professor, and leadership, the proportion of women decreases significantly, while the proportion of men increases, producing a widening gender gap that resembles the shape of scissors, as shown in Fig. 2.

This dropout is due to a combination of structural, social, and institutional barriers, including limited access to research funding, biases in hiring and promotion processes, and the demands of work-life balance, which disproportionately impact women, particularly those with family responsibilities. The *scissors* effect reflects a systemic issue in academia where each level of progression sees more women *leak out* of the academic pipeline, leading to a substantial gender imbalance in leadership and tenured roles [22].

### 3.3 Causes of dropout

The data reveal a complex interplay of factors driving high dropout rates among women in academia, including a shortage of female role models, family planning pressures, and persistent gender biases. One significant factor is the "dream gap"—the divergence between young girls' early ambitions and the societal expectations that often discourage them from pursuing paths in STEM or academia. This gap is amplified by the lack of visible female role models in senior academic roles, limiting students' sense of belonging and making it harder for young women to envision successful careers in these fields [1]. As a result, female students and early-career researchers may feel out of place or unsupported, which reinforces a cycle where they are more likely to leave academia prematurely.

Family planning and societal expectations create additional challenges. Studies show that female postdocs with children are nearly twice as likely as their male counterparts to leave research careers, with many women in demanding fields like physics and biology having fewer children than their male colleagues—and often fewer than they desire [11]. For many, motherhood entails career interruptions or reduced hours, which hinder progress toward promotion and tenure.

The dropout rates are also influenced by persistent gender inequalities in financial compensation and career progression, especially at senior levels. In 2006, for instance, female scientists in the EU public sector earned 25–40% less than men, with a similar 40% gap seen in US physics and astronomy [7]. Although the pay gap has narrowed somewhat for younger scientists, structural inequalities mean that senior-level disparities persist, with full professors in the US experiencing an 8% pay gap. This is partly due to women's higher representation in non-tenure-track or lower-status roles, which come with lower salaries and fewer resources, making it harder for women to build the financial and institutional support needed to sustain long-term academic careers.

## 4 Conclusion

Gender inequality in academia remains a pervasive and global challenge, undermining the full participation of women, particularly in STEM fields. Despite increased representation at the early stages of academic careers, systemic barriers—such as biases in citation practices, publication processes, research funding allocation, and leadership visibility—continue to impede women's progression to senior positions. These obstacles not only hinder individual careers but also deprive the academic community of diverse perspectives and innovation.

Addressing these disparities requires a multifaceted and sustained effort at institutional, national, and global levels. Equitable evaluation processes, transparency in hiring and promotion criteria, and robust structural support for work-life balance are foundational steps. Mentorship programs and targeted initiatives to retain female talent, particularly during critical career transitions, are crucial to bridging the gaps along the academic pipeline. Furthermore, amplifying the visibility of female role models through awards, public recognition, and curriculum reform can inspire future generations and challenge persistent stereotypes.

Beyond these foundational steps, institutions must actively combat biases by embedding equity into their cultures. Practical strategies include unconscious bias training for decision-makers, developing family-friendly policies such as flexible working arrangements and on-site childcare, and creating clear pathways for career advancement that acknowledge diverse experiences and trajectories.

Equally important is ensuring that women researchers can embrace motherhood, including multiple pregnancies, without jeopardizing their productivity or career opportunities. Policies such as extended parental leave for both parents, funding extensions for researchers with caregiving responsibilities, and flexible tenure-clock policies are critical in mitigating the career disruptions often associated with parenthood. By normalizing and supporting these life choices, academia can create an environment where women no longer face a trade-off between family and career, fostering a more inclusive and sustainable academic community.

While this review highlights global trends, it also draws on specific examples from the Spanish academic context to illustrate these challenges and underscore the need for localized solutions. Recognizing the universality of these issues, coupled with region-specific insights, offers a nuanced understanding of how cultural and institutional factors shape gender inequality in academia.

Ultimately, achieving gender equity in academia is not only a matter of justice but also a necessity for fostering an innovative, inclusive, and thriving academic environment. By implementing comprehensive strategies and fostering systemic change, institutions can help close the gender gap and ensure that academia benefits from the full range of talent and perspectives available.

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# The Fading Path to Academia: A Data-Driven Analysis of Gender Disparities in Spanish Universities

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## Abstract

Gender parity in academia remains a pressing global challenge, with notable disparities as women advance through the academic ladder. This paper presents the first study on gender parity in Spanish public universities broken down by institution, analyzing the most recent official data to measure the representation of women at key career stages: graduates, doctorates, temporary workers and civil servants. Our findings show that women's representation falls by an average of 22% in higher positions, with severe imbalances in engineering-focused institutions, highlighting the need for reforms and improved data transparency to promote gender equity.

## 1 Introduction

Gender equality is a pending challenge of our time, promoted in Goal 5 of the 2030 Agenda for Sustainable Development [9]. When it comes to academia, reports from the United Nations Educational, Scientific and Cultural Organization (UNESCO) find that the proportion of women decreases as they move up the ranks. Yet, women outnumber men at 52% in terms of undergraduate students worldwide [1, 2].

Despite the growing importance of this issue, comprehensive analysis focusing at the country or institutional level remains scarce. Previous reports by the Spanish Ministry of Science have focused on measuring gender parity in national institutions and characterizing the impact of state policies [3]. While this series has examined the presence of women researchers in higher education, no further analysis is made at the institutional level.

To fill this knowledge gap, we present the first study on gender parity in Spanish public universities, broken down by institution. Specifically, we sought to answer the question of how the representation of women evolves across key stages of the academic career, depending on the institution. We find that women are systematically less represented in higher academic positions across all observations, whilst on average they make up the majority of bachelor graduates. Moreover, we also find the institutions with the most severe gender disparities are predominantly those specializing in engineering.

## 2 Methodology

We use the official historical data provided by the Spanish Ministry of Universities, which offers several aggregated datasets covering both public and private Spanish universities. We focus on the academic year 2020/2021, as this is the most recent data available for the series. We exclude private universities because, unlike public universities, they do not have permanent positions for civil servants. Specifically, we employ the following datasets:

**Graduates by gender and university.** Students who graduated with a bachelor's degree from a Spanish university, stratified by year, gender and university [4].

**Doctorates by gender and university.** Same information as the previous dataset, but for students who graduated with a doctoral degree instead [5].

**Research personnel.** Researchers working at Spanish universities in 2020/2021, stratified by type of personnel, gender and university [6]. Due to the limitations of publicly available data, we focus exclusively on researchers without a permanent position and civil servants.

### 2.1 Data Processing

All the datasets we use are provided by the Spanish Ministry of Science and contain aggregated data on the different variables we study. The data collection, processing methodology and indicator definitions are publicly available on the website of this entity [8].

Of the various data formats in which these datasets are offered, we use the spreadsheet files (in XLSX format) because they contain rich tabular information that is missing in the other formats.

### 2.2 Dataset Overview

Ultimately, we end up with four sequential key academic career stages: (*i*) graduates, (*ii*) doctorates, (*iii*) temporary workers, and (*iv*) civil servants. We acknowledge that PhD students generally fall into the temporary workers stage. However, we place this stage chronologically after doctorates because it is predominantly composed of postdoctoral researchers and due to the lack of more granular data. The final dataset is comprised of 48 Spanish public universities, with no missing values for any of the stages. We consider this to be the most complete dataset on gender parity in Spanish academia to date, as only 2 of the country's 50 public universities are absent[1] and no more recent official numbers are available [7].

## 3 Results

Figure 1 shows the ratio of women at each of the four major career stages in the 2020/2021 academic year, grouped by university. Looking at the average of all Spanish public universities, we see

[1] Namely Universidad Internacional Menéndez Pelayo (UIMP) and Universidad Internacional de Andalucía (UNIA).


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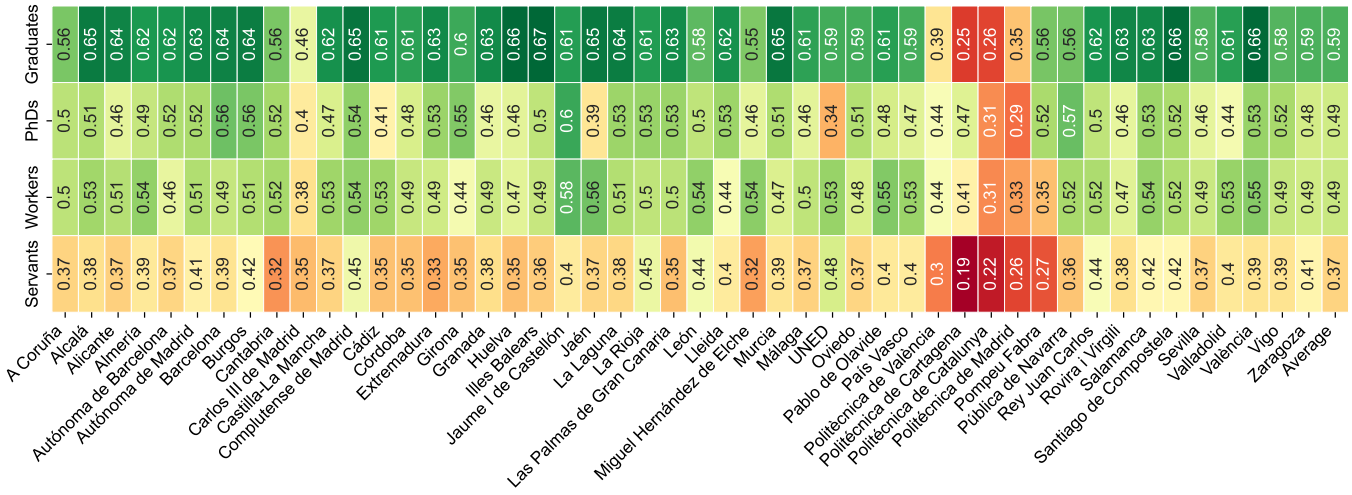


**Figure 1: Ratio of women by career stage in Spanish public universities, stratified by institution.**

that women make up the majority of graduates, accounting for 59%. Yet, for all the universities studied, there are systematically fewer women at public worker and civil servant positions, dropping to 49% and 37%, respectively.

The institution with the highest gender parity ratio is Universidad Nacional de Educación a Distancia (UNED) at a respectable 48%, followed by Universidad de La Rioja (UR) and Universidad Complutense de Madrid (UCM), both at 45%. On the other end of the spectrum, Universidad Politécnica de Cartagena (UPCT) has the worst ratio at 19%, followed by Universitat Politècnica de Catalunya (UPC), Universidad Politécnica de Madrid (UPM), Universitat Pompeu Fabra (UPF) and Universitat Politècnica de València (UPV), ranging between 20% and 30%. With the exception of UPF, all of the latter institutions exclusively offer engineering studies.[2]

Given that all of the former universities have declining gender parity across career stages, we now focus on finding those with the steepest drops. That is, which universities have the highest difference in the ratio of women between graduates and civil servants. Universidad de Huelva (UHU) has the highest decline at -31%, closely followed by Universitat de les Illes Balears (UIB) and Universidad de Extremadura (UEx) at -30%. While these drops may look like outliers, we find that Spanish universities have, on average, 22% fewer women in higher academic positions than in early career stages.

## 4 Discussion

The fading representation of women in higher academic positions suggests enduring structural barriers within Spanish public universities. We find it concerning that the sharp drops in gender parity from graduates to civil servants are not isolated cases, but affect all the institutions studied. Institutes of Technology (where science, technology, and engineering are the only programs offered), show an even greater gap. This broader gender imbalance may be related to the choice of academic discipline, as evidence from UNESCO indicates that women are underrepresented in science, technology, engineering and mathematics (STEM) [1].

Based on our findings, we suggest that initiatives to achieve gender equity in STEM go beyond undergraduate education and extend to the whole academic career. This would require institutional reforms and support instruments designed to retain and incentivize women in these fields. Regardless, the first step towards tackling gender disparities in academia is for institutions (both universities and the State) to publish current and accessible data.

## 5 Conclusion

We have presented the first study on gender parity in Spanish public universities. Using the most recent publicly available data, we provide empirical evidence showing that women are less represented than men in higher academic positions across all institutions studied. This is especially worrisome as women make up the majority of bachelor's graduates.

### 5.1 Future Work

During our research, we find evidence that Institutes of Technology in Spain have the worst gender parity compared to their peer universities. Therefore, we suggest taking a closer look at the prevalence of women across fields (e.g., engineering, education, health) rather than per institution to assess the cause of this phenomenon.

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[2]We note that *Universidad Politécnica* translates to *Institute of Technology* in English.

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# Beyond Graduation: The Struggle for Women in Academic Leadership Roles

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## Abstract

This paper investigates the persistent gender disparities in academic career development in Spain, drawing on data from the National Statistics Institute (INE) to highlight the challenges faced by women in higher education. Despite an increasing number of women completing their degrees, the threshold for achieving high academic positions, such as full professorships, continues to widen, indicating systemic barriers that hinder women's professional growth. Through a probabilistic analysis, we demonstrate that even when considering caregiving responsibilities and academic success as independent events, women face a significantly lower likelihood of attaining prestigious roles in academia. However, these factors are not truly independent, as they are intertwined with various social and institutional biases. By exploring these complexities, this study aims to contribute to a deeper understanding of the structural inequalities present in academia and calls for a concerted effort to address and dismantle these barriers, ultimately fostering a more equitable academic environment for all.

## 1 Introduction

Over the past few decades, discussions about gender equality have gained a lot of attention, especially in the academic world. In Spain, while women have made impressive strides in education and are earning degrees at rates similar to men [4], they still face significant challenges when it comes to advancing in academia [3]. Despite being well-represented in classrooms and degree programs, women are often missing from top positions, like full professors or department heads.

The National Statistics Institute (INE) has been collecting and revealing overwhelming data on this issue. Since the majority of people graduating from higher education are women [4], as one moves up in the academy, the number of women decreases [3]. These events can be shown in Figure 1, where the number of female graduates is over the 50% from 2014 to 2020. On the other hand, Figure 2 shows the evolution of the percentage of women in academia, depending on the position they hold.

This alarming situation is also revealed by the INE in a data collection performed in 2022 [2]. It is shown that the percentage of women researchers in higher education is less than 45%. However, the most concerning situation from these data is definitely the percentage of women in research in private companies, which is less than 33% [2]. Therefore, this structural problem is applicable to other professional fields [2].

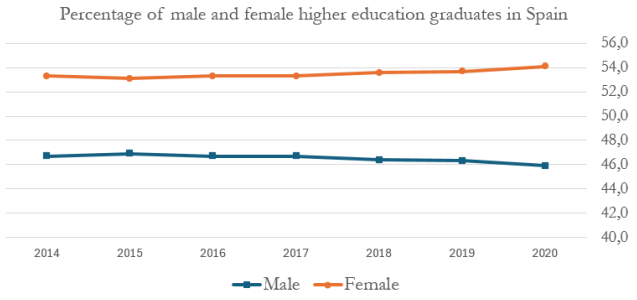


**Figure 1: Percentage of male and female higher education graduates in Spain. Data from [4].**

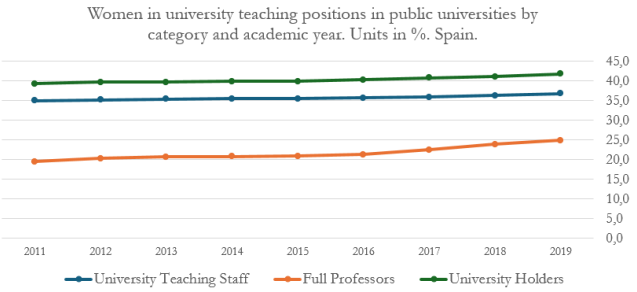


**Figure 2: Women in university education teaching staff at public universities by category and academic year. Data from [3].**

However, this study focuses on analyzing just the academic impact. We acknowledge that the root of this issue is fundamentally structural [8] and manifests across various cultures worldwide. Nevertheless, our analysis will adopt a simplified approach, relying solely on statistical data without considering crucial factors such as individuals' socioeconomic status.

The motivation of this study lies in addressing a critical challenge in academia: the persistent gender disparities that limit women's access to senior academic positions. Despite an increasing number of women excelling in higher education, their representation in leadership roles remains disproportionately low. This imbalance not only reflects systemic biases but also diminishes the diversity of perspectives that are essential for academic progress. The aim of


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this study is to present readers with compelling statistics that raise awareness about this pressing issue.

This paper contributes to the understanding of gender disparities in academia by leveraging recent data from INE to analyze the intersection of caregiving responsibilities and professional advancement. We show that, even when treated as independent factors, women are less likely to reach high academic positions, such as full professorships. Our findings highlight that educational attainment alone is insufficient to close the gender gap, emphasizing the need for targeted policies to address the structural barriers women face in academia.

## 2 Methods

We aim to calculate the probability of women attaining the status of full professor in a simplified manner. We calculate the intersection of being a full professor and at the same time performing caregiving activities. The aim is to make a comparison between being able to do these two things at the same time as being a man and being a woman. For this purpose, we have taken the data from 2016, as it was available for Table 1.

### 2.1 Data Sources

To conduct this experiment, we utilized data from INE. We toke data grouped by women vs. men, and specifically we focused on the following two datasets:

- Weekly frequency of caregiving and household activities in Spain [4] –Figure 2–.
- Women in university education teaching staff at public universities by category, using just full professor-related data [3] –Table 1–.

Additionally, we examined the number of men and women in Spain on 1 January 2016 [5] and the number of full professors that were in Spain in the 2017-2018 academic year [7].

**Table 1: Caregiving Activities by Gender. Percentage of Men and Woman that do these activities more than once per week in Spain in 2016. Table from [1].**

| ID | Activity | Men | Women |
|---|---|---|---|
| 1 | Care or education of children | 76 | 95 |
| 2 | Care or education of grandchildren | 33 | 32 |
| 3 | Cooking or performing household chores | 60 | 93 |
| 4 | Care of sick or disabled family members, neighbors, or friends under 75 years old | 7 | 8 |
| 5 | Care of sick or disabled family members, neighbors, or friends over 75 years old | 5 | 10 |

### 2.2 Calculation Methods

It is the opinion of many, perhaps more than we would like, that caregiving responsibilities and professional development are independent events, although actually this is not true. Therefore, we will treat them as such. Consequently, the probability of being a full professor can be expressed as follows:

$$P(A \cap B) = P(A) \cdot P(B) \tag{1}$$

where $A$ represents the marginal probability of being a full professor and $B$ denotes the marginal probability of caregiving responsibilities.

Since we want to discuss the gap between men and women, the equations that we want to solve are given by:

$$\begin{aligned} &P(fullprof|men \cap activity|men) = \\ &P(fullprof|men) \cdot P(activity|men) \end{aligned} \tag{2}$$

where $fullprof$ represents the probability of an individual being a full professor, given that the person is male and engaged in each of the caregiving activities showed in Table 1.

$$\begin{aligned} &P(fullprof|women \cap activity|women) = \\ &P(fullprof|women) \cdot P(activity|women) \end{aligned} \tag{3}$$

where $fullprof$ represents the probability of an individual being a full professor, given that the person is female and engaged in each of the caregiving activities showed in Table 1.

At the same time, we need to also compute the following two equations.

$$P(fullprof|men) = \frac{P(men|fullprof) \cdot P(fullprof)}{P(men)} \tag{4}$$

$$P(fullprof|women) = \frac{P(women|fullprof) \cdot P(fullprof)}{P(women)} \tag{5}$$

that represent the probabilities of becoming full professor being men or women, respectively.

Here is a step-by-step explanation of the development of Eq. 2 and Eq. 3.

(1) First, caregiving activities-related probabilities are computed using data from Table 3 [1], by dividing those numbers by 100. For example, for the first activity (ID 1) we compute probabilities as:

$$P(activity = ID1|women) = \frac{95}{100} = 0.95$$

$$P(activity = ID1|men) = \frac{76}{100} = 0.76$$

(2) Second, we compute the marginal probabilities of being men or women in Spain in 2016 [5].

$$P(men) = 0.491$$

$$P(women) = 0.509$$

(3) Third, we calculate the probability of being a full professor in Spain, during the academic year of 2017-2018 [6].

$$P(fullprof) = 2.32 \cdot 10^{-4}$$

(4) Fourth, we compute the conditional probabilities of becoming full professor being a men or a women.

$$P(fullprof|men) = 3.73 \cdot 10^{-4}$$

$$P(fullprof|women) = 9.57 \cdot 10^{-5}$$

Finally, following the Eq. 1 $P(fullprof|men \cap activity|men)$ and $P(fullprof|women \cap activity|women)$ are calculated for each of the activities.

Aditionally, the percentage difference was calculated using the formula given by Eq. 6.

$$\% = \frac{|A - B|}{\frac{A+B}{2}} \cdot 100 \tag{6}$$

where $A$ is $P(fullprof|men \cap activity|men)$ and $B$ is related to $P(fullprof|women \cap activity|women)$.

## 3 Results

Results of computing the joint probability of being a full professor and performing caregiving activities for both genders are shown in Table 3. Similarly, Table 2 shows the results of the intermediary operations to arrive at the final result.

**Table 2: Probabilities of performing caregiving activities and being full professors, depending on the gender. Data from 2016. IDs are referred by Table 1. Equations are given by Eq1:** $P(activity|men)$ **Eq2:** $P(activity|women)$ **Eq3:** $P(fullprof|men)$ **Eq4:** $P(fullprof|women)$

| ID | Eq1 | Eq2 | Eq3 | Eq4 |
|---|---|---|---|---|
| 1 | 0.76 | 0.95 | $3.73 \cdot 10^{-4}$ | $9.57 \cdot 10^{-5}$ |
| 2 | 0.33 | 0.32 | $3.73 \cdot 10^{-4}$ | $9.57 \cdot 10^{-5}$ |
| 3 | 0.60 | 0.93 | $3.73 \cdot 10^{-4}$ | $9.57 \cdot 10^{-5}$ |
| 4 | 0.07 | 0.08 | $3.73 \cdot 10^{-4}$ | $9.57 \cdot 10^{-5}$ |
| 5 | 0.05 | 0.10 | $3.73 \cdot 10^{-4}$ | $9.57 \cdot 10^{-5}$ |

**Table 3: Joint probability of being a full professor and performing caregiving activities using data from 2016, for both genders. IDs are referred by Table 1. Equations are given by Eq4:** $P(fullprof|women)$ **Eq5:** $P(fullprof|men \cap activity|men)$ **Eq6:** $P(fullprof|women \cap activity|women)$**.** $\%$ **is given by Eq. 6.**

| ID | Eq5 | Eq6 | % |
|---|---|---|---|
| 1 | $2.84 \cdot 10^{-4}$ | $9.09 \cdot 10^{-5}$ | 103.01% |
| 2 | $1.23 \cdot 10^{-4}$ | $3.06 \cdot 10^{-5}$ | 120.31% |
| 3 | $2.24 \cdot 10^{-4}$ | $8.90 \cdot 10^{-5}$ | 86.26% |
| 4 | $2.61 \cdot 10^{-5}$ | $7.66 \cdot 10^{-6}$ | 109.24% |
| 5 | $1.87 \cdot 10^{-5}$ | $9.57 \cdot 10^{-6}$ | 65.59% |

As shown in Table 3, $P(fullprof|women \cap activity|women) < P(fullprof|men \cap activity|men)$ for all activities. The smallest difference between men and women is 65.59%, which demonstrates a gender gap in this field. Even when treating caregiving activities as an independent variable—despite the reality that they are not—women still have a lower probability of attaining full professorships. Additionally, the comparison between the columns of Eq1 and Eq2 in Table 3 reveals a significant difference in the level of commitment to these activities between men and women.

## 4 Conclusion

In summary, it is well documented for years that a significant gender gap persists in the academic world in Spain [3]. Data from the INE illustrate that although more women are completing their higher education, the threshold for achieving high academic positions continues to rise. This widening gap indicates systemic barriers that hinder women's progress, despite their increasing numbers in higher education.

Moreover, probability studies indicate that even if we assume caregiving responsibilities and academic advancement are independent events, women would still face a lower likelihood of attaining positions as full professors. It is crucial to emphasize that, in reality, these events are far from independent; various intersecting factors, including societal expectations, institutional biases, and familial responsibilities, compound the challenges women face in academia [6].

Addressing these disparities requires a multifaceted approach. Academic institutions must recognize and actively combat the structural barriers that perpetuate gender inequality. By fostering an environment that supports both academic and personal development for women, we can work towards closing the gap and creating a more equitable academic landscape for all.

## 5 Limitations and Future Work

This study has two main limitations. First, the probabilistic analysis relies on data from 2016, as caregiving activities data was only available for that year. Second, the study adopts a simplified approach, assuming independence between variables—a premise that does not fully reflect reality—and considers only two variables. Future research could address these limitations by using more recent data and exploring the main reasons why there are fewer women in top academic positions.

## Acknowledgments

The authors would like to express our gratitude to the organizers of the Precarity and Instability in Academia Symposium (PIAS) for providing a platform that encourages critical reflection on the challenges faced in academia. Acknowledging these challenges, we take an important step towards recognizing and addressing these issues, ultimately working together to create a more inclusive and sustainable academic environment. We also thank the attendees, speakers, and sponsors for their valuable contributions and support throughout the event. Additionally, we acknowledge the assistance of ChatGPT in providing support with the translation and refinement of the manuscript.

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