WHITE PAPER
on the position of Women in Science in Spain

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INTRODUCTION

Women's relationship with the world of science and innovation has not been easy, and neither has the path chosen by many women entering male-dominated environments. Although many of the obstacles encountered by female pioneers in the fields of science and technology have now been overcome, there is still a long road ahead of us, and that is something we must focus on.

Effective equality for women in all areas of social life, as well as science and technology, is a matter of great importance in our country and for our economy. For years society has not recognised this reality but, if we really want to advance as a country, we cannot continue to waste 50% of the talent available.

In spite of the fact that the majority of university alumni today are women, and that they finish their studies with better average grades than their male counterparts, there are certain disciplines that are still resistant to female participation. Such is the case of engineering and some experimental sciences where less than 30% are women. Although it is well known, the fact that we still do not have a single female professor of Paediatrics, Gynaecology or Obstetrics is no less shocking.

The number of women in the higher echelons of science and business is practically unchanging and in no way reflects the pool of qualified, experienced and capable women available for these positions.

The United States National Academy of Science and Engineering highlights that "a greater presence of women in the world of science and technology is essential for scientific excellence and also for the economic development of the country". In the same vein, the European Research Area Vision sets us a clear goal for 2030, stating this will be a time when "Half of all scientists and research policymakers, across all disciplines and at all levels of the science system, are women". European institutions are, therefore, developing mandates to apply the gender policies (gender mainstreaming) as established in the Treaty of Amsterdam in the field of science. This Treaty deals with the principle of gender mainstreaming as adopted by the United Nations at the World Conference on Women in Beijing in1995.

These facts mean we must work hard to correct the imbalance produced by the absence of women in the world of science. This is something we are doing at present in the Spanish Government, and which we will continue to do by developing the new Law on Science, Technology and Innovation. This Law constitutes a major leap forward in promoting the roles women should be playing, incorporating the gender perspective. The articles of the Law relating to gender have been defined by some of the world's leading authorities on the subject, creating a benchmark which, once it has been definitively developed, will put Spain ahead of the rest of the world.

The Law includes the requirement that all assessment committees for science degree courses (and any other committees it covers) comprise an equal number of men and women, reinforcing the related provisions detailed in the Law of Equality and the Law of Universities. It also incorporates gender as a category to be cross-analysed in relation to scientific research, technology development and innovation, at the same time as promoting gender and women's studies. Thanks to this rule, Public Research Bodies will adopt equality plans, like those already in place in universities, which will include incentives for centres that improve their gender indicators.

In order to progress with the development of this new Law, we need to be better aware of the reality; we need more scientific evidence on which to base our policies. It is for this reason we have created this White Paper on the position of Women in Science in Spain. The document provides empirical evidence of the presence of men and women in our scientific system, and the driving force behind it is the Women and Science Unit of the Ministry of Science and Innovation with contributions by professionals of great renown in econometrics in our country. The data that can be systematically examined here shows us the true panorama with its bright spots and more murky areas. It shows us the advances that have been made, but also the difficulties we still have to face.

We have come a long way since Concepción Arenal had to disguise herself to be able to study. Our science system now boasts some fantastic female scientists, but the road we still have to travel is at least as long as that we have travelled so far.

As a woman dedicated to science and innovation, and as a member of a Government committed to equality, I am certain that an ambitious productive system such as ours, that aims to be competitive on a global scale, cannot afford to do without half the talent in the country any longer.

For this reason, all of us, from our respective positions, must strive to achieve the goal set for Europe: that by 2030 half of all scientists and research policymakers, across all disciplines and at all levels of the science system, are women. A just recognition of the merits and abilities of everyone to achieve absolute excellence in science.

Minister for Science, Innovation and Technology, Cristina Garmendia

Chapter 1

GENDER POLITICS IN SCIENCE. PREVENTING BIAS AND PROMOTING EXCELLENCE

Inés Sánchez de Madariaga

The European Research Area Strategic Vision adopted in 2010 sets a target for half of all scientific personnel, in all disciplines and at all levels of the scientific system, to be women by 2030. This is an attempt to break the horizontal and vertical segregation that currently exists in European science, as it does in Spanish science.

Horizontal (or quantitative) segregation is produced to the extent that some fields of knowledge are very feminised (especially those related to life sciences), whilst others are very masculinised (engineering and experimental sciences). Vertical segregation is produced in all fields, independently of the degree of feminisation of the university student body: there are very few women at the highest levels in science, even in fields, such as medicine, where women have been in the majority at Associate Professor level for some time. The presence of women at the highest level in science is not proportional to the number of women who are qualified, of the correct age, and have the necessary merits and motivation for these posts. Furthermore, the number of women in leadership posts is practically unchanging and is progressing only very slowly over time.

1 ACTION BY THE EUROPEAN COMMISSION

Increasing female participation in the system is a goal shared by many scientific institutions in Europe, as demonstrated by the public consultation process started by the European Commission with the aim of defining the new *Horizon 2020 Framework Programme for Research and Innovation*, that will define the course to be taken by EU-funded research over the next few years.[1]

In their responses to the Green Paper for public consultation, a large number of European scientific institutions highlight the need for active measures to be developed to support women's careers. The aim is to avoid missing out on talent and, as a result, quality and excellence in European science. As the European Research Area Board (ERAB), for example, states in their contribution:

> Europe needs excellent science and innovation to tackle the Grand Challenges. All resources are needed. Irrespective of age, race or gender, the European Research Area should exploit all available talents and to that end, specific instruments should be employed. The European Union should actively encourage Member States i) to develop their tertiary education so that also science and technology are attractive to all, ii) to put in place all measures to help the daily life of women in charge of young children when they have the ambition of a successful scientific carrier, iii) to require from their Research institutions to put in place a plan and strategy to raise share of women amongst academic staff, and monitor their development.

iv) When equally competent applicants compete for a post or resources, the one representing the minority gender should have priority. v) the European Commission should ensure adequate female representation in all Committees under its responsibility.

It is broadly agreed throughout European scientific institutions that the scarce presence of women in science and technology is a waste of resources that neither science nor the economy can allow. 60% of people graduating from Spanish and European universities are women. They graduate with excellent academic grades, better than those of their male counterparts. But then this highly qualified personnel does not find a place in the system.

Other institutions apart from ERAB that have supported the adoption of significant gender measures in European science are the following: the Italian National Agency for New Technology, Energy and Sustainable Development, the Ministry for Education, Science and Culture of Iceland, the Association of German Engineers VDI, the German Federal Government, the European Federation of National Academies of Sciences and Humanities ALLEA, the League of European Research Universities LERU, the Scientific Research Funds of Belgium FNRS, the Romanian National Authority for Scientific Research, The Norway Research Council, the Dutch Government, and the European Technology Platform on Smart Systems Integration.

All together, European scientific institutions are asking the Commission for: i) balanced representation of men and women in all spheres and levels of scientific research, as well as the gradual integration of the gender dimension into all areas of the Common Strategic Framework; and ii) the development of specific courses of action and programmes alongside these mainstreaming measures.

Effective public policies are required to remove the obstacles and barriers that stand in the way of women in science careers in Europe. The European Commission started along this path in 1999 with the creation of two organisations responsible for defining these courses of action and putting them into practice: the Women and Science Unit at the very heart of the Directorate-General of Research, and the Helsinki Group, an assessment group for the Commission with two people from each member state participating, one representing the government and one representing the scientific institutions. In 2001 the Commission published a preliminary report on the matter, the *ETAN Report Promoting Excellence through mainstreaming gender equality* that, for the first time, provided a global view of the position of women in science in Europe. The Women and Science Unit has undergone several name changes. In the 2010 remodelling its duties were taken over by the Science in Society Unit, within which a Gender Department has been created.

Since the publication of the ETAN report, the Commission has funded a large number of studies that are already providing a solid base to help us understand the situation, its causes, and the measures taken so far by each country. The 2010 *Meta-Analysis of Gender and Science Research* provides the most complete view of current research on women and science in Europe. Some of these studies, such as *PRAGES-Practising Gender Equality in Science,* 2009, include databases of good practice; *Mapping the maze. Getting more Women to the top in Research,* 2008, also provides a list of good practices to help reduce vertical segregation, as well as national reports on the situation; *WIR- Women in Industrial Research: A wake up call for European industry,* 2003 tackles the participation of women in private sector research; *Waste of talents: turning private struggles into a public issue. Women and science in the ENWISE countries*, 2004, analyses the situation in Baltic, and central and eastern European countries. *The gender challenge in research funding*, 2009 includes recommendations for improving transparency in assessment processes and in research funding in general. *Stocktaking 10 years* of *Women in Science*, 2010, is a compact summary of all the activities carried out by the European Commission over the last decade.

As well as promoting this solid knowledge base, the European Commission Directorate-General for Research has developed a few innovative measures:

- including gender requirements in calls for proposals in the 6th Framework Programme, "proposals should indicate whether, and how, sex and gender are relevant variables in the objectives and methodology proposed".
- gender and science training programmes.
- targets for the presence of women in research programme committees, teams and calls for proposal.
- *She Figures* three-yearly statistics.
- call for proposals for Structural Change to institutions.

During the Spanish Presidency of the European Union in 2010 the Competitiveness Council, comprising European research and innovation ministers, adopted an important agreement to provide support for women in science and to promote structural change through the modernisation of scientific institutions. On the one hand this agreement incorporates the recommendations of the document entitled *Gender and Research Beyond 2009* by the Helsinki Group, while, on the other, it urges the Commission to adopt the contents of a Communication on Structural Change, in other words, a recommendation for member states to follow. In this agreement the Competitiveness Council:

> RECOGNISES that gender stereotyped working culture and environment are strong barriers to gender equality as regards learning, employment and career progress in particular in the field of science and technology;
> ACKNOWLEDGES the work of the Helsinki Group on Women and Science and its position paper "Gender and Research Beyond 2009", which renews its commitment to mainstreaming gender in research and highlights the concept of structural change aiming at suppressing barriers

which today prevent equal scientific recognition and science careers progression between women and men, thus contributing to the improvement of the quality of research;
In this respect, SUPPORTS the concept that structural change should be part of the modernisation process of research institutions. Noting that the inclusion of gender issues in research is a resource to create new knowledge and stimulate innovation, STRESSES that this dimension should be taken into account while modernizing research institutions and in any structural and cultural change, designed to improve the effectiveness and impact of the research itself;
ACKNOWLEDGES the progress made by the Commission in promoting a more gender aware human resources management in research institutions, shortly called structural change programme, however, RECOGNISES that institutional change is a complex process requiring a long term strategy and sufficient funding, therefore, STRESSES the need for further progress in this direction, particularly through the reinforcement of the structural change programme for the modernisation of universities and other research institutions, together with the reinforcement of the integration of the gender dimension in European research.
ENDORSES also the other recommendations proposed by the Helsinki Group in its Position Paper, such as the need for top level management support for change, the benefit to both persons and institutions of a more balanced life and the essential role of school science education, and ENCOURAGES the Member states and the Commission to further work in all these areas.
INVITES the Commission to consider the feasibility of a Communication on Gender and Research Beyond 2010.[2]

To further develop the indications of the Competitive Council Agreement, in 2011 the Commission began the process of drawing up a Communication on Structural Change. A Group of Experts was formed and put in charge of writing a report that would be the basis of the future Communication.[3] It is planned for this Communication to be adopted by the end of 2012. Moreover, since 2010, the Commission has been offering the aforementioned subsidies for Structural Change in European scientific institutions, included in the Science in Society Programme, although it is still a small programme with limited funds for only two plans per call for proposals.

An evolution has been noticed in the stance of European institutions towards understanding the position of women in science as a problem with systemic and structural roots and which, therefore, requires more systematic measures than those taken so far. Both the European Commission and the Competitiveness Council are planning structural changes in scientific institutions aimed at better consideration of the gender dimension in all areas, especially human resource management.

2 PROGRAMMES IN THE UNITED STATES OF AMERICA

With this structural focus aimed at institutions, the European Commission is continuing on the route begun ten years ago by the United States National Science Foundation NSF with its ADVANCE programme founded in 2001.[4] The goal of the ADVANCE programme is to develop systemic approaches to increase the representation and advancement of women in academic science, technology, engineering and mathematics careers, thereby contributing to the development of a more diverse workforce in the fields of science and engineering.

A report by the National Academies of Sciences and Engineering in 2007 *entitled Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering* summarises the relevant research on the matter in the United States, provides a diagnosis, and proposes a series of recommendations and courses of action aimed at the actors in the system. Both institutions, the National Science Foundation and the National Academies of Sciences and Engineering acknowledge that the lack of women is a consequence of:[5]

> … many external factors that are unrelated to their ability, interest and technical skills, such as:
>
> • The organisational barriers of academic institutions
> • The differential effects of the demands of work and family
> • Implicit and explicit bias
> • Under-representation of women in decision-making and academic leadership positions
>
> The cumulative effect of all these factors results in barriers that affect the number of women who manage to enter and progress in science and technology careers.

The NSF established the ADVANCE programme when it was realised the partial and ad-hoc measures carried out by U.S. scientific institutions in previous years were not achieving the results expected and that, in spite of all their efforts, the number of women is still very low in certain fields and in the highest echelons of all fields. The NSF has moved from an approach aimed fundamentally at women, to creating a well-funded programme aimed at the institutions themselves.

ADVANCE has funded projects for more than 100 U.S. academic institutions, and has invested an average of 19 million dollars per year. It funds three types of projects:

• Institutional Transformation (IT). Projects that affect the whole organisation, transforming its institutional practices and work environment. These projects must be based on existing scientific literature in the subject.
• Institutional Transformation Catalyst (IT-Catalyst) awards which fund self-assessment activities, such as data and statistics collection and analysis, and the review of relevant policies, in order to begin the transformation of the institution.
• Partnerships for Adaptation, Implementation and Dissemination (PAID), aimed at projects of varying sizes focussed on sharing experiences, providing and circulating information, and giving training on gender and science.

The institutions participating in these programmes have developed a considerable number of programmes, measures and criteria for creating a more equal environment for women in academic institutions, which can be incorporated into the strategic plans already in place and put into practice through the existing administrative structures. To be successful and sustainable, these activities need to involve people in leadership positions in the institutions, mid-level personnel and the permanent teaching faculty. The results of the funded projects can be seen on the ADVANCE web site.

Of all these programmes it is worth highlighting the University of Michigan STRIDE programme (Science and Technology Recruiting to Improve Diversity and Excellence Committee).[6] This programme identified the main problem as a lack of attention to, and ignorance of, the effects of unconscious bias on the results of recruitment and promotion processes. A procedure was created to inform high-level faculty (men and women) of the data and theories that show bias in assessments, and on several aspects of an academic environment that women may find unwelcoming or hostile. This resulted in a group of well-respected and experienced people helping others understand the problem and developing recruitment methods that have generated larger pools of excellent candidates. The progress has been considerable: from 13% of women among new recruits to 28%. The participation and commitment of opinion leaders at the top level (including very-well-respected men) has been a crucial element in the success of STRIDE.

3 MEASURES TAKEN IN SPAIN

In Spain we now have a legal framework incorporating a considerable number of the recommendations proposed in Europe and the United States. Together, the Law on Equality of 2007, the Law on Universities (LOMLOU) of 2007 and the Law on Science, Technology and Innovation of

2011, cover the areas on which to base specific measures to eliminate these biases and barriers so that highly qualified human capital is not wasted.
The Women and Science Unit, created in an Agreement ratified by the Council of Ministers in March 2005, is the body responsible for gender mainstreaming in science, technology and innovation in our country. This is the response of the Ministry of Science and Innovation to the mandates of the Amsterdam Treaty and Organic Law 3/2007, of the 22nd March, on the effective equality of men and women. These are two legal documents that establish mainstreaming as a principle for political action on gender equality, so that public authorities have to take into account the different impact on the sexes, and consider measures to actively promote equality between men and women throughout the process of defining, applying and assessing public policies at all stages of their development: legislation, policies, programmes, budgets, plans and projects.

The Women in Science Unit makes proposals and is the driving force behind gender perspective in science, technology and innovation policies that affect gender equality. This way it promotes the presence of women in all areas of science, technology and innovation (according to their merits and abilities), the structural transformation of scientific institutions to modernise human resource management by taking into account the gender dimension, and gender analysis in scientific research, technological developments and innovation, as well as specific research in the field of gender and women's studies.
Under the impetus of the Women and Science Unit, the Law on Science, Technology and Innovation includes specific measures in these three fields. They are described in the additional thirteenth disposition, which states as follows:

1. The composition of the bodies, boards and committees regulated by this law, and the assessment and selection bodies in the Spanish Science and Technology System, will conform to the principles of composition and equal presence of men and women as established in Organic Law 3/2007, of the 22nd March, on effective equality between men and women.
2. The Spanish Science and Technology Strategy and the State Scientific and Technical Research Plan will promote the incorporation of the gender perspective as a cross-functional category in research and technology, in such a way that it is considered relevant to all aspects of the process, from the definition of scientific/technical research priorities, research problems, theoretical and explicative frameworks, methods, data collection and interpretation, conclusions, technological applications and developments, to proposals for future studies. It will also promote gender and women's studies, and specific measures to boost the presence of women in research teams and ensure they receive recognition.
3. The Science, Technology and Innovation Information System will collect, handle and release all the data broken down by sex, and will include presence and productivity indicators.
4. The research personnel selection and assessment procedures for Public Universities and the Public

Research Bodies of the General State Administration, and the procedures for grants and subsidies awarded by research funding agents, will establish mechanisms to eliminate gender bias that will include, wherever possible, confidential assessment mechanisms that prevent the assessor knowing the personal characteristics of the applicant, in particular their sex or race.
5. The State Innovation Strategy will promote the incorporation of gender perspective as a cross-functional category in all development areas.
6. The Public Research Bodies will adopt Equality Plans within a maximum of two years from the publication of this law, and these will be monitored on a yearly basis. These plans must include incentives for centres to improve their gender indicators in the annual reviews.

Another of the functions of the Women and Science Unit is to encourage gender and science related studies and the publication of statistics. Some reports have already been produced on the position of women in science and higher education in Spain, such as those by Pérez Sedeño (2003), Fecyt (2005), and some on specific areas, such as those by Cecilia Castaño on information technology (2005). This White Paper on the Position of Women in Science in Spain aims to broaden this knowledge base so that public policies are established with more solid foundations.

In this White Paper we analyse the statistical information available, that is, existing empirical data on the position of women in science in Spain, and compare and contrast it to the data available for Europe and the United States. The information has been organised into three chapters which is analysed in the following order: gender differences in science education; gender differences in science careers; and the role of institutions and the family in gender differences in science careers.

The data presented in this book give the best description of the situation that is possible with the data available. The majority of the evidence given is descriptive, although in some cases it has been possible to carry out econometric analyses with the use of a significant number of control variables, from which we have been able to infer certain relationships between these variables. In this way we were able to calculate the differential probability of promotion to Full Professor, *ceteris paribus*, based on the indicators of presence and productivity in the Human Resources in Science and Technology Survey by the National Institute of Statistics (INE).

4 BIASES, STEREOTYPES AND SOCIAL NORMS

The most interesting findings of this document are precisely those obtained from the econometric analysis of the Human Resources in Science and Technology Survey by the National Institute of Statistics. This analysis has detected significant differences in the processes of promotion to the highest rank of a science career, Full Professorship:

- When comparing men and women of the same age, with the same amount of time since their PhD, the same field of knowledge and recent academic production in terms of articles and books published, as well as dissertations or theses directed, we see that the probability of a male Associate Professor being promoted to Full Professor is 2.5 times higher than that of a woman with similar personal, family and professional characteristics.
- When comparing men and women with the same personal and professional characteristics, the same academic productivity, and both with children, we see that having children affects women much more negatively: a man with children is 4 times more likely to be promoted to Full Professor than a woman with children and similar characteristics.
- When comparing men and women with the same personal and professional characteristics, but differing with regards to having children, we see that a man who has at least one child is 1.7 times more likely to be a Full Professor than a man without children.
- In contrast to the findings regarding promotion to Full Professor, the gender differences observed in promotion to Associate Professor are not significant either as an aggregate or broken down by field of specialisation.

Do these results mean gender bias exists in promotion in the field of science? It seems so, although, as we can see in the corresponding chapter, there is a need for a little clarification.
Not all the factors that can affect possibilities of promotion are included, due to lack of information, and there may be unobserved factors that cause the differences we see.
Furthermore, as we explain later, the sample used is problematic as regards representation, especially with reference to the Full Professor group (although the men and women represented in the sample are comparable). In any case, even when we compare very similar men and women, the differences observed are definitely significant. Perhaps the differences are due, in part, to unobserved factors, but it is difficult to believe that these unobserved factors could be so definitive as to fully explain the differences. This seems to indicate, therefore, that gender bias does exist in the assessment of scientific merit in Spain.

Existing international empirical evidence proves the existence of gender bias in scientific assessment and, more specifically, assessment of merit, ability and professional performance. The findings of this White Paper will confirm for Spain what research has already shown via studies in other countries.

One of the first studies that pointed out the existence of gender bias in scientific assessment was that carried out by Weneras and Wold (1997) in their analysis of assessments in the Swedish Academy of Medicine. In these assessments, women needed to have 2.5 more merits than men to gain a similar qualification, measured by the number of articles published in scientific magazines of renown. Steinpreis et al, (1999) show that in the United States both men and women are considerably more likely to vote for a male candidate than a female one, when candidates are equal on academic merit.

Ceci and Williams (2007) provide an overall view of the main empirical evidence that currently exists on gender bias in science. By way of illustration I will mention just two examples of several given in the book: in one study, the same curriculum signed by a man, a woman, or with initials only was consistently given three different evaluations. The one signed by the man was always the highest, and the one signed by the woman always the lowest and the one signed only with initials always in the middle. In another study, the assessors change the assessment criteria ad-hoc (academic merit versus professional merit) to justify what a priori seems reasonable to them, consistently favouring men.

The findings of the White Paper on the differences in promotion to Full Professor, with regards to the family situations of both men and women, are consistent with similar evidence obtained by Correll et al. (2007). In this study, the participants assessed job application material of two same-sex candidates who only differed in their parental status. The findings show that, for women of equal merit, mothers are perceived as less competent and committed than women without children, whilst not only are men not penalised when they have children, but, on the contrary, at times it is a factor that works in their favour. The study shows that employers discriminate against mothers and favour fathers.

The analysis carried out by Zynovyeva and Bagués (2010) of the qualification assessment process for promotion to Full Professor that existed in Spain between 2002 and 2007 also shows the existence of gender bias, in this case, in relation to the sex of the assessors and the rank of the position the candidates are applying to. In this study, if we compare men and women with similar characteristics in terms of age and academic publications, an additional male assessor on a seven-person committee reduces the probability of a woman being promoted, with regards to a male candidate, by 14%. For promotion to Associate Professor, the effect of the gender composition of the committee is the opposite, albeit to a much lesser extent: an additional male assessor on a committee increases the probability of a woman being promoted, with regards to a man with similar characteristics, by 5%. This would imply that female members of committees for promotion to Associate Professor discriminate against candidates of their own sex – although the difference is certainly small.

Stereotypes regarding what are, or should be, reasonable or expected characteristics of people according to their sex affect women in different ways in their professional careers, and also in science. Empirical evidence on the different effects gender stereotypes have on women's professional careers is abundant. The Harvard University Implicit project[7] shows how stereotypes can influence the way girls and boys participate in science and also how they can affect the differential performance and success of men and women in science careers. The Gendered Innovations project run by the European Commission and the University of Stanford and directed by Full Professor Londa Schiebinger, provides a selection for consultation of the main studies on the effect of bias and stereotypes on the professional and science careers of men and women.

Below I have included a few of the more notable results of these investigations and refer the reader to the Gendered Innovations and Implicit web sites for consultation of the scientific articles cited here. Assertive women are perceived as competent, but disagreeable, which produces bias in recruitment decisions; leadership characteristics are considered incongruent with women's gender roles, so women face prejudice in leadership assessment; the image of a scientist is still overwhelmingly masculine; boys tend to rate their mathematical literacy higher than girls with the same ability, which increases the chance of them studying sciences, so career choice is, in part, the result of an idea biased towards what we are good in, rather than real ability or interest; successful women can feel they are "impostors" who do "not belong" in academic environments, and who lack confidence in their achievements and abilities; gender bias is also produced in letters of recommendation; blind assessment procedures significantly increase the probability of women being recruited; "*stereotype threat*" negatively affects women's performance in science, but its effect can be moderated by environments that provide "identity safety". The studies coincide in their findings on the cumulative effect of these small disadvantages that apparently affect women.

Gender stereotypes and social norms affect many other aspects of life that have an indirect, but significant, influence on the professional development of men and women, a rule that is also applicable to science. The effect that gender stereotypes and social norms have on the use of time is an example that has considerable repercussions on the time men and women have available to dedicate to their professional lives.

Using information taken from surveys on the use of time in several different European countries, we find evidence that men, on average, spend more time on their work away from home than women, especially in the case of Mediterranean countries with low rates of female employment. The time needed to look after a family (a job still done in the main by professional women) is undoubtedly another key factor to be taken into consideration when explaining the obstacles faced by women in their professional careers.

However, gender stereotypes also seem to be working here: women with higher salaries than their partners not only spend relatively more time on housework than their husbands, but in many cases they also spend more time on this housework than women whose salaries are lower than those

Horas	Finlandia		Italia		España		Inglaterra	
	Hombres	Mujeres	Hombres	Mujeres	Hombres	Mujeres	Hombres	Mujeres
Trabajo en empleo	3,5	2,3	4,1	1,5	4,2	2,6	4,1	2,2
Trabajo en el hogar	2,2	3,5	1,3	5,2	1,4	4,5	2,2	4,1
Ocio	5,5	5,1	5	4	5,1	4,2	5,2	4,5

TABLA 1

AVERAGE TIME (HOURS PER DAY) SPENT BY MEN AND WOMEN (20-74 YEARS) ON DIFFERENT ACTIVITIES (2002)

of their husbands. Akerlof and Kranton (2000) for the United States and Australia, and corroborated for Spain by Sevilla-Sanz (2005). A possible explanation based on the existence of social norms is that, when a man earns less than a woman a gender social norm is violated and, as a consequence, both the man and the woman try to "neutralise" this violation by reinforcing the traditional model of housework assignment.

The empirical evidence shown in this White Paper also indicates that family is certainly still an additional obstacle in the science careers of women. Therefore, we must continue to develop measures for reconciliation of work and family and co-responsibility, to make scientific organisations workplaces where people, both women and men, are equal when it comes to forming a family and having a full professional career.

However, confirming empirical evidence obtained in other European countries and the United States, the data also suggests that other types of obstacles exist, as a consequence of gender bias and stereotyping that are often unconscious and involuntary. They are less visible, but have a very real and differential effect on the careers of men and women.

Chapter 2

GENDER DIFFERENCES IN SCIENCE EDUCATION. EMPIRICAL EVIDENCE

Mario Alloza | Brindusa Anghel | Sara de la Rica

The main objective of this chapter is to document the most significant gender differences in the stages prior to a career in science, in other words, during the education phase, both at degree and post-graduate degree level.

However, given that there is evidence of possible gender differences in aptitude and ability prior to university education, it is worth beginning at this earlier stage (secondary education) to get a better understanding of the differences that can be observed later in the education of people with careers in science.

The structure of the chapter is as follows. The first section presents the basic results of the three PISA reports currently available on gender differences in reading, mathematical and scientific literacy. The second section examines the distribution of male and female undergraduates, distinguishing between disciplines and analysing the differences in enrolment and success rates separately. Section three analyses the transition from degree/master's degree, to the final post-graduate phase, describing participation and success rates for doctorate programmes corresponding to the different fields of knowledge. Section four portrays a study of the transition from doctorate to post-doctorate, focussing on the gender differences encountered in obtaining post-doctorate positions, whilst section five analyses differences in the awarding of prestigious grants of this type (Ramón y Cajal, Juan de la Cierva and Fulbright). The final section presents the most important findings and poses new questions that have arisen as a result of the data analysis.

1 GENDER DIFFERENCES IN DIVERSE SUBJECT AREAS AT 15-16 YEARS OF AGE. PISA REPORTS

The most well-known and reliable empirical evidence available are the findings of the studies contained in the PISA [Programme for International Student Assessment] reports[8]. Due to the fact this study is carried out on a regular basis and covers a wide range of countries, and given the horizontal nature of the programme assessment content, PISA can be a useful tool for documenting the gender differences that exist in the attitude and performance of secondary school pupils. As the assessment is carried out when these pupils are 15-16 years old, the PISA test can provide very relevant information on the capabilities of students regarding access to higher education, which many of them will be entering later.

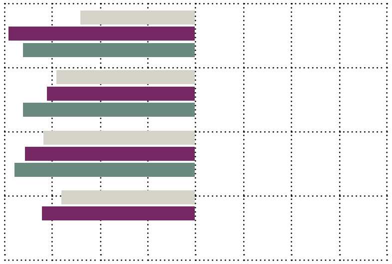
To give a brief outline of the characteristics of the PISA, it is best to start by explaining that it consists of an assessment, carried out every three years in OECD countries, of the reading, mathematical and scientific literacy of pupils between 15 and 16 years of age. Reports currently exist for the years 2000, 2003 and 2006, although each of the areas of literacy was not dealt with to the same extent in each of the reports. The first report, PISA 2000, took an in-depth look at reading literacy. The second report, PISA 2003, focussed on mathematical ability. Lastly, PISA 2006 primarily analysed scientific literacy. However, although the focus is different for each of the reports, each of the three literacy aspects have been assessed in all of them.

Reading Literacy

Gender differences

Pupils reading abilities and gender differences were dealt with extensively in PISA 2000. In addition to the assessment of reading ability, pupils were asked to respond to a series of questions on their interest in reading, their reading habits and the type of literature read, etc., so that the differences in reading ability results could be better understood. The basic conclusion drawn from PISA 2000 is that in all the participating countries girls showed a much higher level of reading literacy than boys. The average difference in score in the participating countries was 32 points in favour of girls.[9]

> As well as the gender difference in average score, PISA 2000 also provides relevant information on gender differences regarding the "best" and "worst" scores: in particular, in the highest score level, 12% were female as opposed to 7.2% male, while at the bottom end of the scale, 1% corresponded to females as opposed to 3.3% to males.



GRAPH 1
GENDER DIFFERENCES IN READING LITERACY

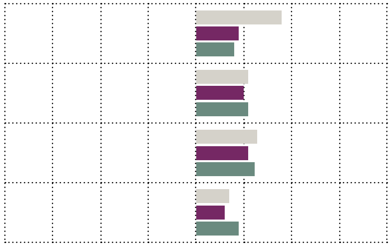
Gender differences by country

In Spain the gender difference in reading literacy is 24 points in favour of girls. This is less than the average for the OECD countries and, in fact, Spain and Portugal are the countries which show the fewest gender differences. Finland is at the other end of the scale with the greatest gender difference (51 points in favour of girls).

What causes these differences in reading literacy?

Having observed these major differences in reading literacy between males and females aged 15-16, the next question to be posed is what the underlying reason behind such a difference is. PISA 2000 included questions in its survey about pupils' interest in reading, their reading habits and the type of literature they normally read. Based on this information the rate reflecting both the interest in reading and the type of reading were established. Interestingly, while no great gender differences are reading and the type of reading were established. Interestingly, while no great gender differences are observed in the level of interest in reading, males seem to have a tendency to read shorter texts i.e. comics (34% boys as opposed to 23% girls), and girls a tendency to read longer texts i.e. newspapers, books, magazines, etc. (29% girls as opposed to 16% boys). In spite of the remarkable nature of this fact, as far as we are aware, no scientific studies have been made to determine whether these reading habits have been a decisive factor in gender differences as regards reading literacy.[10]

If we analyse the results by countries over the years, we see that the differences in favour of girls are very noticeable in the three years the reports were compiled in. When comparing Spain to the EU-15, we see the gender differences are quite similar, particularly in 2006. Looking at the United States, we see that the differences in favour of girls are noticeable in 2003, but not so much in 2000.



GRAPH 2
GENDER DIFFERENCES IN MATHEMATICS

Mathematics

Gender differences

In the same way the gender differences in reading are consistently in favour of girls in all OECD countries, exactly the opposite occurs in mathematics results: boys get better results than girls in maths tests in all the OECD countries. The average difference is 11 points in favour of boys.[11] Nevertheless, the difference is much smaller than the 32-point gap in reading literacy in favour of girls. Regarding gender differences in the best and worst scores, 17% of boys are at the higher end of the point scale, as opposed to 12% of girls. However, no gender differences are observed between the two at the lower end of the scale (22% in both cases).

Gender differences by country

Although the average gender difference in the OECD countries is 11 points in favour of boys, there are significant differences between countries. Among those showing an above-average difference, Austria (20 points in favour of boys), and Spain and Portugal (18 points in favour of boys) stand out. At the other end of the scale we find Finland (1point in favour of boys), followed by Belgium (6 points) and Greece (7 points).

What causes these differences in mathematics?

The report includes several questions which can help us better understand the attitude and relative literacy of males and females with regards to mathematics. The answers to these questions seem to confirm that the gender difference is greater in the attitude towards mathematics rather than in literacy, where the difference is much less: on average girls are much less interested and enthusiastic about mathematics than boys. In fact, these differences are much greater than those found in the exam results[12]

Evolution from PISA 2000 to PISA 2006

Graph 2 shows the changes in gender differences in mathematics results between 2000 and 2006. The graph compares the results from Spain with those of the EU-15 and the United States.

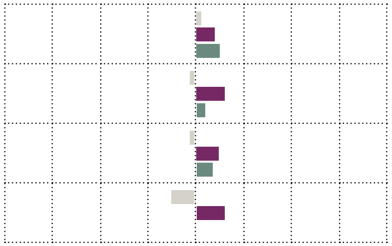
In this graph we can see some interesting differences in the evolution of the gender differences. Whilst in Spain the differences in favour of boys were considerably reduced between 2000 and 2006 (by more than 10 points), these differences have remained stable for the EU-15 average, and have increased in the United States.

Lastly, it is interesting to note that, in absolute terms, the gender differences in mathematics in favour of boys are less than the differences in reading literacy for girls.

Sciences

Gender differences

What is most striking about the gender differences in science tests is that they are generally very small , around 1 point on average.[13] In fact, depending on the specific science discipline in question, in some cases boys obtain better results, and in others girls do. Moreover, contrary to the findings for reading and mathematical literacy, in the sciences there are some countries where boys have higher points, such as Denmark (12 points) and the United Kingdom (8 points), while there are others where girls have the advantage, such as Finland (7 points) and Greece (7 points). Spain is reflected in the average score and does not, therefore, stand out.



GRAPH 3
GENDER DIFFERENCES IN SCIENCES

Evolution from PISA 2000 to PISA 2006

The second aspect of note is that there has been very little change in gender differences over time. Graph 3 shows the evolution of these differences in Spain, EU-15 and the United States between 2000 and 2006.

In Spain, a slight increase can be seen in the point differences for the science tests in favour of boys, which are similar to those observed in the EU-15, although these differences are still small (around 4-5 points). In 2006, the differences according to sex disappear in the USA.

2 GENDER DIFFERENCES IN UNIVERSITY EDUCATION

Prior to embarking on a career in science, university education must be completed. It is a well-known fact that, since the mid-nineties, women have out-numbered men in the lecture halls of our universities. In this section of our report we will analyse the relative presence of women at University, in terms of both university enrolment and graduation rates.

Relative presence of Women in the University system. Total Enrolment rates and by fields of knowledge

Table 2 shows the percentage of women enrolled in University Education (ISCED level 5A, that includes University Degrees and Master's Degrees) in Spain, the EU-15 and the United States in two years (1998 and 2007) with distinctions made between areas of specialisation.

If we look at the aggregate enrolment figures (column one), we see that Spain and the EU-15 have similar percentages of women enrolled in the higher education system, although they are lower than the U.S. percentage.

However, table 2 also reveals significant differences in the presence of women in the different fields of university education. The presence of women is overwhelming in the field of Education and Health Sciences, and clearly greater (although to a somewhat lesser extent) in Humanities and Social and Juridical Sciences. This fact is common to all three geographical areas analysed. On the other hand, women in the fields of Sciences and Mathematics and, especially, in Engineering, are still in the minority.

A POINT OF INTEREST

The gender gap in math scores disappears in countries with a more gender-equal culture.

A recent report by Luigi Guiso, Ferdinando Monte, Paola Sapienza and Luigi Zingales, "Culture, Gender and Math", published in Science, highlights a very interesting aspect of the relationship between better mathematical literacy in the PISA tests and gender-equal cultures. These authors use several indicators that reflect the relative gender equality of a country, based on political, economic and educational opportunity, as well as women's well-being. Their findings show that in countries with a high level of gender equality the maths exam scores for girls increase significantly. This important finding highlights the fact that gender differences in maths tests in favour of males are fundamentally a question of culture. As countries make *de facto* progress in gender equality, these differences will gradually disappear.
Guiso, L. F. Monte, P. Sapiensa y L. Zingales (2009), "Culture, Gender and Math", Science, vol. 320, no. 5880, pp.1164-1165

The second interesting aspect of table 2 is the evolution over time of women at university. Disparity is observed with regards to trends in fields of knowledge, although this disparity is curiously similar in Spain and the EU-15.[14] In particular, between 1998 and 2007 the relative university presence of women in Spain increased by around 4 percentage points in Engineering and 1 percentage point in Education and Social and Juridical Sciences. Contrarily, during the same time period, there was a reduction of 2 percentage points in Humanities and 6 points in Science and Mathematics. In the EU-15, between 1998 and 2007 the relative university presence of women also increased by around 4 percentage points in Engineering, and around half a point in Education, whilst the increase experienced in the fields of Social and Juridical Sciences was of almost 4 points. On the other hand, the presence of women remained stable in Humanities over that time period, and fell by 3 percentage points in Sciences and Mathematics.

Another point highlighted by table 2 is that, in spite of being a minority, the number of female pupils enrolled on Engineering courses is higher in Spain (30%) than in the EU-15 (25%), and even more so with regards to the United States (19%).

Percentage of Women Graduates. Total Graduation rates and by field of knowledge

Although we have seen there is an outstanding female presence in the university education system and progress being made in traditionally male areas, the second aspect we need to analyse is whether these high numbers are later converted into corresponding success rates. There are several studies which analyse university drop-out rates for men and women, especially in the areas of science and engineering. Seymour and Hewitt (1997), and Ginorio (1995) are just a couple of examples of studies carried out in the United States which show, although the enrolment percentage of women on technical university courses is much lower than that of men, there is no evidence that the drop-out rate is higher among women, once they have entered that field of knowledge.Table 3 shows the percentage of women who finish their university studies (including Master's degrees), once again in Spain, the EU-15 and the United States, in two years (1998 and 2007) with distinctions made between subject areas.

When we compare tables 2 and 3, the first point that stands out is that the relative percentage of women who finish their university studies is higher than those who enrol, which indicates that the university drop-out rate is higher among men. This is the case in both Spain and the EU-15. In the United States, on the other hand, the aggregate rates of enrolment and graduation are quite similar for men and women, as they also are when broken down by fields of knowledge.

	Total campos	Educación	Humanidades y Artes	Ciencias Sociales y Derecho	Ciencias Matemáticas	Ingeniería	Agricultura y Veterinaria	Ciencias de la Salud
España	53,3 %	75,3 %	64,0 %	56,8%	41,1 %	25,9 %	43,0 %	74,2 %
UE-15	51,0 %	75,2 %	66,4 %	51,9 %	40,8 %	21,7 %	45,9 %	66,6 %
EEUU	55,8 %							
España	54,5 %	76,4 %	61,6 %	57,9 %	35,1 %	30,4 %	47, 6 %	74,4 %
UE-15	54,2 %	75,6 %	66,4 %	55,6 %	37,7 %	25,3 %	50,9 %	70,1 %
EEUU	56,7 %	80,0 %	58,0 %	54,6 %	41,1 %	19,2 %	50,8 %	74,2 %

TABLA 2

PERCENTAGE OF WOMEN ENROLLED IN UNIVERSITY EDUCATION SYSTEM (ISCED LEVEL 5A)

	Total campos	Educación	Humanidades y Artes	Ciencias Sociales y Derecho	Ciencias Matemáticas	Ingeniería	Agricultura y Veterinaria	Ciencias de la Salud
1998								
España	58,6 %	75,9 %	67,8 %	58,8 %	44,9 %	25,6 %	44,8 %	77,6 %
UE-15	54,2 %	73,1 %	69,6 %	55,1 %	44,0 %	20,8 %	46,5 %	67,3 %
EEUU	55,3 %	75,8 %	59,8 %	52,9 %	43,6 %	19,3 %	45,8 %	74,6 %
2007								
España	60,9 %	79,3 %	66,3 %	62,0 %	41,0 %	33,0 %	50,9 %	78,6 %
UE-15	57,8 %	78,3 %	69,8 %	57,8 %	41,1 %	26,7 %	53,0 %	72,1 %
EEUU	58,0 %	77,8 %	60,1 %	54,4 %	43,4 %	21,6 %	49,9 %	79,5 %

TABLE 3

PERCENTAGE OF WOMEN WHO FINISH UNIVERSITY DEGREE AND/OR MASTER'S DEGREE COURSES (ISCED LEVEL 5A)

3 DIFFERENCE BY GENDER

The last stage of study before the start of an academic career consists of the preparation of a doctoral thesis. In this section we analyse the relative presence of women in doctorate programmes in Spain, the EU-15 and the United States, in two years (1998 and 2007), and also by subject area. As in the previous section, the percentages of both women enrolled on doctorate programmes and women finishing this stage are presented.

Relative presence of Women in Doctorate programmes. Total Enrolment rates and by field of knowledge

Table 4 shows the presence of women enrolled in doctorate programmes. The first column shows the percentage of women per field of knowledge, and we can highlight the following as points of interest: (i) In 1998, the presence of women in doctorate programmes in Spain was greater than that of the EU-15 and the United States, and (ii) in 2007, the percentage of women enrolled in Spain was very similar to that of the United States and slightly higher than the EU-15.

If we look at the breakdown by fields of knowledge, it is worth highlighting the following aspects: firstly, when comparing EU-15 with Spain in 1998 (it is not possible to compare with the USA due to lack of information), we can see that the percentage of women PhD candidates is higher in Spain than the EU-15 countries in all fields of knowledge. Moreover, the presence of women is greater in all fields, except Engineering, Sciences and Mathematics, and Agriculture and Veterinary Science (although in the latter two cases with a presence exceeding 40%). Secondly, when studying the situation of the female PhD candidates in 2007, an increase can be seen in their presence in all fields of knowledge, with the exception of Social Sciences, where the percentage remains practically the same at around 50%, and in Humanities and Arts, with a percentage of 57%. There is a significant increase of between 4-6 percentage points during the decade analysed for female PhD candidates in fields where they were traditionally in the minority (Science and Mathematics, Engineering, and Agriculture and Veterinary Science). It is precisely in these fields of knowledge (particularly Sciences and Mathematics, and Engineering) where the presence of women in Spain is clearly greater that in the EU-15 and the United States. In other fields, such as Education and Health Sciences, the presence of women is similar in all three geographical areas analysed, whilst in Social Sciences and Law the percentage in Spain is almost on a par with the EU-15, and is less than that of the United States.

	Total campos	Educación	Humanidades y Artes	Ciencias Sociales y Derecho	Ciencias Matemáticas	Ingeniería	Agricultura y Veterinaria	Ciencias de la Salud
1998								
España	50,4 %	61,6 %	57,1 %	50,9 %	44,0 %	24,4 %	40,9 %	57,8 %
UE-15	44,2 %	61,1 %	54,4 %	45,7 %	39,7 %	21,6 %	41,1 %	54,8 %
EEUU	46,1 %							
2007								
España	51,8 %	64,7 %	57,0 %	50,3 %	48,9 %	30,9 %	46,5 %	63,5 %
UE-15	48,2 %	64,8 %	55,9 %	51,3 %	42,0 %	27,8 %	52,1 %	59,6 %
EEUU	52,1 %	65,1 %	48,8 %	57,0 %	40,9 %	23,5 %	44,9 %	66,3 %

TABLE 4

PERCENTAGE OF WOMEN ENROLLED IN DOCTORATE PROGRAMMES

Percentage of women who Finish PhD programmes and are awarded the title Doctor. Total Graduation Rates and by field of knowledge

In the previous section we highlighted the fact there are more women enrolled in doctorate programmes than men in the majority of the fields of knowledge. However, the next question to be asked is whether more women finish these programmes than men and, therefore, more are also awarded the title of Doctor. By comparing the number of women enrolled in the programmes and the number who become Doctors, we can see the drop-out rates of women in relation to those of men in doctorate programmes.

Table 5 shows the percentage of women with PhDs in Spain, the EU-15 and the United States, in two years (1998 and 2007) and by fields of specialisation.

The first point of note when observing the percentage of women for the aggregate of all fields of knowledge (first column) is that in 1998 the percentage of women Doctors is lower than that of men in Spain and in the EU-15 and the USA. This fact, in combination with the majority presence of women enrolled in doctorate programmes, leads us to the following conclusion: *the drop-out rate for doctorate programmes was higher for women than men in 1998.*

A comparison of the situations in 1998 and 2007 reveals a significant increase in the presence of women participating in these programmes: the increase is of 5 percentage points in Spain and 9 points in both the EU-15 and the United States. In addition to this, the difference between the relative percentage of women enrolled in doctorate programmes and that of those who finish them decreases, leading us to conclude that there is a reduction in the drop-out rate of women at this stage of study.

Lastly, it is also interesting to note that the drop-out rate of women in doctorate programmes in the United States is less than that of the EU-15, and this, in turn, is slightly lower than the rate for Spain.

Breaking the data down by field of specialisation, and comparing tables 4 and 5, several interesting facts are revealed: firstly, the drop-out rates of women in relation to men were much higher in 1998 than in 2007 in the EU-15 in all the fields of specialisation. However, in Spain the drop-out rates of women in relation to men were significant and increased in areas with a female majority, such as Education and Humanities, whilst they decreased significantly in a fields where women were in the minority, such as Engineering and Health Sciences. In Science and Mathematics, Social and Juridical Sciences, and Agriculture and Veterinary Science, the drop-out rates in 2007 were higher for men. It should be noted that in the United States it is relatively common for drop-out rates for doctorate programmes to be higher among men than women, especially in fields such as Education, and Social, Juridical and Health Sciences, whilst in the rest of fields the drop-out rates are higher among women, although the differences are minimal. A similar situation can be observed in the EU-15, where there are no significant gender differences as regards drop-out rates for these programmes.

	Total campos	Educación	Humanidades y Artes	Ciencias Sociales y Derecho	Ciencias Matemáticas	Ingeniería	Agricultura y Veterinaria	Ciencias de la Salud
1998								
España	42,0 %	55,2 %	41,4 %	44,1 %	43,9 %	18,8 %	42,9 %	45,1 %
UE-15	36,9 %	51,7 %	47,4 %	37,3 %	33,2 %	17,8 %	43,2 %	45,6 %
EEUU	40,8 %	62,8 %	44,0 %	49,2 %	31,1 %	12,7 %	29,8 %	58,4 %
2007								
España	47,6 %	49,6 %	46,8 %	51,2 %	50,2 %	27,9 %	48,5 %	55,1 %
UE-15	45,6 %	66,8 %	53,9 %	48,6 %	40,9 %	25,2 %	54,7 %	54,6 %
EEUU	50,1 %	67,5 %	45,7 %	58,8 %	38,1 %	21,4 %	38,5 %	73,3 %

TABLE 5

PERCENTAGE OF WOMEN WHO FINISH THEIR DOCTORATE

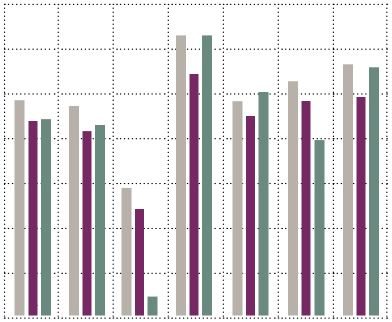
The exception to the rule here is the field of Engineering, where the drop-out rate of women is particularly high for all three geographical areas analysed.

Percentage of women with a PhD by field of specialisation. Description by cohorts for Spain

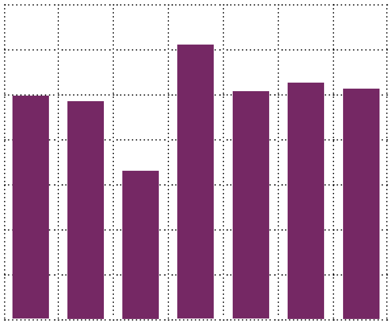
An additional piece of interesting evidence for Spain can be taken from the Human Resources in Science and Technology Survey[15]. In particular, this survey provides information on the presence of women with PhDs by field of study according to when the doctorate was awarded (0-5 years, 6-15 years or more than 15 years ago). This can help us understand the evolution over time of the presence of women with doctorates per field of study.

Graph 4 shows this information. There are two points that should be highlighted:

> **a)** Medical Sciences and Humanities have a majority of women with PhDs awarded more than 15 years ago, and the percentage is relatively high in all other fields of specialisation (around 40%), again with the exception of Engineering and Technology where the presence of women with doctorates from more than 15 years ago is almost insignificant (4%).
> **b)** The presence of women has evolved favourably over time, especially in areas where they were previously more in the minority. The presence of women with PhDs has risen from 4% to almost 30% in Engineering and Technology. In the rest of the fields of specialisation virtual gender parity, or even a majority of women with recently-awarded doctorates, is observed.



GRAPH 4
PERCENTAGE OF WOMEN WITH DOCTORATES BY FIELD OF SPECIALISATION AND TIME SINCE DOCTORATE

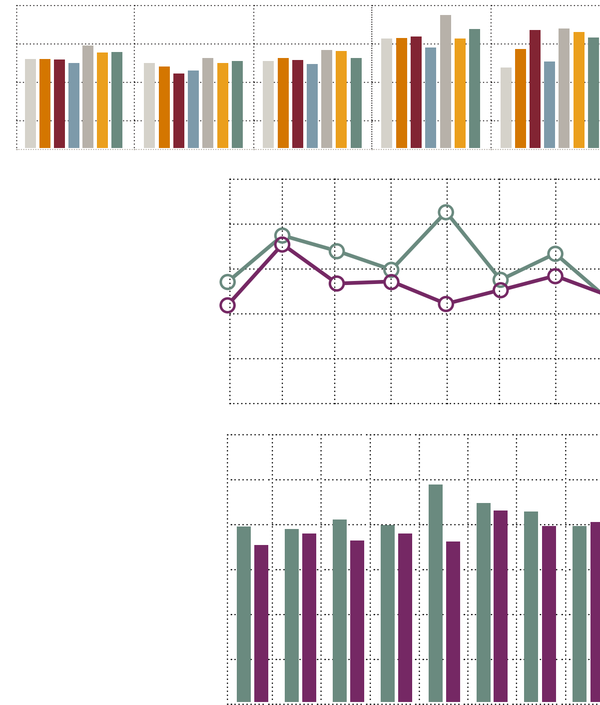


GRAPH 5
PERCENTAGE OF WOMEN WHO HAVE DONE A POST-DOCTORATE BY FIELD OF SPECIALISATION

4 TRANSITION FROM DOCTORATE TO POST-DOCTORATE. GENDER DIFFERENCES IN SPAIN

After the pre-doctoral stage, and before entering true academic life, some doctors decide to take up post-doctoral residencies in universities (more often than not) different from those where they studied for their doctorate. These residencies allow them to widen the field of application of what they have learnt during the doctoral stage for their future academic life, whilst, at the same time, enabling them to establish professional relationships with other researchers in the same area. Both of these aspects are highly advisable, especially if their PhD is from the same university as their degree.

Given that this paper attempts to identify gender differences in academic activity, it is interesting to know whether men and women make different choices regarding their post-doctoral residencies. Graph 5 uses data from the Human Resources in Science and Technology Survey on the number of doctors who were doing a post-doctorate in 2006 (the year of the survey). The graph helps us understand that there are no gender differences in the majority of research fields (Natural Sciences, Social Sciences and Humanities), while women are overly-represented in Medical Science post-doctoral residencies, and under-represented in Engineering and Technology.



GRAPH 6
PERCENTAGE OF WOMEN AWARDED FPI GRANTS

5 PUBLIC GRANTS FOR POST-GRADUATE AND POST-DOCTORATE STUDY IN SPAIN. GENDER DIFFERENCES

Although we may not have detailed information of public grants for US and EU post-graduate studies, we do have information on the distribution, by gender, of the grants awarded to students in Spain for post-graduate study. Therefore, as in the previous sections we will provide an analysis over time (as far as possible), and by field of specialisation. We will begin by looking at the gender differences in the grants awarded by the Ministry of Education.

Pre-Doctoral Study Grants for Research Personnel (FPI)[16]

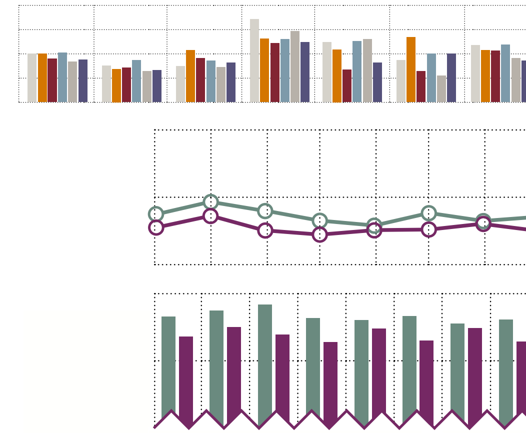
Graph 6 shows the evolution in the percentage of women who have been awarded FPI grants by the Ministry, as well as differences regarding applications for these grants and the awarding of them. The information is provided by field of specialisation. The most significant facts are the following:

a) In an analysis of all the fields of knowledge, results seem to show that in 2009 parity had been reached in both the awarding of these grants and applications for them.
b) Although there are some gender gaps in the awarding of grants by fields of knowledge, the differences are not significant. It is interesting to note that gender parity has been achieved in the field of Science and Technology.
c) LThe success rate for grants awarded is similar for both women and men. This leads us to the conclusion that the applications made by both sexes are most likely of a comparable quality.

Ramón y Cajal Grants

Although we have seen that gender parity has been achieved in the awarding of FPI grants, the awarding of "Ramón y Cajal" grants paints quite a different picture.[17] Graph 7 provides the following information:

a) In an analysis of all grants awarded across the fields of specialisation, a very stable percentage (around 30%) of women is observed over time for this category of grants.
b) However, in the chart below left we can see that there are also fewer applications by women (although they are over 30%), which leads us to suggest that the ratio of grants awarded to applications made for this type of subsidy is greater for men than women. In fact, the chart below right corroborates this information. Here we see that men enjoy a greater degree of success in obtaining these grants than women. Nevertheless, given that we do not have any information on the scientific qualifications of the candidates, we cannot venture to give the reasons for the gender gap observed.
c)If we analyse each of the scientific fields separately, we observe a relatively stable situation over time in the majority of fields, although with a disparate number of women among them. d) The drop in the number of women in the field of Humanities is worthy of note: this changes from around 50% in 2001 to 24% in 2009. However, due to the lack of information on the percentage of women applicants by field of specialisation, we cannot say whether this reduction is due to a decrease in the number of women applicants in relation to men, or a decrease in the success rate of women.

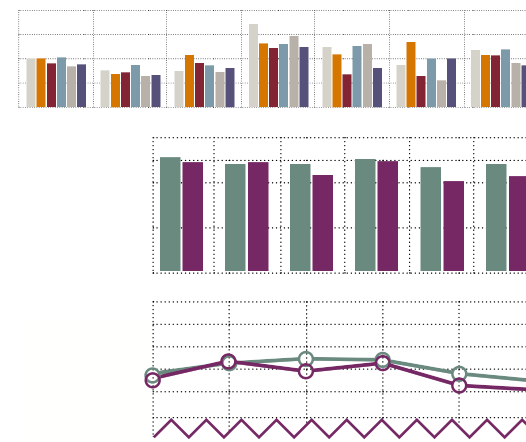


GRAPH 7
PERCENTAGE OF WOMEN WITH RAMÓN Y CAJAL GRANTS

Juan de la Cierva Grants

Graph 8 shows the percentage of women with "Juan de la Cierva" grants.[18] We can see that the aggregate percentage is around 40-50% - higher than the "Ramón y Cajal", but lower than the FPI grants. The conclusions reached regarding this programme are as follows:

a) The differences between fields persist, but in a less latent way.
b) The differences in degrees of success in the awarding of grants are slightly below those of the "Ramón y Cajal" grants.



GRAPH 8
PERCENTAGE OF WOMEN WITH JUAN DE LA CIERVA GRANTS

Torres Quevedo Programme

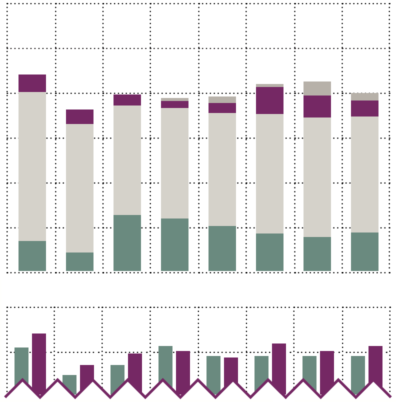
The Torres Quevedo programme is aimed at laboratory and private sector work, especially small and medium enterprises. Its purpose is not, therefore, so academic as for the aforementioned grants. Graph 9 offers information on the evolution of the presence of women. The following are the most significant points:

a)Regarding the evolution of the percentage, we see the presence of women with these subsidies remains relatively stable and around 40%.
b) The success rate in the awarding of the grants is greater for women (around 3 percentage points).

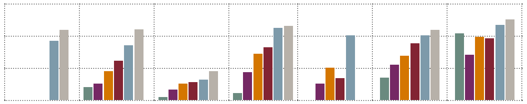
Pre and Post-Doctoral Grants from the Fulbright Commission[19]

Finally, here is a look at the percentage of women with pre- and post-doctoral grants awarded by the Fulbright Commission. The information we have available covers a much greater time period than that of the aforementioned grants, which translates to a far richer scope of data. The most significant points are as follows:

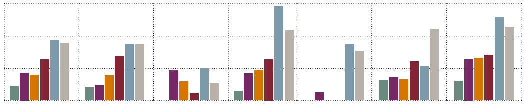
a) This Commission's grants for both pre-doctoral and post-doctoral studies show an impressive increase in the percentage of women. This increase is particularly sharp in the areas of Natural Sciences, Medical Sciences and Social Sciences. The percentage of women in Science and Technology, however, is still very low for pre-doctoral grants and, in particular for, post-doctoral ones.
b) The percentage of women with post-doctoral grants seems to be growing at a slower rate than that of women with pre-doctoral ones.



GRAPH 9
PERCENTAGE OF WOMEN WITH TORRES QUEVEDO PROGRAMME GRANTS



GRAPH 10
PERCENTAGE OF WOMEN WITH FULBRIGHT GRANTS FOR PRE-DOCTORAL STUDIES/RESEARCH



GRAPH 11
PERCENTAGE OF WOMEN WITH FULBRIGHT GRANTS FOR POST-DOCTORAL STUDIES/RESEARCH

6 CONCLUSIONS

In the stage prior to university education (secondary education), the three PISA reports available to date show that there is a better reading ability and attitude among girls than among boys in both Spain and the EU-15. As regards mathematical skills, boys achieve better results than girls, although the gender gap is significantly narrower than that observed in reading literacy. Recent studies available seem to confirm that the better results by boys in mathematics are mainly due to girls showing less inclination towards the discipline, rather than a difference in mathematical ability between boys and girls. They also show that these differences between the sexes tend to be smaller in more gender-equal countries. Finally, there do not seem to be any significant gender differences as regards learning the sciences.

b) During the 1998-2007 period, there was a high level of over-representation of female university students enrolled in the areas of Education (77% of all students enrolled in this area in 2007), Health Sciences (74%) and Humanities (62%), and a clear under-representation in Engineering (30%) and Sciences and Mathematics (35%). These patterns also apply in the United States and the EU-15 though, on a positive note, it is important to highlight the fact that the percentage of women enrolled in Engineering in Spain is higher than that in the other reference zones. In addition, this phenomenon of gender segregation by field of study tends to disappear gradually. Over the 10 years analysed, we can see a progressive reduction in the number of women on degree courses where they were in the majority, and an increase in the percentage of women on those courses where they were in the minority. Finally, in keeping with the theory that women view higher education as an essential requirement for work in less competitive labour markets, female graduation rates in Spain and the EU-15 are higher than male ones in almost all areas. This is a phenomenon that does not occur in the United States where the situation is more equal as regards gender.

c) The above trends are repeated in the percentage results for doctorate programmes, with Engineering showing the smallest percentage (25%), the same as in the United States and the EU-15. However, in this case the PhD rates of women are quite a lot lower than those for men, the opposite of the United States.

d) As regards participation in grant programmes, the percentage of women is greater in pre-doctorate programmes than in post-doctorate ones. The evolution of the percentage of women in post-graduate programmes (with the exception of the Fulbright programme) does not show a sustained increase over time that reflects the increase in the number of women qualified to obtain these grants.

e) The percentage of women in pre-doctorate grant programmes is around 50%, that is 10% below the percentage of women among the candidates that qualify for the grants.

f) The percentage of women in the Juan de la Cierva programme has fallen gradually over the last five years. The percentage of women in the Ramón y Cajal programme is remarkably low and does not seem to be improving with time. The percentage of women in the Torres Quevedo programme is stable at around 40%, although it is not an academic programme, but a programme for incorporating technologists into small and medium enterprises.

g) The Fulbright Programme, one of the most competitive and prestigious programmes available, is the grant programme with the highest number of female participants, and is the only one where the percentage of women has consistently increased over time, both at pre- and post-doctorate levels. In the case of the Fulbright pre-doctoral grants, the percentage of women is now very close to the percentage of women qualified to obtain them (women undergraduates).

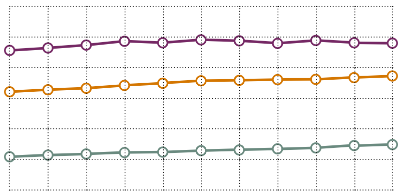
Chapter 3

GENDER DIFFERENCES IN SCIENCE CAREERS. EMPIRICAL EVIDENCE

Brindusa Anghel | Sara de la Rica | Juan José Dolado

The main objective of this chapter is to document the gender gaps in science careers, taking into account the evidence provided in the previous chapter on the differences that exist between the achievements of men and women in the previous secondary and university education stages.

The chapter is structured as follows. The first section uses recent data to illustrate the relative percentage of women holding university teaching and research positions, both on a first contract level (post-doctoral positions or Assistant Professors), and in the civil service areas of career consolidation and professional development (tenure and professorship), distinguishing between fields of knowledge and making comparisons with other countries. The following section provides a more detailed and dynamic view of the gender differences that exist in professional science careers. As much descriptive evidence on scientific production is given here (publications, thesis direction, project financing, prestige among peers, and promotion to higher academic levels), as econometric evidence, controlling for factors other than gender which affect possible achievements in these activities. Finally, the third section summarises the main conclusions reached in this chapter.



GRAPH 12

PERCENTAGE OF FEMALE TEACHING FACULTY IN SPAIN

1 GENDER DIFFERENCES IN RESEARCH PERSONNEL IN PUBLIC SPANISH UNIVERSITIES AND THE CSIC[20]

The evidence that exists on the relative presence of women among the teaching and research staff (trs) of public universities in Spain comes from the University Teaching in Spain Statistics produced annually by the National Statistics Institute (INE).[21] This source of information includes the most relevant characteristics of the alumni, teaching and research staff, first and second cycle university centres, and Master's degree and PhD studies. The information available is from academic years 1998-99 to 2007-8.

Percentage of women in the teaching and research faculty of public Spanish universities: Evolution from 1998 to 2008

Graph 12 shows the evolution over time of the percentage of women in the teaching and research staff (trs) of centres belonging to the public Spanish universities during that time. A distinction is made between Assistant Professorships, Associate Professorships and Full Professorships.

In a study of graph 12 we can see that over the ten years analysed in the study (1998-2008) the trend towards greater female representation has grown gradually and in parallel in all three areas (Full Professorships, Associate Professorships and Assistant Professorships), with a percentage increase of less than 1% per year in all cases.

In the case of the Assistant Professors, this slow rhythm of growth can be explained in so far as it has reached parity, with our percentage of women assistants even being higher than that of the United States and the European Union countries, as we will see below.

Regarding Associate Professorships, a quicker increase in this percentage can be expected given the practical parity of the lower strata and the lack of significant gender differences in promotion to Associate Professor. However, in specific reference to Full Professorships, this increase is clearly insufficient. Given the number of female Associate Professors in Spain (35%), in an ideal situation of equality (which is perhaps not the current situation), we could expect that around 1/3, or a slightly higher percentage, of the new Full Professors would be women.

Spain in an international context

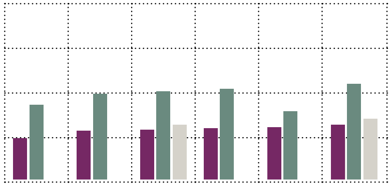
Graphs 13, 14 and 15 compare the percentage of women among the university teaching faculty of Spanish universities with that of the United States and the European Union (EU-25).

The graphs generally show that the percentages of women integrated into the different categories of teaching faculty in Spanish universities are comparable to the average percentages for all categories in the EU-25 (or even slightly more favourable), except in the case of Full Professorships. There is an even greater deficit regarding Full Professorships when we compare with the United States. If we look at the evolution over time, we see that the increase in the presence of women at different levels of the academic scale is the result of a continual, but slow, process, although this evolution does not differ substantially from those of the EU-25 or the United States, the latter being the country with the most women in the academic world. The graphs show a significant persistence in the gender gaps over the 10 years analysed. In Spain, the percentage of women in the Assistant Professorship category increased by some 5 percentage points (from 45% to 50%), and somewhat less (around 2-3 points) for Associate Professorships, whilst growth has been around 4 percentage points for Full Professorships (from 10% to 14%). This is similar to the growth experienced in the United States (from 22% to 26%), but starting from a much lower level.

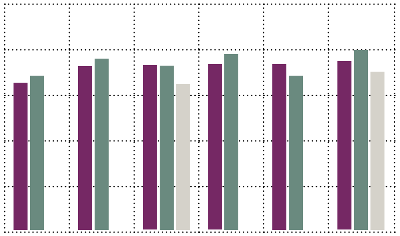
Percentage of women by field of knowledge

In the same way there is occupational segregation of the sexes in the labour market, the same occurs in the scientific world: the distribution of women over fields of knowledge is quite unequal to that of men. Graphs 16, 17 and 18 compare the relative presence of women among Spanish university teaching faculty for these fields.

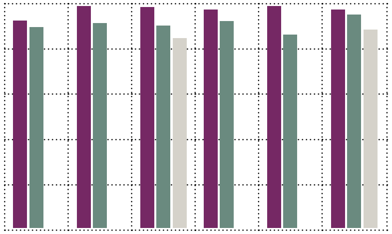
In the case of Full Professorships it is clear that, although the percentage is still low, the greatest proportion of women is to be found in the field of Humanities. This is followed by Natural Sciences, a field in which women have achieved a greater presence over time. Following this come Social and Medical Sciences, where the percentage of women has also increased significantly. Lastly,



GRAPH 13
PERCENTAGE OF WOMEN WITH FULL PROFESSORSHIPS



GRAPH 14
PERCENTAGE OF WOMEN WITH ASSOCIATE PROFESSORSHIPS

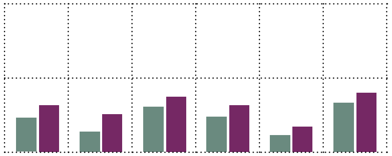


GRAPH 15
PERCENTAGE OF WOMEN WITH ASSISTANT PROFESSORSHIPS

the percentage of women with Full Professorships in technical disciplines is still under 10%.

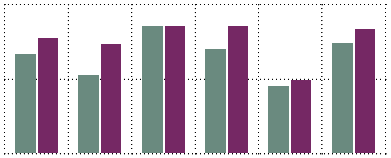
In the case of Associate Professorships, a greater percentage of women is found in Natural Sciences than in any other area (around 45%). In recent years Humanities, Social Sciences and, to a lesser extent, Medical Sciences have experienced an increase in the relative presence of women. Once again, at this level, technical degrees continue to show the lowest percentage of women (approximately 20%).

As regards Assistant Professorships, women almost achieve parity in Humanities, Natural Sciences and Social Sciences, whilst, since they passed the 50% threshold in 2000 women have maintained their majority in Medical Sciences. Once again the lowest percentage of women (around 30%) is in technical careers. Table 6, shown here under the graphs, provides the total number of Full Professorships and Associate Professorships by field of knowledge, as well as additional information to complement that revealed in the graphs.



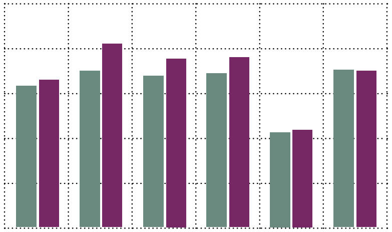
GRAPH 16

PERCENTAGE OF WOMEN WITH FULL PROFESSORSHIPS BY AREA



GRAPH 17

PERCENTAGE OF WOMEN WITH ASSOCIATE PROFESSORSHIPS BY AREA



GRAPH 18

PERCENTAGE OF WOMEN WITH ASSISTANT PROFESSORSHIPS BY AREA

	Médicas		Naturales		Sociales		Técnicas		Humanidades	
	Mujeres	Total	Mujeres	Total	Mujeres	Total	Mujeres	Total	Mujeres	Total
Cátedras										
1998	54	774	157	1.049	186	1.593	98	1.730	291	1.755
2007	120	954	267	1.507	268	1.806	175	2.057	521	2.652
Titularidades										
1998	655	2.557	1.732	3.991	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 6

NUMBER OF WOMEN BY FIELD AND ACADEMIC LEVEL

EXTREMELY Male-dominated Fields of Knowledge: A brief mention

It is worth mentioning that there are some fields of knowledge in our country where the presence of women is particularly low (both in the Full Professorship and Associate Professorship categories). The table below shows each of the fields of knowledge with branches where the percentage of women Full Professors and Associate Professors is low. The percentage is provided for the total number of women Full Professors and Associate Professors for the entire field, as well as the breakdown by branch to give a good idea of the size of them. The most "worrying" situations are those where the presence of women is almost (or even totally) non-existent, but the global percentage of women is not particularly low. This seems to be the case for some areas in the fields of Natural Sciences and Medical Sciences, and even in Engineering and Technology, although in the latter two the total number is generally very small. In the case of Medical Sciences, it is particularly striking that there are no women Full Professors in areas such as gynaecology and obstetrics, and paediatrics, and that these fields have a greater number of women who obtain their PhD but do not embark on an academic career.

Campo	Area de Conocimiento	% Mujeres catedráticas	Número total cátedras
Ciencias Naturales (Mujeres catedráticas: 18 %)			
427	Geodinámica Externa	0,00 %	16
395	Física de la Materia Condensada	2,25 %	89
405	Física Teórica	5,33 %	75
800	Teoría de la Señal y Comunicaciones	5,98 %	117
Ingeniería y Tecnología (Mujeres catedráticas: 8 %)			
083	Ciencias y Técnicas de la Navegación	0,00 %	2
115	Construcciones Navales	0,00 %	13
505	Ingenería Cartográfica, Geodésica y Fotogrametría	0,00 %	10
515	Ingeniería de los Procesos de Fabricación	0,00 %	13
525	Ingeniería del Terreno	0,00 %	22
530	Ingeniería e Infraestructura de los Transportes	0,00 %	22
600	Mecánica de Fluidos	0,00 %	30
710	Prospección e Investigación Minera	0,00 %	19
715	Proyectos Arquitectónicos	0,00 %	36
815	Urbanística y Ordenación del Territorio	0,00 %	29
Ciencias Médicas (Mujeres catedráticas: 13 %)			
645	Obstetricia y Ginecología	0,00 %	37
653	Otorrinolaringología	0,00 %	16
670	Pediatría	0,00 %	35
817	Urología	0,00 %	6
830	Traumatolgía y Ortopedia	0,00 %	12
Ciencias Sociales (Mujeres catedráticas: 16 %)			
195	Didáctica de la Lengua y la Literatura	0,00 %	10
245	Educación Física y Deportiva	0,00 %	8
813	Trabajo Social y Servicios Sociales	0,00 %	2
125	Derecho Administrativo	5,56 %	90
Humanidades (Mujeres catedráticas: 20 %)			
327	Filología Eslava	0,00 %	1
655	Paleontología	6,67 %	30
480	Historia e Instituciones Económicas	7,81 %	64
270	Estética y Teoría de las Artes	8,33 %	12

BRANCHES OF KNOWLEDGE WITH A LOW PERCENTAGE OF WOMEN FULL PROFESSORS

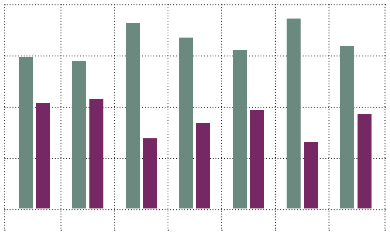
Campo	Area de Conocimiento	% Mujeres titulares	Número total titularidades
Ciencias Naturales (Mujeres titulares: 47 %)			
405	Física Teórica	11,21 %	116
428	Geodinámica Interna	16,33 %	49
800	Teoría de la Señal y Comunicaciones	16,34 %	355
585	Lógica y Filosofía de la Ciencia	17,02 %	94
Ingeniería y Tecnología (Mujeres titulares: 24 %)			
083	Ciencias y Técnicas de la Navegación	3,03 %	33
115	Construcciones Navales	4,88 %	41
495	Ingenería Aeroespacial	5,00 %	20
515	Ingeniería de los Procesos de Fabricación	9,09 %	44
530	Ingeniería e Infraestructura de los Transportes	9,09 %	33
Ciencias Médicas (Mujeres titulares: 36 %)			
817	Urología	0,00 %	13
830	Traumatolgía y Ortopedia	0,00 %	31
090	Cirugía	5,14 %	175
610	Medicina	10,03 %	329
Ciencias Sociales (Mujeres titulares: 42 %)			
245	Educación Física y Deportiva	17,48 %	143
187	Didáctica de la Expresión Corporal	30,43 %	92
125	Derecho Administrativo	30,87 %	230
070	Ciencia Política y de la Administración	31,86 %	113
Humanidades (Mujeres titulares: 41 %)			
375	Filosofía	19,70 %	198
383	Filosofía Moral	20,97 %	62
480	Historia e Instituciones Económicas	22,52 %	151
475	Historia del Pensamiento y Movimientos Sociales y Políticos	22,58 %	31

BRANCHES OF KNOWLEDGE WITH A LOW PERCENTAGE OF WOMEN ASSOCIATE PROFESSORS

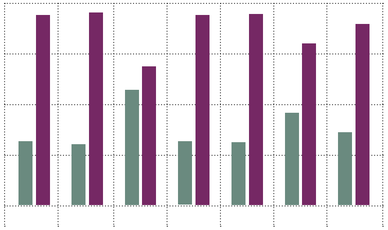
Ageing at Full Professorship and Associate Professorship levels

An additional matter worth mentioning is the gradual ageing of Full Professors in certain fields of knowledge, such as Medical Sciences and Humanities, where over 75% are currently 55 or over, as opposed to other fields, such as Natural Sciences or Engineering and Technology, where the percentage does not reach 60%. A similar phenomenon occurs with the ages of Associate Professors (for obvious reasons somewhat younger than the Full Professors), where the fields of Natural Sciences, Engineering and Technology, Social Sciences and Agricultural Sciences have a greater percentage of under-55s, whilst Medical Sciences and Humanities are once again the fields where researchers are older. This data is influenced by factors relating to possible expansions, creation of new universities and Associate Professorships, and moments of mass creation of Full Professorships. Medicine and Humanities have been limited in their possibilities for expansion: due to the numerus clausus of the first and the drop in students in the second.

These differences imply that, in the coming years, a greater generational changeover should be experienced in the more mature areas (in terms of age of faculty). Given that women are over-represented in Medical Sciences and Humanities on an undergraduate level, these should be the fields where an advance is made towards parity with men in the two categories analysed.



FULL PROFESSORS: % BORN BEFORE AND AFTER 1955



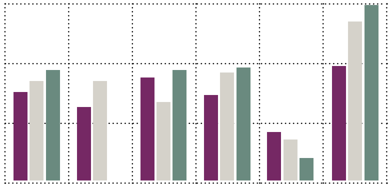
ASSOCIATE PROFESSORS: % BORN BEFORE AND AFTER 1955

Spain in an international context

When attempting to compare Spain to the principal countries surrounding us, we encounter the problem of a lack of data broken down by fields of knowledge. However, we have had access to the percentage of women in the EU-25 and the United States that held full professorships in 2007. Graph 19 shows the differences with regards to Spain.

As regards this group, we can see that Spain is on the same level as the United States for Natural Sciences. Regarding more technical areas, it is noticeable that, in spite of the scarce presence of women in technical careers, the Spanish university system shows a percentage of women Full Professors that is higher than that of the EU and much higher than that of the USA.

In Spain this percentage is almost 10%, whilst in the EU countries it hardly clears 5% and in the United States it does not even reach that. However, in Social Sciences it is below the levels reached in both the EU and the USA, an unfavourable difference which is even greater in the field of Humanities. Therefore, by combining this evidence with that represented by Graph 16, we can conclude that our distribution of women professors over the fields of knowledge does not differ substantially from that observed in other countries: the highest percentage is in Humanities and the lowest in Technical Sciences.



GRAPH 19
PERCENTAGE OF WOMEN FULL PROFESSORS BY AREA. SPAIN, EU-27 AND USA (2007)

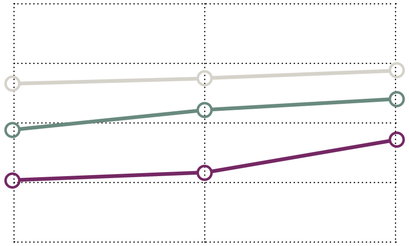
Percentage of women at different levels of the CSIC

To round up this overview of the presence of women in science careers in our country, it is worth taking the time to look at the situation of women in the Higher Scientific Research Centre (CSIC), as it is the largest public research body in Spain.

Continuing with the same methodology used so far, we will show three sources of evidence regarding the presence of women in the CSIC:

a) Firstly, we show the evolution (2001-2010) of the aggregate percentage of women at different levels of the CSIC – Grade C researchers, Grade B researchers and Grade A researchers.[22]
b) Secondly, the information previously provided is broken down by field of knowledge.
c) Thirdly and finally, we look at the situation of women, not only in relation to the percentage evolution over time, but also with regards to different age brackets.

Graph 20 reveals that the evolution seen in recent years is promising. A clear increase is observed in the number of women entering primarily through promotion (Grade B and Grade A), with a boost of about 8% in both categories. On the other hand, the percentage has remained the same, at around 40%, at entry level (Grade C researchers).



GRAPH 20
PRESENCE OF WOMEN IN THE CSIC. EVOLUTION OVER TIME BY PROFESSIONAL LEVEL

The remarkable increase in the presence of women at levels with greater requirements (Grade A researchers) over the last 5 years is particularly significant, having risen from 12% to 22% with a clear point of inflection in 2005. This significant increase in the percentage of women in the highest category coincides with parity commissions being imposed on CSIC tribunals in 2005 for promotion to higher levels. The results show the efficiency of the active measures taken.

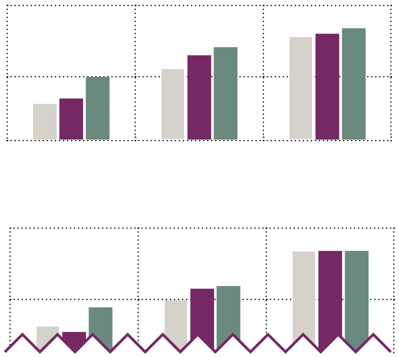
We will now move on to the evolution over time of the presence of women, breaking the data down by (i) fields of knowledge, and (ii) age groups. Graphs 21 and 22 show these results.

An analysis of the percentage of women by field of knowledge allows us to highlight the following:

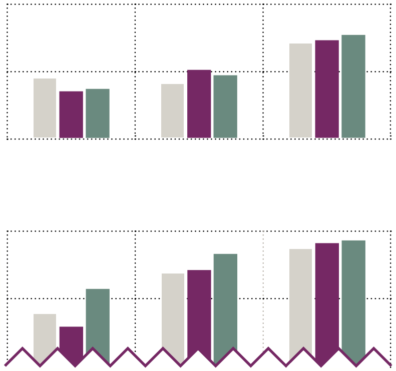
- The percentage of women at the highest level of the CSIC (Grade A researchers) is particularly low in Biology and Biochemistry, and in Agricultural Sciences. Although the percentage of women in these two fields is around 40% at the lowest level of Grade C researcher, it is only half that at the highest level. It is promising for the future, however, that the growth rates in recent years have been particularly high in these areas and in Science and Technology, even at the Grade A level.
- Such large differences in the presence of women at the different levels of the CSIC are not observed in the fields of Natural Resources, and Humanities and Social Sciences. However, neither is there such a positive evolution of the percentage of women over the last 5 years at the higher levels as we have documented for the more technical areas. In fact, from 2005 to 2010, the presence of women at the intermediate level of Grade B researcher has fallen in the field of Natural Resources. The area of Humanities and Social Sciences has remained practically stable at the upper and lower levels, whilst it has increased significantly at the Grade B level, rising from 32% in 2005 to 42% in 2010.

All these data results have been influenced by circumstances related to the history of the centres, the number of places assigned internally to each area, and the recruitment of new staff as a result of internal policies for creating new centres.
Another interesting aspect is that related to the evolution of the percentage of women in the CSIC by age group and field of knowledge (aggregate CSIC levels).

Graph 22 provides us with this information. As with the previous graph, it first shows the percentage of women in the CSIC and their evolution over time by age groups (in aggregate form for all fields of knowledge), and then shows the situation of women by age group for each separate area. This graph reveals the following points of note:



GRAPH 21
PRESENCE OF WOMEN IN THE CSIC BY FIELD OF KNOWLEDGE. EVOLUTION OVER TIME BY CSIC LEVELS



GRAPH 22
PERCENTAGE OF WOMEN IN THE CSIC BY FIELDS OF KNOWLEDGE. EVOLUTION OVER TIME BY AGE GROUP

a) Looking at all the fields as a whole, we can see a clear increase in the amount of women in the CSIC. In 2010 the percentage of women under 45 years old is almost 40%, as opposed to only 26% of women over 65.
b) A study of each of the different fields of knowledge separately reveals some interesting phenomena: (i) the advancement of the presence of women in fields where they are in the minority, such as Science and Technology, especially for the 26-45 age bracket. This means we can predict an upward trend in the presence of women in the CSIC over the next few years, although this will be influenced by how many places are offered (ii) parity between men and women in the field of Humanities and Social Sciences for the 25-45 age group in 2010, with a spectacular increase (20 percentage points) in the presence of women over the last five years, an effect of the creation of a new centre and the policy of gender-equal evaluation committees, and (iii) the absence of a growing trend to relatively incorporate more women into other areas such as Biology and Biochemistry, Natural Resources and Agricultural Science, where the presence of women in each age group seems to remain consistent, with a scant increase in the number of places offered.

2 SUCCESS IN A SCIENCE CAREER. GENDER DIFFERENCES

In this section we analyse gender differences in terms of success in a science career. Two aspects are identified as representative of success in a science career (i) gender differences in terms of scientific productivity, and (ii) gender differences in terms of promotion and/or recognition.[23]

Gender differences in Scientific Productivity

Labour productivity is generally very difficult to measure. In the world of science current norms tend to consider research activity more important than other areas of professional activity, such as teaching ability or student support (this is particularly significant for those who work at universities), or as opposed to other activities of equal social value, such as the release, management and transfer of knowledge to society in general.

In this chapter we will not try to evaluate whether this is the most suitable criterion or not. However, it is important to point out that this criterion cannot be neutral from a gender point of view. Studies do exist, such as S.M Park (1996) or Gottleib and Keith (1977), that show that on average academic women spend more time preparing teaching materials than their male counterparts, which would leave them with less time for research.

In this section we will focus on the gender differences observed in the areas that are usually most valued in an assessment of the productivity of an academic. Specifically, and in decreasing order of importance, we will analyse the following aspects related to productivity:

a) The publication of articles in scientific journals, the publication of books.
b) The direction of doctoral theses.
c) Participation as Principal Investigator on projects funded by competitive schemes.
d) Participation in evaluation and selection committees, including the Editorial Committees of academic journals.

Before describing the gender differences in scientific productivity, we should first point out that the quantitative evidence available for comparing men and women is scarce. There are many qualitative evaluations on these gender differences but, in this section, we intend to limit ourselves to summarising the quantitative evidence that exists. Firstly, we will focus on describing the existing evidence in an international context (USA and EU). We will than tackle the specific analysis of the situation in Spain, using the Human Resources surveys carried out by the INE on a sample of Spanish doctors.

Gender differences in scientific publications (articles and books)

International Evidence . General considerations

A fair amount of evidence exists on gender differences in the form of scientific articles published for the United States, although the fields of specialisation analysed are limited to Basic Sciences and Engineering. The evidence generally suggests that, on average, men publish more than women in these areas (Hunt (2010), Ceci and Williams (2007)). However, there are several interesting aspects that should be highlighted:

• The longitudinal analysis by Xie and Shauman (1998) of the evolution of gender differences in scientific publications for the aforementioned areas shows that the ratio between publications by women and men has risen from 0.580:1 in 1969 to 0.817:1 in 1993. This indicates a significant evolution for women in relation to men over these 15 years, in spite of the difference still being in favour of men. However, the authors show that the number of publications by the academic women surveyed depends heavily on such aspects as academic rank, institutional affiliation and academic position, to the extent that, when men and women with the same rank, affiliation and academic position are compared, the gender differences in the publication of articles disappear.[24]

• In the field of Biochemistry, Long (1992) shows that, although the number of publications by women is once again somewhat lower than that of men, the number of times the articles written by women are quoted is above average. For this reason, when evaluating academic productivity in terms of publications, it is very important to include not only the number of articles, but also other means of measuring quality, such as the impact factor of each of them.

For the EU, the quantitative evidence on gender differences in academic publications is much more scarce. There are many reports by the European Commission aimed at developing gender equality, but in the majority of cases only qualitative evidence is provided, with only a minimum of quantitative evidence available. Consequently we have to limit the greater part of the analysis to Spain, as we have a micro-data base available that allows us to analyse this quantitative aspect that we believe significantly contributes to what we have seen so far.

Gender differences in academic publications: Spain

Our analysis of gender differences in Spain in specific areas such as scientific productivity and/or success in an academic career is largely based on information taken from the Human Resources in Science and Technology Survey (RRHH) by the INE. Two waves are currently available: the first survey was carried out in 2006 (RRHH-2006) and the second in 2009 (RRHH-2009). One of the objectives of this Survey (described and discussed in detail in the Appendix to this paper) is to look at the professional productivity of each of the individuals that have completed their doctorate. The questions relating to this aspect are included in the module entitled "Professional experience and scientific productivity". This module poses questions on experience and the recent academic profile of the subjects of the survey, and asks whether they have directed any doctoral theses or Master's degree dissertations. Questions are also included on inventions, patents and publications. These questions are used in this section to estimate the gender differences with regards to publications in our country.

However, it is important to make two points relevant to the survey for an adequate interpretation of the results.

The first of these refers to the people surveyed in the both the first and second waves. As is shown in the appendix, the sample was taken from people who did their doctoral thesis in Spain between 1990 and 2006 for the RRHH-2006, and between 1990 and 2009 for RRHH-2009. This restriction means a significant limitation is placed on the survey participants with regards to age, as older doctors are automatically excluded from it. Although it is true that the restriction is on both men and women, and the groups are therefore comparable, it is important to remember that the results cannot apply to all the doctors in our country, as there is a lack of representation of the older population.

Secondly, and more specifically, with regards to the information provided by individuals on their published work (articles or books), and the direction of doctoral theses, the questions refer to the three years prior to the survey (2004-2006 for RRHH-2006 and 2007-2009 for RRHH-2009). Consequently, the survey only covers "recent" activity in terms of academic publications, and not that produced throughout the professional lives of the academics. We will discuss this in more detail later on as it affects the interpretation of some of the results obtained.

Two types of evidence are presented here: first we describe the gender differences in the recent publication (between 2004 and 2006) of (i) academic articles, and (ii) books written or collaborated on, without controlling for other factors. Then, given that the gender difference can be attributed to several causes, we estimate the determining factors of differences in publications by the subjects in the sample, placing special emphasis on gender comparison. The advantage of this second focus is that is allows us to compare men and women with similar characteristics (family, age, etc.), and belonging to the same field of knowledge. This way, any differences between men and women are produced exclusively as a result of the gender of the researcher rather than by any other observable characteristics.

Before presenting the results, we should add that the evidence presented here is that obtained from the RRHH-2006 survey. The main reason for using the older survey is that, according to the INE, budget restrictions meant the number of persons surveyed in RRHH-2009 was less than half the number of those surveyed in RRHH-2006. Given that our analysis breaks down the subjects by academic level, the number of observations available from the RRHH-2009 (particularly at full professor level) is far too reduced to obtain even slightly accurate estimations. Nevertheless, we do also provide the results of this more recent survey in section 2 of the Appendix to this paper. It is easy to see that in all cases the results of both survey waves remain generally very stable, although those taken from the 2009 wave are less statistically precise, and for this reason we preferred to present them in the Appendix.

(i) Gender differences in articles published. Descriptive evidence

Graph 23 shows the academic productivity of women by field of specialisation, measured according to the number of articles published. The following relevant points stand out:

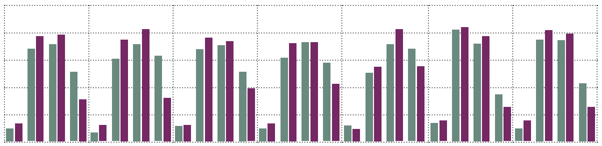
a) Women publish fewer articles than men. This can clearly be seen in the fact that the percentage of women with "few" publications (<10) is greater than that of men, whilst there are relatively many more men who publish "many" articles (>10).
b) This phenomenon is repeated in all fields of knowledge.
c) If we compare fields of knowledge, we can clearly see that the gender differences are particularly large in Natural Sciences, followed by Humanities. However, gender differences are smaller in other areas such as Social Sciences, and even in Basic and Medical Sciences and Engineering.

We have also included a table (7) which shows the average recent academic productivity (2004-2006) of men and women by professional category –Full Professors, Associate Professors and Assistant Professors, in relation to articles published, books published and the percentage of men and women who direct doctoral theses or dissertations. The average number of articles published by men and women is given in the first column of Table 7. We find the following facts:

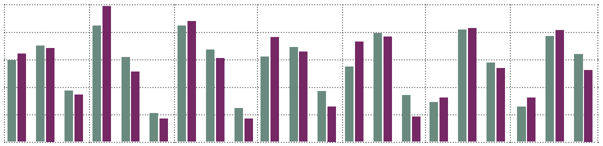
a) On average women published fewer articles in the 2004-2006 period than men (an average of 6.6 articles as opposed to 8.2 articles for men).
b) The largest average difference found in the academic categories is between Full Professors (10.7 articles for men and 7.3 for women). The smallest is in the Assistant Professor category (approximately one article difference in favour of men). It seems that cultural and generational differences, and differences in expectations, enter into play here. Among Assistant Professors the slogan is *publish or perish*.
c) The fact that the publications considered in the survey must have been published within a specific time frame may introduce a certain level of bias, as some high quality research papers, aiming for publication in top scientific journals that have longer publication processes, are underrepresented.

(ii) Gender differences in books published. Descriptive evidence

Graph 24 provides descriptive evidence on the gender differences in the publication of books. The most significant points are as follows:



GRAPH 23
NUMBER OF ARTICLES PUBLISHED BETWEEN JANUARY 2004 AND DECEMBER 2006 BY FIELD OF SPECIALISATION



GRAPH 24
NUMBER OF BOOKS / MONOGRAPHS PUBLISHED BETWEEN JANUARY 2004 AND DECEMBER 2006 BY FIELD OF SPECIALISATION

a) Looking at the total for all fields, we see gender differences in book publication are smaller than for the publication of articles.
b) However, in all fields the percentage of men with more than three books published is higher than the percentage of women.
c) In a comparison of fields we see that, regardless of gender, the publication of books is less common in the fields of Natural Sciences, Basic Sciences and Engineering, and Medical Sciences, whereas it is more common practice in the fields of Social Sciences and Humanities. This is due to the specific cultural aspects of each scientific field.

The second column in Table 7 shows academic productivity measured according to the average number of books published over the 2004-2006 period for each professional category (Full Professors, Associate Professors and Assistant Professors). The following points are of note:

a) Men published an average of 2.4 books, whilst women published an average of 2.1 books in the 2004-2006 period. However, these differences are NOT statistically significant.
b) At the highest professional level (Full Professors), we see an average difference of approximately one book published in favour of men. However, there are no differences observed between men and women at Associate Professor and Assistant Professor.
The differences in this area are minimal.

(iii) Estimation of differences in the publication of articles and books

Having shown the descriptive evidence, we will use the RRHH-2006 Survey information to analyse the factors that determine, to a greater or lesser extent, the differences in academic productivity. Again this is measured in terms of articles and books published.[25] This is a very relevant exercise as the differences in productivity between men and women can be a result of differences in characteristics relating to family, age, type of institution worked in, professional level, etc. Using simple econometric estimation techniques we can analyse how each of these factors contributes to the gender differences observed, as well as which of these differences persist in academic productivity terms once all factors have been considered. Consequently, the objective is to be able to make comparisons between individuals whose observed characteristics are the same. In this case, the exercise allows us to compare the (recent) academic productivity of men and women whose personal, professional and family characteristics are similar.

To do this, the number of published articles (books) is estimated in accordance with several different personal characteristics (gender, age, years since completion of PhD), family characteristics (whether they have dependent minors or not)[26], and professional characteristics (time spent teaching, type of research carried out (basic or applied), and field of knowledge). Furthermore, not only do we consider all sample subjects in aggregate form in these estimations, but we also look at estimations broken down by professional category (Full Professors, Associate Professors and Assistant Professors).

		Nº. medio de artículos publicados en el periodo 2004-2006	Nº. medio de libros publicados en el periodo 2004-2006	Proporción relativa de hombres y mujeres que han dirigido alguna tesis doctoral o de máster en el periodo 2004-2006
Todas las categorías profesionales	Hombres	8,2	2,4	44,93 %
	Mujeres	6,6	2,1	33,18 %
Catedrático	Hombres	10,7	3,7	73,50 %
	Mujeres	7,3	3,0	46,58 %
Profesorado Titular	Hombres	8,0	2,6	51,21 %
	Mujeres	6,2	2,6	41,52 %
Profesorado asociado, ayudante, visitante y similar	Hombres	7,8	2,5	25,63 %
	Mujeres	6,5	2,4	17,99 %

TABLE 7
AVERAGE ACADEMIC PRODUCTIVITY BY GENDER AND PROFESSIONAL CATEGORY

Tables 8, 9 and 10, respectively, show the figures for the numbers of articles published, number of books published, and the estimation of the factors which affect possible direction of theses or dissertations. Two estimations are given for each of the categories: the first of these (first column of each category), is the indicator for both men and women with children, whilst the second (second column of each category), gives the interaction of the variable of having children with the gender indicator to allow an estimation of the difference the impact of having children on women as opposed to on men. The detailed analysis of the results in the second column (total and per professional category) will be discussed at length in Chapter 5, where an analysis is made of any possible conflict between family and academic life for men and women.

Estimation of the number of articles published. Gender differences

a) The first result to be highlighted is that, when comparing men and women of the same age, with the same time elapsed since their PhD, the same research time, the same field of research and the same family situation in terms of having children or not, men publish 1.5 more articles on average than women ("woman" variable coefficient in the first column).[27] To understand the reasons behind these differences, we would need to look at those factors that are NOT included in the estimations due to the lack of information. For example, if men, on average, spend more time on research than women, then this could be a factor that would explain the differences observed. We do not have any information on the amount of time spent on research by gender, but we do know that women spend considerably more time on teaching (see below), which undoubtedly affects the amount of time available for research.
b) If we break the sample down into professional categories, we can see that the differences are significant for the categories of Associate Professor and Assistant Professor, but not for Full Professors. Although in the latter case, this is more due to the fact the number of observations is low - this increases the degree of uncertainty (standard error) of the estimated coefficient.
c) When all other characteristics are identical, PhDs (men and women) in the of Humanities and Social Sciences fields publish, on average, fewer academic articles than in the areas of Natural Sciences, Medical Sciences and Science and Technology. However, there are no significant gender differences between the different disciplines.[28] Moreover, if we analyse the professional categories separately, the main difference is found at Associate Professor level.
d) With regards to the relationship between the time spent on teaching activities and academic productivity, estimations reveal that as the time spent on teaching increases, the number of articles published diminishes. This effect occurs with both men and women. However, given that on average women spend more time on teaching activities than men (according to the RRHH-2006 Survey data, 33% of women spend between 50% and 75% of their time on teaching, as opposed to 24% of men), this result implies that the negative effect of teaching on academic productivity is greater on average for women than for men. The greater percentage of time spent on teaching activities by women could be due as much to better

class preparation and student support, as to a greater teaching workload assigned to women teaching staff, but we do not have the data available to be able to control for these factors. Once again, these differences are particularly relevant for Associate Professors, but no statistically significant differences are found in the Full Professor and Assistant Professor groups.

Estimation of the number of books published . Gender differences

Table 9 in the chapter Appendix shows the effect of the determining factors for the differences in the number of books (or contributions to books) published, again placing special emphasis on gender differences. The most relevant results are as follows:

a) A comparison of men and women with the same observable characteristics shows that men publish an average of 0.33 more books than women. As a consequence, the academic productivity of women in relation to men is once again lower when controlled for personal and professional characteristics. If we analyse these gender differences by professional category, we see that this difference is greater among the group of Full Professors (where the difference rises to 2.2 books in favour of men), whilst the gender differences in the groups of Associate Professors and Assistant Professors are not significant.
b) PhDs (men and women) in the fields of Humanities and Social Sciences, followed by Medical Sciences, produce more books on average than the rest of the areas. The fields with the least number of publications in terms of books are Natural Sciences, Basic Sciences and Technology. This result is particularly true of the groups of Associate Professors and Assistant Professors, with no noticeable differences observed among Full Professors. Once again no significant gender differences in the different disciplines are observed.[29]
c) As regards the effect of teaching on the number of books published, we can see that spending between 25% and 50% of time on teaching, as opposed to 0% to 25%, has a positive (although marginally significant) effect on the number of books published. However, spending more than 50% of time on teaching activities does not have any significant effect. When the analysis is broken down by professional category, no significant differences are observed.

Gender differences in doctoral thesis direction

The INE Human Resources Survey also allows us to study the gender differences in the recent direction of doctoral theses. As with the publication of books and articles, we will show the descriptive evidence before moving on to the estimation of the differences controlled for factors other than gender.[30]

Descriptive Evidence

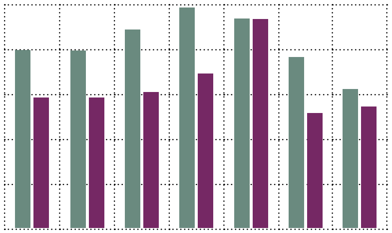
Before presenting the evidence, it is important to make a few points regarding the information available on the subject in the INE Human Resources Survey. Firstly, it is important to point out that doctoral theses and Master's degree dissertations are both included, and there is no way to distinguish between the two. Secondly, the information refers solely to those Master's dissertations and doctoral theses directed between January 2004 and December 2006. Lastly, the specific question asked was "Did you direct a Master's degree dissertation or doctoral thesis between January 2004 and December 2006?". Consequently, the information is qualitative, not quantitative.

With these factors taken into account, the gender differences are shown in Graph 25 and Table 7. The graph shows the relative percentage of men and women who have directed a Master's dissertation or doctoral thesis; in other words, the percentage of men (and women) who have carried out this activity is calculated from the total of men (and women) doctors in the sample.

a) The first point to be highlighted is that the relative percentage of male doctors who direct these activities is higher than the percentage of women in all fields of knowledge, with the exception of Agricultural Sciences. If we consider the direction of these papers to be a part of academic productivity, then we must conclude once again that, according to this indicator, men are more productive on average than women. This also has a bearing on the productivity of publications through co-authorship.
b) The second point of note is that the percentage of PhDs (male and female) that have recently directed theses and dissertations is relatively small. The direction of research projects should be considered an important part of an academic career, so the fact that only around 40% of men and 30% of women have carried out such tasks of supervision is a clear indicator of low academic productivity in Spain.
c) The third point to be highlighted is the gender difference by field of knowledge. Here we can see that the biggest gender differences (in favour of men) are found in Medical Sciences, and in Engineering and Technology (around 15 percentage points). These are two fields where men hold an overwhelming majority of full professorships. The gender difference decreases slightly in Social Sciences and Natural Sciences (around 12 points in favour of men), reaching a minimum of 4 points in Humanities.

Table 7 (last column) shows the relative percentage of men and women who directed a doctoral or Master's degree thesis in the 2004-2006 period, according to professional category (Full Professor, Associate Professor and Assistant Professor).

a)Regarding the total, 45% of men had recently directed a doctoral thesis or Master's dissertation, as opposed to 33% of women.
b)The professional category with the largest gender gap is that of the Full Professors, where 73.5% of men directed a doctoral thesis or Master's degree dissertation in the last 3 years, as



GRAPH 25
RELATIVE PERCENTAGES OF MEN AND WOMEN WHO DIRECTED A MASTER'S DISSERTATION OR DOCTORAL THESIS IN 2004-2006

opposed to 46.5% of women.

c) In the case of Associate Professors, the gap between men and women in thesis direction is 10 percentage points in favour of men.

Estimation of the determining factors for directing theses or Master's degree dissertations. Gender differences

Table 10 in the Appendix for this chapter shows the determining factors for the gap in relation to theses and Master's dissertations, with special emphasis on gender differences. The variable that is estimated is the probability of directing at least one doctoral thesis or Master's degree dissertation in the 2004-2006 period. The most interesting facts of note are as follows:

a) If we compare men and women of the same age, with the same time elapsed since the end of their PhD, the same type of research and the same field of knowledge, the probability of a man having directed a dissertation or doctoral thesis is 1.3 times higher than that of a woman with similar characteristics. The gender difference is particularly acute among Full Professors, where men are 1.7 times more likely to direct a dissertation or thesis than a woman of similar characteristics. Among Associate Professors and Assistant Professors, the differences are similar to the global probability given. This is also true for all the fields of knowledge, with no significant differences between them.[31]

b) When comparing fields of knowledge, we find that the total probability (men and women) for the supervision of theses and dissertations is greater in the fields of Medical Sciences and Engineering and Technology, and clearly much lower In the fields of Humanities and Social Sciences.

c) Regarding the effect of teaching on academic productivity measured by the probability of directing a doctoral thesis or Master's dissertation, the estimations show that teaching has a negative effect: the more work time spent on teaching activities, the less likely the probability of directing a doctoral thesis or Master's dissertation (for example, a person who spends more than 75% of their work time on teaching activities has a probability of directing a doctoral or Master's thesis that is 0.35 times smaller (or the equivalent of 35% lower) than that of a person who spends 25% of their time on teaching). Given that women spend more time on teaching activities, it could be said that the negative effect of teaching is greater among women than men. If we analyse the impact of teaching by professional category, we see that this difference is particularly significant for Associate Professors, for who it seems that more time spent on teaching reduces the probability of directing a thesis more than in the other professional categories.

Principal Investigators (PI) on projects funded on a competitive basis. Gender differences

International Evidence. General considerations

Chapter 5 of the European Commission report entitled "The Gender Challenge in Research Funding: Assessing the European National Scenes", provides interesting, albeit incomplete, descriptive evidence on the gender differences in different European countries relating to: (i) success rates for research project applications on a competitive basis, and (ii) the amount of funding obtained for these subsidised projects.

The data collected refers to 2007. Although we do not aim to describe the results in detail in this section, it is useful to briefly summarise the most important findings:

(i) Gender differences in success rates of research project proposals:

When measuring the success rate between proposals funded and proposals submitted, and looking separately at those where the Principal Investigator (PI) is male or female, the report shows that, on average, projects with a male PI are 7% more likely to be accepted than those with a female PI. There are, however, visible differences between countries and fields of research. For example, of the 28 countries analysed, 21 countries reported higher success rates if the PIs were men, and 7 reported higher success rates if the PIs were women. Differences were also observed with regards to fields of research. For example, in Health Sciences, the balance in the majority of countries is tipped in favour of men. However, in Engineering and Technology, women have higher success rates in 10 countries, whilst the opposite is observed in 8 other countries. The opposite is true of Medical Sciences and Humanities, where the balance is slightly in favour of women. Lastly, in Social Sciences, 8 countries showed higher success rates for male PIs, and 8 for female PIs. In summary, the differences observed are slightly in favour of men, but there are large variations between countries and between fields of research.

However, we cannot infer any differences in productivity from this gap, as we do not have the information available to control for other factors (institutional affiliation, the quality of the team, the possibility of obtaining prior national funding, etc.) that undoubtedly affect the probability of a submitted project proposal being subsidised. Given the complexity of the European projects, there are many factors that may influence them.

This report also provides results on the success rates for "ERC Grants". These are awarded to European projects for scientific excellence where, in principle, the sole criterion for obtaining the generous grants is the excellence of the research team. The success rate for these project proposals has been very low: 3.3% on average, 2.9% for teams with a female PI and 3.4% for teams with a male PI, meaning the gender differences are quite small.[32]

(ii) Gender differences in funding success rates

This ratio is defined as the coefficient between the funding granted and the funding applied for, and it is measured according to the total number of projects granted. The report contains information for 2007 from many EU countries, but no clear behaviour pattern among countries and disciplines is found. The report highlights an interesting aspect that it is important to take into account: on average, women PIs request less funding than male PIs and, therefore, it is easier for the number of grants awarded to be nearer the number applied for if the latter is lower. The differences should also be controlled for other factors such as team size or number of participating institutions.

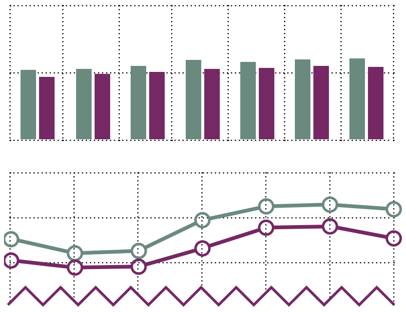
Gender differences in Principal Project Investigators. Spain

The Ministry of Science and Innovation (MICINN) provides information on the percentage of women who put themselves forward as PIs for R&D and innovation projects. The data is broken down by fields of knowledge. Graph 26 sums up the gender differences in terms of MICINN R&D and innovation project PIs. The data analysed reveals that 25% of the PIs on R&D and innovation projects co-funded by the MICINN are women. This percentage is low if we compare it to the current percentage of women n the faculty. In other words, if women represent 35% of the Associate Professors in the Spanish university system (with Associate Professors making up ¾ of the government-employed faculty), and 15% of Full Professors (comprising ¼ of this faculty), the percentage of women PIs in the R&D and innovation projects ought to be 30% to reflect, in an equal manner, the current situation of women in the university system.

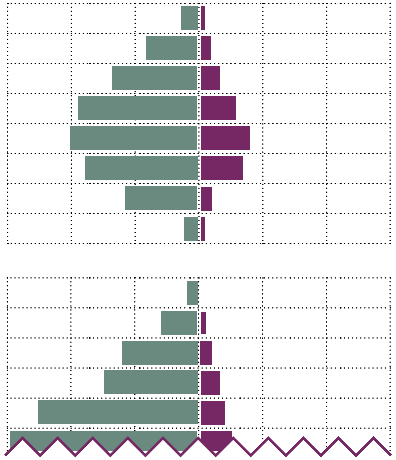
The gender differences in the percentages of proposals submitted and granted are similar. Furthermore, if we analyse the percentage of success in project funding, depending on whether these projects are led by a male or female PI, we see (top right panel) how the probability of success is slightly higher if the PI is male, and that these differences do not seem to have changed substantially over the last decade.

Finally, the bottom panel of Graph 26 shows us the differences in percentages of PIs by gender according to field of research. To do this, we have divided the PIs into age groups, thereby allowing us to analyse the differences between different cohorts and, as a result, study the evolution over time. An increase in the percentage of women PIs is observed over time in Science and Technology (Production and Communication), in Humanities and Social Sciences, and in Life Sciences, whilst in the Environment field we do not see younger women more involved as PIs in research projects.

Graph 27 provides additional interesting information on the distribution of Principal Investigators by gender and age in the different research disciplines. In the section that shows all the areas grouped together (total), the graph reveals information on the distribution by age of PIs that are male (75%), and those that are female (25%). The 40 to 49 age groups are those where the incidence of PIs is highest for both sexes, although the differences by age between men are much more pronounced than between women.



GRAPH 26
GENDER DIFFERENCES IN GRADE A RESEARCHERS IN MINISTRY OF SCIENCE AND INNOVATION R&D AND INNOVATION PROJECTS



GRAPH 27
GENDER DIFFERENCES IN PRINCIPAL INVESTIGATORS IN R&D AND INNOVATION PROJECTS (MICINN) BY AGE OF PRINCIPAL INVESTIGATOR (% OF TOTAL, 2009)

However, slight variations are observed when the information is broken down by fields of specialisation, especially in the area of Science and Technology (Production and Communications), where the presence of women PIs, apart from being very low for all ages, is relatively homogeneous, while the percentage is particularly high for men in the 40-49 age group. We would need to evaluate the extent to which this is influenced by the new requirements for PIs (six-year periods, doctoral team direction, and the creation of groups and lines of research.

Before bringing this section to a close, it is worth commenting on a final piece of information related to gender differences in research teams that cooperate with foreign research groups. This information is taken from the Human Resources in Science and Technology Survey, which includes a specific question on this matter.[33] Graph 28 shows the existence of significant gender differences between fields of research. In Engineering and Technology, of the people who have cooperated with foreign research groups, only 23% are women, whilst in Medical Sciences and Humanities, this proportion reaches 55%. These figures are consistent with those that show less international mobility among women, except in the case of the Fulbright grants.

Participation in Excellence Committees: Magazine editorial boards, project selection committees, etc.

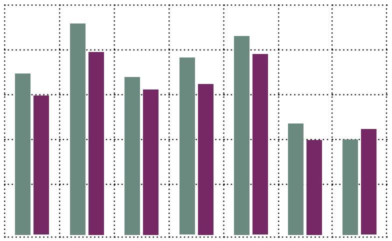
International Evidence

The Thomson Journal Citation Report (2005) provides very revealing information on gender differences in the composition of the editorial committees of prestigious magazines. This report gives the percentage of women among the Editors-in-Chief of the top 10 academic magazines for each of the fields of knowledge listed below.

We can see that, apart from Medical Sciences and Social Sciences (where the presence of women is equal to that of men in the first case and at 40% in the latter), women are clearly in the minority on these Editorial Boards. The areas of Engineering and Physics stand out, as the presence of women is non-existent. These are followed by Chemistry and Psychology where their presence does not even reach 10%.

She Figures 2009

The She Figures 2009 booklet provides interesting information on the percentage of women on Committees. These committees can include: scientific committees, R&D committees, academic assemblies, foundations, etc. A study of the data presented in the booklet shows that, on average for the EU-27, 22% of board members are women. However, there are significant variations between countries: for example, this proportion is over 44% in Sweden, Norway and Finland - consistent with their obligation for at least 40% of all members of national committees and equivalent bodies to



GRAPH 28
PERCENTAGE OF INVESTIGATORS WHO HAVE COOPERATED WITH FOREIGN RESEARCH GROUPS (2004-2006)

Campos de investigación	% Mujeres "Chief-editors" de las 10 Revistas Top del área según El índice Thomson
Biología	10
Ciencias Médicas	50
Química	9
Ciencias Computacionales	13
Ingeniería	0
Matemáticas	20
Física	0
Psicología	9
Ciencias Sociales	40

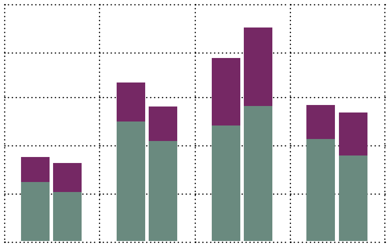
TABLE 12
PORCENTAJE DE MUJERES EDITORAS/JEFA EN LAS DIEZ MEJORES REVISTAS, POR CAMPO DE INVESTIGACIÓN, SEGÚN EL ÍNDICE DE IMPACTO

be women. In other countries, such as Croatia, Bulgaria, Iceland and Denmark, female participation exceeds 30%. Finally, in other countries, such as Hungary, Lithuania, Switzerland, Slovakia, the Czech Republic, Cyprus, Israel, Poland and Luxembourg, this presence is under 20%. (pages: 106-108).

Spain

The MICINN provides information on the percentage of women Experts on Research Project Selection Committees. The data on the gender of these experts in 2008/09 by areas of research is shown in graph 29.

These figures show that, on average, the percentage of women experts on the MICINN project committees only reached 30% in 2008, and increased to 33% in 2009. By fields of knowledge, the percentage is less (24% in 2008 and 25% in 2009) in Science and Technology (Production and Communications), followed by Environment and Natural Resources. On the other hand, it is important to point out the significant increase in the percentage of women experts in the field of Life Sciences.



GRAPH 29
EXPERTS 2008/2009, BY SEX (BY FIELD OF RESEARCH)

3 GENDER DIFFERENCES IN TERMS OF SCIENTIFIC RECOGNITION

In our analysis of gender differences in terms of academic recognition, we will focus on two levels that can show different dimensions of this type of recognition:

a) On the one hand, promotion to a higher academic level (Associate Professor to Full Professor) can be considered "medium level" recognition, when men and women with similar academic productivity are compared.
b) On the other hand, a study of the gender differences in (i) guest speakers, (ii) appointments to academic society presidencies, and (iii) the awarding of degrees honoris causa or other highly prestigious awards (Nobel and other recognised prizes), can help us determine whether gender differences exist at the "high level" of recognition in a science career.

Gender differences in scientific promotion

International Context

On an international level, the most relevant evidence is that for the United States provided in a recent book entitled "Gender Differences at Critical Transitions in the Careers of Science Engineering and Mathematics Faculty" (2009). This book provides information taken from a survey carried out in departments specialising in research in the fields of science and engineering in the United States in 2004/2005. These findings show whether there are any differences between men and women in the granting of tenure and promotions from Assistant Professor to Associate Professor[34], or from Associate Professor to Full Professor. The promotion rates for men and women who are similar on many professional levels, such as academic productivity, experience, field of research, public or private university, university promotion policies, etc. are also compared.

The survey leads to the following interesting conclusions regarding these promotions:

a.In all fields women are under-represented among candidates for tenure as regards the total number of female Assistant Professors in the department. A very surprising fact is that women candidates for tenure were under-represented in fields where female Associate Professors were more numerous (biology and chemistry).
b. The probability of a woman gaining tenure (or being promoted from Assistant Professor to Associate Professor) increases when the percentage of women Associate Professors in the department is small. This can generate differences in the probability rates of success for men and women in departments with few female Associate Professors. It is important to remember that in many departments with these characteristics in the United States positive action measures are used that may influence this result.
c. Neither the field of research nor the size of the department affects the probability of promotion for men or wome
d. Of all the departments comprising the sample, and in all fields, 90% of men and 88% of women that applied for Full Professorship were awarded it. The difference between men and women is not statistically significant. Neither were significant differences found between men and women when the data was broken down by fields of research.

Spain

The Human Resources in Science and Technology Survey provides information on a set of interesting variables that allow us to make a simple econometric analysis, through which we can identify the factors that determine academic promotion to a higher level (Associate Professor and Full Professor). This exercise contributes to our study by allowing us to discover whether any gender differences exist in access to higher academic positions, once the differences due to personal and professional factors that can also affect academic productivity have been controlled for. This exercise is important because it compares men and women with similar (or as similar as the information allows) personal, family and professional characteristics. If gender differences in promotion to higher positions are still observed in spite of this, then we must look for their origins either in factors that cannot be observed (and, therefore, have not been included) or in sexual discrimination.

We will use the results of the RRHH-2006 survey in this paper due to its greater scope and, consequently, more accurate results. The appendix to this report also shows the results of the RRHH-2009 survey, where it can be seen that they are generally very consistent with those shown here. The failure of the survey sample to represent all levels, as described in the appendix to this report, does not allow us to extend our findings to the whole academic community. Although the promotion to Associate Professor is adequately represented, this is not true for promotion to Full Professor, where a noticeably younger sample than the global average for the group is included. Although the gender differences found are comparable, even in promotion to Full Professor, we must be very careful in extending these results to the whole scientific community. This extension will be possible as we receive the results from the next RRHH survey waves, where all the academic community will be adequately represented.

Promotion to Full Professor. Gender differences

To measure the gender differences in promotion to Full Professor we chose the RRHH-2006 Survey sub-sample comprising Full Professors and Associate Professors.[35] This sub-sample contains information on around 3,000 PhDs in Spain.[36]

Taking men and women Associate Professors as the reference category, the probability of being promoted to Full Professor is estimated with controls for the following variables: gender, number of years since PhD, number of articles published recently, number of books or monographs published recently, recent supervision of theses or dissertations, having dependent children, and field of specialisation.[37]

The probability of reaching Full Professorship is estimated using a simple econometric technique that uses discrete choice models, known as *logit* or *probit*, depending on the type of underlying distribution supposed for the dependent variable analysed. This technique allows us to quantify the relative importance of each variable included in the estimation. For example, the coefficient for the gender variable indicates whether men or women with the same observable characteristics (the same number of articles, books and PhDs directed over the last three years, the same number of years since their PhD, the same family situation, the same field of specialisation) are more or less likely to be Full Professors as opposed to Associate Professors.

Columns (1) and (2) of Table 11 in the Appendix to this chapter show the results of this estimation. Column (1) gives the estimation for the model without interactions between the explanatory variables, whilst column (2) adds some interactions between gender and child-related family situation with the aim of analysing if the latter variable affects men and women differently in terms of academic promotion. The results regarding the impact of the family situation on promotion to a higher level will be discussed in Chapter 5. The reported coefficients are odd-ratios, in other words probability in relation to the group taken as a reference.

The following results stand out:

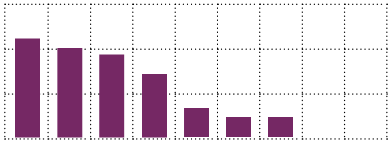
a. When comparing men and women of the same age, time since PhD, same field of knowledge and recent academic productivity in terms of published articles and books, as well as theses or dissertations directed, we see that the probability of a male Associate Professor being promoted to Full Professor is 2.5 times higher than that of a woman with similar personal, family and professional characteristics.[38]

b. Does this result mean women are discriminated against in relation to men when it comes to promotion possibilities? Possibly, but we need to clarify an important point: We must remember that not all the factors that might affect a candidate's chance of promotion are included (due to lack of information). For example, the articles and books published, and the theses and dissertations directed, that are included here are only recent ones (2004-2006). If any gender differences in productivity at different times of their professional careers were to exist, and if they were in favour of men, then these could explain the gender differences observed. On the other hand, the academic quality of the publications is not included in the data either. As a consequence, there may be factors that are not observed that may cause the differences observed in promotions. In any case, the interesting part of this exercise is that even when we compare very similar men and women, the differences observed are certainly significant. Maybe this could be partly due to non-observed factors, but it is difficult to believe that these determining factors could be so significant as to explain the differences observed in academic promotion.[39]

Promotion to Associate Professor. Gender differences

In the same way the possibility of promotion to Full Professor was estimated for the group of professors eligible for that category in the previous section, this estimation is made for the sub-sample of Assistant Professors. Once again we have taken gender differences, differences in years since PhD, differences in the number of articles published, and in the number of books and monographs published, whether subjects have directed a Master's degree or doctoral thesis, if they have children under 18 who are financially dependent on them, and field of specialisation into consideration. Using the same estimation technique as in the previous section, the results are displayed in columns (3) and (4) of Table 11 in the Appendix. The following result stands out:

> Unlike the case of promotion to Full Professor, when comparing men and women with the same observable characteristics, no significant differences are observed in the probability of being promoted to Associate Professor.



GRAPH 30

PERCENTAGE OF WOMEN IN THE INSTITUTO DE ESPAÑA (SPANISH INSTITUTE) AND THE ROYAL ACADEMIES (2007)

Gender differences in "high-level" recognition in the profession

International Context

Another indicator of academic productivity, that is particularly important for professional promotion, is "high-level" recognition in the profession. With this type of recognition we are referring to prizes, honorary doctorates (honoris causa), etc.

On an international level we have only found evidence on gender differences in "high-level" recognition for the United States. In general, both the number of women nominated for honorary prizes and the number of women who have received these prizes are very low. In the United States, the National Medal of Science is a Science and Engineering prize awarded by the President of the United States to people who have made important contributions in fields such as social sciences, biology, chemistry, engineering, mathematics and physics. During the 1996-2003 period only 12% of the prizes were awarded to women (See "Beyond Bias and Barriers…", 2006). Another important prize is the Lasker Award which is awarded every year to people who have made very relevant contributions in the field of medicine. During the 1996-2005 period only 6% of the nominees for this award were women, and 4% of the awards went to women. An explanation for this fact given by some of the organisations that award these prizes is that the number of women who are eligible for this kind of prize is very low. Generally, for a prize recognising a life's work nominees must have completed their PhD at least 30 years previously, which is why the number of women in these cohorts is still very small.

Spain

With regards to high-level recognition in Spain, we have been able to collect data on the National Research Awards and the Royal Academies.

The National Research Awards are prizes awarded by the MICINN in five fields: Medicine, Biology, Engineering, Law and Economic and Social Sciences, and Humanities. Between 2001 and 2009 only three women received this award in the following areas: Law and Economic and Social Sciences (2002), Engineering (2008) and Humanities (2008).

Regarding the Royal Academies, graph 30 shows that the presence of women is scarce. The highest percentage of women is found in the Royal Academy of Pharmacy (11%), whilst in the Royal Academy of Exact Sciences, only 2% are women. There is not a single woman in the Royal Academy of Moral and Political Sciences or the Royal Academy of Jurisprudence and Legislation. Unlike the United States, this type of recognition is achieved through co-option.

4 CONCLUSIONS

a. For the 1998-2007 period, the percentage of women Full Professors (15% in 2008) observed is significantly lower than in the EU-25 (18%) and, in particular, the USA (26%). The situation is more equal at the level of Associate Professors, where the percentage of women in Spain (34%) is similar to that of the other two geographical areas. However, the massive influx of women to Spanish universities has resulted in a greater female presence (around 50%) at the Assistant Professor level than in the United States and the EU-25. There is a slow, but steady, upward trend in the integration of women in all categories analysed, from which we can infer a possible convergence with men in the long term. Nevertheless, judging by the speed of this convergence, it will be many years before this happens, if it ever does.

b. When making distinctions by fields of knowledge, the gender patterns described in the previous chapter are repeated: minimal, though increasing, female participation in Engineering and Technology, and higher participation in Humanities, Social Sciences and Natural Sciences. Compared with the experience of the EU-25 and the USA, the convergence patterns in Spain are more doubtful, given that the percentage of female Full Professors in Humanities is lower in our country, whilst the percentage of them in Engineering is higher.

c. Regarding scientific productivity, the availability of detailed information allows us to control for the influence of factors other than gender when assessing the influence this has on the number of articles recently published in scientific magazines, books written or published, theses and dissertations supervised, and publicly-funded research projects directed. We found that when men and women with a wide range of professional and family characteristics in common were compared, women publish somewhat fewer articles than men (approximately 1.6 articles less during the 2004-2006 period) and they direct fewer theses and dissertations (30% of women have directed one as opposed to 40% of men). On the other hand, although the bias is generally towards men, no relevant quantitative differences are found for the publication of books (a more important activity than the publication of articles in humanities, unlike in science), or projects granted in

Appendix

	Todas las categorías profesionales		Catedrático/a		Profesor/a titular		Profesor/a asociado/a, ayudante, visitante o similar	
	1	2	3	4	5	6	7	8
Mujer	-1,509***		-2,833		-1,262***		-1,291***	
	(0,190)		(2,023)		(0,283)		(0,367)	
Edad	-0,082***	-0.081***	-0,442***	-0,443**	-0,054	-0,052	-0,108***	-0,108***
	(0,024)	(0,024)	(0,161)	(0,172)	(0,041)	(0,041)	(0,035)	(0,035)
Número de años desde cuando terminó el doctorado	0,191***	0,191***	0,696***	0,696***	0,151***	1,152***	0,104	0,105
	(0,027)	(0,027)	(0,253)	(0,250)	(0,039)	(0,039)	(0,068)	(0,068)
Universidad	[illegible]	[illegible]						

TABLE 8

DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF ARTICLES

	Todas las categorías profesionales		Catedrático/a		Profesor/a titular		Asociado/a	
	1	2	3	4	5	6	7	8
Mujer	-0,332***		-2,218*		-0,248		-0,336	
	(0,102)		(1,289)		(0,156)		(0,205)	
Edad	0,013	0,013	0,040	0,043	0,013	0,013	-0,009	-0,10
	(0,010)	(0,010)	(0,078)	(0,084)	(0,013)	(0,013)	(0,021)	(0,021)
Número de años desde cuando terminó el doctorado	0,041***	0,041***	0,257**	0,261**	0,028	0,028	0,027	0,027
	(0,014)	(0,014)	(0,100)	(0,104)	(0,020)	(0,020)	(0,036)	(0,036)
Universidad	-0,006	-0,007						
	[illegible]	[illegible]						

TABLE 9

DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF BOOKS

relation to applications made, although the figures are always lower for women. To understand this data we must take into account the context of the time available for research also showing gender differences, particularly as a consequence of women spending more time on other professional activities such as teaching.

d. The most striking results are found in the analysis of the determining factors of professional success, measured by the probability of promotion to Full Professor from Associate Professor for both sexes, and the corresponding probability of becoming a Associate Professor. In both cases they are controlled for a wide range of factors (age, recent publications, family situation, discipline, etc.). In the first case, a man is 2.5 times more likely to be promoted to Full Professor than a woman.

e. In contrast to the promotion to Full Professor, the gender differences in promotion to Associate Professor are not significant either in aggregate form or broken down by field of specialisation.

f. Lastly, the number of women academics who receive high-level recognition (prizes, honorary doctorates (honoris causa), etc.) is very scarce.

	Todas las categorías profesionales		Catedrático/a		Titular		Asociado/a	
	1	2	3	4	5	6	7	8
Mujer	0,718***		0,322***		0,712***		0,629***	
	(0,047)		(0,188)		(0,065)		(0,096)	
Edad	0,992	0,992	0,975	0,973	0,997	0,997	0,997*	0,976*
	(0,005)	(0,005)	(0,031)	(0,033)	(0,007)	(0,007)	(0,014)	(0,014)
Número de años desde cuando terminó el doctorado	1,208***	1,208***	1,220***	1,219***	1,165***	1,165***	1,193***	1,195***
	(0,011)	(0,011)	(0,084)	(0,085)	(0,014)	(0,014)	(0,031)	(0,031)
Universidad	1,757***	1,759***						

TABLE 10

DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, PROBABILITY OF DIRECTING A MASTER'S OR DOCTORAL THESIS

	Todas las categorías profesionales		Catedrático/a		Titular		Asociado/a	
	1	2	3	4	5	6	7	8
Mujer	0,718***		0,322***		0,712***		0,629***	
	(0,047)		(0,188)		(0,065)		(0,096)	
Edad	0,992	0,992	0,975	0,973	0,997	0,997	0,997*	0,976*
	(0,005)	(0,005)	(0,031)	(0,033)	(0,007)	(0,007)	(0,014)	(0,014)
Número de años desde cuando terminó el doctorado	1,208***	1,208***	1,220***	1,219***	1,165***	1,165***	1,193***	1,195***
	(0,011)	(0,011)	(0,084)	(0,085)	(0,014)	(0,014)	(0,031)	(0,031)
Universidad	1,757***	1,759***						

TABLA 11

ESTIMATION OF DETERMINING FACTORS OF ACADEMIC PROMOTION

Chapter 4

THE ROLE OF INSTITUTIONS IN GENDER DIFFERENCES IN SCIENCE CAREERS

Brindusa Anghel | Sara de la Rica | Juan José Dolado

Having presented the empirical evidence available on gender differences in Science in the previous chapters, we are devoting this chapter to the analysis of the possible role played by the institutions that control scientific life (universities and research centres), and the family life of the people who work in the field of science in relation to these differences. We will aim to analyse the question of whether institutions or family characteristics have any positive or negative effects on gender differences.

1 SCIENCE INSTITUTIONS AND GENDER DIFFERENCES

It is interesting to know whether academic institutions themselves actually foster gender differences in science careers or, on the contrary, whether the trend is towards equality in treatment and equal opportunities for men and women. In keeping with the nature of this report, it is our intention to provide quantitative evidence that will allow us to relate science institutions to gender differences, particularly in Spain, and compare them on an international level.

Science institutions and gender differences. International context

There are several different sources of information available that provide data on the relationship between science institutions and gender differences in the United States. In this chapter we will refer to two of them. The first comprises several studies carried out by the MIT (Massachusetts Institute of Technology) in 2011, 2002, and 1999, after a Committee on the Status of Women Faculty in the Schools of Science and Engineering alerted them to the significant gender differences at the centre. The second is a book entitled "Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty" (2010), which only refers the disciplines of Science, Engineering and Mathematics.

In the studies carried out by the MIT data was analysed from several MIT faculties and men and women, also from different faculties, were surveyed. Based on the information collected, reports were written on the status of women in each of the faculties of this prestigious university. Although we do not pretend to give an exhaustive analysis here, it is worth highlighting at this point that the 1999 and 2002 reports revealed and quantified women's lower access to resources of all kinds: lower salaries, less recognition in the form of prizes and others, less laboratory space and fewer metres of window, fewer promotion opportunities in relation to their male colleagues, etc.[40] the report shows how successive generations of women at the MIT thought the problem "had been solved with the previous generation", only to find over time that this was not the case. As a result of these reports, in the 1990s the MIT adopted a series of positive action measures that have served as inspiration for many other North American universities.

The new 2011 report analyses the status at that time as well as the effect the policies have had. This new report shows significant progress has been made in terms of greater equality, status and number of women. Although it also shows that, in spite of these improvements, many problems do persist and others have appeared which affect women's careers in a negative manner. The most important conclusion to be drawn from this report is the need to maintain the active policies and collaborative effort developed over the last decade between the central administration of the university and the women researchers who work there.

The second study, "Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty" (2010) also provides the results of surveys aimed at scientists of both sexes. From these results we can glean information on how their respective academic institutions treat them.[41]

The results of this report differ from those of the MIT, although their indicators are also different and they generally measure more specific aspects. This study does not find any evidence of men and women spending different amounts of time on teaching, research and management activities (unlike in Spain). Neither does it find any differences in the total resources that men and women receive from their respective institutions for them to be able to attend congresses, reduce their teaching time and/or as summer pay (the MIT data on salaries and income is comprehensive). The number of assistants and post-docs supervised annually by academic men and women is very similar, as is the availability of laboratories and their inclusion on committees and research teams.

Many American universities have been following positive action programmes similar to those at the MIT since the 1970s to promote women's careers. The Advance programme established a decade ago by the United States National Science Foundation is worth a special mention. This programme was designed because the specific programmes aimed at women in previous decades had not had the effect that had been hoped for. The National Science Foundation's Advance programme is based on the premise that this problem is a structural problem of institutions (it is targeted more at the institutions than the women), and funds active measures for structural change in scientific institutions aimed at improving human resource management with regards to gender. This programme has had an annual budget of around 19 million dollars over the last decade, and funds competitive projects presented by the institutions themselves.

Science institutions and gender differences. Spain

To date there have been no surveys of Spanish academics of both sexes available to provide us with information on their relationship with different aspects of the institution where they work. If these existed we would be able to make significant progress in our understanding of the role the science institution plays in gender differences in our country.

However, we have had access to certain public information that helps us link science institutions and gender differences in our country based on the composition of selection boards and gender differences in:

a. Qualification assessment in Spanish universities.
b. Accreditation assessment in Spanish universities.
c. Promotion assessment in the CSIC.

Gender composition of promotion committees and gender differences. Spain

Although there is little related information available, an interesting question to ask ourselves is whether the gender composition of promotion committees affects the probability of promotion for men and women. A reply in the affirmative would indicate that science institutions as such (which in some way or other may affect the composition of the committees) might have a certain influence on the probability of promotion for men and women.[42]

Before 2002, each university in Spain carried out the assessment tests for promotion to Full Professor or Associate Professor individually. However, in 2002 a central test system was implemented on a national level, meaning the first step (a necessary, though not always adequate, requirement)[43] in promotion to Full Professor or Associate Professor. These assessments, known as "qualification", were used between 2002 and 2006 when they were replaced by the so-called "accreditation" which has been in use since 2006. We aim to provide evidence of the relationship between the gender composition of the committees and probability of promotion, given the information we have available.

Qualification assessment boards and gender differences in academic promotion

Zinovyeva and Bagues (2010) analyse the impact of the gender composition of committees for the qualification of candidates for Full Professorships or Associate Professorships in Spain between 2002 and 2006. In the rest of this section we will summarise the most important findings of this study that provides very interesting empirical evidence on the relationship between the gender composition of these committees and the probability of promotion for women as opposed to men.

1. Data

For the qualification assessments (2002-2006), the authors provide information on practically all the qualifications made for Full Professors and Associate Professors in Spain between 2002 and 2006, in all fields of knowledge.[44] They show information on the gender composition of promotion committees, as well as on all the participants in each of the assessments. An interesting characteristic, and one that validates this study, is that the assessment committees were composed of a completely random selection of persons from the group of eligible candidates.[45]

The authors have information on the gender composition of the qualification assessment boards for 891 tests (of a total of 1016 exams), 455 of which correspond to promotion to Associate Professor and 436 to promotion to Full Professor. As regards the candidates, the authors compiled information on sex, age and academic quality (based on academic publications). Regarding the committees, the authors compiled information on gender, age and academic quality in terms of scientific publications.

2. Results

For the qualification for Full Professorship, the authors found that in a comparison of men and women with similar characteristics (in terms of age and academic publications), the presence of an additional male assessor on the committee reduced the probability of a woman being promoted, as opposed to a man, by 14%. To understand the reason behind these gender differences, the authors compared larger fields of knowledge with smaller ones and found that this behaviour is more common in the smaller fields, where the old boys´ club effect is stronger.

For the qualification for Associate Professor, the effect of the gender of the members of the committee is the opposite, although by a much smaller margin: An additional male assessor on the committee increases the probability of a woman being promoted, as opposed to a man with similar characteristics, by 5%. This would imply that women members of the committees for Associate Professors discriminate against candidates of their own sex (although the difference is certainly small).

Accreditation boards and gender differences in academic promotion

As previously mentioned, the centralised qualification system in our country was replaced by the current system of "Academic Accreditation". With this system, each candidate sends his/her curriculum vitae to be examined and hopefully "accredited" to obtain the promotion, either to Associate Professor or Full Professor. Unlike the case of qualification assessment, the accreditation assessment committee is not chosen at random, rather the Ministry directly proposes members to form part of these committees. Although the 2007 Law of Equality demands a quota of 40% of women on accreditation committees, this requirement only began to be applied as from 2010, and even then not equally in all fields of knowledge.

Although it makes no sense to carry out a similar analysis to that of the qualification assessments, given the difference in the configuration of the committees, we can show the relative participation of women in these accreditation assessments for both Full Professors and Associate Professors, as well as the success rates of men and women.

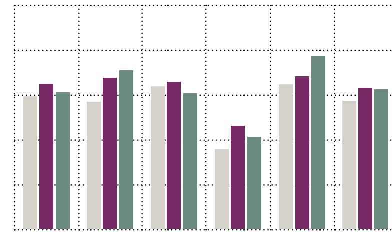
Accreditation for Full Professorships. Gender differences

Graph 31 shows the percentage of women applying for accreditation for Full Professorships by fields of knowledge in the years 2008, 2009 and 2010.

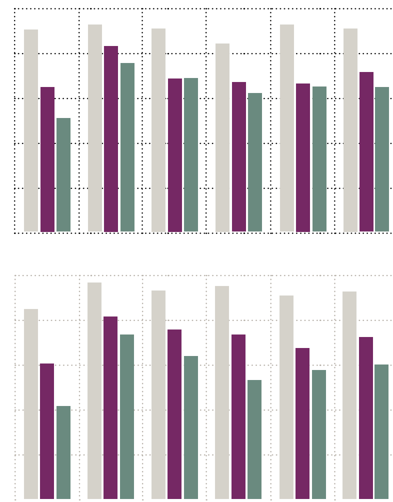
This graph reveals several interesting facts:

1.Women are clearly in the minority in applications for accreditation for Full Professorships –around 30%. In some fields, such as Art and Humanities, it is over this figure, but in others, such as Engineering and Architecture, the percentage of women applying for accreditation is considerably lower. Nevertheless, what is relevant here is not the absolute percentage of women applying for accreditation for Full Professorships, but the relative percentage of the presence of women Associate Professors – the figures for which were shown in Graph 17 in the previous chapter. Looking at all the fields together, we see that the percentage of women applying for accreditation for Full Professorships (30%) is less than the presence of women Associate Professors in 2008 (38%), which accounts for the lower relative participation of women in accreditation assessment in relation to men.
2. Regarding the evolution over time of the percentage of women sitting these assessments, there is a slight increase between 2008 and 2009, although this increase comes to a standstill in 2010. When broken down by fields of knowledge, the increase is continuous and noticeable in Sciences and in Art and Humanities, but no clear pattern is observed in Social Sciences, Health Sciences and Engineering and Architecture.

As well as knowing the percentage of women candidates for Full Professorships, it is important to know the success rates by gender. Graph 32 (both panels) gives information of the success rates of accreditation assessments for both men and women, respectively, and for each of the three years there is data available for.



GRAPH 31
PERCENTAGE OF WOMEN APPLYING FOR ACCREDITATION FOR FULL PROFESSORSHIPS



GRAPS 32
SUCCESS RATES FOR PhDs APPLYING FOR ACCREDITATION FOR FULL PROFESSORSHIPS

The graphs reveal the following interesting facts:

1. If we look at the evolution over time of the total of all fields, we can see that the success rates of both men and women have fallen (from 90% in 2008 to 60% in 2010). Given that the assessment committees have practically remained stable over these three years, the explanation we consider most plausible is as follows: given that the qualification assessments only had positive outcomes for very few candidates (due to heavy restrictions on number), at the beginning of the accreditation assessments there was a large number of very qualified candidates waiting for accreditation (which does not now have restrictions on number). As these candidates became accredited, the new candidates assessed became less qualified and, consequently, the success rates were lower. This phenomenon occurred in a similar manner and with a similar intensity among both men and women.
2. There are considerable differences in both gender and the evolution over time depending on the fields of knowledge: for example, in Social Sciences, the fall in success rates is very sharp (from 90% in 2008 to 50% in 2010 for men, and from 85% in 2008 to 40% in 2010 for women). At the other end of the scale we see a very slight decrease that is similar in terms of gender in Sciences, where the success rate fell less than 15 percentage points between the two years. Finally, in the fields of Health Sciences, Engineering, and Art and Humanities, the success rates for men fell around 20 percentage points over those three years (from 90% to 70%), whilst for women the drop is much steeper (from 90% to less than 60%).

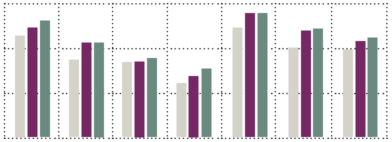
In summary, the descriptive evidence presented regarding accreditation for Full Professorships shows, firstly, that there are fewer women assessed for accreditation than men in relation to their number in each professional category. Evolution in favour of women is slow and limited. With regards to success rates, a clear drop in success rates of accredited candidates is observed, with this drop being greatest for women.

Accreditation for Associate Professorship. Gender differences

Here we provide a similar analysis for accreditation assessments for Associate Professorship. Firstly, Graph 33 shows the percentage of women candidates for this type of accreditation assessment in the years 2008, 2009 and 2010 by fields of knowledge.

The graph provides the following evidence:

a. Firstly, a much more considerable female presence is observed in the assessment tests for accreditation for Associate Professorships – between 40 and 45% for a total of all fields. Given that the relative percentage of women among Assistant Professors in 2008 was almost 50% (see Graph 18 in the previous chapter), it can be said that the relative presence of women in accreditation



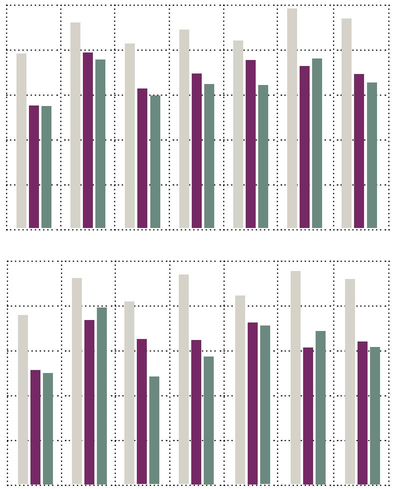
GRAPH 33
PERCENTAGE OF WOMEN SITTING ACCREDITATION ASSESSMENTS FOR Associate ProfessorshipS

assessments for Associate Professorships is gender equal.
b. The evolution of the percentage of women in these assessments is positive (slightly above that seen for accreditation for Full Professorships) over the 2008-2010 period.
c. Broken down by fields of knowledge, the level of female participation is uneven: from 25-30% in Engineering and Architecture (minimal percentage of women), to 48-52% in the fields of Social Sciences, and Art and Humanities.
d.The increase in female participation in these assessments is around 5% in almost all the fields of knowledge.

Regarding gender differences in success rates, Graph 34 (both panels) shows the evolution of these rates for men and women, respectively.

This graph gives us the following relevant findings:

a. As with the accreditation for Full Professorships, we can see a clear drop in success rates between 2008 and 2010, and we believe this is due to the same causes proposed for the drop in accreditation for Full Professorships – basically, a reduction in the quality of the accreditation candidates. However, given that there is no information on the academic quality of the candidates, it is not possible to infer the reason behind the sharper drops in success rates in the aforementioned fields. If the reduction in "quality" were similar for men and women, then we would be witnessing a certain amount of gender discrimination against women. Given that we do not have any information on the quality of the candidates we cannot reach a conclusion on this point. Looking at the total of success rates, a similar drop is observed for men and women –from 90% in 2008 to 65% in 2010.
b. If we study the data separately by field of knowledge, a sharper decrease in the success rate for women is observed in the fields of Social Sciences, Health Sciences, and Engineering and Architecture. The gender differences are less obvious in Sciences, Art and Humanities, and all other fields.



GRAPH 34
SUCCESS RATES OF PHDS SITTING ACCREDITATION ASSESSMENTS FOR ASSOCIATE PROFESSORSHIP

Promotion assessment in the CSIC and gender differences

Apart from public universities, the CSIC also boasts a considerable number of scientists of both sexes in our country. Although it has not been possible to find any data on gender differences with regards to promotion by fields of specialisation, the CSIC has provided us with interesting information on the evolution over time of the percentage of women holding positions at different levels within the institution. Graph 35 gives the evolution over time (2004-2009) of the percentage of women to have taken up posts (both through open competition and internal promotion) at all three levels of the CSIC: Grade A researcher, equal to a university Full Professor, Grade B researcher and Grade C researcher.

The latter two are civil service positions and, therefore, are equivalent to Associate Professorships in the university system, where the civil service only covers two levels and not three like in the CSIC. A Grade B researcher is a higher level of promotion than Grade C.

This graph revels several interesting facts:

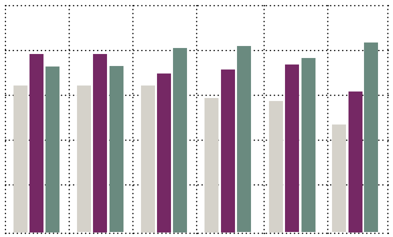
• Firstly, the percentage of women granted a Grade A or Grade B post in the CSIC has fallen considerably over the last 5 years. Although in 2004-2006 the percentage of women holding these positions was around 30% for Grade A researchers and 40% for Grade B researchers, in 2009 these percentages had fallen to 23% for Grade A researchers and 30% at Grade B level.
• A slight increase over time is observed for the presence of women at Grade C level (from 37% to 42%).

In light of these results, the next question we must ask ourselves is whether the minority presence of women, and the drop in number at the Grade A and Grade B levels, is due to the percentage of women candidates for these positions being lower or, on the contrary, that the success rate for women in promotion assessments is lower. Below, therefore, we present the gender differences in success rates for assessments for accessing the different levels.

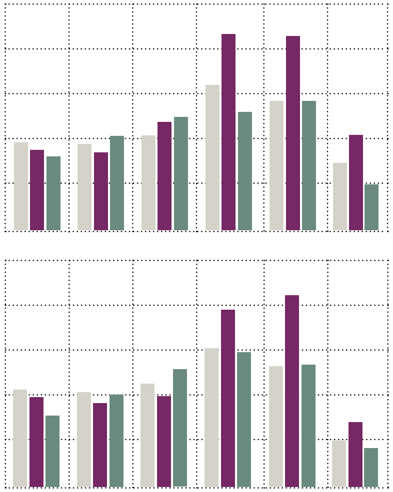
Graph 36 provides this information.

• The first point of note is that, for both men and women, the success rates for the three levels have followed the curve of an inverted letter U: in 2004 the success rates were under 20% on the three levels for both sexes, with a significant increase in 2007 and 2008 (mainly at the Grade B level), whilst in 2009 the success rates fell sharply to levels even lower than those of 2004.
• If we study the gender differences in the success rates, no significant differences are observed until 2009. In this final year, success rates for women drop further than they do for men on all three levels, but particularly at the two higher levels: the success rate for men is around 15% compared to 10% for women at Grade A level, and around 21% as opposed to 15% at Grade B level.

In summary, it is important to point out that women were in the minority in positions offered by the CSIC in the 2004-2009 period, especially at higher levels (Grade A and Grade B). In addition, in spite of no obvious gender differences being observed in success rates up until 2008, these results were relevant in 2009 when success rates dropped for all candidates, but with the drop being relatively greater for women. In this year the number of places offered was significantly reduced in relation to previous years. The data indicates that success does not depend as much on the quality of the candidates as the places available, or the administrative logic for filling positions.



GRAPH 35
PERCENTAGE OF POSITIONS FILLED BY WOMEN THROUGH OPEN JOB OFFERS AND INTERNAL PROMOTION



GRAPH 36
PERCENTAGE OF SUCCESS IN PLACES ASSIGNED THROUGH OPEN JOB OFFERS AND INTERNAL PROMOTION

2 FAMILY AND GENDER DIFFERENCES IN SCIENCE

International empirical evidence abounds (mainly from the USA) on motherhood creating additional obstacles to women's advancement in Science, as well as in other professions. In general, the years of most scientific production are those immediately after obtaining a PhD (27-40 years of age), and these coincide with the biological age for having children. The considerable amount of time required for childcare, which still falls mainly to women, is an additional difficulty.
Given the demands for the accumulation of very specific human capital imposed by an academic career, this dedication to children can create differences that will be "unrecoverable" later on in a professional career. Below we give some interesting points on an international level before moving on to focus on the evidence available for Spain.

Family and Science in an international context

The *Beyond Bias and Barriers (*2006) report by the National Academy of Sciences provides an abundance of evidence on the conflict between a professional academic career and having children. Below we provide a summary of the evidence presented in two important studies discussed in this report. Xie and Shauman (2003) obtain the following interesting results:

- Among academics of both sexes in science or engineering who already have a tenured position, or are in the process of obtaining one (tenure-track positions), 83% of men are married, whilst only 64% of women are married
- Regarding the number of children, only 42% of this group of women have children, as opposed to 50% of men.

While Drago et al. (2005) provide a longitudinal study which follows the professional career of more than 160,000 academics. Their study reaches the following interesting conclusions:

- Around 2/3 of women who chose high-level academic careers never had children.
- 45% of women with academic tenure in the United States do not have children.

In summary, the evidence above points to the fact there seems to be a conflict between establishing a home and having children, and following an academic career.

Family and Science in Spain

Below we provide evidence on the possible conflict between having children and the professional success of women who choose academic careers in Spain.

In previous chapters we revealed some interesting findings on gender differences in scientific productivity and academic promotion. In this chapter we will show additional evidence of the impact having children has on these differences. We will cover all professional categories, both in total and separately.

However, before looking at these results, it is important to remember that the results shown in the text are those of the RRHH-2006 as, although we also have the more recent data from the RRHH-2009, the smaller scope of the latter survey leads to much less precise results. Once again we would like to refer the reader to the Appendix of this report where we discuss to what extent these samples represent the group of academics, especially Full Professors as a whole in our country.

Having children and academic productivity. Gender differences[46]

Using the data from the INE Human Resources Survey allows us to quantify the impact of having children on the academic productivity of women as opposed to men with similar personal characteristics and in the same field of research. In fact, we can see this impact quantified in the second, fourth, sixth and eighth columns of Tables 8, 9 and 10. Given that academic productivity is measured in terms of three indicators, we have analysed the gender differences for each indicator separately.

Having children and publishing articles. Gender differences

The columns in Table 8 which include interaction between gender and having children, allow us to compare productivity in terms of the publication of articles by members of the different groups, distinguishing between the following groups with different family characteristics:

1. **Women with children versus men with children:** In a comparison of men and women of the same personal and professional characteristics, in this case both with children (under 18), women publish an average of 1.1 articles less than their male counterparts (-1.96+0.86). This difference is mainly due to the greater disadvantage children put women at, in relation to men, in the categories of Associate Professor and Assistant Professor. No significant differences were found among the group of Full Professors.
2. **Women without children versus men with children:** In a comparison of men and women with the same personal and professional characteristics, but with the difference of the men having family responsibilities and the women not, we see that women also publish an average

of 0.8 articles less, with this difference being less than in the previous cases. This time the differences are only found in the Associate Professor group.

In summary, it seems obvious from the evidence above that, although women publish less than men even when they do not have any dependent minors, family responsibilities (in terms of children) affect women more than men for this scientific productivity indicator.

Having children and publishing books. Gender differences

The columns in Table 9 which include interaction between gender and having children allow us to compare productivity in terms of books published among the different groups (grouped as before), depending on whether they have family responsibilities or not:

1. **Women with children versus men with children:** A comparison of men and women with identical personal and professional characteristics, and both with family responsibilities, reveals that women with dependent children (under 18) publish an average of 0.4 books less than their male counterparts. Furthermore, an analysis of the separate professional categories allows us to add that these differences are basically due to the greater disadvantage children put women at, in relation to men, at Full Professor level.
2. **Women without children versus men with children:** A comparison of men and women with similar personal and professional characteristics, but with the difference of the men having family responsibilities and the women not, no significant differences are observed with regards to the publication of books. We see, therefore, that regarding the publication of books, when women have no family responsibilities in the form of children, their productivity is no less than that of their male counterparts.

Having children and directing theses or dissertations. Gender differences

The columns in Table 10 which allow interaction between gender and having children allow us to compare productivity in terms of thesis and dissertation direction (measured as the probability of directing a thesis or dissertation) in the following groups:

1. **Women with children versus men with children:** A comparison of men and women with identical personal and professional characteristics, and both with family responsibilities, reveals men with children are 1.3 times more likely to direct a thesis or dissertation than women. These differences are much more acute at Full Professor level, where the probability of directing a thesis or dissertation is 1.7 time higher for men than women. There are no significant differences at Associate Professor level.

2. **Women without children versus men with children:** A comparison of men and women with similar personal and professional characteristics, but with the difference of the men having family responsibilities and the women not, reveals that men with children are 1.3 times more likely to direct a thesis or dissertation than women without family responsibilities. This clearly suggests that there must be other different determining factors that lead to men directing more theses and dissertations than women with similar characteristics.

Having children and academic promotion

The INE Human Resources Survey also allows us to estimate the impact having children has on the possibility of academic promotion.

The impact of having children on promotion to Full Professor [47]

If we take the group of Associate Professors and Full Professors and estimate the probability of promotion to a Full Professorship, once we have again compared men and women of the same age, with the same number of years since their PhD, in the same field of knowledge, and with the same academic productivity in terms of the publication of articles, books and directing doctoral theses, the impact having children has for men and women is as follows:

1. A comparison of men and women with the same personal and professional characteristics (especially academic productivity), and both with children, shows that having children has a much more negative effect on women: a man with children is 4 times more likely to be promoted to Full Professor than a woman with similar characteristics.[48]
2. A comparison of men with the same personal and professional characteristics, but differing in the factor of having children, reveals that men with at least one child are 1.7 times more likely to be a Full Professor than a man without children.

Composition of Science academics in Spain according to family situation

Another very interesting piece of information we can obtain from the aforementioned Human Resources Survey is the composition of the families of academics at each level and for each field of research. Although this information is merely descriptive, and although we are aware of the lack of representation in this sample (especially at the highest academic levels), the men and women included in it are "comparable", and the obvious differences we see are certainly clear descriptive evidence of the conflict between family and career faced by academic women in our country.

Composition of faculty at Full Professor level by family situation

Graph 37 (both panels) provides evidence on the gender composition of the faculty at Full Professor level according to family situation.

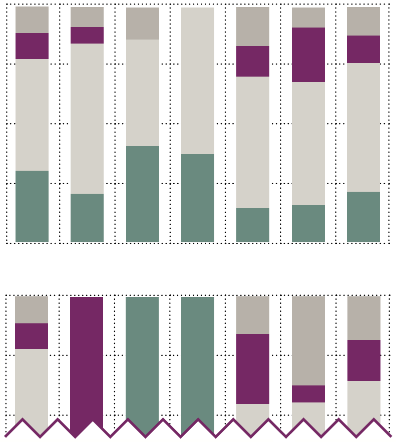
We can draw some interesting conclusions from both these panels:

1. An analysis of the total distribution of men and women by family (without differentiating by field of knowledge) reveals considerable gender differences: only 31% of women have children, as opposed to 54% of men. There is also a higher proportion of single women without children as opposed to single men: 17% as opposed to 12%.
2. EIn the fields of Engineering and Technology, Medical Sciences and Agricultural Sciences, weighted averages (so that they represent the academic population in Spain) of women by family situation reveal there are no women Full Professors with children in these areas. In Engineering and Technology, the only female Full Professors are single women, while in Medical Sciences and Agriculture all the Full Professors are married, but without children.[49]
3. In the field of Humanities, although there are a few women Full Professors with children, the percentage of these in relation to the rest (married without children, single without children, or others) is much lower: 16% as opposed to 52% of male Full Professors with children.
4. In the field of Social Sciences, there seems to be less of a situation of conflict between family and career as the distribution of women Full Professors by family situation is more similar to that of men. In any case, the single status percentage at Full Professor level is still substantially higher among women: 30% as opposed to 13% for men.

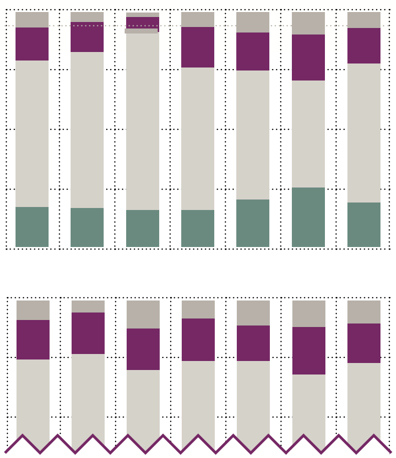
In summary, we must point out that there seems to be a very clear conflict between promotion to the highest academic level and having children. The disadvantages having children has on their academic career means many women have to decide between motherhood and academic career advancement. As we saw in the previous section, having children improves men's chances of promotion, when all other constant variables are taken into account.

Composition of faculty at Associate Professor level by family situation

Graph 38 (both panels) provides the composition of the faculty of both sexes at Associate Professor level by family situation and area of research. The difference between these two graphs and those discussed previously is very clear: although we can see the percentage of single women without children is higher among Associate Professors in all fields of knowledge, the gaps are much smaller than they were for the Full Professors.



GRAPH 37
COMPOSITION OF UNIVERSITY FACULTY AT FULL PROFESSOR LEVEL BY FAMILY SITUATION



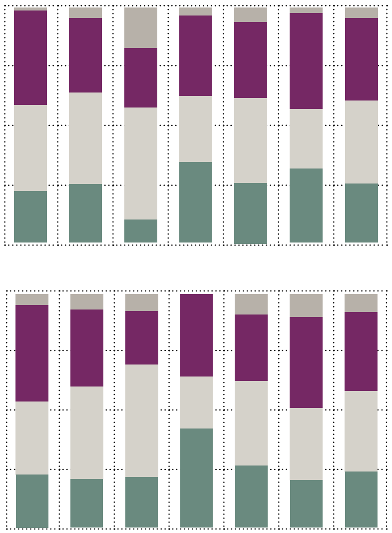
GRAPH 38
COMPOSITION OF UNIVERSITY FACULTY AT ASSOCIATE PROFESSOR LEVEL BY FAMILY SITUATION

Composition of faculty at Assistant Professor level by family Situation

Finally, Graph 39 (both panels) shows the composition, by gender, of faculty members at Assistant Professor level by family situation and field of knowledge. There are certainly considerable similarities between men and women at this level, both as regards the number of single and married men and women, with or without children.

From all this analysis we can conclude that having children clearly creates a conflict for women as regards reaching the higher levels of an academic career. However, having children increases the probability of a man reaching Full Professor level, when equal to a woman in terms of years since PhD and merits. Having children negatively affects the academic productivity of women and their promotion to Full Professor. As a result of these difficulties, we see far fewer women with children than without children (either single or married without children) at this level, data which does not correspond in the slightest to the case of men. This scarcity of women with children at the higher academic levels indicates that women, in the majority of fields of knowledge (with the exception of Social Sciences), often have to choose between their academic career and having children.

To round off this section, we would like to remind the reader that the graphs shown here on family situation are a statistical reflection of a reality corresponding solely to a representative sample of the faculty object of the study in the INE Human Resources Survey (2006). As we have already mentioned several times throughout this report, this sample cannot be considered representative of the entire spectrum of the current faculty and, as a consequence, the conclusions we draw here cannot be extrapolated to the whole group of university faculty.[50] In fact, if there was information available on the family situation of all the university faculty in our country, it would be interesting to show the data described here (particularly that relating to the family situation of male and female Full Professors), for different academic cohorts, in so far as the situation at any given time is largely the result of conditions inherited from a University system with different characteristics to the current one. In fact, it could be argued, with a rather optimistic outlook as regards gender, that the situation revealed in the graph on the composition of Full Professors' families in our country is the result of an "old" Spanish university system, whilst that reflected in the graph showing the distribution of women Associate Professors according to their family situation more faithfully represents the current situation in universities.



GRAPH 39

COMPOSITION OF UNIVERSITY FACULTY AT ASSISTANT PROFESSOR LEVEL BY FAMILY SITUATION

3 CONCLUSIONS

1. The results seem to be different with regards to the effect of the gender composition of qualification committees for Full Professorships and Associate Professorships. We find that when comparing male and female candidates with similar observable characteristics (in terms of age and academic publications), an extra man on the assessment committee reduces the probability of a woman being promoted to Full Professor as opposed to a man by 14%. This negative effect is considerably higher in smaller fields of knowledge, where the "old boys' club" effect is probably stronger. In qualification assessments for promotion to Associate Professor, the effect of the gender composition of the committees is just the opposite, although to a lesser extent (5%).

2. Regarding the accreditation assessments that replaced the qualification assessments in 2006, findings show that women are still greatly in the minority (30%) in these assessments for Full Professorship, and for Associate Professorships, although to a lesser extent (40%) in the latter. As regards success rates, a clear drop is observed over time, probably due to the gradual disappearance of the best candidates in the sample (cream skimming), as they are given their accreditation in the first few years. However, it is important to point out that the drop is much more pronounced for women. The same patterns are found when we analyse the promotion of men and women to the levels of Grade A researcher, Grade B researcher and Grade C researcher in the CSIC.

3. The greater drop in the success rates of women in accreditation assessments for Full Professorships could be indicative of discrimination, if we look at it in light of the results of the qualification assessments from the period immediately before this one. The effective discrimination shown in the previous process of qualification assessment for Full Professorships would imply that the eligible pool contains the best women candidates, at least those that are comparatively better than their male counterparts. This, if the system was based on merit, should have led to greater success rates among women in accreditation assessment processes.

4. Regarding the impact of family life on the work of scientific personnel, international evidence shows that around 2/3 of women who chose academic careers never had children and that, in the case of the United States, 45% of women with academic tenure do not have a child. These percentages are much higher than those of their male counterparts, for whom having children does not seem to be an obstacle in an academic career.

5. With regards to Spain, findings show that having children seems to be an obstacle for women in their academic career, but not for men in any way. Not only is having children not a conflictive factor in an academic career for men but, on the contrary, it seems to work in their favour, independently of their scientific productivity. Having children produces a negative effect on the academic productivity

of women and their promotion to Full Professor, with the effects clearly less negative in promotion to Associate Professor. For example, if we look at the distribution of men and women in academia as a whole, and by family situation (without differentiating between fields of knowledge), we see that only 38% of women Full Professors have children as opposed to 63% of men, and the percentage of single women is 21% as opposed to 15% of single men. This phenomenon is particularly noticeable in Engineering and Technology, Medical Sciences and Agricultural Sciences where none of the female Full Professors have children. In Engineering and Technology the only women Full Professors are single, whilst in Medical Sciences and Agriculture they are al married, but without children.

Chapter 5

FINAL THOUGHTS AND CONCLUSIONS. ORCHESTRATING IMPARTIALITY AND PROMOTING CO-RESPONSIBILITY

Sara de la Rica | Inés Sánchez de Madariaga

To bring this study to a close, we will summarise the most important findings of the analysis, as well as considering the questions that arise from the results. The data analysed and used in this report enables us to explain certain facts, but, as we will discuss below, in the majority of cases it does not let us draw definitive conclusions on the causes of the gender differences found. Therefore, we hope this final chapter can be used for reflection and, at the same time, as a road map to be followed in order to gain a clearer and deeper understanding of the motives behind the gender differences found. Much more precise and complete qualitative and quantitative information on individuals (both at specific points in time and over the whole period) in a sample fully representing the scientific community is fundamental in order to make progress on this ambitious project.

To achieve this we must insist on the creation of more and better data bases, that include presence and productivity indicators broken down by sex, and which form an adequate statistical representation. Furthermore, this is a legal requirement of responsible institutions, established in the Law on Equality and the Law on Science, Technology and Innovation.

Together with the questions posed here, these conclusions and final thoughts, must help boost the availability of quantitative and qualitative information on individuals that will allow us to progress with the determining factors of gender difference to be able to detect the causes of the under-representation of women in science in Spain more accurately. We would like to take this opportunity to call for the creation of accurate and complete surveys that will, on a regular basis, allow us to account for the gender situation in science in our country, as well as to be able to observe its evolution over time.

1 SUMMARY OF FINDINGS

We will present our conclusions in the same order used in the body of the document, that is: (i) Science Education, (ii) Professional Career in Science, and lastly (iii) Institutions and Science.

Gender Differences in Science Education

Although we summarised our conclusions on gender differences in Science Education in detail at the end of chapter two, here we would like to highlight two interesting results which in turn pose some relevant questions:

Firstly, the chapter shows that graduation rates of women in Higher Education are higher than those of men both in Spain and the EU-15 for many degrees – a phenomenon not observed in the United States. We can also see that the drop-out rate at degree level is greater among men than women. However, when looking at higher (PhD) levels, the data analysed leads us to the conclusion that the drop-out rates of women on PhD programmes in Spain and the EU-15 are higher than those of men – a phenomenon that does not exist in the United States, where the drop-out rates for women and men are similar. The data currently available prevents us making any progress towards finding an explanation for this phenomenon, although the fact that more women than men drop out of this specialised education (the opposite of the situation for undergraduate study) is, undoubtedly, worth studying in detail. To be able to do this, individualised information on aspects such as time taken to complete the doctoral thesis, family situation (principally having children or not) during the PhD phase, and other factors like personal support (at home and at work) and institutional support in successfully completing the doctoral thesis, would undoubtedly be relevant to a better understanding of these differences.

The second aspect we would like to focus on refers to the gender differences in participation in pre- and post-doctoral grant programmes. Regarding the first of these, women enjoy 50% of pre-doctoral Ministry grants, although Graph 6 shows that in recent years more grants have been awarded to men than women. If we look at post-doctoral grants, the most significant gender differences are observed in the Ramón y Cajal grants (Graph 7), where both the relative presence of women on these programmes, and the success rates for grants awarded, are lower for women than men. The progress in the percentage of women with Fulbright grants has been continual and spectacular to the point where very few gender differences are seen today in the awarding of these grants in relation to the pool of possible candidates.

These results prompt us to ask ourselves what is behind these differences. The unavailability of information on the scientific quality of the candidates prevents us getting any nearer an explanation. These grants should have been awarded on merit alone, so we would need specific information on the scientific quality of the candidates applying. This would allow us to compare the success rates in the awarding of these programmes to men and women of the same scientific calibre, and conclude, as a result, whether the differences observed are due to differences in merit or not. It is also worth studying the possible impact of the different award procedures. This could explain the smaller differences in the Fulbright Programme, which is run differently and in line with procedures similar to those common in the USA.

Gender Differences in Science Careers

In reference to the analysis in chapter 3 of this paper, in this section we will highlight two important conclusions that cause us to reflect on several points:

Gender Differences in Scientific Productivity

If we measure scientific productivity in terms of publishing articles, directing theses or dissertations and publishing books, the evidence leads us to the conclusion that, when comparing men and women that are similar in a wide range of observable professional and family characteristics, women publish fewer articles than men (approximately 1.6 articles less in 2004-06), and direct fewer theses and dissertations (30% of women have directed one as opposed to 40% of men). On the other hand, no relevant quantitative differences are found regarding the publication of books.

What causes these differences? Yet again the lack of data prevents us from finding a satisfactory explanation. However, we did discover two facts that may help to explain them. Firstly, the data leads us to the conclusion that women spend more time on teaching activities (preparation and teaching) than men. Given that both teaching and research compete for time, this difference could be a determining factor in the differences observed. But this evidence leads us to further questions: Why do women spend more time on teaching activities? Is it a voluntary decision or a situation resulting from a higher teaching load? These questions can only be answered if we have access to detailed individual information on teaching quota, and other aspects related to the time spent on lesson preparation. We need, therefore, to have better information available on the underlying reasons for women spending more time on teaching activities than men. We would also need to know whether there are any gender differences in the time spent on other professional activities such as administration, both on a formal level (department secretaries, for example, or coordinating master's degrees, etc.), and an informal one (support activities, coordination, meetings and event organisation, etc.) that is less visible and recognised.

Gender Differences in Professional Success (Promotion)

In this study we have measured professional success as the possibility of promotion to a higher level in a science career – promotion to Full Professor for Associate Professors, and promotion to Associate Professor for Assistant Professors. Although we have found no relevant gender differences in the possibility of promotion to Associate Professor, the differences in promotion to Full Professor in favour of men are quite significant. More specifically, when comparing men and women with similar characteristics, the probability of a man being promoted to Full Professor is 2.5 times that of a woman. There is little variation in these differences between fields of research.

In light of these results, can we conclude that gender discrimination against women exists in promotion to Full Professorships? If all individual productivity indicators were adequately covered by our analysis, then the results would be clear and conclusive. However, the information available on scientific probability is limited: There is no information on quality/impact indicators for candidates' publications (only number), neither is there a precise measurement of the total number of publications presented by them since they finished their PhDs, only those corresponding to a short period before the granting of the promotions. The existence of these non-observable differences could go some way towards explaining the gender differences found in promotion to Full Professorship. We hope that in the future we will be able to reduce this information gap but, in the meantime, we must be cautious in classifying these differences as discriminatory. In any case, given that numerous controls have been used (so that men and women are compared who are very similar in personal and professional terms), the result obtained should act as an incentive to continue investigating the possible existence of discriminatory practices in promotion to Full Professor in our country.

Institutions and Gender Differences in Science Careers

In chapter 4 we analysed the role of institutions (scientific institutions and family) in gender differences in science careers. Here we will present the main conclusions and the thoughts and questions that arise from them.

Science Institutions and Gender Differences

Current data allows us to use econometric analysis to calculate the differential probability by gender of being promoted to Associate Professorships and Full Professorships, using several control variables, including scientific productivity, family situation, and, for qualification assessments, the composition by sex of the assessment boards. These analyses provide valuable information on the differential impact of gender on such important institutional practices as the processes regulating professional promotion.

Regarding qualification assessments for Full Professorships and Associate Professorships, the evidence discussed in chapter 4 leads us to the conclusion that, when comparing men and women with similar characteristics (in terms of age, field of specialisation and academic publications), an additional man on the corresponding committee reduces the probability of a woman being promoted to Full Professor as opposed to a male candidate by 14%. This negative effect is considerably greater in smaller fields of knowledge, where the 'old boys' club' effect is probably stronger. In qualification assessments for promotion to Associate Professor, the effect is exactly the opposite, although the size of the gap is somewhat smaller (5%).

Regarding the accreditation assessments that substituted the qualification assessments as from 2006, the data analysed leads us to the conclusion that the presence of women in the accreditation assessment tests for Full Professor is lower than that of men in relation to their presence at Associate Professor level. As regards success rates, a clear drop in accreditation success rates is observed in general, but it is much more pronounced for women. The fall in success rates is possibly due to the fact the best candidates gradually disappeared as they had already achieved their accreditation in the first few years of the process. However, this explanation does not justify the greater drop for women. Once again we lack information relating to the individual merits of the candidates, without which it is impossible to attribute the differences observed to a specific cause.

These patterns also appear when we analyse the promotion of men and women to the positions of Grade A researcher, Grade B researcher and other lower categories within the CSIC. Specifically, in the CSIC in the last two years, a reduction in the amount of places offered has more negatively affected women than men.

Impact of family life on science careers

With regards to the impact of family life on the work of male and female researchers, the evidence shown here indicates that having children clearly seems to be detrimental to a woman's career in science. For men, however, if family does have an effect on their work, this effect is more positive than negative. It seems to be evident, in light of the findings, that rearing children clearly interferes in the scientific productivity of women and the possibility of them being promoted to a higher level when their productivity is the same.

This conflict between family and profession for women scientists is clearly shown in the distribution of male and female academics in Spain by family situation. The INE Human Resources Survey reveals that only 38% of women Full Professors have children, as opposed to 63% of men, and that the percentage of single women is 21% as opposed to 15% of single men. This phenomenon is especially noticeable in areas such as Engineering and Technology, where all the women included in the survey sample are single, and Medical Sciences and Agricultural Sciences, where they are all married, but none have children.

2 THE FUTURE. ORCHESTRATING IMPARTIALITY AND PROMOTING CO-RESPONSIBILITY

Some North American and European institutions are already developing programmes to prevent stereotypes and gender bias in assessment, recruitment, promotion and other aspects of organisational culture and institutional practices. These programmes are additional to the more traditional family support programmes, programmes to help balance work and family life, and co-responsibility programmes. This involves (to use the expression coined by Goldin and Rouse (2000)), orchestrating impartiality.

The aforementioned experiments of the National Science Foundation, the Massachusetts Institute of Technology, and the University of Michigan, in the United States should serve as models to be followed by scientific institutions throughout the world. In Europe, there are also many model experiments, and many of them are documented in studies funded by the European Commission listed above.

Presented in October 2011, the most recent document with recommendations published by the European Commission is the *Structural Change in research institutions: Enhancing excellence, equality and efficiency in research and innovation* report.[51] This report was commissioned from a group of experts who were asked to provide recommendations to help boost the Commission's science policy instruments: the European Research Framework Programme, the Horizonte 2020 research funding programme, and the Recommendation to the Member States on Structural Change in research institutions, as requested by the European research ministers, in an agreement of the Competitiveness Council of May 2010. This report identifies the following five main problems facing research institutions.

The first is opaqueness in decision-making. Despite significant progress in Europe in recent years, lack of transparency continues to affect structures and processes, with the associated phenomenon of "old boys" networks and patronage. Evidence suggests that women and men would both benefit from a system where the criteria are clear and information is freely available for all. A second set of problems relates to institutional practices which, while appearing to be neutral, do have negative effects on the career opportunities of women. Cognitive errors in assessing merit, suitability for leadership, or evaluation of performance are embedded in institutional practices, often despite the good intentions and commitment to fairness of institutions and individuals. Thirdly, since the pioneering study by Wenneras and Wold on applications to the Swedish Medical Research Council in *Nature* in 1997, a number of studies have demonstrated the considerable effect of unconscious gender bias in what is the hallmark of science: the assessment of excellence and particularly the process of peer review. Fourth, gender inequality in science generates wasted opportunities and cognitive errors in knowledge, technology and innovation. Research has shown that gender bias has important implications for the content of science itself. The integration of sex and gender analysis in the research content increases the quality of research and improves the acceptance of innovation in the market. Finally, despite the many years of European legislation on equal opportunities, statistics show that EU Member States still have a gender pay gap, and gender continues to be a structuring factor in the workplace, also in research, making it difficult for talented women to reconcile work and family.

Concentration of power and the guru/acolytes model of power relations are also factors affecting women negatively.

This report proposes structural change in science institutions as the means to address each of these five sets of problems, so that decision making is more transparent, unconscious bias is removed from institutional practices, human resources management is modernized, excellence is promoted through diversity, and research and innovation are improved by the integration of a gender perspective.

In addition, it signals three essential elements which should be considered as prerequisites: knowing the institution, by developing statistics and indicators broken down by gender, in accordance with the Law on Science, Technology and Innovation in Spain; getting top level support from persons in positions of responsibility; and generating effective management practices, by ensuring the gender knowledge and expertise of those responsible for the implementation of the structural change, and also that they are personally committed to equal opportunities for men and women, an essential factor for the ensuring gender mainstreaming policies become more than just a declaration of good intentions.

The report presents its recommendations organised in two ways: by subject and by the actors they are aimed at. Here we give the recommendations according to the actors they are aimed at.

*Gender Equality Strategy: key steps for actors at EU, national and local level**

The following provides a comprehensive list of recommendations for an overall strategy for gender mainstreaming in research, including structural change in research institutions. It should be noted that although some of the initiatives listed have already been launched in some form, they nevertheless need to be integrated into a more consistent and inclusive strategy.

To the European Commission

1. Attach gender requirements to all funding programmes:

- Set requirements for research organizations (at an early stage of the eligibility process), including:
  - adapted gender equality plans with clear targets
  - iimplementation of gender audits which include data published in the annual reports on pay gaps, and participation statistics
- Ensure systematic integration of gender and sex analysis in all proposals (requiring that all applicants specify whether, and in what sense, sex and gender are relevant in the objectives and the methodology of their projects) –e.g. Norwegian Research Council , Spanish legislation
- Ensure gender balance in research teams as a criterion for evaluation
- Provide briefings to all evaluation panels on the evidence of bias occurring in the assessment and selection of people and work

2. Create a well-funded, dedicated programme to promote the structural change in research institutions (on the model of the ADVANCE programme in the US)

- Funding to institutions implementing a programme for structural change
- Support for cooperation between national gender and research focus centres
- Fund specific research on women and gender
- Fund exploratory actions, e.g. international cooperation with US organizations, including ADVANCE institutions
- Fund up-skilling and train-the-trainers programmes

*extracted to:
http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1406

3. Gender mainstream all EC activities in R&I (in order to become an example of good practice at the worldwide level)

- Gender-proof relevant EC policy documents
- Introduce gender measures throughout
- Garantizar el equilibrio de género en comités, grupos de expertos, puestos de alto rango, ponentes de conferencias importantes, comités asesores senior
- Ensure gender balance in committees, expert groups, high-ranking positions, speakers at important conferences, senior advisory committees

4. Re-establish the Women and Gender Unit in the EC Research and Innovation Directorate-General, ensure that it has sufficient expertise, personnel, financial resources, stability, and create an advisory position on women and gender in the Cabinet
5. Create a well-funded, high-quality leadership development (up-skilling) programme, targeting officials, experts (with training to ensure there is in-house capacity to lead worldwide with this agenda))
6. Ensure that researcher mobility measures incorporate the gender dimension (e.g. taking into account dual careers, work-life balance issues)

To European-wide organizations

1. Demonstrate leadership

- show senior level commitment to gender equality
- promote opportunities for new blood to circulate in institutions –e.g. transparency in criteria and appointment to committees and bodies, set time limits on membership of committees, promote gender balanced committees

2. Identify, publicize and promote gender equality best practices
–e.g. create special programmes, promote specific initiatives
3. Establish an award for well performing institutions, as appropriate
-e.g. Athena Swan (UK)

4. Establish an award for best research which integrates a gender analysis in frontier research, as appropriate
5. For those with funding programs, attach gender analysis requirement to calls (see also recommendations for the European Commission)
6. Create a panel of experts, higher level group of high status men and women to advise, monitor gender in research

To Member States

1. Enact legislation requiring:

- integration of gender dimension into university curricula
- integration of sex and gender analysis in publicly funded research programmes, at all stages of research (refers to content of research)
- universities and science institutions to:
    - adopt gender equality plans
    - create gender equality units
    - develop programmes to suppress bias and barriers to women's careers in science
- public funding bodies to develop research programmes on women and gender
- provisions for ensuring compliance with existing and new legislation

2. Create organizational structures on gender and science at the highest possible governmental level, with good resource of personnel, expertise, funding
3. Integrate gender requirements into all action plans and calls for research, and attach requirements to funding programmes
4. Create a dedicated programme to finance actions on women, gender and science (similar to ADVANCE, and structural change in EC) e.g. gender analysis, training, support to universities and research / funding organizations, fund gender programmes at Master's and PhD level
5. Ensure decision makers, evaluators, etc are trained in gender awareness and how to avoid gender bias in evaluations, and researchers are trained in gender analysis

6. Disseminate information on all the scholarship available (particularly on bias, stereotypes, diversity)
7. Ensure that all measures dealing with mobility within countries and in Europe properly consider gender differences

To gatekeepers of scientific excellence

1. Gender in research (research projects that specify the relevance –or lack of relevance– of sex and gender should achieve a higher score for funding)

- include requirement in calls for inclusion of sex and gender analysis
- provide up-skilling, guidelines, examples
- fund specific programmes on women and gender

2. Eradicate institutionalized bias (i.e. practices that favour one sex)

- carry out gender impact assessment including audits of procedures and practices to identify potential gender bias; identify and support mechanisms to eradicate bias
- make decision-making transparent – define criteria that are publicly available and actually implemented, publish the data online
- sign up to a set of good practices: re-advertising positions if there are no women in the applicant pool, assessing research quality rather than quantity

3. Address evaluation bias (improve peer review)

- carry out up-skilling (e.g. specific leadership training)
- provide guidelines, examples of good and bad practice, tutorials
- disseminate existing research on evaluation and organizational bias
- provide online training, and a certification process with basic minimum knowledge for evaluators and referees

To universities and scientific institutions

1. Ensure gender dimension is integrated into the undergraduate and postgraduate curricula, across the university (particularly in engineering and science)
2. Adopt an Equality Plan, and include audit results (gender disaggregated statistics) in annual reports. These should include gender pay gap, staff statistics and senior committee membership
3. Sign up to and follow a set of good practices

- gender proofing of important policy documents
- gender impact assessment of policies and practices
- train staff on gender dimension in research and introduce regular staff assessment
- mentoring, networking, role models
- Code of Conduct for developing early researcher standards
- set up gender equality unit (on a high hierarchical level); centre of expertise for women and science
- gender balance in committees, and train men to understand the issue; leadership development in implementing gender awareness
- work-life balance for both women and men
- positive work environment: dignity for all, no harassment or bullying, ombudsman, training
- fair and transparent workload balance; ensure women are not allocated all the teaching and administrative work and taking care of students
- fair recognition of work; ensure fair signature, giving credit where credit is due
- mobility and contract funding conditions
- at a minimum: data and indicators, carry out climate surveys in departments (diagnosis)

4. Provide up-skilling –for careers, and on the content of research

Description of the Human Resources in Science and Technology Survey (RRHH Survey). Waves 2006 and 2009

The RRHH-2006 is an extensive study of PhDs resident in Spain who obtained their PhD from a public or private Spanish university between 1990 and 2006. The statistical unit comprises people who are PhDs and, at the most, 70 years old (this corresponds to the ISCED 6/PhD category).

The second wave of this survey, RRHH-2009, which was made public in November 2010, takes as its population area all doctors under 70, resident in Spain, and who obtained their PhD from a private or public Spanish university between 1990 and 2009.

For the purposes of this White Paper, only those PhDs working in universities and/or on research projects at the time of both survey waves are considered. Therefore, from a total sample of 12,625 PhDs surveyed in the RRHH-2006, we are left with a sample of 7,299, that is 57.8% of the total sample. Regarding the RRHH-2009 the original sample only covers 4,132 PhDs. If we then restrict this sample to only PhDs working in universities or research centres, we get a final sample of 2,281 doctors –55.2% of the total sample.

The marked reduction in the number of PhDs surveyed in the 2009 wave in comparison to the 2006 wave (the sample is practically reduced to 1/3), makes a thorough econometric analysis impossible when the aim is to study the gender differences in matters such as academic productivity or promotion, especially in the case of higher academic levels. Therefore, although on the one hand the use of the 2009 wave would provide us with more up-to-date information, on the other, the reduction in the number of people surveyed does not allow us to make estimations on gender difference that are sufficiently precise. This is the main reason why we eventually decided only to use the information provided in the 2006 survey.

The questionnaire for the survey comprises the following modules: Personal Characteristics, PhD, Work Situation, Unemployed or Not Working, Mobility and Professional Experience, and Scientific Productivity. All the information on the questionnaire, the methodology and the results can be found at the INE:

(http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t14/225&file=inebase&L=0)

Representation of the INE RRHH samples. Waves 2006 and 2009

Although this survey contains new and very valuable information to allow us, using individual data, to analyse numerous aspects of academic life (determining factors of productivity, academic success in terms of promotion, the international mobility of surveyed PhDs, etc.), there are several drawbacks relating to its representation that it is important to highlight:

The first, and possibly the most important, drawback is that the survey is only aimed at PhDs who defended their doctorate in 1990 or later. This restriction leaves a considerable part of the academic profession out, particularly the older doctors, among whom we find the majority of PhDs that occupy the highest academic ranks –Full Professors in Universities, or Grade A researchers in the CSIC. In this sense, the survey cannot be considered representative of the total population of academics in our country, especially those at the highest academic levels.

The second drawback is that the survey is aimed at PhDs who did their doctorate in Spain. Although it is true that in the 80s the percentage of doctors who studied for their PhDs in foreign universities was very low, this percentage has increased over time. In this sense, the findings presented here are only representative of the group of doctors who defended their thesis in a Spanish university.

To get a better understanding of the lack of representation of these samples as regards the group of University Teaching Faculty in Spanish Universities, we are including a table below that shows the relative weight of each professional category both in the University Teaching Faculty group, and in these samples. The presence of women in the different data sources is also shown. Unfortunately, the INE University Teaching Statistics do not provide breakdowns by variables such as age and field of specialisation for each professional level. As a result, we find we have to restrict this comparison to the distribution of PhD faculty in each category, as well as the presence of women in each of them. [53]

We also have to bear in mind that the statistics on University Teaching cover all PhDs, regardless of when they obtained their doctorates, whilst the two waves of the RRHH only cover those individuals who obtained their PhD between 1990 and 2006 (2009).

	Estadísticas Enseñanza Universitaria (2005-2006)	RRHH 2006	RRHH 2009
Total Doctores/as	71,817	48,230	46,305
Total Mujeres (%)	23,907 (33,3 %)	22,042 (45,7 %)	20,447 (44,2 %)
	Distribución según escalas o sexo		
% Catedrático/a Universidad y Catedrático/a Escuela Universitaria	15,5 %	3,3 %	4,5 %
% Mujeres entre CU y CEU	18,1 %	20,6 %	25 %
Profesorado titular (%)	39,1 %	54,4 %	59 %
% Mujeres entre los profesorado titular	36,5 %	41 %	41,1 %
Otros Doctores	45,4 %	42,3%	36,5 %
% Mujeres entre Otros Doctores	35,7 %	48,2 %	48,2 %

TABLE 13
DISTRIBUTION OF DOCTORS BY PROFESSIONAL CATEGORY, (MULTIPLE DATA SOURCES)

NOTES

1. http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=home
2. *Council Conclusions Concerning various issues related to the development of the European Research Area (ERA),* 26th May 2010, European Union Council.
3. The Group of Experts is formed by: Inés Sánchez de Madariaga, chairwoman, Tiia Raudma, rapporteur, Teresa Rees, Elisabeth Pollitzer, Martina Schraudman, Thomas Eichemberger, Sophie Sergent and Alice Hogan.
4. http://www.portal.advance.vt.edu/ ;
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383
5. National Science Foundation, ADVANCE programme leaflet.
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383
6. 6 http://sitemaker.umich.edu/advance/recruitment__stride_
7. http://projectimplicit.net/generalinfo.php
8. There are also some assessments of reading literacy carried out on fourth grade pupils (in primary school), such as PIRLS (Progress in International Reading Literacy Study), and even of analytical ability, such as TIMSS (Trends in International Mathematics and Science Study). Both these assessments have recently been carried out for many of the OECD countries, but in this report we will focus on the results obtained from secondary school pupils, as this stage is more relevant for university entrance.
9. The results of the PISA tests are weighted so that the average for the OECD countries corresponds to a 500 point score.
10. Further details in "Equally prepared for life? How 15-year-old Boys and Girls perform in School", OCDE report 2009.
11. The maximum difference is observed in Korea, with 23 points in favour of boys, while Iceland is the only country where the difference is in favour of girls (15%).
12. This is an important point, because when pupils find a task or subject more difficult, their level of interest and "enthusiasm" generally diminihses noticeably. The fact that the differences in interest and enthusiasm are much greater than the differences in results would suggest that there are certain genetic or cultural gender differences in preference for the subject.
13. In the field of science, points are awarded for literacy in each of the following three science areas: identifying scientific questions, explaining phenomena scientifically and using scientific evidence. Points are also awarded for science knowledge (i.e. knowledge of science processes as a form of research) and knowledge of science (i.e. literacy in the following areas: "Earth and space systems", "Physical systems" and "Living systems"). Unlike the mathematical assessment (more related to the ability to identify, tackle and solve mathematical problems), the science literacy assessment measure the level of knowledge of science-related concepts and their connection to scientific research.
14. As regards the evolution in enrolment rates, due to data being unavailable for the United States for 1998, we only discuss the evolution in Spain and the EU-15.
15. A detailed description of this survey can be found in the Appendix to this White Paper.
16. We would like to thank the Ministry of Science and Innovation and, in particular, Carmen Peñas, for the provision of all the data reported here.
17. The main objective of the "Ramón y Cajal" programme run by the Ministry of Science and Innovation is to strengthen the research capacity of R&D groups and institutions, both in the public and private sector, via the recruitment of researchers with PhD's, and who have presented a line of research to be developed, through grants gradually and progressively co-financed by the receiving institutions, that identify and define their research strategies and the areas in which they want to specialise.
The decision made on the sub-programme is based on a rigorous competitive process of proposals put forward by candidates.
This guarantees the objectivity, scientific quality and merit of the selected researchers.
The grants awarded are to co-finance the contracting of doctors in all fields of knowledge, by Spanish R&D centres for a period of five years.
18. The "Juan de la Cierva" programme run by the Ministry of Science and Innovation is designed to help contract young doctors (with special

attention given to those doctors who have recently obtained their doctoral degree) so that they can join research teams and build on their scientific knowledge. Requirements state that researchers must be doctors and have obtained their PhDs no earlier than the first of September 2007 (unless they can prove just cause in line with the terms and conditions). They must also comply with the mobility requirements specified in the decision and the corresponding section of the guide. Applications for participation are presented by the R&D centre and must include the research candidates to be incorporated into the research teams.
The grants awarded are to co-finance three-year contracts for doctors, in all fields of knowledge, by Spanish R&D Centres.

19. We would like to thank the Fulbright Commision, and especially Patricia de la Hoz, for taking the time to provide us with this data.

20. The data in this section refers solely to publicly-funded universities because the same contractual schemes may not exist in private universities. With regards to the Higher Board of Scientific Research (CSIC), reference is made, at the end of this section, to the percentage of women at different professional levels.

21. According to the definition given in the University Teaching in Spain Statistics, a Professor is a person employed, even on a part-time basis, to transmit knowledge, skills, etc. A university's *teaching and research staff* comprises the government-employed teaching staff of the bodies of University Full Professors, University Associate Professors, University School Full Professors, University School Associate Professors, as well as other contracted teaching staff in the following categories: Adjunct Professors, Visiting Professors, Emeritus Professors, University Assistants, Lecturers, Tenured Full-time Lecturers and Lecturers (not necessarily with PhD) in Public Universities, and the teaching staff contracted by privately-owned centres. (Translator's note: Due to its similarity to the Spanish terminology, we will use the American academic rank system of Full Professor, Associate Professor and Assistant Professor in this translation).

22. There are three categories (levels) of civil service research personnel in the CSIC, and these are (from low to high): Grade C researchers (the science career entry level), Grade B researchers and Grade A researchers. The Grade C researcher category corresponds to a University Degree level, and the Grade A category to a university Full Professorship. Grade B researcher is an intermediate category that was abolished from the university system 25 years ago, but which survives in the CSIC.

23. Given that the objectives of both this chapter and the previous one are to carry out a descriptive analysis of the situation of women in several different aspects of science, we do not aim to include any evaluation of the origins of these differences.

24. The importance of academic rank and institutional affiliation in understanding gender differences in the publication of articles is also shown in a report by the National Research Council (2001), "From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers".

25. The "academic productivity" variable considered here refers, as previously mentioned, only to "recent" academic productivity. Furthermore, this data does not allow us to measure academic productivity in terms of the "quality" of the publications, given that there is no evidence provided on the impact factor of the publications, or on any other relevant quality indicators. Consequently, the differences in productivity are only measured in terms of quantity and not of quality.It is important to bear this in mind when interpreting the findings.

26. Given that the variable to be explained is that of recent productivity (over the last 3 years) and we want to measure to what extent the presence of children has affected productivity, we have taken children between the ages of 5 and 18 as the variable that best covers the family responsibilities of subjects at the time of carrying out the work, as there tends to be a gap of 2 to 3 years between the actual research and publication. Lastly, it is considered that having children over the age of 18 does not affect possible publication.

27. To explain the size of this difference, remember that the average number of articles published between 2004 and 2006 is, as Table 7 shows, 8.2 and 6.6 for men and women respectively.

28. When interaction terms between being a woman and fields of research are included, the coefficients of the interaction terms are not statistically significant. These results are available on request for interested readers.

29. The interactions between fields of knowledge and gender are not significant in any of the cases and are not shown for this reason. However, they do indicate that there are no differences between men and women according to fields of knowledge. The results are available on request for interested readers.

30. As previously mentioned, the text presents the results taken from the information contained in RRHH-2006. In the appendix to this work, the results derived from RRHH-2009 are presented. These are generally

consistent with the former, although the precision is reduced due to the smaller number of observations.
31. Once again we introduced the interaction between being a woman and field of research, and in none of the cases does this interaction seem to be significant. The results are available on request for interested readers.
32. One issue revealed in the report, and which must be taken into account, is the possible selection of women who are the PIs for the submitted Research Projects. We observe that the proportion of women PIs who submit project proposals is much lower than that of men and, consequently, if the women who submit these proposals are clearly "the best", then here we are comparing men and women with possibly different levels of academic productivity. This effect is known as "selection bias" and must be kept in mind so that the results are not distorted in an attempt to generalise the results for all female investigators.
33. The question refers solely to cooperation with foreign research groups in the time between January 2004 and December 2005. As the survey refers to people with PhDs in 2006, the answer to this question indicates very recent cooperation with foreign research groups.
34. In the majority of universities in the USA, achieving a tenured position corresesopnds to the transition from Assistant Professor to Associate Professor.
35. Therefore, we are excluding those that are Assistant Professors (PhD) from this analysis. The reason behind this is that an Assistant Professor cannot aspire to be a professor as the steps in academic promotion are very clearly defined.
36. This sub-sample includes PhDs resident in Spain and who obtained their doctorate in either a public or private Spanish university.
37. The data does not tell us exactly when the promotion took place, nor how many academic papers they have had published throughout their career, it only refers to recent ones. Therefore, we are forced to assume that the recent academic publications are an adequate reflection of career productivity. If this were not so, and there were obvious gender differences in the intensity of academic productivity throughout the professional career of the candidate, then our control variable on publications would contain an error of measurement, which would mean a low bias for the estimated coefficient. As a consequence, we must be aware that, although we might be controlling somehow for academic productivity, it is possible that this control is not perfect.
38. Technical note: Given that the odd-ratio is defined as the coefficient between the probability of success (P) and the probability of failure (1-P), when comparing these relative probabilities between men and women, the relative probability of a man (reference) with regards to a woman is 1/0.4=2.5. Equally, the relative probability of success of a women with regards to a man (reference) would be 0.4/1=0.4. Therefore, we can say that the probability of a man being promoted to Full Professor is 2.5 times that of a woman, and the probability of a woman being promoted to Full Proessor is 0.4 times that of a man.
39. In the Appendix to this paper, the probability of promotion to Full Professor is estimated using the data from the RRHH-2009. As previously mentioned, the full professorship category contains very few observations (78) and, consequently, the estimations are very imprecise. Nevertheless, if we compare men and women of similar characteristics from this sample, we see that men are twice as likely as women to be promoted to Full Professor. A comparison between men and women with children is impossible for RRHH-2009 due to the small number of Full Professors with children in the sample (11 women and 29 men).
40. The detailed and individual faculty reports can be found at: http://web.mit.edu/faculty/reports/
41. These conclusions are basically those given on pages 102-104. Bear in mind that this work only refers to a few specific disciplines and, consequently, its results cannot be extrapolated to other fields of research.
42. The article by Goldin and Rouse (2000) is an international study prior to this paper which analyses the relationship between gender differences and committee composition, although it does not exactly refer to academic careers. The authors of this study collected data on the gender of candidates contracted by several different orchestras in the USA both before and after the change incorporated into the majority of them during the 70s and 80s. This change consisted of the introduction of "blind" selection tests, in other words, the judges evaluated the quality of the musical interpretation without seeing who was playing the instrument, knowing their name or, consequently, knowing their sex. The result is conclusive in that this change provoked a considerable increase in the number of women contracted by the majority of US orchestras.
43. After receiving the qualification, the candidate must request the university provide a post for which s/he has been qualified. If the university agrees to provide it, the competition is open and the

candidate must compete with other possible candidates from the pool of persons qualified for the post.

44. The breakdown of fields is as follows: Engineering, Mathematics and Physics, Medicine, Biology and Chemistry, Social Sciences and Humanities.

45. The qualification committees for associate professorships were formed by three full professors (with experience spanning at least two six-year periods) and four associate professors (with at least one six-year period). The qualification committees for full professor were formed by seven full professors with at least two six-year periods of experience each.

46. As mentioned in the previous chapter, given that the variable reflecting academic productivity (whether it be the publication of books, articles, or the directing of theses) only measures recent production, in order to measure the extent to which having children affects this productivity it is important to make sure the children were had prior to the productivity (otherwise we cannot say having children has a specific effect on productivity). Therefore, the indicator for having children reflects whether they have children aged between 5 and 18 – in which case the indicator is 1, and 0 for the rest of cases (children under 5, over 18, or absence of children).

47. A lack of information on when a person was promoted to a higher academic level means we must restrict the impact having children has on academic promotion to promotion to the top level of Full Professor. The reason behind this is that to measure the impact having children has on promotion it is important that the children were had before the promotion. This is very probable for promotion to Full Professor, but not so clearly so for promotion to Associate Professor.

48. It is possible that the gender differences observed, as well as the impact having children has on these differences, is different for each cohort. However, given that the sample of PhDs available in the Human Resources Survey is restricted to PhDs who obtained their doctorate in 1990 or later and is, consequently, a relatively "young" sample, it is not possible to break the data down into differences by cohorts.

49. The fact that in this sample women full professors with children do not appear in some fields does not mean there are no women with children at that professional level. The people surveyed represent a random sample of male and female PhDs who obtained their doctorate in a Spanish university (public or private) from 1990 onwards. The sample we used is the sub-sample of PhDs working in the academic profession in Spain in 2005. The averages obtained are weighted to represent the total for the group of academics who gained their PhD from 1990 onwards.

50. In fact, given that the survey only covers information collected on PhDs whose doctoral theses were defended in 1990 or later, the group included is relatively young. This restriction may not be too important for the group of Associate Professors, but it is relevant for the Full Professors, as the majority of the members of this group defended their theses before 1990. Moreover, this data restriction prevents an analysis by cohorts being carried out, as the sample of Full Professors is relatively small and young.

51. http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1406

52. http://genderedinnovations.stanford.edu/

53. The INE University Teaching Statistics also provide the distribution of Teaching Faculty in Universities by age, but in this breakdown it is not possible to select only the Teaching Facuty with PhDs (the analysis unit in the RRHH) and, consequently, we cannot make this comparison by age group.

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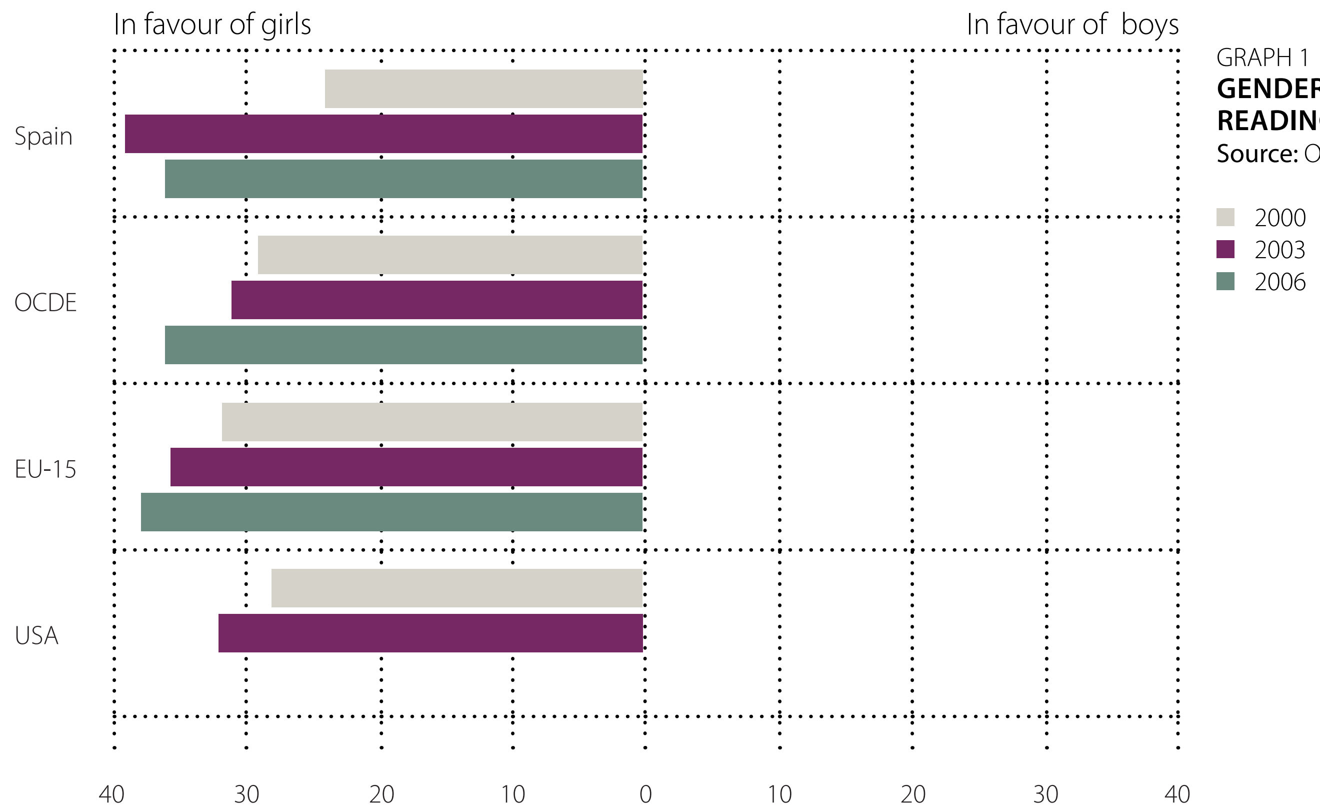
TABLE 1
AVERAGE TIME (HOURS PER DAY) SPENT BY MEN AND WOMEN (20-74 YEARS) ON DIFFERENT ACTIVITIES (2002)
Source: HETUS

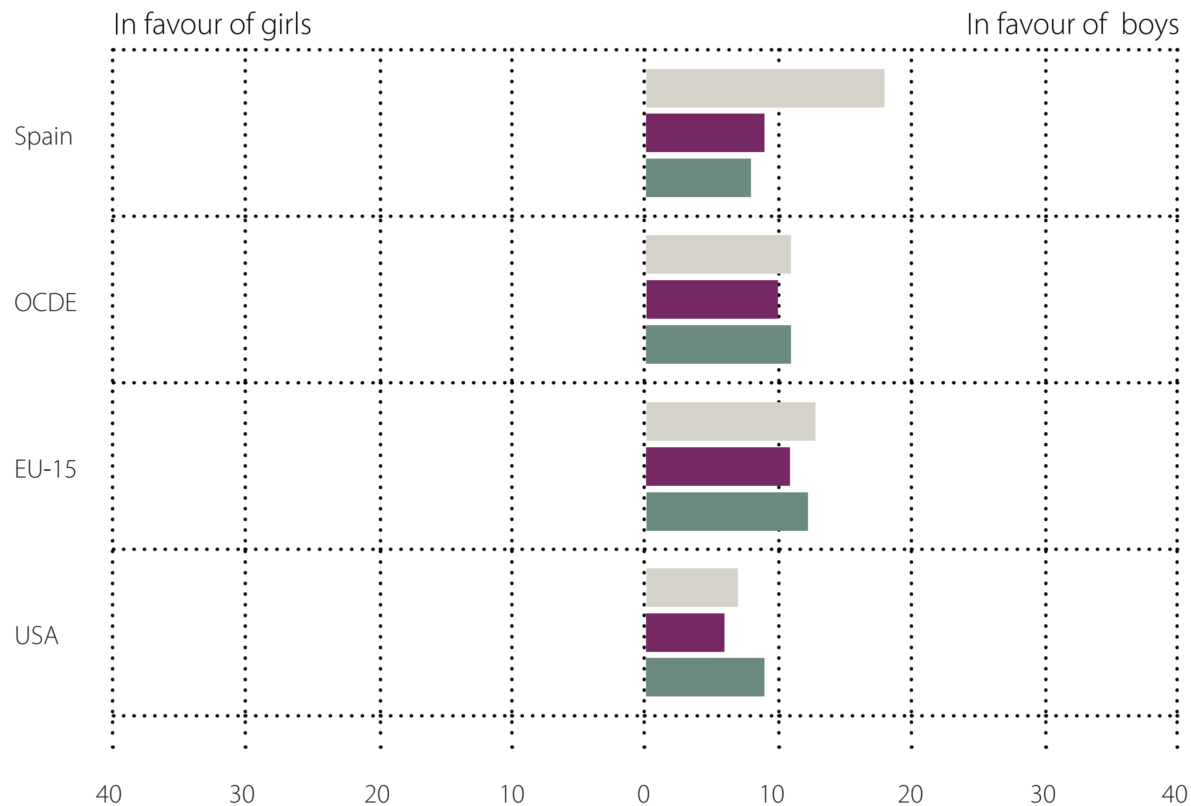
Hours	Finland		Italy		Spain		England	
	Men	Women	Men	Women	Men	Women	Men	Women
Work in a job	3,5	2,3	4,1	1,5	4,2	2,6	4,1	2,2
Work at home	2,2	3,5	1,3	5,2	1,4	4,5	2,2	4,1
Leisure	5,5	5,1	5	4	5,1	4,2	5,2	4,5

GRAPH 1

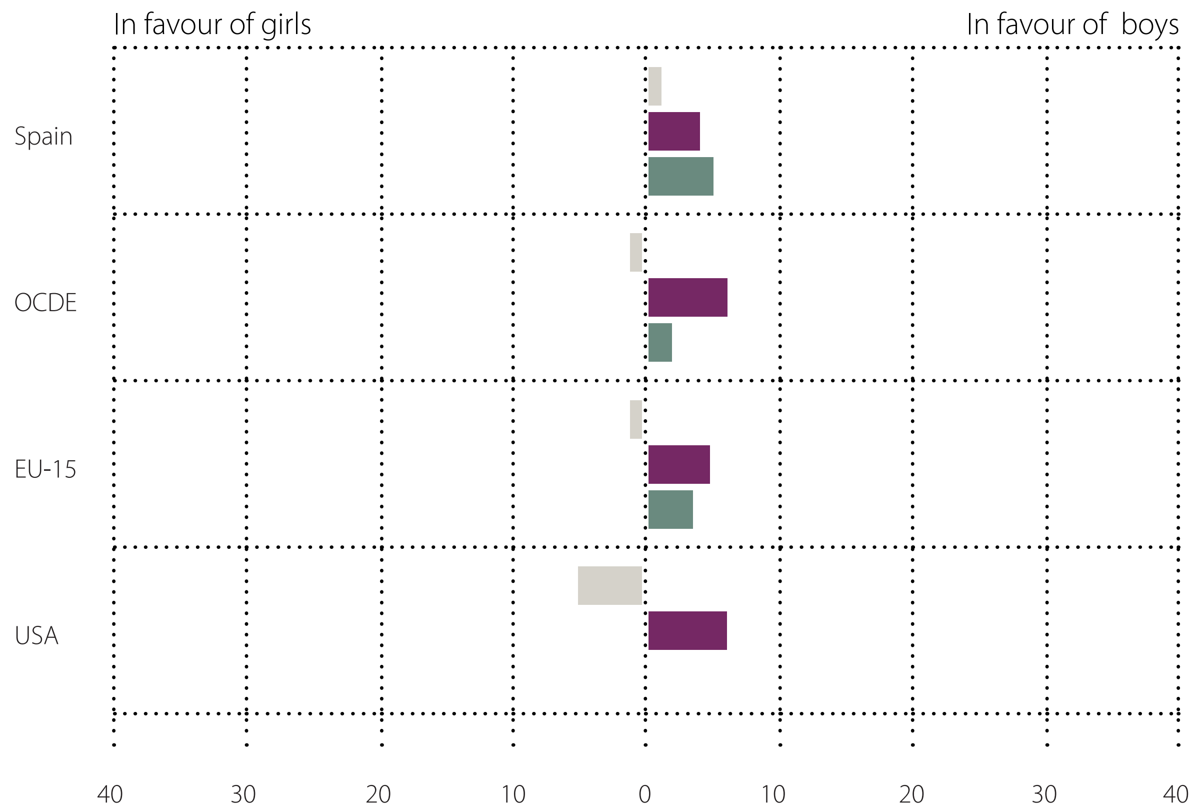
GENDER DIFFERENCES IN READING LITERACY

Source: OCDE (PISA).





GRAPH 2
GENDER DIFFERENCES IN MATHEMATICS
Source: OCDE (PISA).



GRAPH 3
GENDER DIFFERENCES IN SCIENCES
Source: OCDE (PISA).

	Total all fields	Education	Humanities and Arts	Social Sciences and Law	Sciences and Mathematics	Engineering	Agriculture and Veterinary Science	Health Sciences
1998								
Spain	53,3 %	75,3 %	64,0 %	56,8%	41,1 %	25,9 %	43,0 %	74,2 %
EU-15	51,0 %	75,2 %	66,4 %	51,9 %	40,8 %	21,7 %	45,9 %	66,6 %
USA	55,8 %							
2007								
Spain	54,5 %	76,4 %	61,6 %	57,9 %	35,1 %	30,4 %	47, 6 %	74,4 %
EU-15	54,2 %	75,6 %	66,4 %	55,6 %	37,7 %	25,3 %	50,9 %	70,1 %
USA	56,7 %	80,0 %	58,0 %	54,6 %	41,1 %	19,2 %	50,8 %	74,2 %

TABLE 2

PERCENTAGE OF WOMEN ENROLLED IN UNIVERSITY EDUCATION SYSTEM (ISCED LEVEL 5A)

ource: Eurostat. **Notes: 1)** The data r 1998 EU-15 does not include Belgium, Greece or France. **2)** The data for EU-15 2006 does not include Luxembourg or Holland. The data for Greece is not broken down by field, except for Engineering; the percentages per field for the EU-15 do not include Greece. **3)** The data for the EU-15 2007 does not include Luxembourg.

	Total all fields	Education	Humanities and Arts	Social Sciences and Law	Sciences and Mathematics	Engineering	Agriculture and Veterinary Science	Health Sciences
1998								
Spain	58,6 %	75,9 %	67,8 %	58,8 %	44,9 %	25,6 %	44,8 %	77,6 %
EU-15	54,2 %	73,1 %	69,6 %	55,1 %	44,0 %	20,8 %	46,5 %	67,3 %
USA	55,3 %	75,8 %	59,8 %	52,9 %	43,6 %	19,3 %	45,8 %	74,6 %
2007								
Spain	60,9 %	79,3 %	66,3 %	62,0 %	41,0 %	33,0 %	50,9 %	78,6 %
EU-15	57,8 %	78,3 %	69,8 %	57,8 %	41,1 %	26,7 %	53,0 %	72,1 %
USA	58,0 %	77,8 %	60,1 %	54,4 %	43,4 %	21,6 %	49,9 %	79,5 %

TABLE 3

PORCENTAJE DE MUJERES QUE TERMINAN ESTUDIOS UNIVERSITARIOS DE LICENCIATURA Y/0 MÁSTER (NIVEL ISCED 5A)

Source: Eurostat. **Notes: 1)** The data for 1998 does not include Belgium and Luxembourg. **2)** The data for EU-15 2006 does not include Greece and Luxembourg. **3)** The data for EU-15 2007 does not include Luxembourg.

	Total all fields	Education	Humanities and Arts	Social Sciences and Law	Sciences and Mathematics	Engineering	Agriculture and Veterinary Science	Health Sciences
1998								
Spain	50,4 %	61,6 %	57,1 %	50,9 %	44,0 %	24,4 %	40,9 %	57,8 %
EU-15	44,2 %	61,1 %	54,4 %	45,7 %	39,7 %	21,6 %	41,1 %	54,8 %
USA	46,1 %							
2007								
Spain	51,8 %	64,7 %	57,0 %	50,3 %	48,9 %	30,9 %	46,5 %	63,5 %
EU-15	48,2 %	64,8 %	55,9 %	51,3 %	42,0 %	27,8 %	52,1 %	59,6 %
USA	52,1 %	65,1 %	48,8 %	57,0 %	40,9 %	23,5 %	44,9 %	66,3 %

TABLE 4

PERCENTAGE OF WOMEN ENROLLED IN DOCTORATE PROGRAMMES

Source: Eurostat. **Notes: 1)** The data for EU-15 1998 does not include Belgium, Germany, Greece, France, Luxembourg or Holland, **2)** The data for EU-15 2006 does not include Germany, Luxembourg or Holland. The data for Greece is not broken down by fields of knowledge; the percentages by fields of knowledge for EU-15 do not include Greece. **3)** The data for EU-15 2007 do not include Germany or Luxembourg. The data for Holland is not broken down by fields of knowledge.

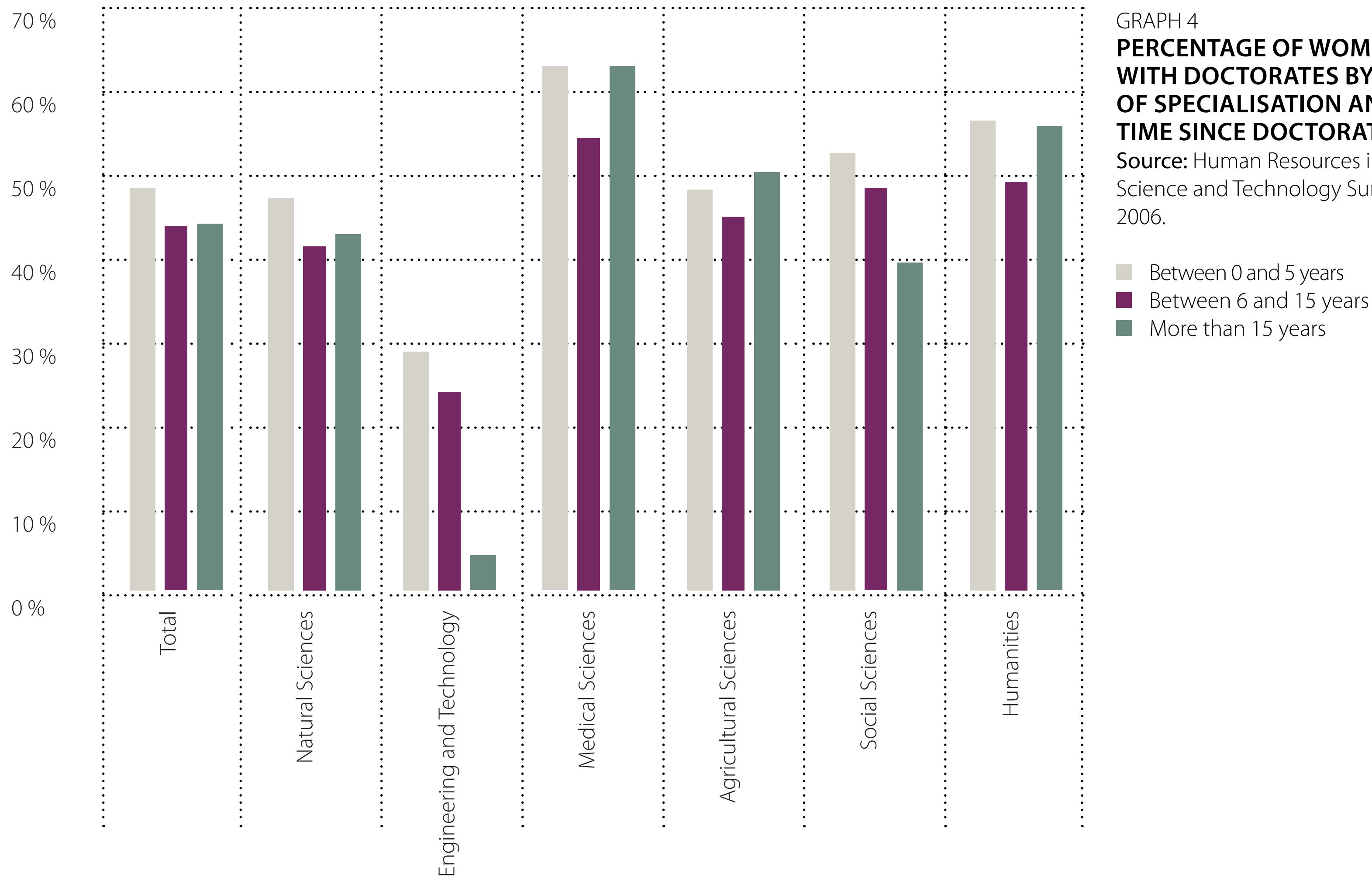
TABLE 5
PERCENTAGE OF WOMEN WHO FINISH THEIR DOCTORATE
Source: Eurostat. **Notes: 1)** The data for the EU-15 1998 does not include Belgium, Greece and Luxembourg. **2)** The data for the EU-15 2006 does not include Greece and Luxembourg. **3)** The data for EU-15 2007 does not include Luxembourg.

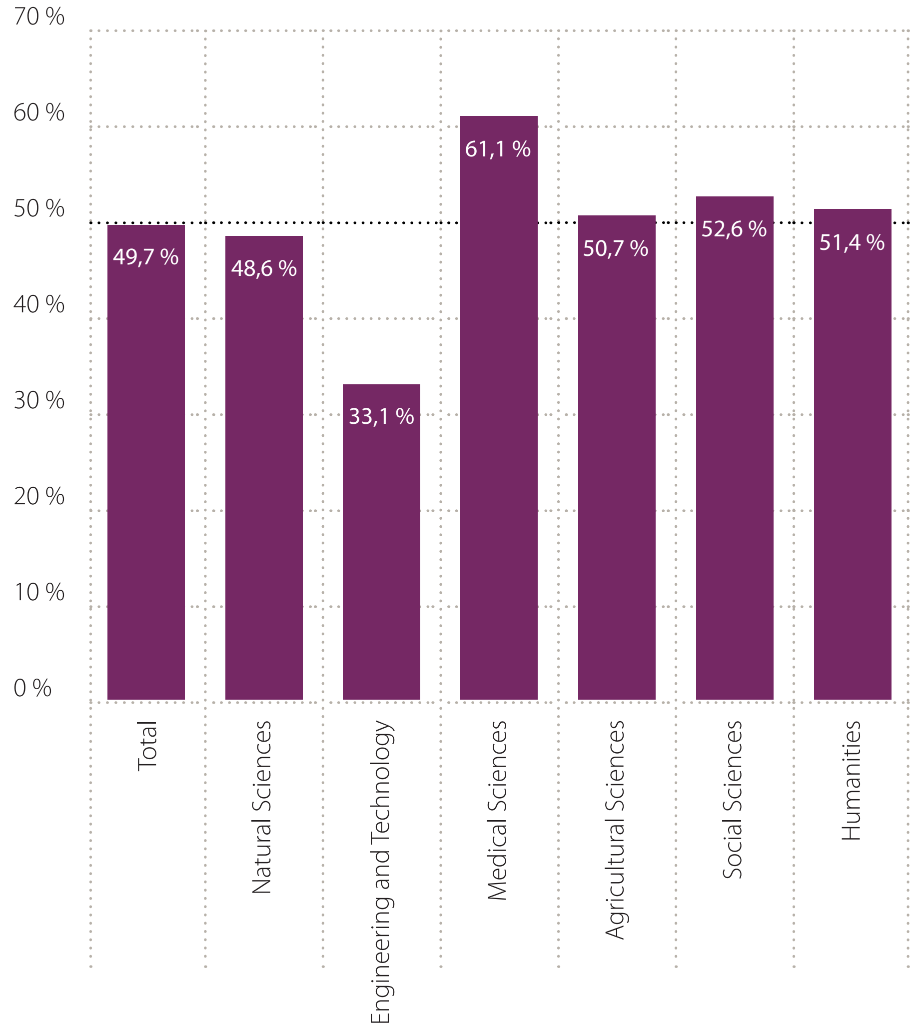
	Total all fields	Education	Humanities and Arts	Social Sciences and Law	Sciences and Mathematics	Engineering	Agriculture and Veterinary Science	Health Sciences
1998								
Spain	42,0 %	55,2 %	41,4 %	44,1 %	43,9 %	18,8 %	42,9 %	45,1 %
EU-15	36,9 %	51,7 %	47,4 %	37,3 %	33,2 %	17,8 %	43,2 %	45,6 %
USA	40,8 %	62,8 %	44,0 %	49,2 %	31,1 %	12,7 %	29,8 %	58,4 %
2007								
Spain	47,6 %	49,6 %	46,8 %	51,2 %	50,2 %	27,9 %	48,5 %	55,1 %
EU-15	45,6 %	66,8 %	53,9 %	48,6 %	40,9 %	25,2 %	54,7 %	54,6 %
USA	50,1 %	67,5 %	45,7 %	58,8 %	38,1 %	21,4 %	38,5 %	73,3 %

GRAPH 4

PERCENTAGE OF WOMEN WITH DOCTORATES BY FIELD OF SPECIALISATION AND TIME SINCE DOCTORATE

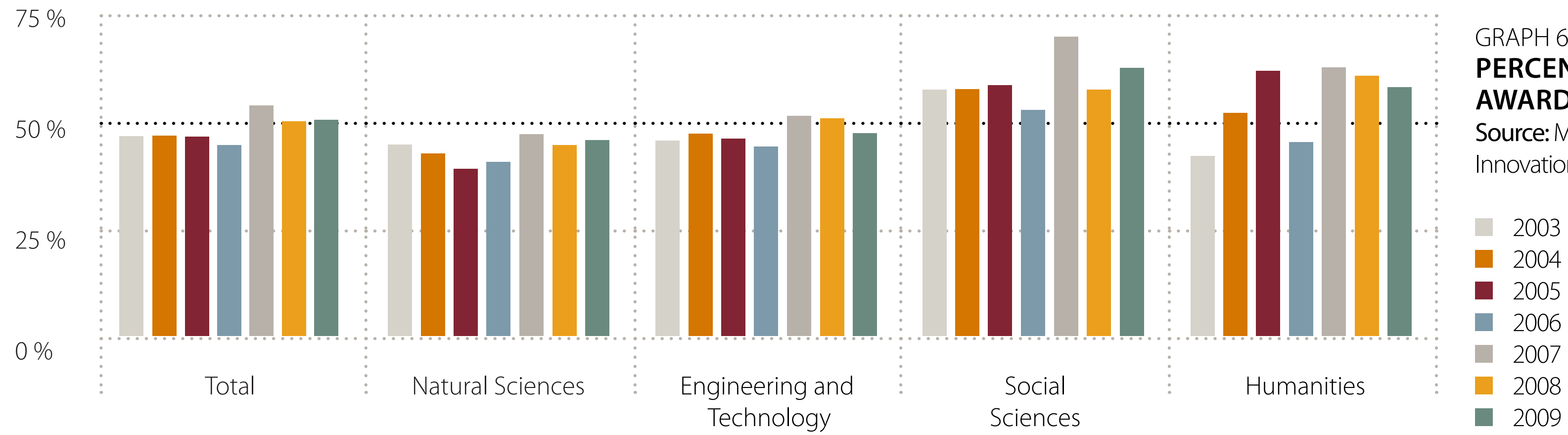
Source: Human Resources in Science and Technology Survey 2006.

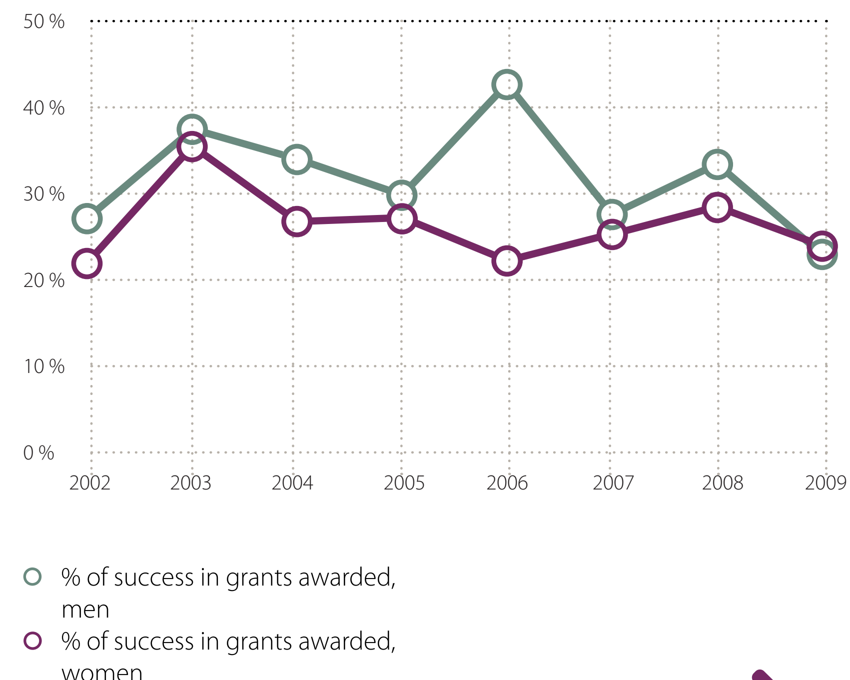


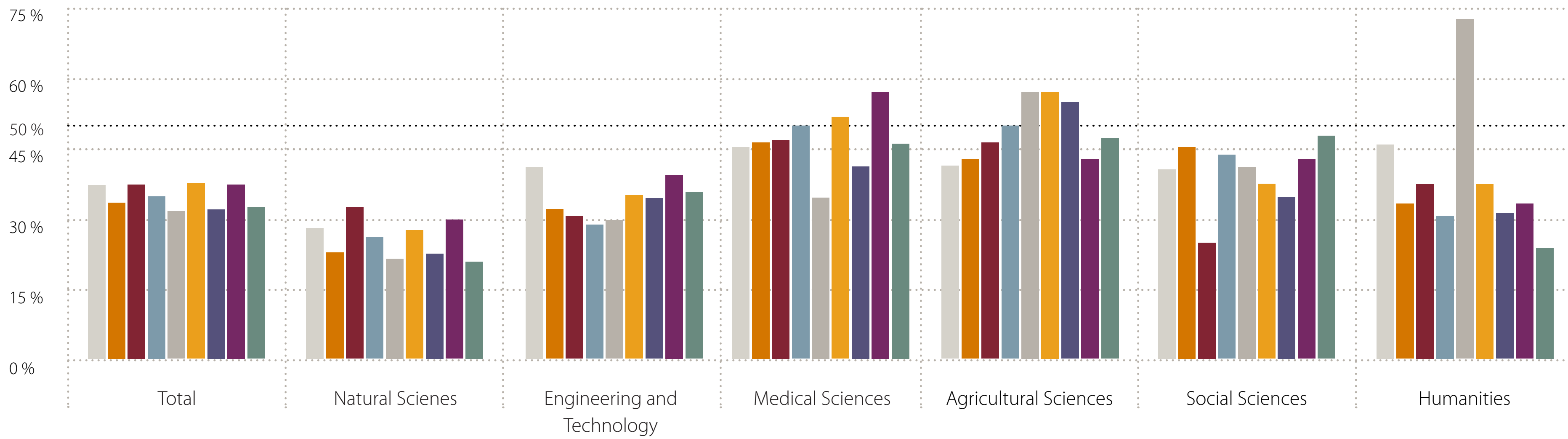


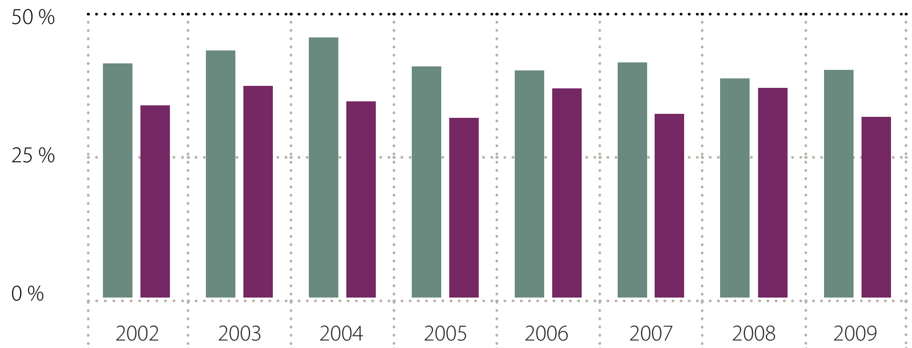
GRAPH 5
PERCENTAGE OF WOMEN WHO HAVE DONE A POST-DOCTORATE BY FIELD OF SPECIALISATION
Source: Human Resources in Science and Technology Survey 2006.

GRAPH 6
PERCENTAGE OF WOMEN AWARDED FPI GRANTS
Source: Ministry of Science and Innovation.

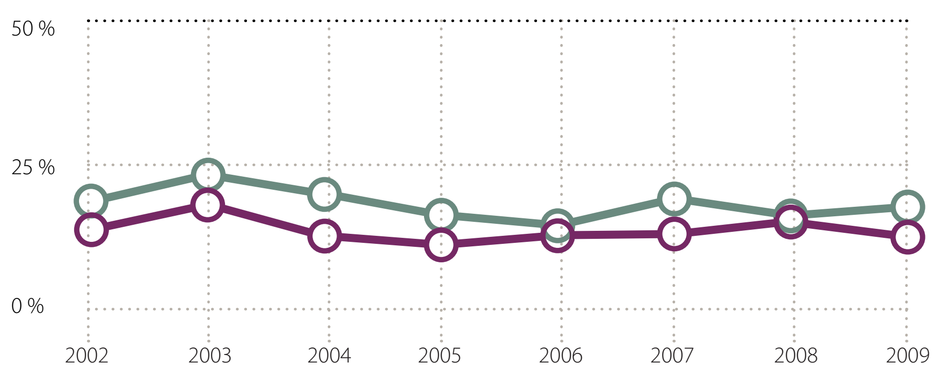








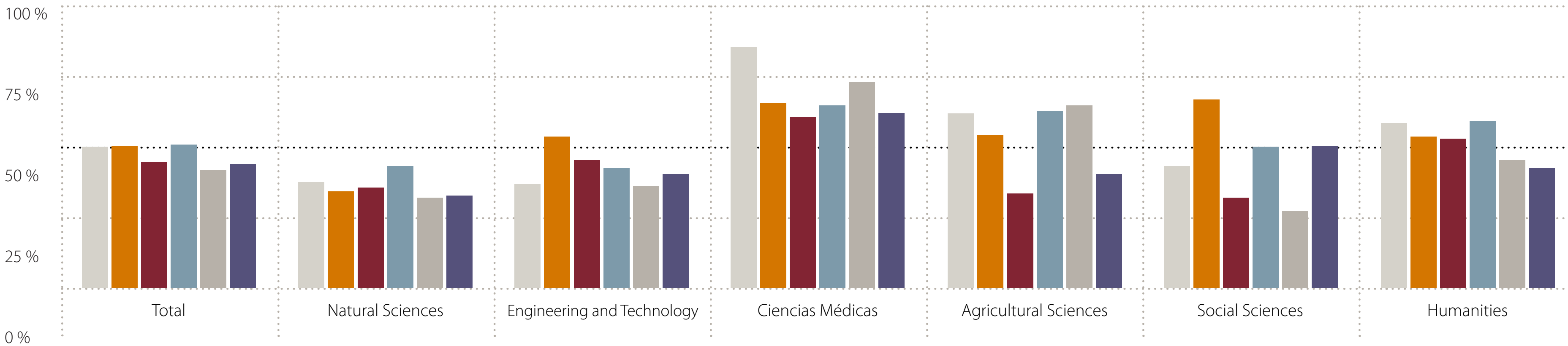
% of women out of the total number of applictions
% of women out of the total awarded



% of success in grants awarded, men
% of success in grants awarded, women

GRAPH 7
PERCENTAGE OF WOMEN WITH RAMÓN Y CAJAL GRANTS
Source: Ministry of Science and Innovation.

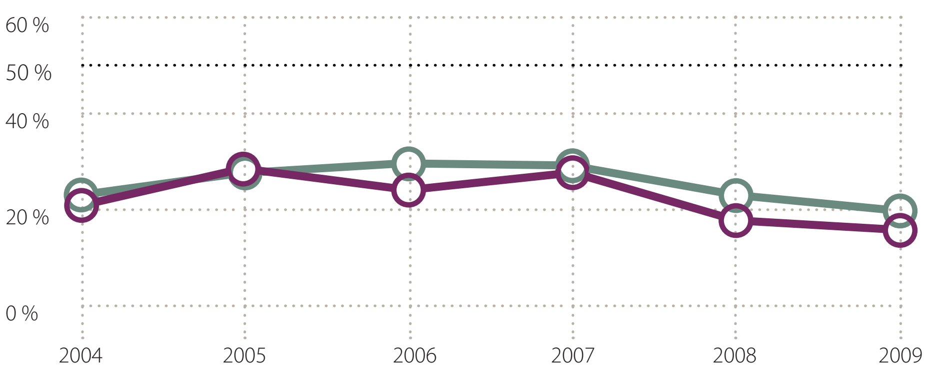
2001
2002
2003
2004
2005
2006
2007
2008
2009



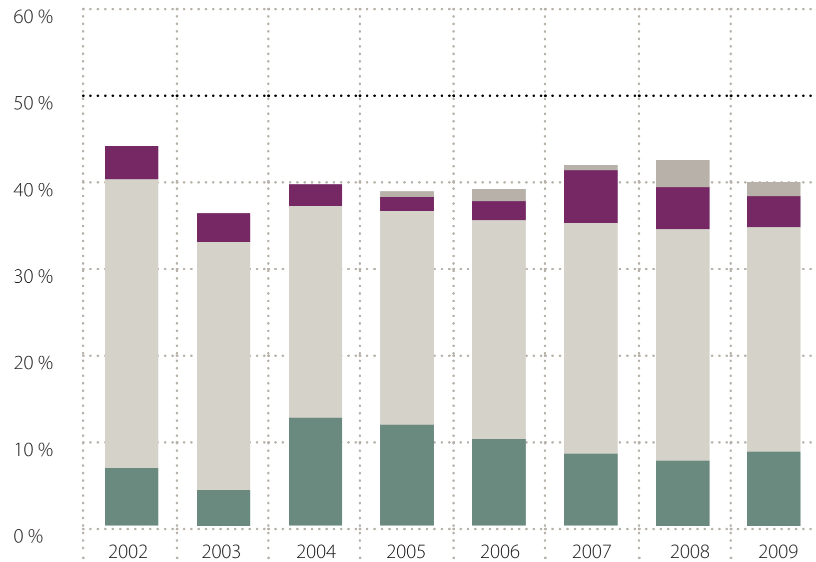
- % of women out of the total number of applications
- % of women out of thel total number of grants awarded

GRAPH 8
PERCENTAGE OF WOMEN WITH JUAN DE LA CIERVA GRANTS
Source: Ministry of Science and Innovation.

- 2004
- 2005
- 2006
- 2007
- 2008
- 2009

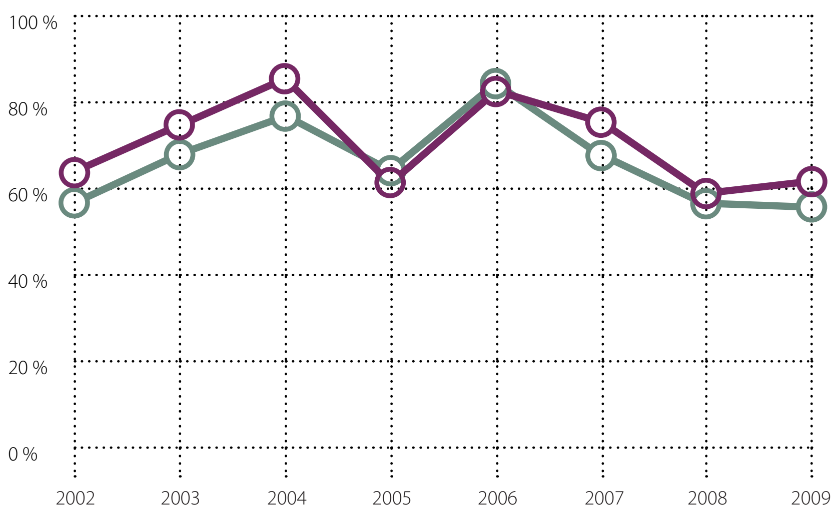


- % of success in grants awarded, men
- % of success in grants awarded, women



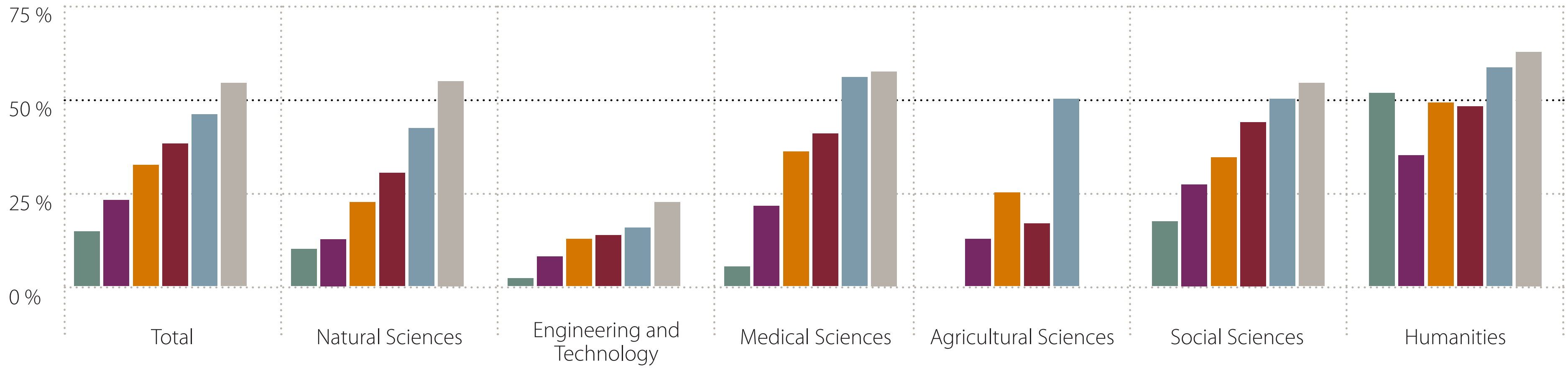
GRAPH 9
PERCENTAGE OF WOMEN WITH TORRES QUEVEDO PROGRAMME GRANTS
Source: Ministry of Science and Innovation.

- Other R&D Centres
- Non-SME Company
- SME Company
- Technology Centre



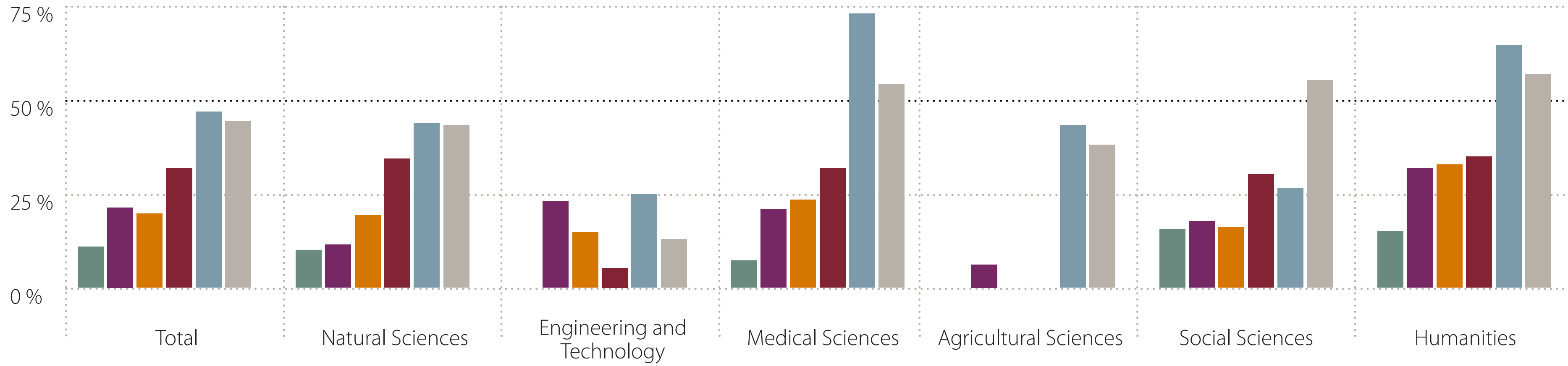
- % of success in grants awarded, men
- % of success in grants awarded, women

- % of women out of the total number of applications
- % of women out of the total number of grants awarded



GRAPH 10
PERCENTAGE OF WOMEN WITH FULBRIGHT GRANTS FOR PRE-DOCTORAL STUDIES/ RESEARCH
Source: Fulbright Programme.

- until 1974
- 1975 - 1981
- 1982 - 1988
- 1989 - 1995
- 1996 - 2002
- 2003 - 2009

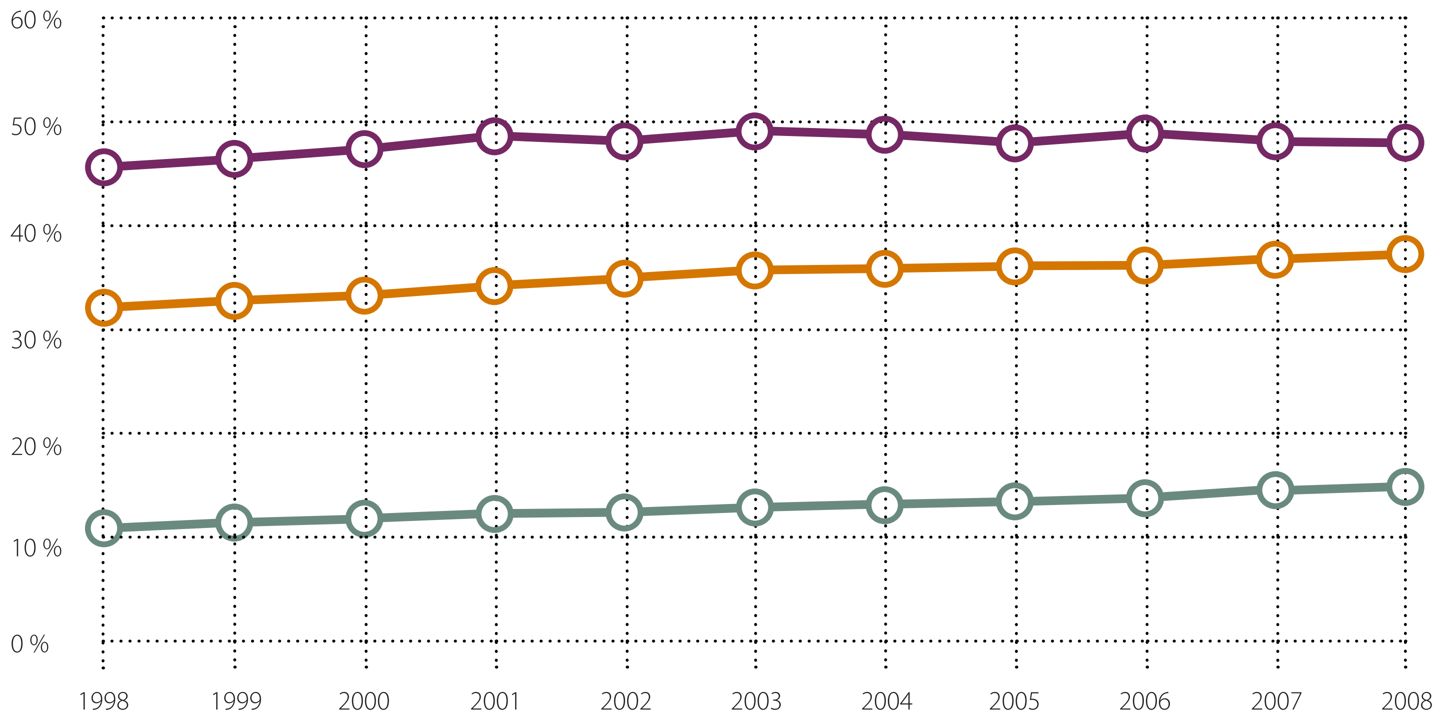


GRAPH 11

PERCENTAGE OF WOMEN WITH FULBRIGHT GRANTS FOR POST-DOCTORAL STUDIES/ RESEARCH

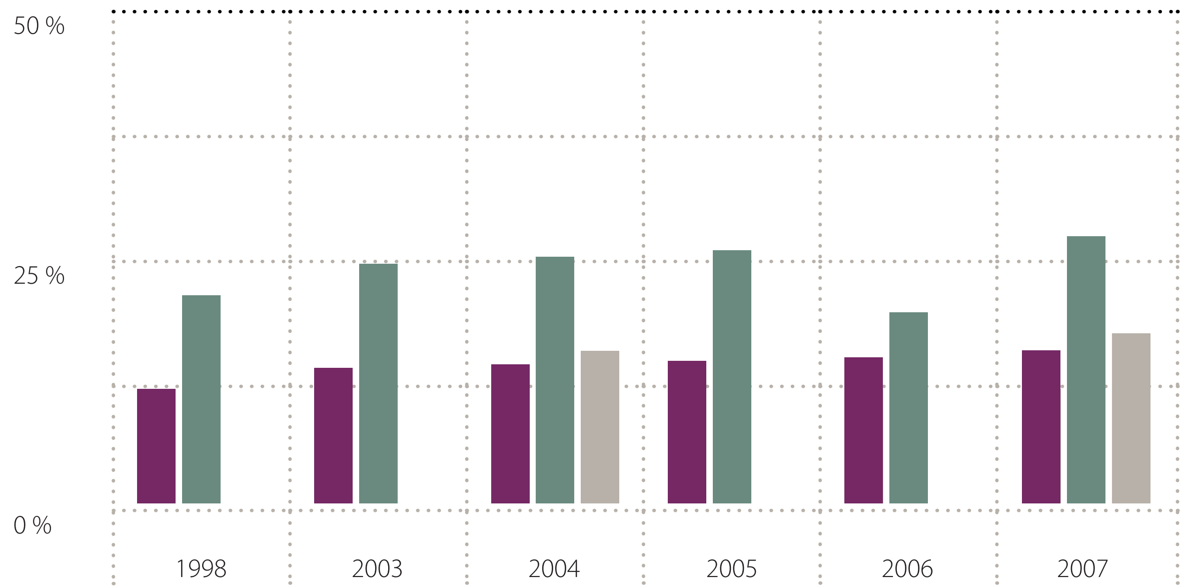
Source: Fulbright Commission.

- until 1974
- 1975 - 1981
- 1982 -1988
- 1989 -1995
- 1996 - 2002
- 2003 - 2009



GRAPH 12
PERCENTAGE OF FEMALE TEACHING FACULTY IN SPAIN
Source: INE. **Note:** Full Professorships = University Full Professors; Associate Professorships = University Associate Professors; Assistant Professorships = Assistant Professors, Lecturers and Tenured Full-time Lecturers.

Full Professorships
Associate Professorships
Assistant Professorships



GRAPH 13
PERCENTAGE OF WOMEN WITH FULL PROFESSORSHIPS
Source: Spain: INE; USA: NCES, NSF. EU-25: She Figures 2006, 2009.

Spain
USA
EU-25

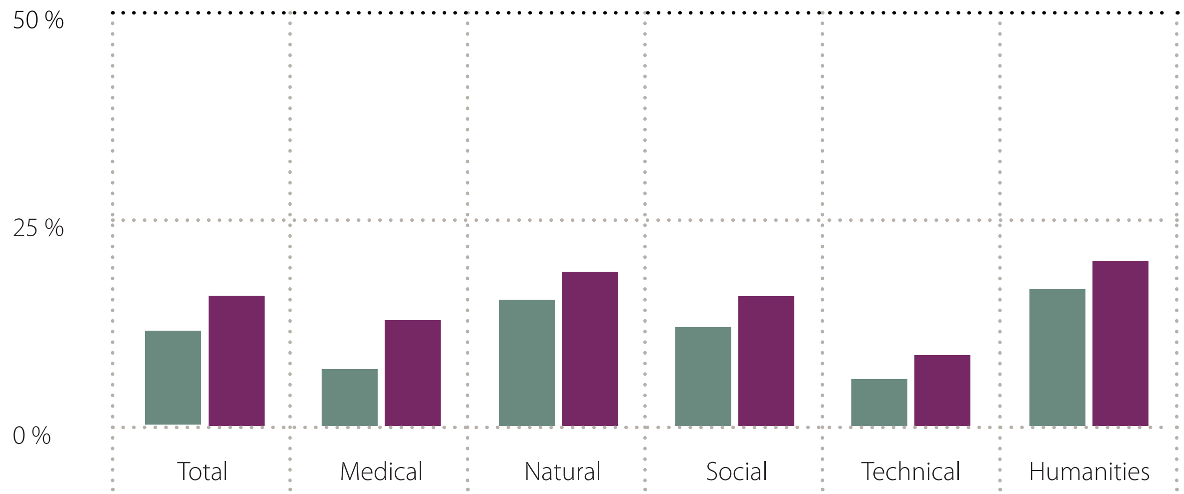
GRAPH 14
PERCENTAGE OF WOMEN WITH ASSOCIATE PROFESSORSHIPS
Source: Spain: INE; USA: NCES, NSF. EU-25: She Figures 2006, 2009.

GRAPH 15

PERCENTAGE OF WOMEN WITH ASSISTANT PROFESSORSHIPS

Source: Spain: INE; USA: NCES, NSF. EU-25: She Figures 2006, 2009.

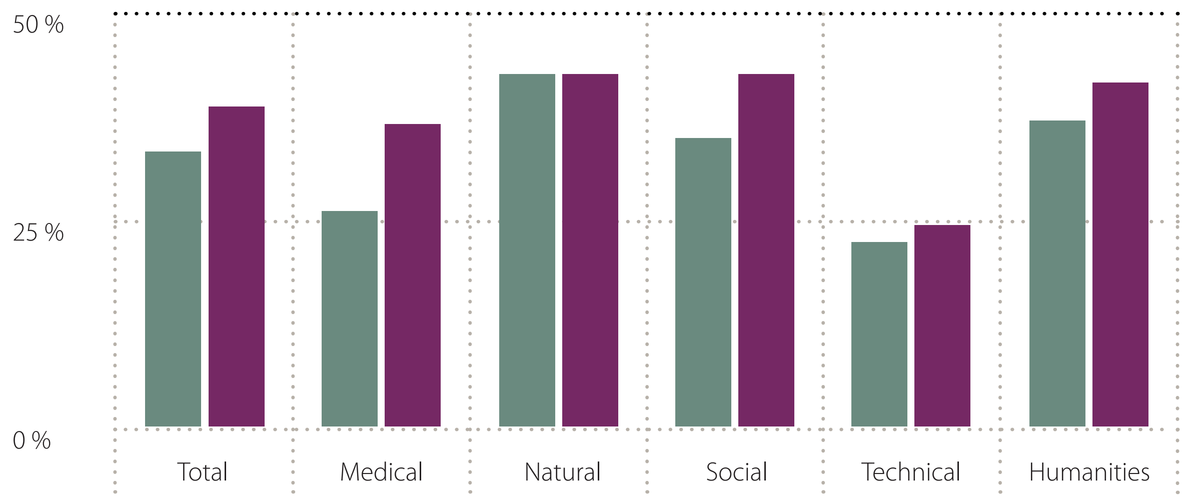
GRAPH 16
PERCENTAGE OF WOMEN WITH FULL PROFESSORSHIPS BY AREA
Source: INE.



GRAPH 17

PERCENTAGE OF WOMEN WITH ASSOCIATE PROFESSORSHIPS BY AREA

Source: INE.



GRAPH 18
PERCENTAGE OF WOMEN WITH ASSISTANT PROFESSORSHIPS BY AREA
Source: INE.

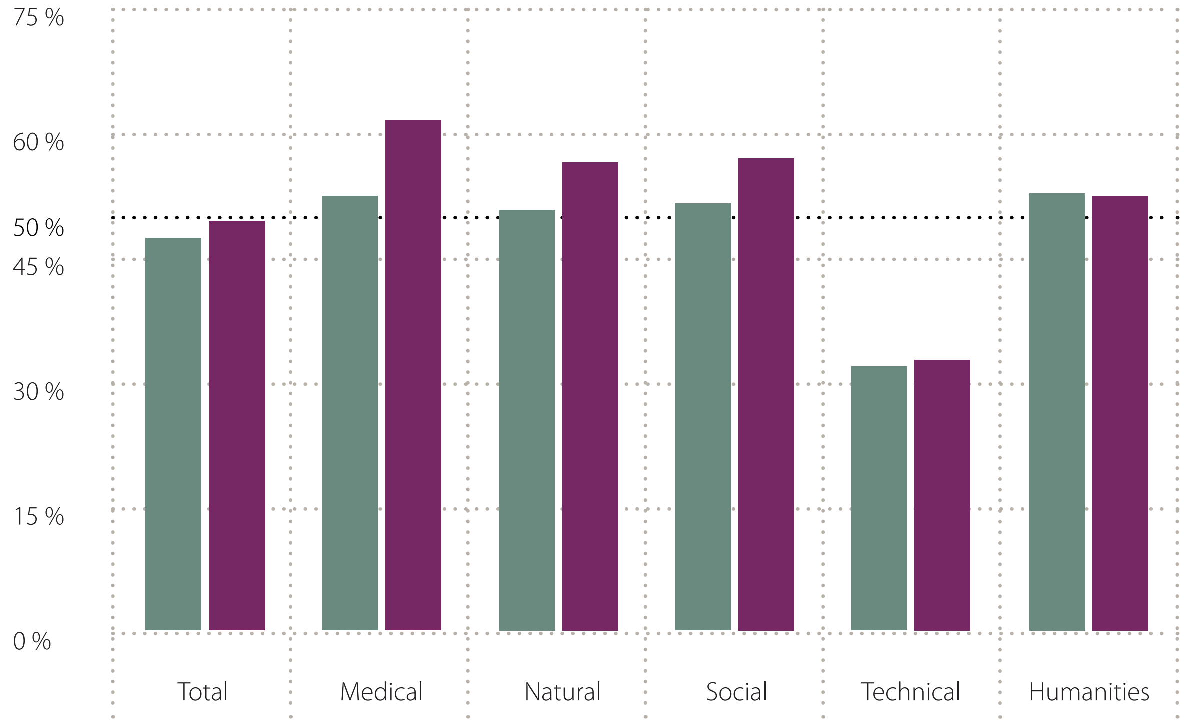


TABLE 6

NUMBER OF WOMEN BY FIELD AND ACADEMIC LEVEL

Source: INE.

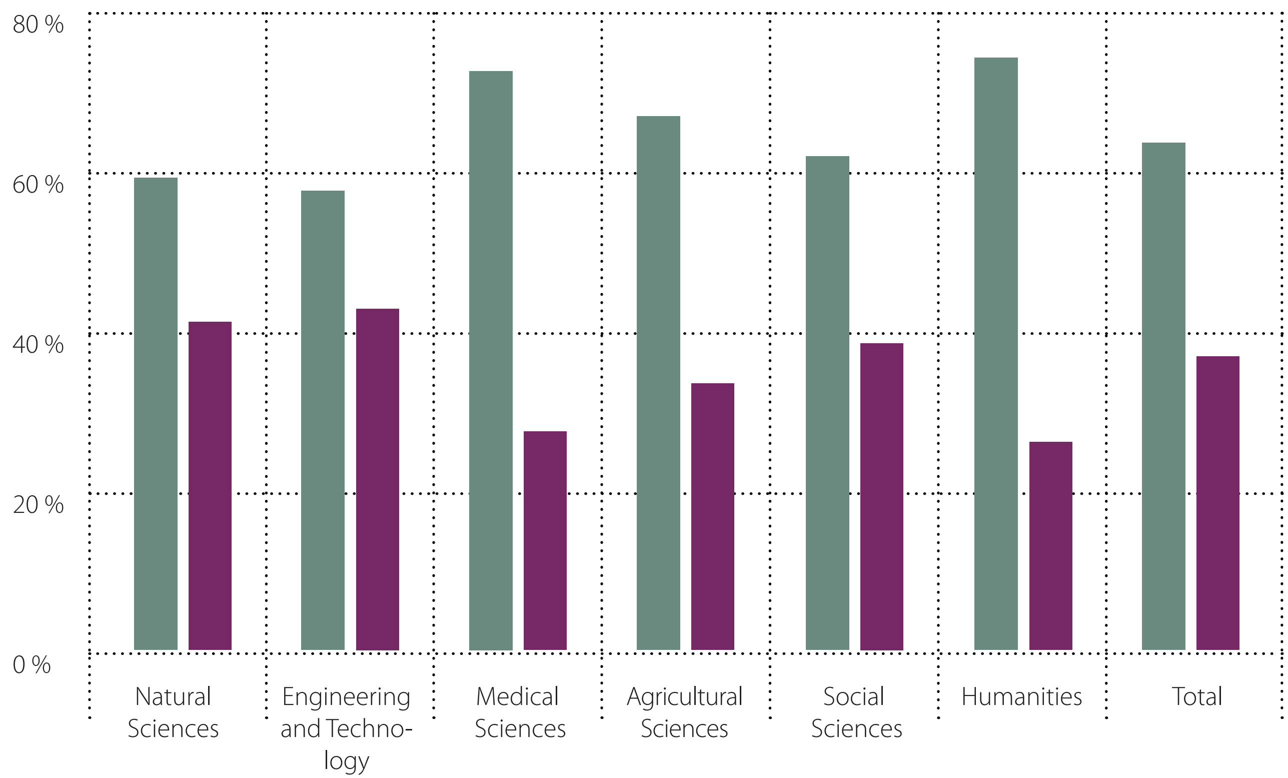
	Medical		Medical		Social		Technical		Humanities	
	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total
Full Professorships										
1998	54	774	157	1.049	186	1.593	98	1.730	291	1.755
2007	120	954	267	1.507	268	1.806	175	2.057	521	2.652
Associate Professorships										
1998	655	2.557	1.732	3.991	1.254	3.867	1.108	5.111	2.444	6.725
2007	962	2.847	2.064	4.432	2.161	5.176	1.411	6.064	3.894	9.681
Assistant Professorships										
1998	105	206	298	603	740	1.468	302	977	524	1.020
2007	334	546	665	1.205	1.126	2.040	668	2.127	1.583	3.089

Campo	Area de Conocimiento	% Mujeres catedráticas	Número total cátedras
Ciencias Naturales (Mujeres catedráticas: 18 %)			
427	Geodinámica Externa	0,00 %	16
395	Física de la Materia Condensada	2,25 %	89
405	Física Teórica	5,33 %	75
800	Teoría de la Señal y Comunicaciones	5,98 %	117
Ingeniería y Tecnología (Mujeres catedráticas: 8 %)			
083	Ciencias y Técnicas de la Navegación	0,00 %	2
115	Construcciones Navales	0,00 %	13
505	Ingeniería Cartográfica, Geodésica y Fotogrametría	0,00 %	10
515	Ingeniería de los Procesos de Fabricación	0,00 %	13
525	Ingeniería del Terreno	0,00 %	22
530	Ingeniería e Infraestructura de los Transportes	0,00 %	22
600	Mecánica de Fluidos	0,00 %	30
710	Prospección e Investigación Minera	0,00 %	19
715	Proyectos Arquitectónicos	0,00 %	36
815	Urbanística y Ordenación del Territorio	0,00 %	29
Ciencias Médicas (Mujeres catedráticas: 13 %)			
645	Obstetricia y Ginecología	0,00 %	37
653	Otorrinolaringología	0,00 %	16
670	Pediatría	0,00 %	35
817	Urología	0,00 %	6
830	Traumatolgía y Ortopedia	0,00 %	12
Ciencias Sociales (Mujeres catedráticas: 16 %)			
195	Didáctica de la Lengua y la Literatura	0,00 %	10
245	Educación Física y Deportiva	0,00 %	8
813	Trabajo Social y Servicios Sociales	0,00 %	2
125	Derecho Administrativo	5,56 %	90
Humanidades (Mujeres catedráticas: 20 %)			
327	Filología Eslava	0,00 %	1
655	Paleontología	6,67 %	30
480	Historia e Instituciones Económicas	7,81 %	64
270	Estética y Teoría de las Artes	8,33 %	12

BRANCHES OF KNOWLEDGE WITH A LOW PERCENTAGE OF WOMEN FULL PROFESSORS

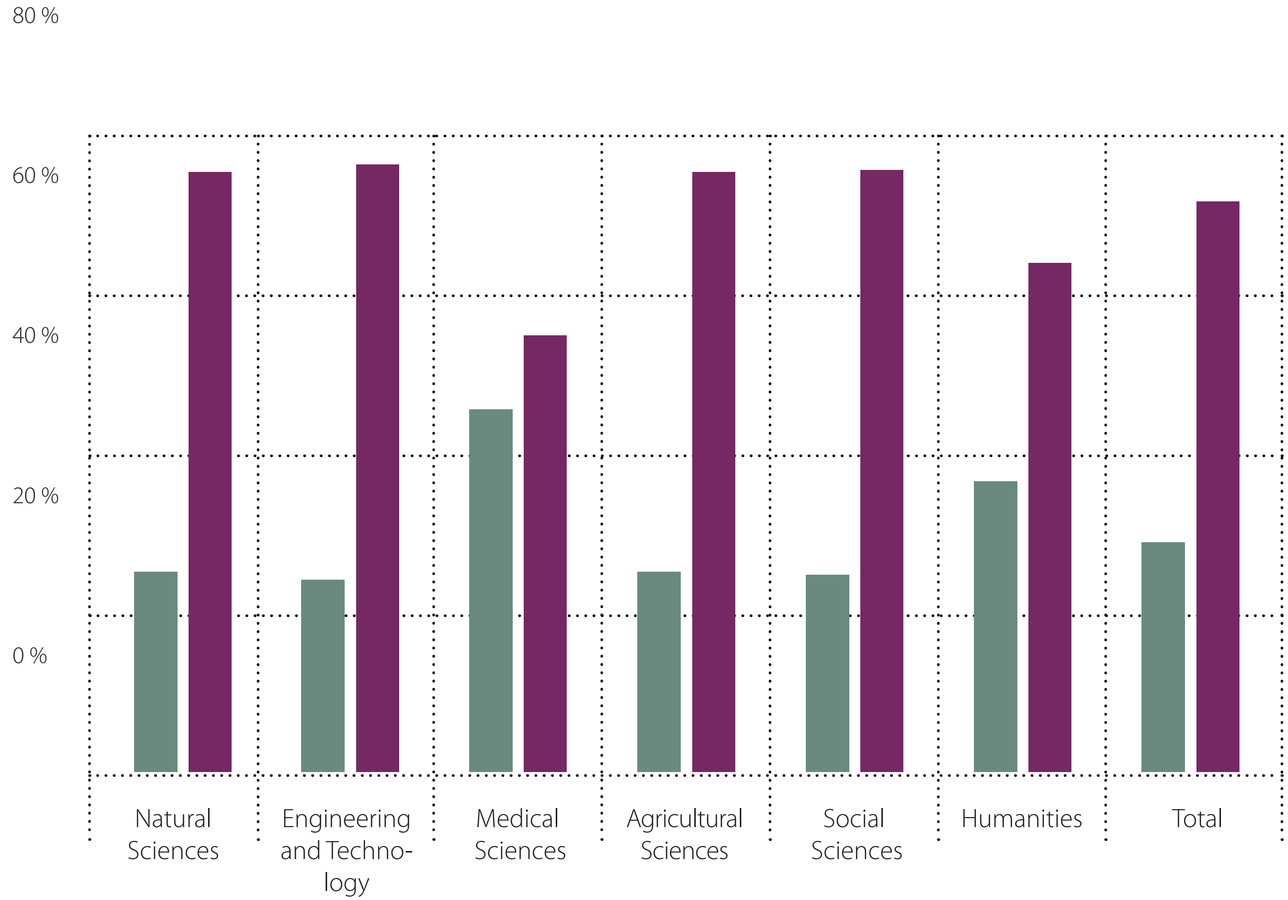
Campo	Area de Conocimiento	% Mujeres titulares	Número total titularidades
Ciencias Naturales (Mujeres titulares: 47 %)			
405	Física Teórica	11,21 %	116
428	Geodinámica Interna	16,33 %	49
800	Teoría de la Señal y Comunicaciones	16,34 %	355
585	Lógica y Filosofía de la Ciencia	17,02 %	94
Ingeniería y Tecnología (Mujeres titulares: 24 %)			
083	Ciencias y Técnicas de la Navegación	3,03 %	33
115	Construcciones Navales	4,88 %	41
495	Ingenería Aeroespacial	5,00 %	20
515	Ingeniería de los Procesos de Fabricación	9,09 %	44
530	Ingeniería e Infraestructura de los Transportes	9,09 %	33
Ciencias Médicas (Mujeres titulares: 36 %)			
817	Urología	0,00 %	13
830	Traumatolgía y Ortopedia	0,00 %	31
090	Cirugía	5,14 %	175
610	Medicina	10,03 %	329
Ciencias Sociales (Mujeres titulares: 42 %)			
245	Educación Física y Deportiva	17,48 %	143
187	Didáctica de la Expresión Corporal	30,43 %	92
125	Derecho Administrativo	30,87 %	230
070	Ciencia Política y de la Administración	31,86 %	113
Humanidades (Mujeres titulares: 41 %)			
375	Filosofía	19,70 %	198
383	Filosofía Moral	20,97 %	62
480	Historia e Instituciones Económicas	22,52 %	151
475	Historia del Pensamiento y Movimientos Sociales y Políticos	22,58 %	31

BRANCHES OF KNOWLEDGE WITH A LOW PERCENTAGE OF WOMEN ASSOCIATE PROFESSORS



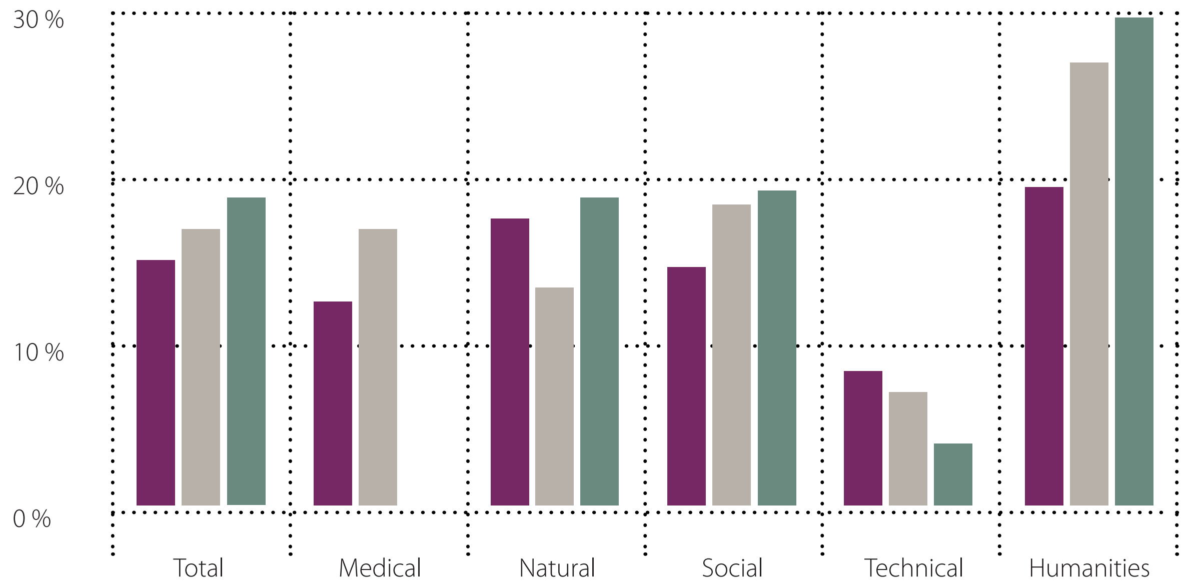
FULL PROFESSORS: % BORN BEFORE AND AFTER 1955

% Born before 1955
% Born after 1955



ASSOCIATE PROFESSORS: % BORN BEFORE AND AFTER 1955

% Born before 1955
% Born after 1955



GRAPH 19

PERCENTAGE OF WOMEN FULL PROFESSORS BY AREA. SPAIN, EU-27 AND USA (2007)

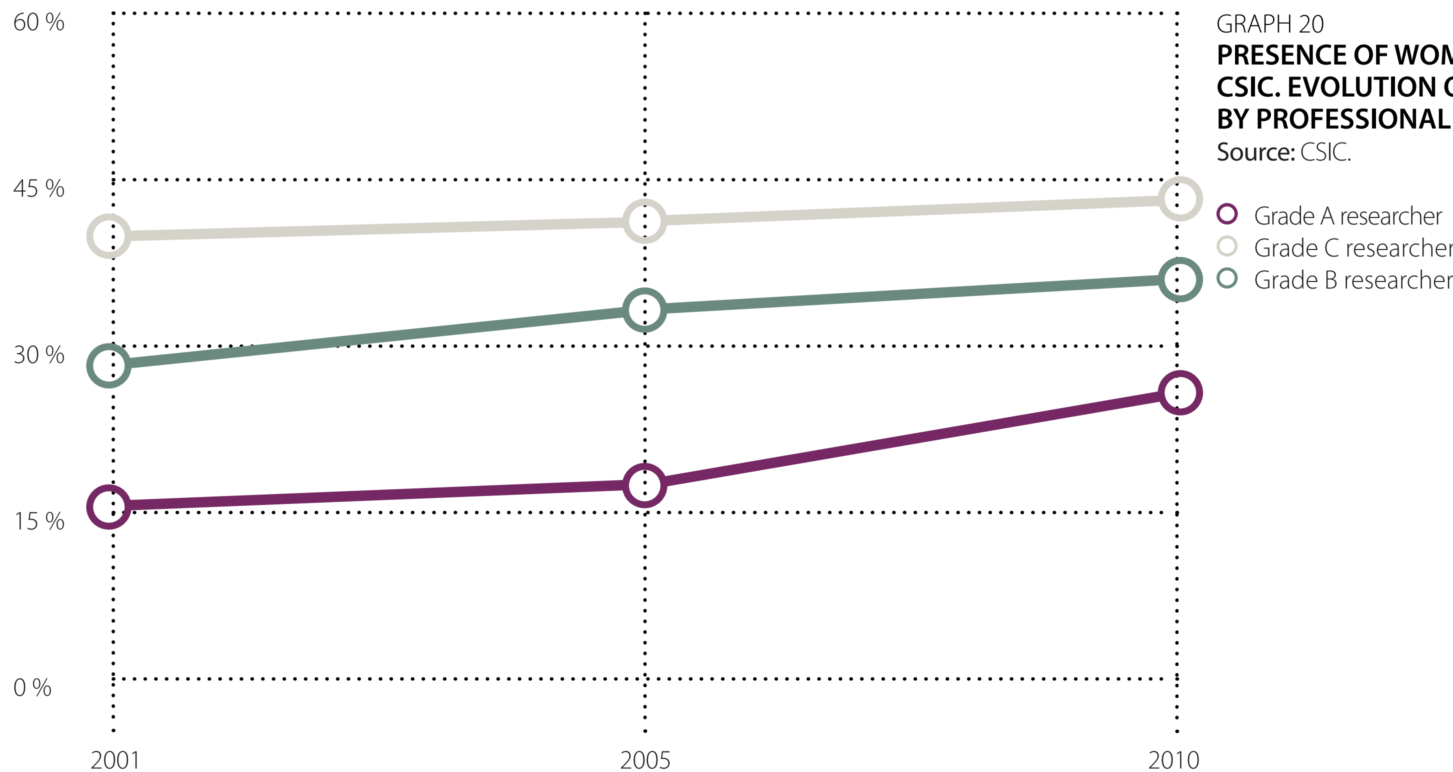
Source: INE, She Figures 2009 and NCES (NSF).

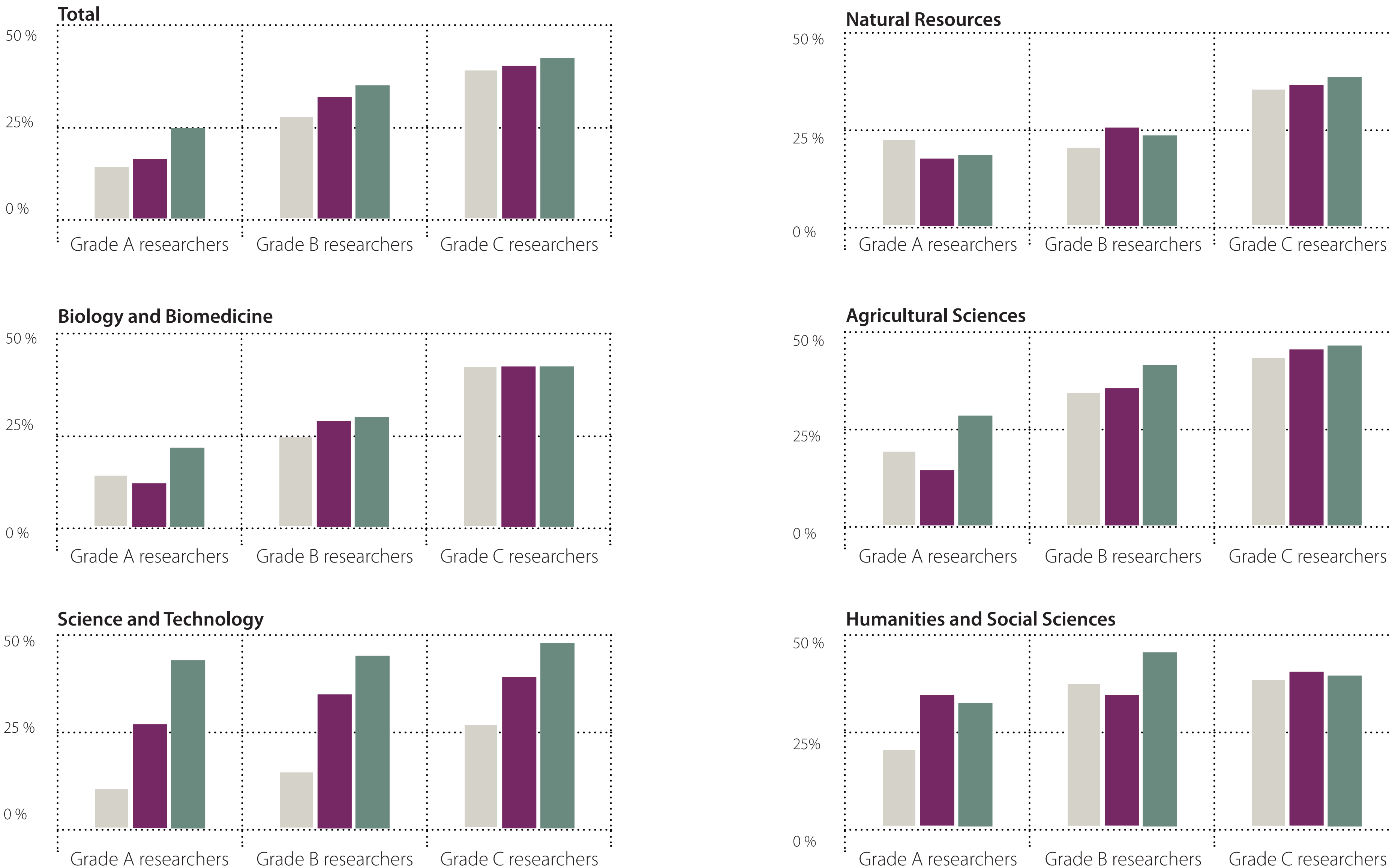
- Spain
- EU-25
- USA

GRAPH 20

PRESENCE OF WOMEN IN THE CSIC. EVOLUTION OVER TIME BY PROFESSIONAL LEVEL

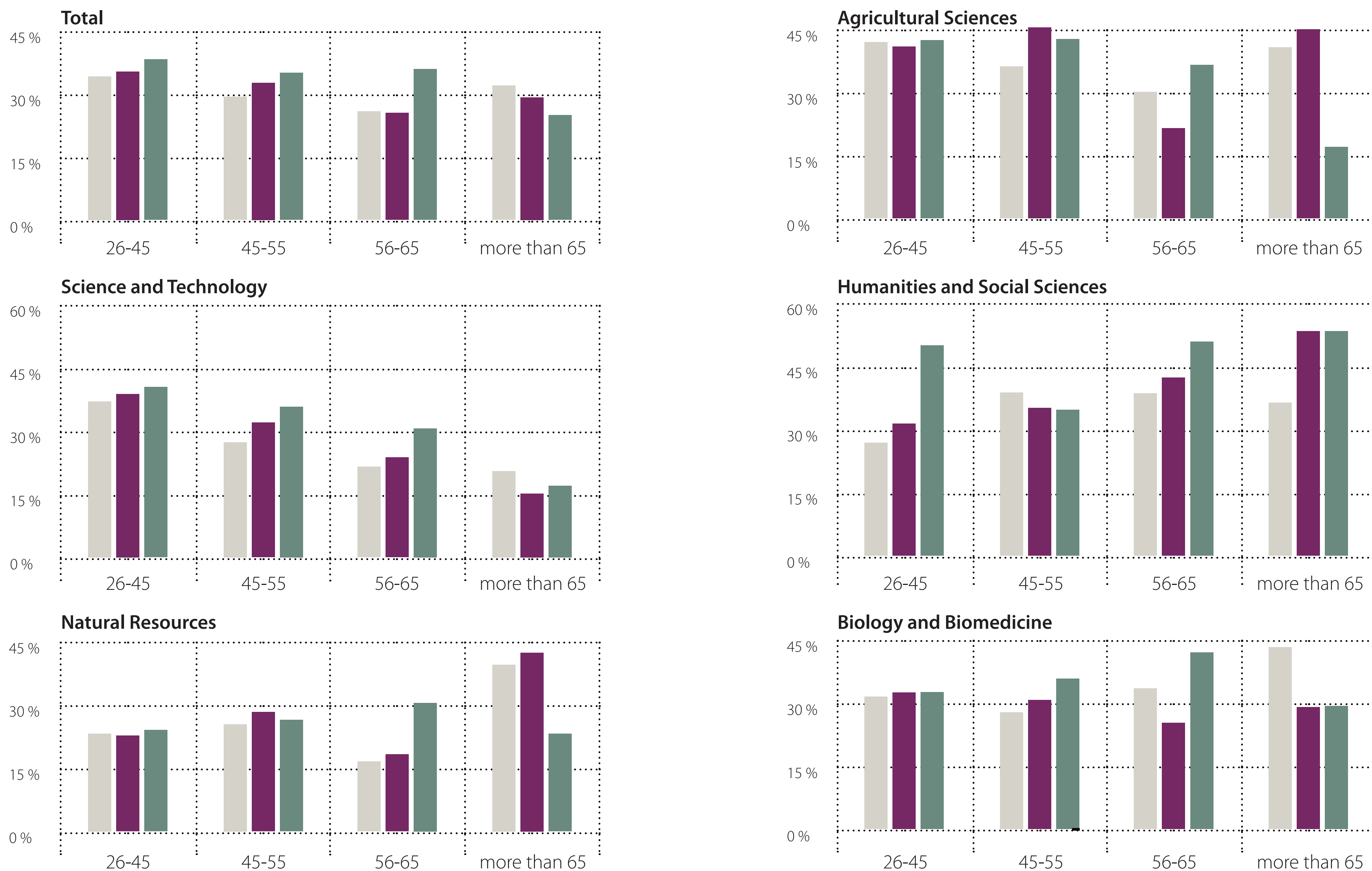
Source: CSIC.





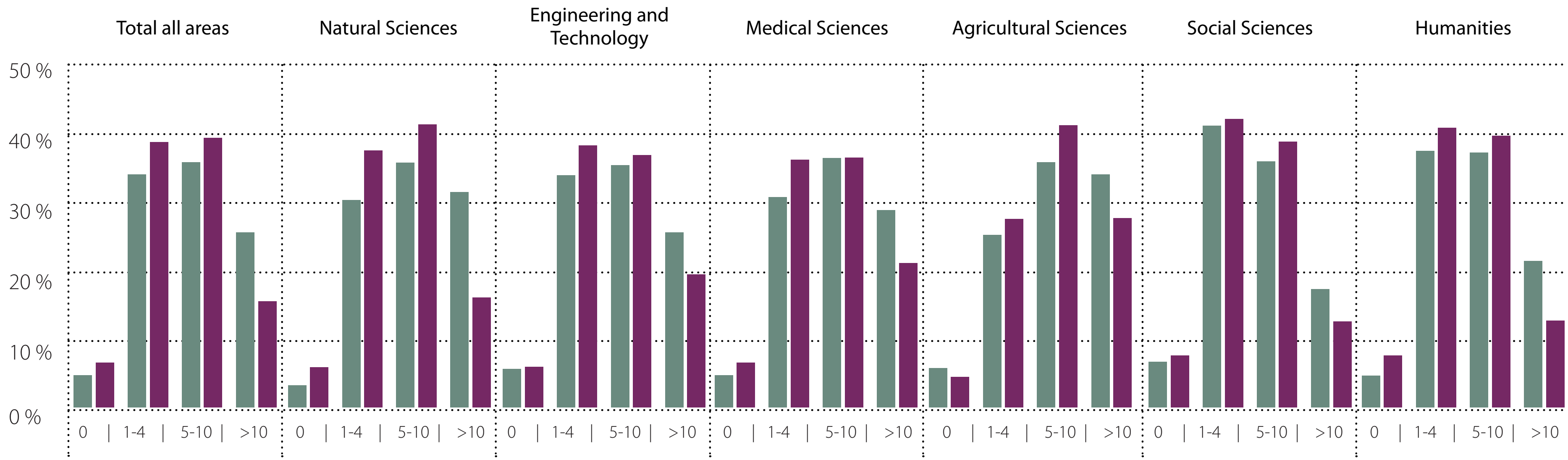
2001
2005
2010

GRAPH 21
PRESENCE OF WOMEN IN THE CSIC BY FIELD OF KNOWLEDGE.
EVOLUTION OVER TIME BY CSIC LEVELS Source: CSIC.



2001
2005
2010

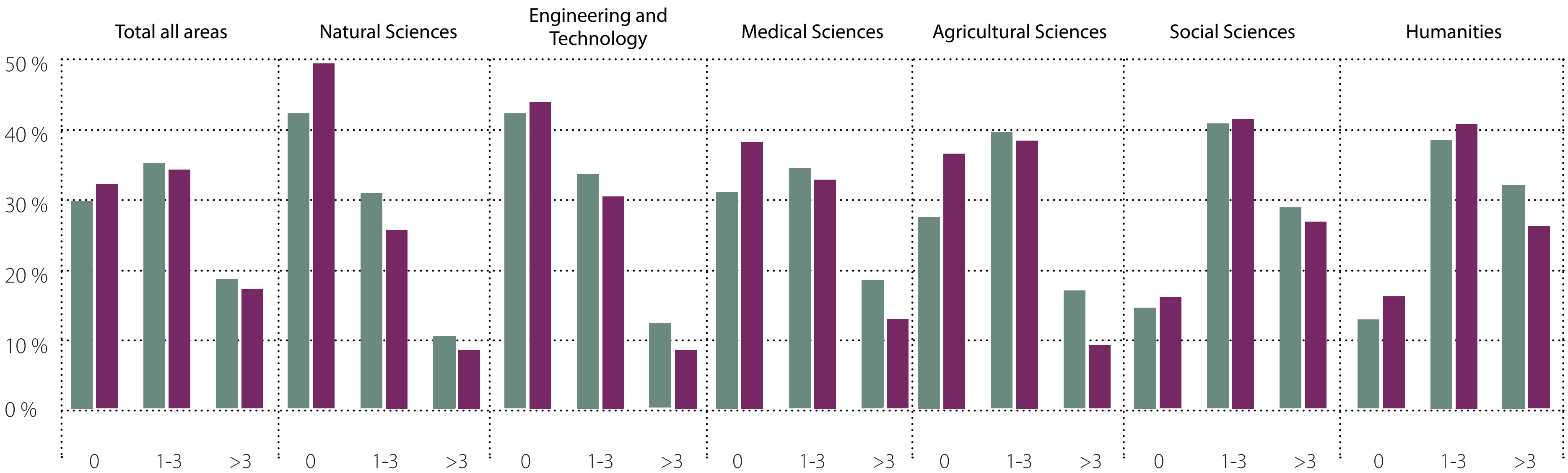
GRAPH 22
PERCENTAGE OF WOMEN IN THE CSIC BY FIELDS OF KNOWLEDGE. EVOLUTION OVER TIME BY AGE GROUP Source: CSIC.



GRAPH 23
NUMBER OF ARTICLES PUBLISHED BETWEEN JANUARY 2004 AND DECEMBER 2006 BY FIELD OF SPECIALISATION

Source: Human Resources in Science and Technology Survey 2006.

- Percentage of articles published by men
- Percentage of articles published by women

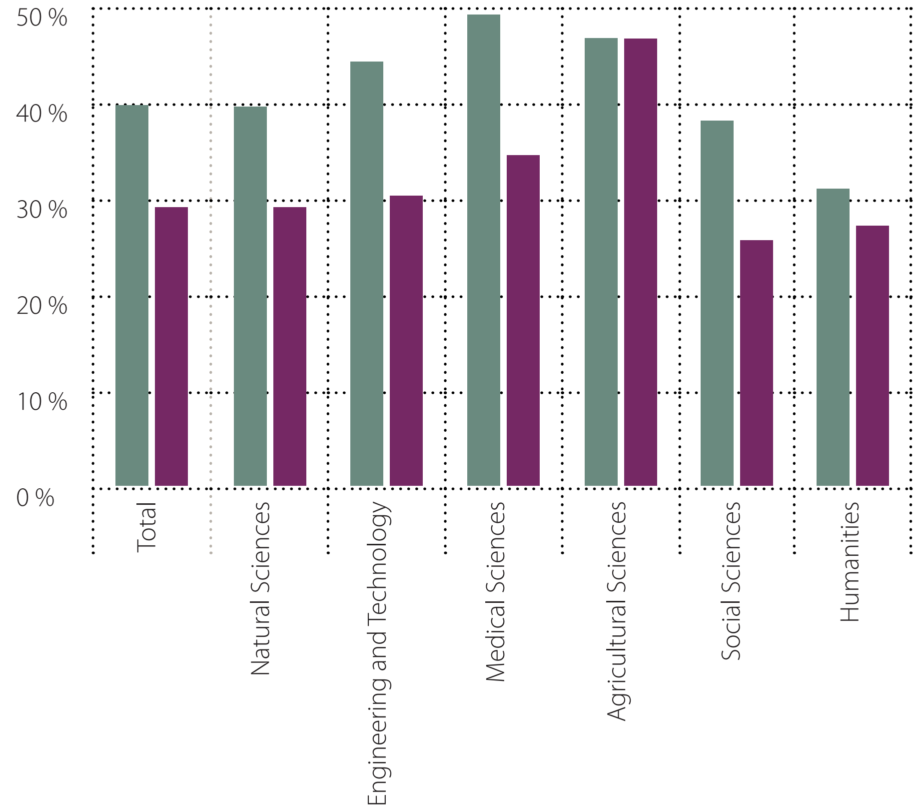


GRAPH 24
NUMBER OF BOOKS / MONOGRAPHS PUBLISHED BETWEEN JANUARY 2004 AND DECEMBER 2006 BY FIELD OF SPECIALISATION
Source: Human Resources in Science and Technology Survey 2006.

- Percentage of articles published by men
- Percentage of articles published by women

		Average no. of articles published 2004-2006	Average no. of books published 2004-2006	Relative percentage of men and women who directed a PhD or Master's degree thesis 2004-2006
All professional categories	Men	8,2	2,4	44,93 %
	Women	6,6	2,1	33,18 %
Full Professors	Men	10,7	3,7	73,50 %
	Women	7,3	3,0	46,58 %
Associate Professors	Men	8,0	2,6	51,21 %
	Women	6,2	2,6	41,52 %
Assistant Professors, visiting lecturers and similar	Men	7,8	2,5	25,63 %
	Women	6,5	2,4	17,99 %

TABLE 7
AVERAGE ACADEMIC PRODUCTIVITY BY GENDER AND PROFESSIONAL CATEGORY
Source: Own creation based on information in the INE "Human Resources Survey".



GRAPH 25

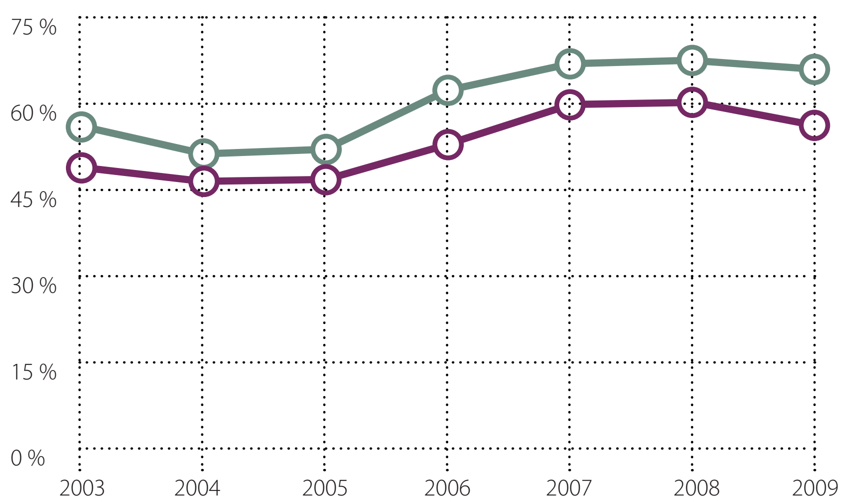
RELATIVE PERCENTAGES OF MEN AND WOMEN WHO DIRECTED A MASTER'S DISSERTATION OR DOCTORAL THESIS IN 2004-2006

Source: Human Resources in Science and Technology 2006.

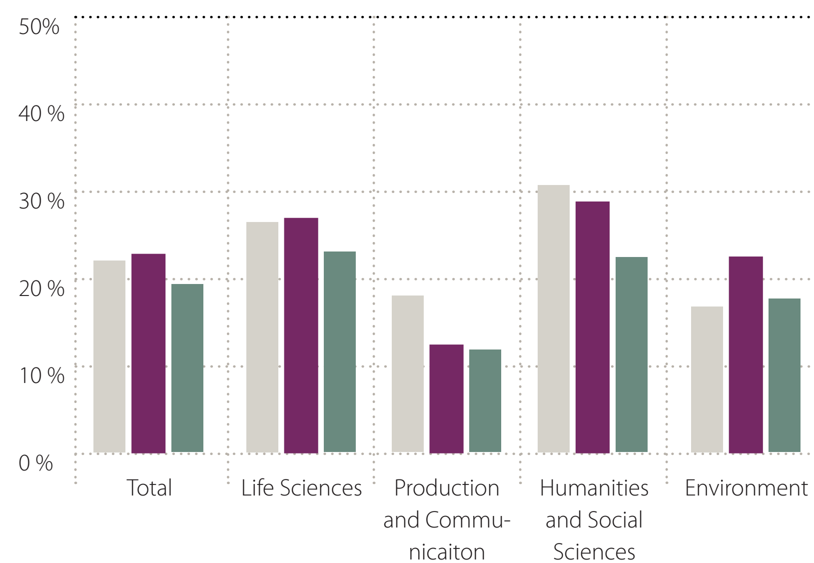
Men
Women

GRAPH 26
GENDER DIFFERENCES IN GRADE A RESEARCHERS IN MINISTRY OF SCIENCE AND INNOVATION R&D AND INNOVATION PROJECTS
Source: Ministry of Science and Innovation.

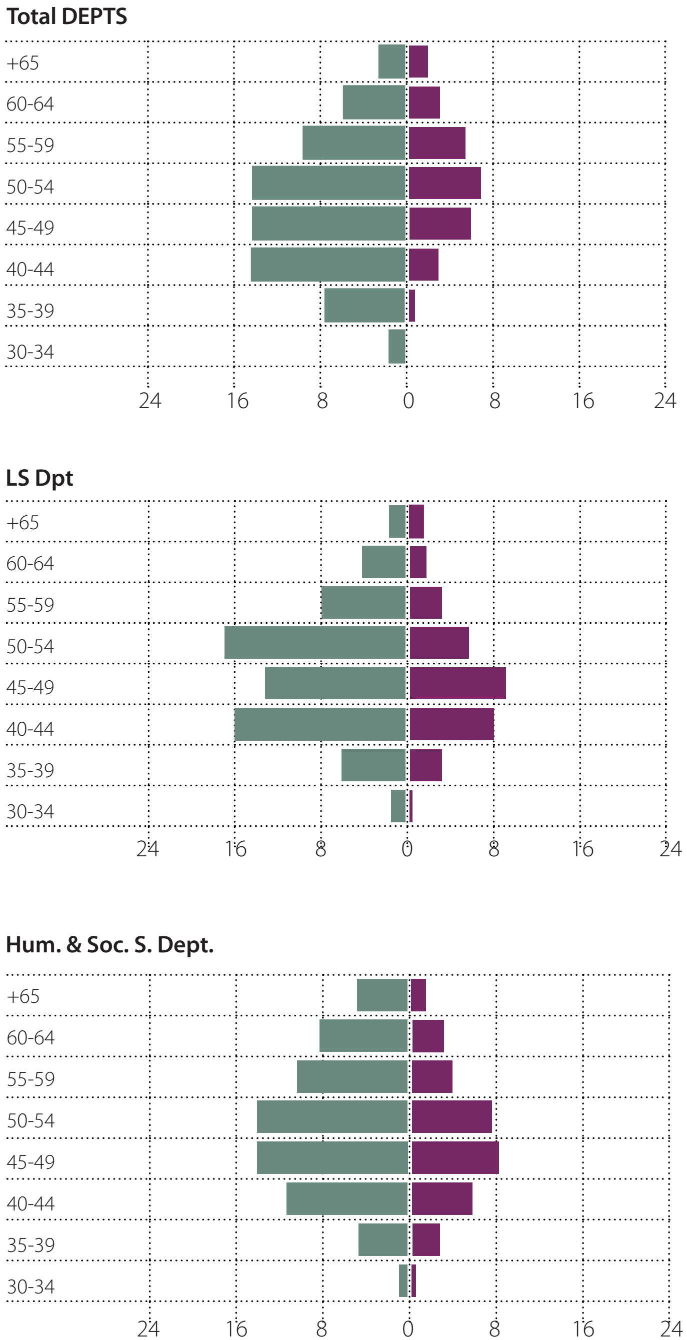
% Women in total applications
% Women in total of grants awarded



% of success in grants awarded, men
% of success in grants awarded, women

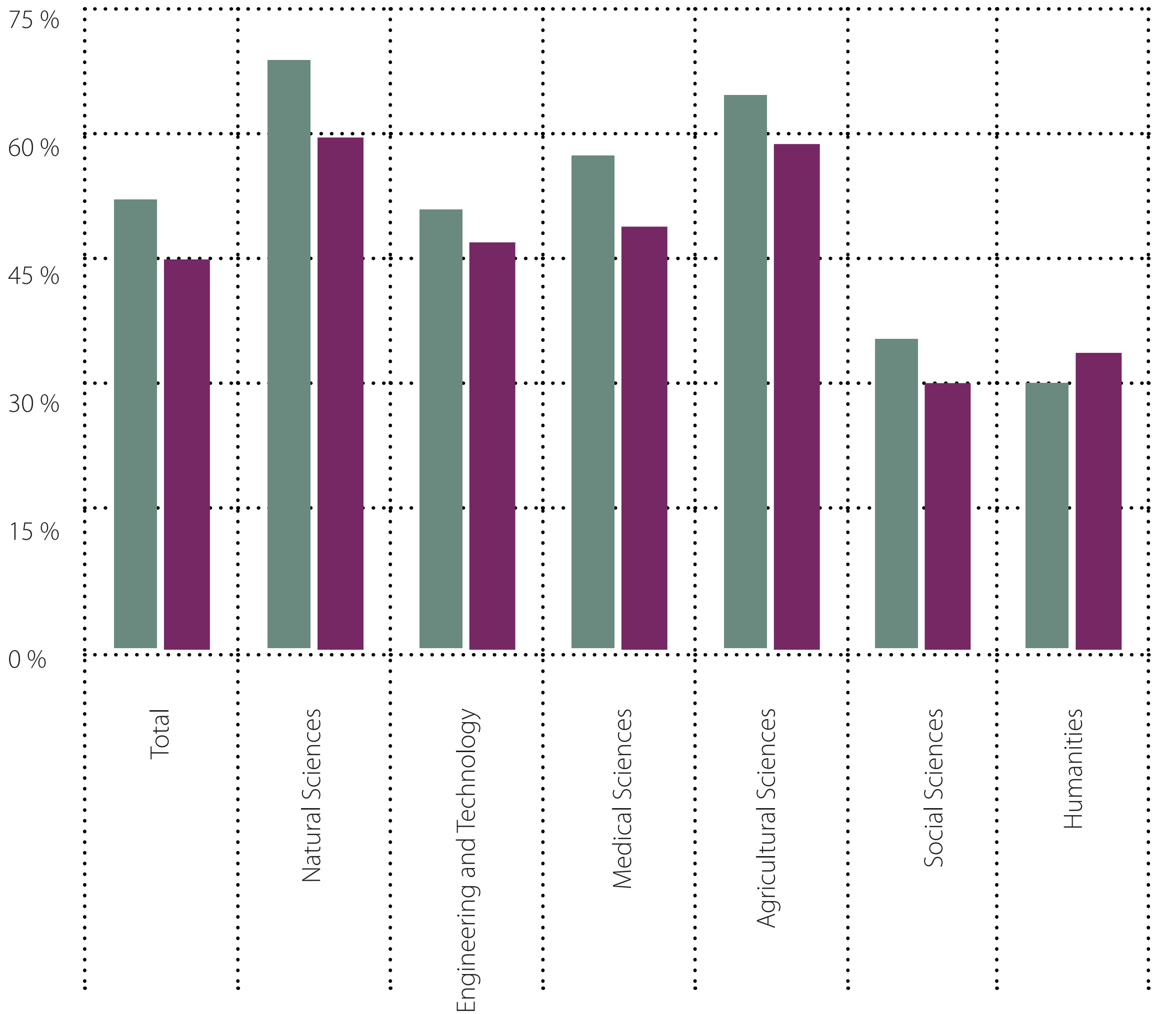


Under 40
40-54
55-64



GRAPH 27
GENDER DIFFERENCES IN PRINCIPAL INVESTIGATORS IN R&D AND INNOVATION PROJECTS (MICINN) BY AGE OF PRINCIPAL INVESTIGATOR (% OF TOTAL, 2009)
Source: Ministry of Science and Innovation.

Men
Women

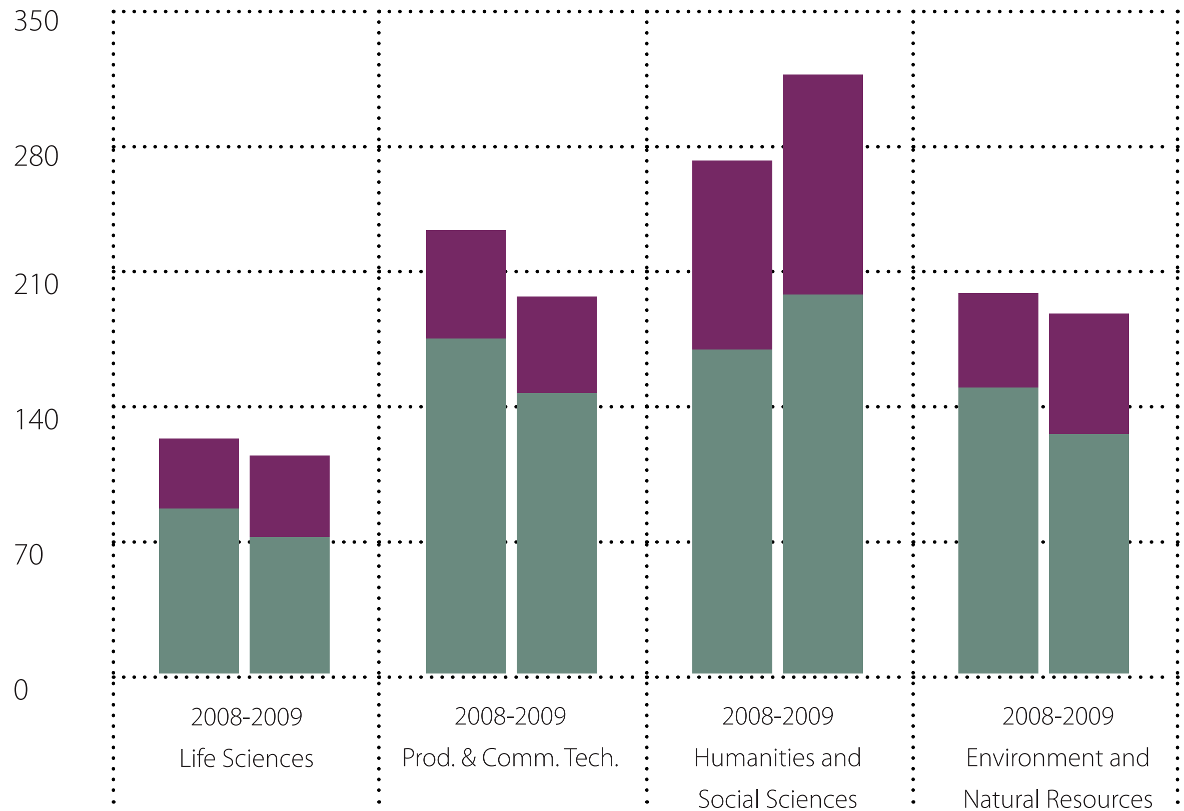


GRAPH 28
PERCENTAGE OF INVESTIGATORS WHO HAVE COOPERATED WITH FOREIGN RESEARCH GROUPS (2004-2006)
Source: Human Resources in Science and Technology Survey 2006.

Men
Women

Fields of research	% Women "Editors –in-Chief" for the Top 10 magazines in the field according to the Thomson Index
Biology	10
Medical Sciences	50
Chemistry	9
Computer Sciences	13
Engineering	0
Mathematics	20
Physics	0
Psychology	9
Social Sciences	40

TABLE 12
PERCENTAGE OF WOMEN EDITORS-IN-CHIEF FOR THE TOP 10 MAGAZINES, BY FIELD OF RESEARCH, IN ACCORDANCE WITH THE IMPACT FACTOR
Source: Thomson Citation Report (2005).



GRAPH 29

EXPERTS 2008/2009, BY SEX (BY FIELD OF RESEARCH)

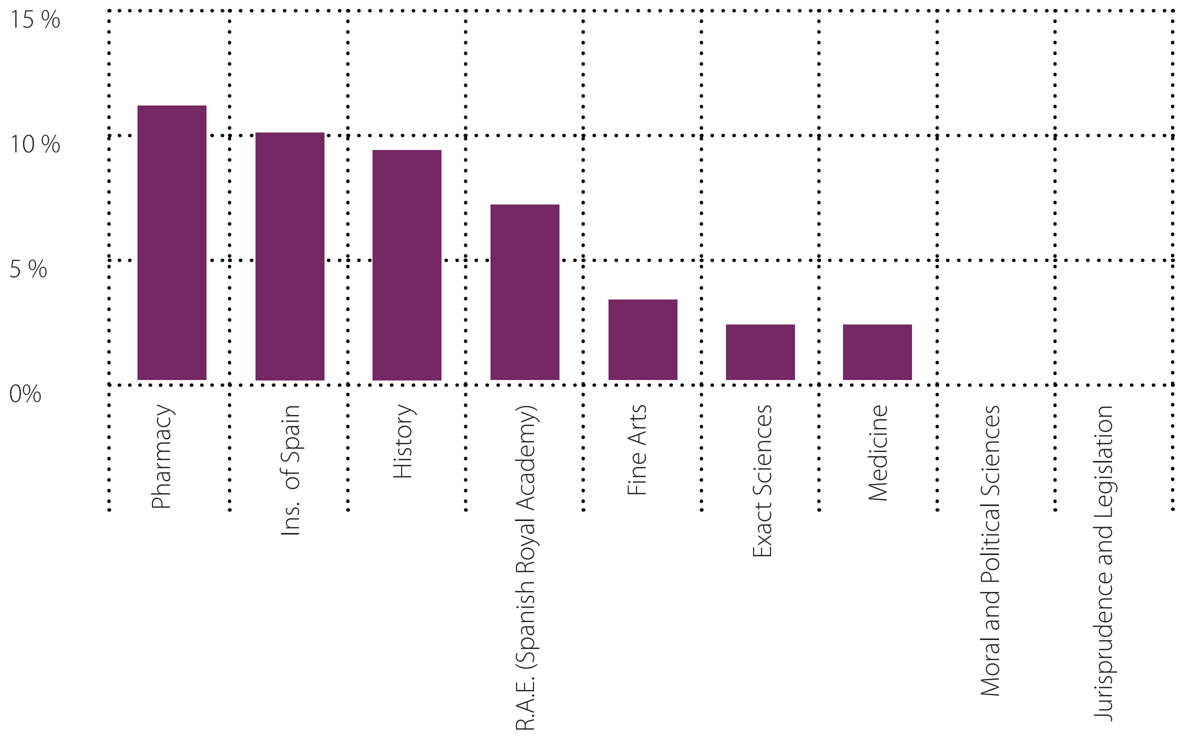
Source: Ministry of Science and Innovation. **NB:** the numbers shown in each bar represent the total number of men and women. The percentages above the bars represent the percentage of women out of the total number of people.

- Men
- Women

GRÁFICO 30

PORCENTAJE DE MUJERES EN EL INSTITUTO DE ESPAÑA Y REALES ACADEMIAS (2007)

Fuente: *Académicas en cifras, 2007*



	All professional categories		Catedrático/a		Profesor/a titular		Profesor/a asociado/a, ayudante, visitante o similar	
	1	2	3	4	5	6	7	8
Woman	-1,509***		-2,833		-1,262***		-1,291***	
	(0,190)		(2,023)		(0,283)		(0,367)	
Age	-0,082***	-0.081***	-0,442***	-0,443**	-0,054	-0,052	-0,108***	-0,108***
	(0,024)	(0,024)	(0,161)	(0,172)	(0,041)	(0,041)	(0,035)	(0,035)
No. of years since finishing PhD	0,191***	0,191***	0,696***	0,696***	0,151***	1,152***	0,104	0,105
	(0,027)	(0,027)	(0,253)	(0,250)	(0,039)	(0,039)	(0,068)	(0,068)
University	0,505	0,507						
	(0,356)	(0,356)						
Basic or fundamental research	0,660***	0,658***	6,410**	6,409**	0,837**	0,824**	0,346	0,345
	(0,248)	(0,249)	(2,896)	(2,897)	(0,360)	(0,360)	(0,469)	(0,469)
Applied research	0,878***	0,874***	3,049	3,052	0,659*	0,656*	0,439	0,441
	(0,223)	(0,223)	(2,611)	(2,660)	(0,347)	(0,347)	(0,405)	(0,404)
Experimental development	0,601***	0,601***	1,472	1,473	0,904**	0,908**	0,776*	0,774*
	(0,233)	(0,233)	(2,944)	(2,931)	(0,362)	(0,361)	(0,424)	(0,424)
Spends 25% to 50% of work time on teaching activities	-0,313	-0,315	-1,158	-1,163	-0,168	-0,175	-0,021	-0,022
	(0,342)	(0,342)	(2,013)	(2,114)	(0,648)	(0,648)	(0,635)	(0,634)
Spends 50% to 75% of work time on teaching activities	-1,578***	-1,590***	1,660	1,660	-2,068***	-2,092***	-0,504	-0,512
	(0,345)	(0,346)	(3,653)	(3,671)	(0,628)	(0,628)	(0,635)	(0,636)
Spends more than 75% of work time on teaching activities	-2,038***	-2,041***	0,270	0,270	-2341***	-2,343***	-1,000	-0,999
	(0,353)	(0,353)	(2,961)	(2,973)	(0,650)	(0,649)	(0,701)	(0,700)

TABLE 8
DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF ARTICLES
Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

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	All professional categories		Catedrático/a		Profesor/a titular		Profesor/a asociado/a, ayudante, visitante o similar	
	1	2	3	4	5	6	7	8
With minors between 5 and 18 years old financially dependent on survey subject	-0,615**		-4,548**		-0,310		-0,386	
	(0,243)		(1,895)		(0,309)		(0,509)	
Natural Sciences	-0,118	-0,120	-3,485	-3,481	-0,005	0,003	-0,149	-0,146
	(0,369)	(0,369)	(4,845)	(4,786)	(0,540)	(0,540)	(0,676)	(0,676)
Humanities	-0,874**	0,876**	-5,197	-5,197	-1,503***	-1,492***	-0,080	-0,067
	(0,392)	(0,392)	(4,620)	(4,638)	(0,569)	(0,570)	(0,710)	(0,709)
Medical Sciences	0,923	0,921	-1,046	-1,048	0,600	0,621	1,038	1,048
	(0,651)	(0,650)	(5,235)	(5,287)	(0,897)	(0,894)	(1,237)	(1,237)
Agricultural Sciences	1,199*	1,198*	-7,216	-7,219	0,687	0,676	1,285	1,282
	(0,636)	(0,637)	(5,069)	(5,116)	(0,894)	(0,892)	(1,444)	(1,436)
Social Sciences	-1,199***	-1,207***	-3,218	-3,214	-1,590***	-1,591***	-0,748	-0,735
	(0,353)	(0,353)	(5,118,)	(5,058)	(0,490)	(0,490)	(0,638)	(0,639)
Woman* With minors between 5 and 18 years old financially dependent on survey subject		-1,965***		-7,409*		-1,418***		-1,840***
		(0,326)		(3,922)		(0,437)		(0,637)
Man* With minors between 5 and 18 years old financially dependent on survey subject		-0,860**		-4,539**		-0,647		-0,121
		(0,337)		(1,998)		(0,437)		(0,783)
Woman*No minors between 5 and 18 years old financially dependent on survey subject		-1,273***		-2,807		-1,189***		-1,203***
		(0,227)		(2,441)		(0,369)		(0,403)
Constant	10,067***	10,132***	22,483**	22,503**	9,590***	9,670***	11,237***	11,202***
	(0,931)	(0,928)	(8,939)	(9,437)	(1,715)	(1,709)	(1,482)	(1,486)
Observations	6.061	6.061	148	148	2.791	2.791	1.410	1.410
R-squared	0,061	0,061	0,214	0,214	0,071	0,072	0,044	0,044

TABLE 8

DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF ARTICLES

Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

TABLE 9
DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF BOOKS

Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

	All professional categories		Full Professors		Associate Professors		Assistant Professors	
	1	2	3	4	5	6	7	8
Woman	-0,332***		-2,218*		-0,248		-0,336	
	(0,102)		(1,289)		(0,156)		(0,205)	
Age	0,013	0,013	0,040	0,043	0,013	0,013	-0,009	-0,10
	(0,010)	(0,010)	(0,078)	(0,084)	(0,013)	(0,013)	(0,021)	(0,021)
No. of years since finishing PhD	0,041***	0,041***	0,257**	0,261**	0,028	0,028	0,027	0,027
	(0,014)	(0,014)	(0,100)	(0,104)	(0,020)	(0,020)	(0,036)	(0,036)
University	-0,006	-0,007						
	(0,191)	(0,191)						
Basic or fundamental research	0,151	0,152	1,547*	1,555*	0,137	0,135	0,295	0,294
	(0,129)	(0,129)	(0,913)	(0,929)	(0,195)	(0,196)	(0,239)	(0,240)
Applied research	0,313***	0,315***	0,112	0,087	0,248	0,247	0,384*	0,386*
	(0,108)	(0,108)	(0,951)	(0,985)	(0,164)	(0,164)	(0,219)	(0,220)
Experimental development	0,139	0,139	0,487	0,480	0,151	0,151	-0,120	-0,121
	(0,113)	(0,113)	(1,206)	(1,201)	(0,170)	(0,170)	(0,249)	(0,249)
Spends 25% to 50% of work time on teaching activities	0,576***	0,577***	0,902	0,940	0,190	0,188	0,683**	0,683*
	(0,166)	(0,166)	(1,265)	(1,243)	(0,247)	(0,247)	(0,311)	(0,311)
Spends 50% to 75% of work time on teaching activities	0,294*	0,298*	1,589	1,587	-0,073	-0,076	0,332	0,328
	(0,170)	(0,170)	(1,285)	(1,290)	(0,249)	(0,249)	(0,315)	(0,316)
Spends more than 75% of work time on teaching activities	-0,039	-0,038	-0,893	-0,891	-0,556**	-0,557**	0,224	0,224
	(0,188)	(0,188)	(1,373)	(1,379)	(0,268)	(0,268)	(0,348)	(0,348)

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TABLE 9
DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, NUMBER OF BOOKS

Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

	All professional categories		Full Professors		Associate Professors		Assistant Professors	
	1	2	3	4	5	6	7	8
With minors between 5 and 18 years old financially dependent on survey subject	-0,174		-1,601*		-0,144		0,303	
	(0,116)		(0,954)		(0,151)		(0,300)	
Natural Sciences	-0,136	-0,136	-0,607	-0,637	-0,460*	-0,459*	0,445*	0,447**
	(0,153)	(0,153)	(1,343)	(1,359)	(0,242)	(0,243)	(0,227)	(0,228)
Humanities	2,002***	2,003***	1,381	1,381	1,959***	1,961***	2,112***	2,119***
	(0,213)	(0,213)	(1,473)	(1,477)	(0,340)	(0,341)	(0,361)	(0,363)
Medical Sciences	-0,631***	0,631***	0,537	0,551	0,633*	0,636*	0,865*	0,861*
	(0,241)	(0,241)	(1,299)	(1,303)	(0,350)	(0,351)	(0,459)	(0,460)
Agricultural Sciences	0,611*	0,611*	1,907	1,928	-0,095	-0,097	1,279**	1,278**
	(0,333)	(0,333)	(2,469)	(2,531)	(0,329)	(0,328)	(0,632)	(0,627)
Social Sciences	1,707***	1,710***	2,031***	2,003	1,268***	1,268***	2,200***	2,206***
	(0,168)	(0,168)	(1,571)	(1,574)	(0,250)	(0,250)	(0,283)	(0,286)
Woman* With minors between 5 and 18 years old financially dependent on survey subject		-0,553***		-3,613***		-0,366		-0,120
		(0,159)		(1,325)		(0,223)		(0,377)
Man* With minors between 5 and 18 years old financially dependent on survey subject		-0,101		-1,672		-0,198		0,446
		(0,151)		(1,096)		(0,199)		(0,439)
Woman*No minors between 5 and 18 years old financially dependent on survey subject		-0,284**		-2,410		-0,300		-0,288
		(0,124)		(2,003)		(0,212)		(0,220)
Constant	0,406	0,387	-2,274	-2,877	1,090*	1,103*	0,564	0,546
	(0,397)	(0,399)	(4,803)	(4,985)	(0,643)	(0,644)	(0,679)	(0,690)
Observations	6.061	6.061	148	148	2.791	2.791	1.410	1.410
R-squared	0,075	0,075	0,155	0,156	0,065	0,065	0,079	0,079

TABLE 10
DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, PROBABILITY OF DIRECTING A MASTER'S OR DOCTORAL THESIS
Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

	All professional categories		Full Professors		Associate Professors		Assistant Professors	
	1	2	3	4	5	6	7	8
Woman	0,718***		0,322***		0,712***		0,629***	
	(0,047)		(0,188)		(0,065)		(0,096)	
Age	0,992	0,992	0,975	0,973	0,997	0,997	0,997*	0,976*
	(0,005)	(0,005)	(0,031)	(0,033)	(0,007)	(0,007)	(0,014)	(0,014)
No. of years since finishing PhD	1,208***	1,208***	1,220***	1,219***	1,165***	1,165***	1,193***	1,195***
	(0,011)	(0,011)	(0,084)	(0,085)	(0,014)	(0,014)	(0,031)	(0,031)
University	1,757***	1,759***						
	(0,198)	(0,199)						
Basic or fundamental research	1,018	1,018	1,978	1,940	1,051	1,046	1,004	1,004
	(0,081)	(0,081)	(1,142)	(1,132)	(0,115)	(0,114)	(0,183)	(0,184)
Applied research	1,347***	1,346***	2,245	2,260	1,359***	1,356***	1,366*	1,376*
	(0,099)	(0,099)	(1,420)	(1,432)	(0,139)	(0,138)	(0,241)	(0,243)
Experimental development	1,205***	1,205***	3,172*	3,146*	1,211*	1,213*	1,202	1,204
	(0,086)	(0,086)	(1,958)	(1,942)	(0,124)	(0,124)	(0,195)	(0,196)
Spends 25% to 50% of work time on teaching activities	1,089	1,089	0,726	0,700	0,917	0,915	1,194	1,193
	(0,111)	(0,111)	(0,542)	(0,527)	(0,152)	(0,152)	(0,296)	(0,296)
Spends 50% to 75% of work time on teaching activities	0,787**	0,786**	0,369	0,365	0,625***	0,619***	1,215	1,204
	(0,083)	(0,083)	(0,302)	(0,297)	(0,105)	(0,104)	(0,311)	(0,307)
Spends more than 75% of work time on teaching activities	0,649***	0,648***	0,317	0,312	0,546***	0,544***	0,841	0,846
	(0,075)	(0,075)	(0,268)	(0,264)	(0,098)	(0,098)	(0,245)	(0,246)

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	All professional categories		Full Professors		Associate Professors		Assistant Professors	
	1	2	3	4	5	6	7	8
With minors between 5 and 18 years old financially dependent on survey subject	0,952		0,767		0,996		0,909	
	(0,068)		(0,370)		(0,089)		(0,186)	
Natural Sciences	0,718***	0,717***	0,268*	0,275	0,684***	0,685**	1,051	1,058
	(0,078)	(0,078)	(0,208)	(0,217)	(0,101)	(0,101)	(0,277)	(0,279)
Humanities	0,506***	0,506***	0,345	0,348	0,639***	0,640***	0,646	0,658
	(0,066)	(0,066)	(0,304)	(0,306)	(0,111)	(0,111)	(0,203)	(0,207)
Medical Sciences	1,256	1,256			1,374	1,379	2,558**	2,600**
	(0,198)	(0,198)			(0,340)	(0,342)	(0,947)	(0,977)
Agricultural Sciences	1,231	1,231	0,416	0,418	1,276	1,270	1,611	1,611
	(0,220)	(0,220)	(0,515)	(0,508)	(0,332)	(0,330)	(0,698)	(0,702)
Social Sciences	0,593***	0,593***	0,731	0,747	0,571***	0,571***	0,948	0,962
	(0,066)	(0,066)	(0,570)	(0,580)	(0,084)	(0,084)	(0,243)	(0,247)
Woman* With minors between 5 and 18 years old financially dependent on survey subject		0,693***		0,217*		0,748**		0,455***
		(0,072)		(0,176)		(0,100)		(0,134)
Man* With minors between 5 and 18 years old financially dependent on survey subject		0,932		0,811		0,899		1,167
		(0,085)		(0,422)		(0,102)		(0,319)
Woman*No minors between 5 and 18 years old financially dependent on survey subject		0,706***		0,362		0,636***		0,699**
		(0,055)		(0,299)		(0,074)		(0,116)
Constant	0,189***	0,190***	1,235	1,329	0,450**	0,460**	0,277**	0,267**
	(0,046)	(0,046)	(2,398)	(2,644)	(0,161)	(0,164)	(0,155)	(0,150)
Observations	6.321	6.321	152	152	2.885	2.885	1.454	1,454

TABLE 10
DETERMINING FACTORS OF ACADEMIC PRODUCTIVITY, PROBABILITY OF DIRECTING A MASTER'S OR DOCTORAL THESIS

Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors aged 5-18 financially dependent on him, Engineering and Technology. Male*Does not have minors aged 5-18 financially dependent on him.

	Probability of being a Full Professor vs. Associate Professor		Probability of being an Associate Professor vs. Assistant Professor/visiting professor or similar	
	1	2	3	4
Woman	0,394***		0,885	
	(0,091)		(0,080)	
Age	1,124***	1,122***	1,073***	1,073***
	(0,018)	(0,018)	(0,009)	(0,009)
No. years since PhD	1,147***	1,146***	1,343***	1,343***
	(0,034)	(0,034)	(0,020)	(0,020)
Natural Sciences	0,795	0,798	0,540***	0,540***
	(0,234)	(0,234)	(0,077)	(0,077)
Humanities	0,665	0,663	0,329***	0,330***
	(0,231)	(0,230)	(0,055)	(0,055)
Medical Sciences	0,872	0,879	0,248***	0,248***
	(0,388)	(0,392)	(0,073)	(0,073)
Agricultural Sciences	0,439	0,441	0,515**	0,515**
	(0,290)	(0,290)	(0,142)	(0,142)
Social Sciences	0,990	0,992	0,519***	0,520***
	(0,284)	(0,283)	(0,071)	(0,071)
Number of articles published in 2004-2006 period	1,023	1,022	0,987**	0,987**
	(0,014)	(0,014)	(0,006)	(0,006)

TABLE 11
ESTIMATION OF DETERMINING FACTORS OF ACADEMIC PROMOTION
Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. **NB:** Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors under18 financially dependent on him, Engineering and Technology. Male*Does not have minors under 18 financially dependent on him.

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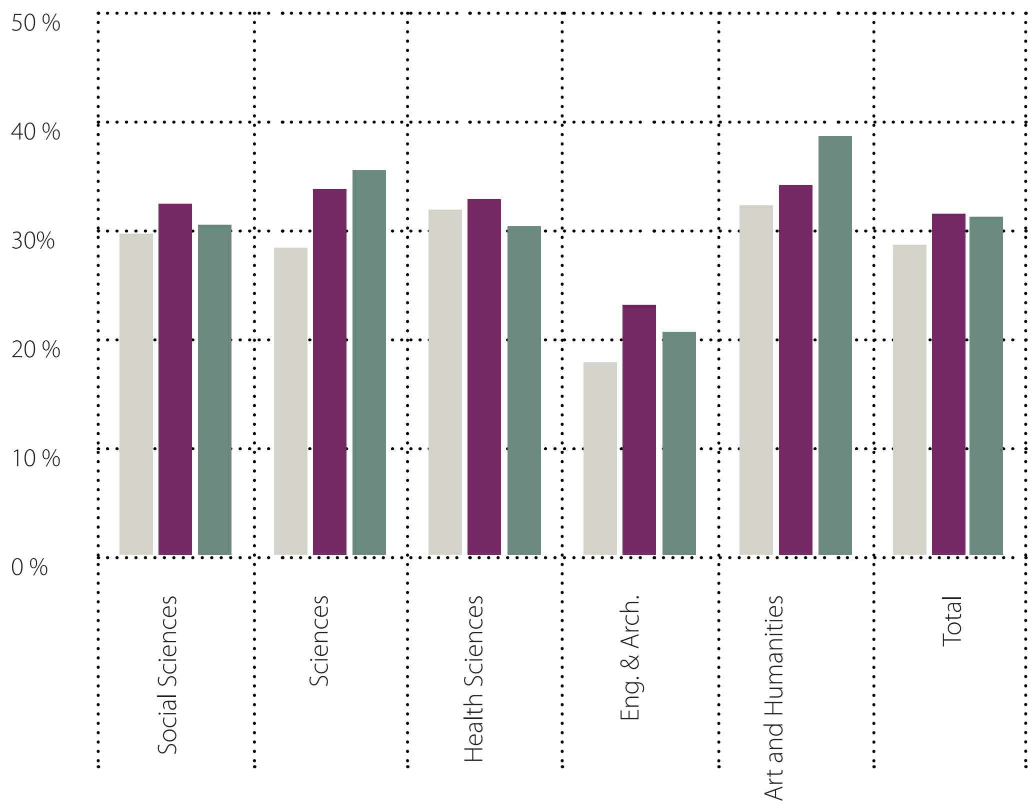
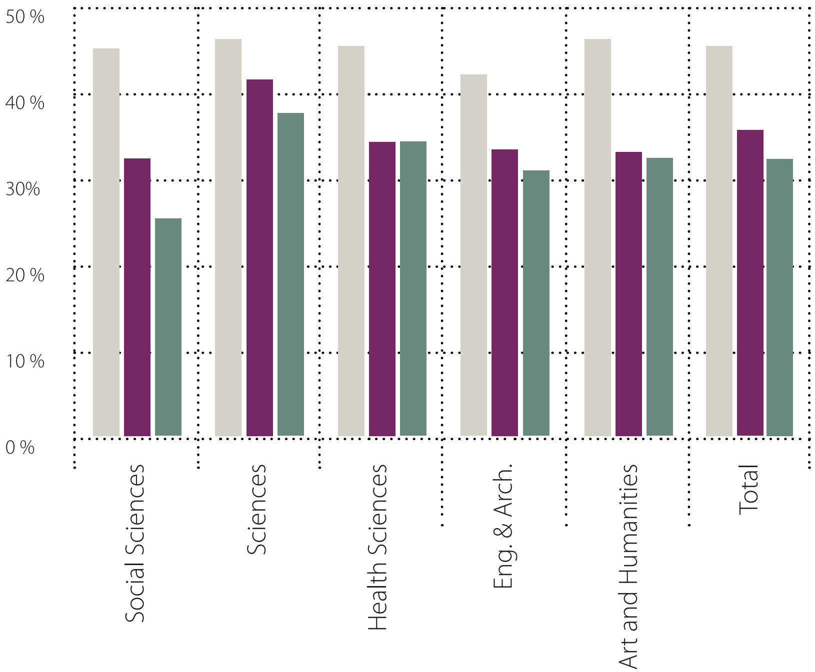
TABLE 11
ESTIMATION OF DETERMINING FACTORS OF ACADEMIC PROMOTION

	Probability of being a Full Professor vs. Associate Professor		Probability of being an Associate Professor vs. Assistant Professor/visiting professor or similar	
	1	2	3	4
Number of books and/or monographs published in 2004-2006 period	1,011	1,012	1,004	1,004
	(0,020)	(0,020)	(0,013)	(0,013)
Has directed a Master's degree or doctoral thesis	1.456*	1,465*	1,534***	1,533***
	(0,296)	(0,297)	(0,158)	(0,158)
With minors under 18 years old financially dependent on survey subject	1,431		1,612***	1,208***
	(0,333)		(0,144)	(0,011)
Woman* With minors under 18 years old financially dependent on survey subject		0,453*		1,423***
		(0,183)		(0,181)
Man* With minors under 18 years old financially dependent on survey subject		1,690**		1,645***
		(0,452)		(0,199)
Woman* No minors under 18 years old financially dependent on survey subject		0,575*		0,905
		(0,189)		(0,113)
Constant	0,000***	0,000***	0,032***	0,045***
	(0,000)	(0,000)	(0,011)	(0,016)
Observations	2.958	2.958	4.229	4.229

Source: Own creation with data from the Human Resources in Science and Technology Survey 2006. **NB:** Reference categories for the fictitious variables: Male, Spends less than 25% of time on teaching activities, Does not have minors under18 financially dependent on him, Engineering and Technology. Male*Does not have minors under 18 financially dependent on him.

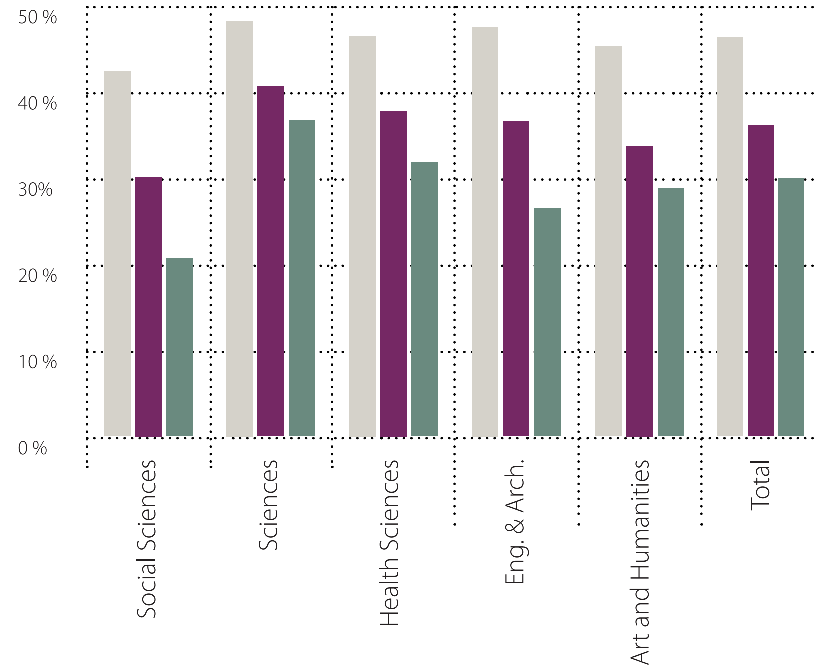


GRAPH 31
PERCENTAGE OF WOMEN APPLYING FOR ACCREDITATION FOR FULL PROFESSORSHIPS
Source: National Agency for Quality Assessment and Accreditation (ANECA).



Men

- 2008
- 2009
- 2010

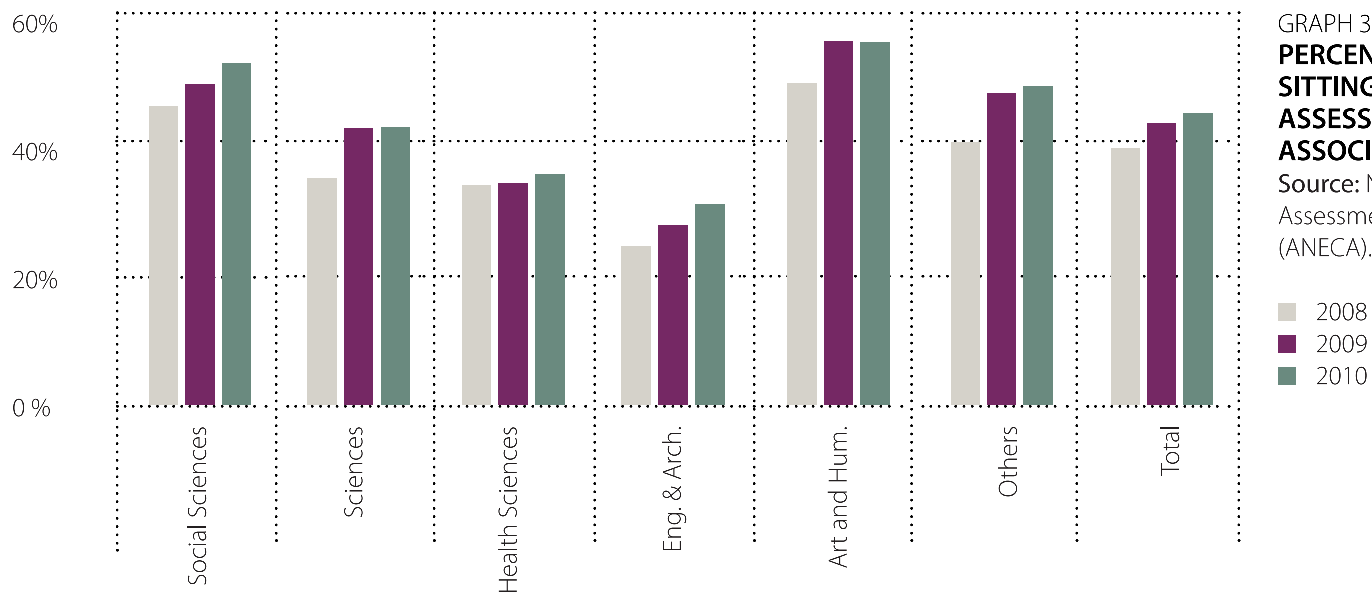


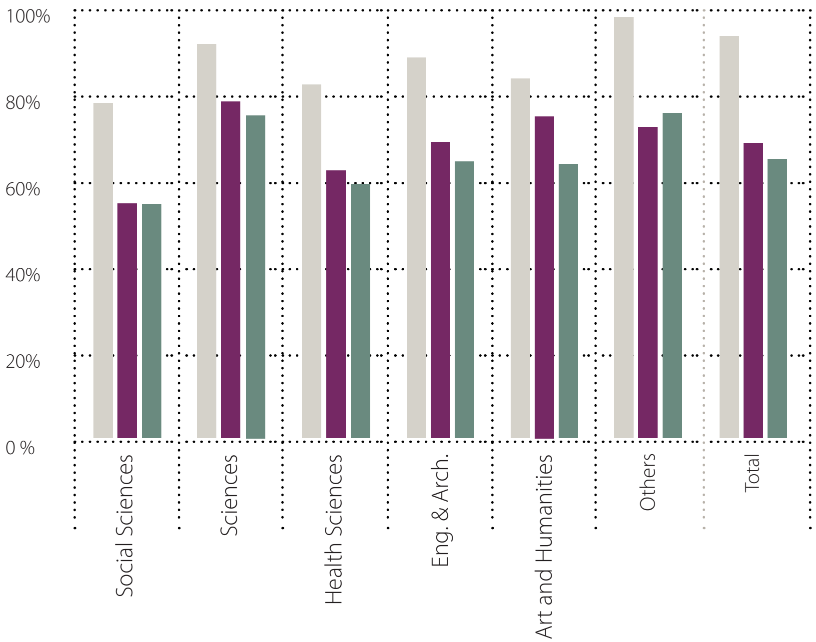
Women

- 2008
- 2009
- 2010

GRAPH 32
SUCCESS RATES FOR PhDs APPLYING FOR ACCREDITATION FOR FULL PROFESSORSHIPS
Source: National Agency for Quality Assessment and Accreditation (ANECA).

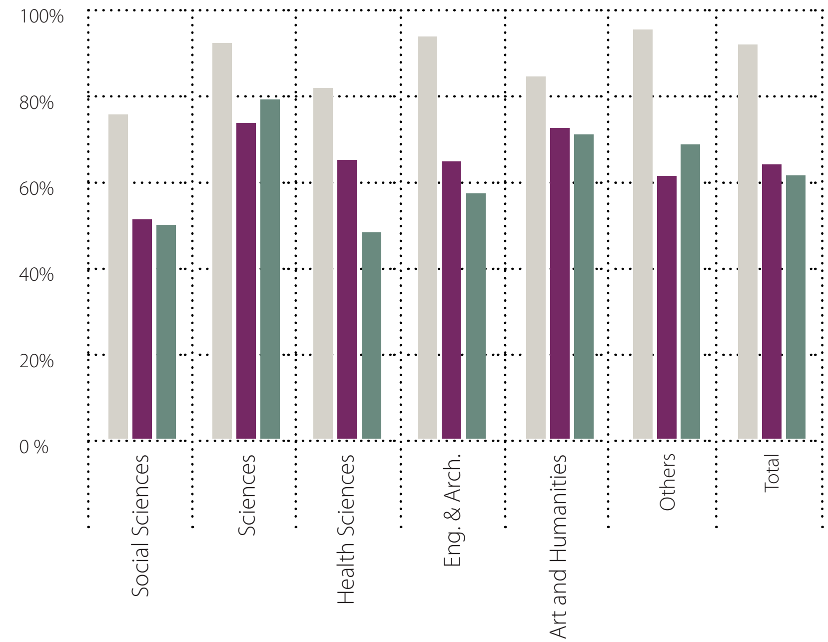
GRAPH 33
PERCENTAGE OF WOMEN SITTING ACCREDITATION ASSESSMENTS FOR ASSOCIATE PROFESSORSHIPS
Source: National Agency for Quality Assessment and Accreditation (ANECA).





Men

- 2008
- 2009
- 2010



Women

- 2008
- 2009
- 2010

GRAPH 34

SUCCESS RATES OF PHDS SITTING ACCREDITATION ASSESSMENTS FOR ASSOCIATE PROFESSORSHIP

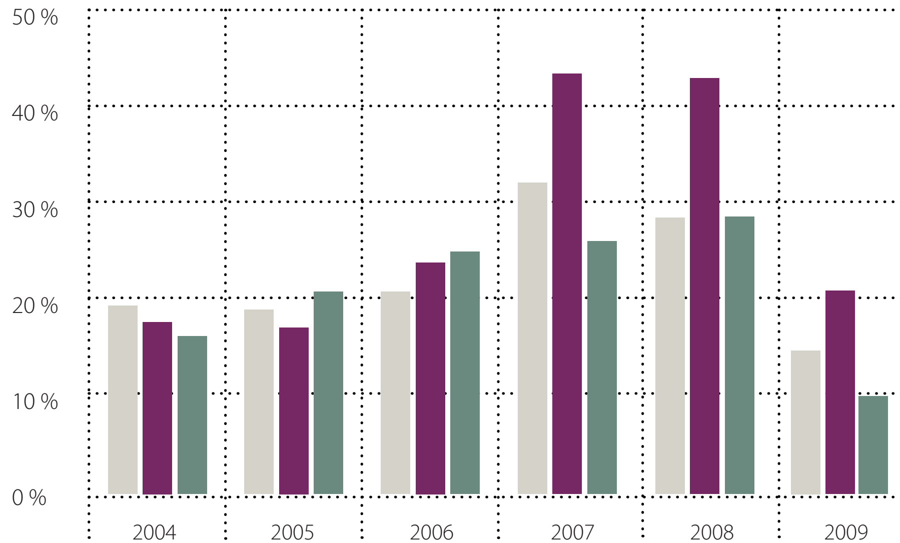
Source: National Agency for Quality Assessment and Accreditation (ANECA).

GRAPH 35
PERCENTAGE OF POSITIONS FILLED BY WOMEN THROUGH OPEN JOB OFFERS AND INTERNAL PROMOTION
Source: CSIC.

A
B
C

GRAPH 36
PERCENTAGE OF SUCCESS IN PLACES ASSIGNED THROUGH OPEN JOB OFFERS AND INTERNAL PROMOTION
Source: CSIC.

Men



Women

Men

- Married/Unmarried Couple without children
- Married/Unmarried Couple with children
- Single without children
- Others

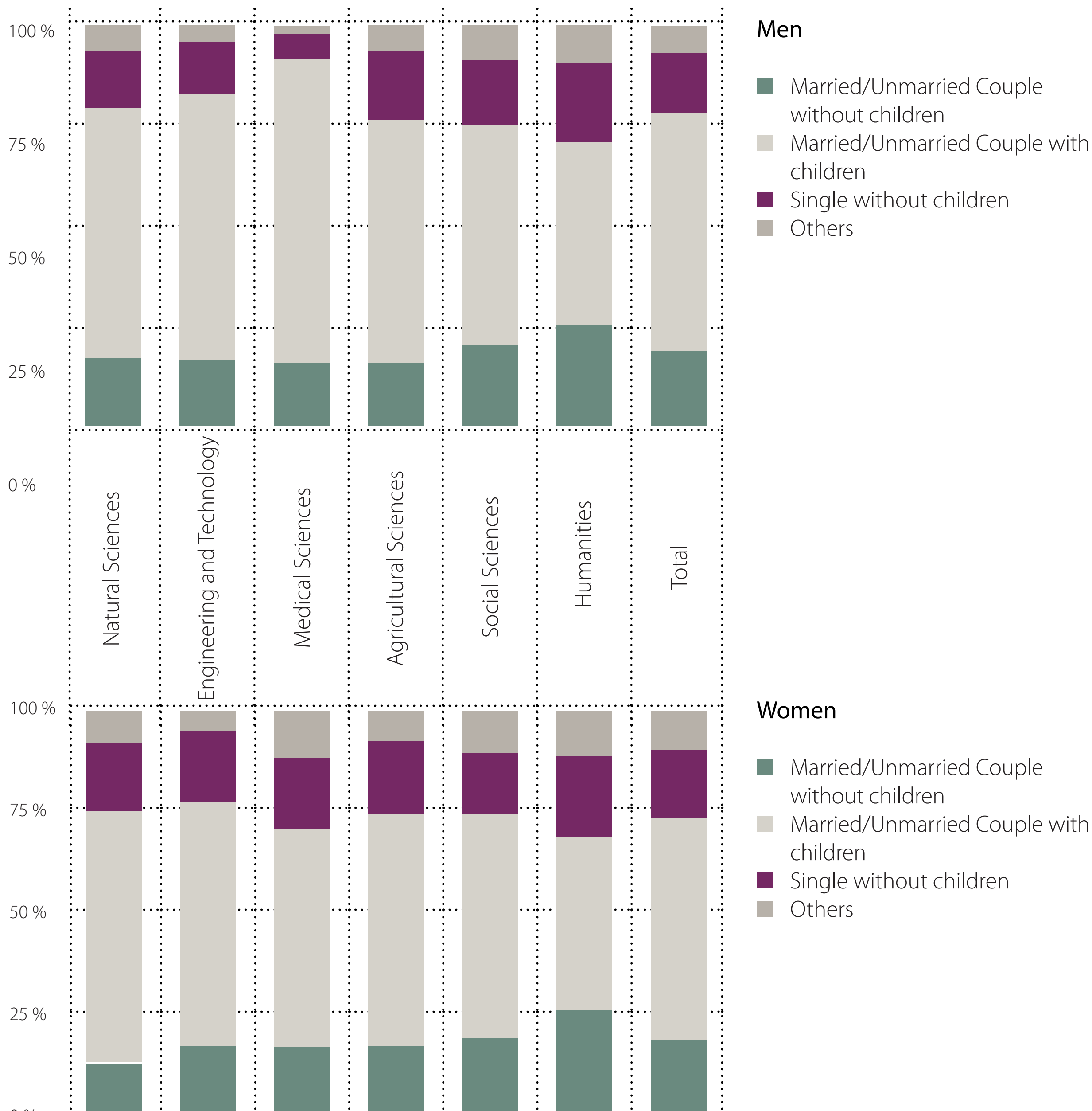
Women

- Married/Unmarried Couple without children
- Married/Unmarried Couple with children
- Single without children
- Others

GRAPH 37

COMPOSITION OF UNIVERSITY FACULTY AT FULL PROFESSOR LEVEL BY FAMILY SITUATION

Source: Human Resources in Science and Technology Survey 2006. **NB:** The category "others" includes people who are single with children, separated, divorced or widowed, with or without children. These categories represent 6.5% of the sample, so we decided to include them all together in a single category.



GRAPH 38

COMPOSITION OF UNIVERSITY FACULTY AT ASSOCIATE PROFESSOR LEVEL BY FAMILY SITUATION

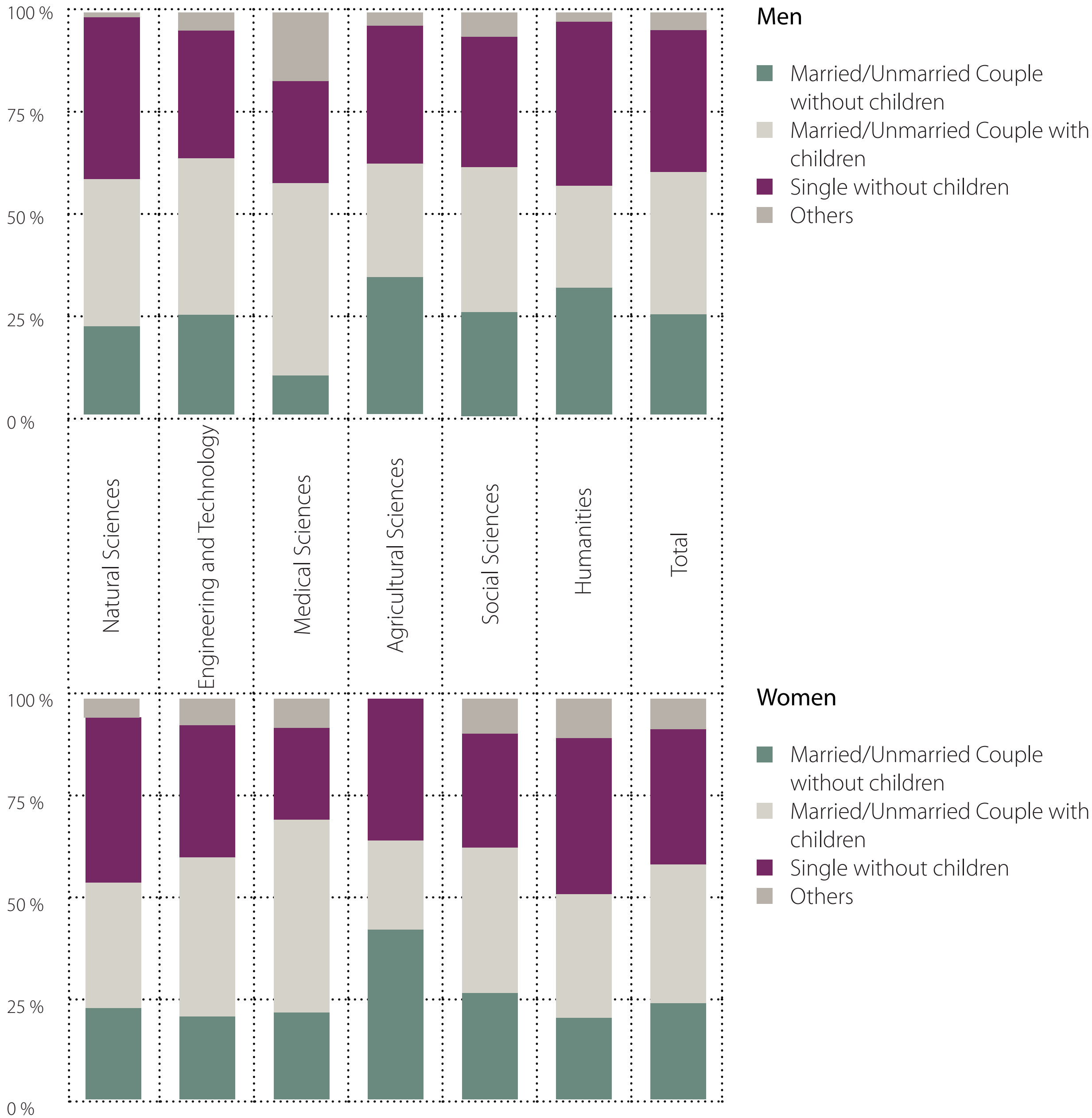
Source: Human Resources in Science and Technology Survey 2006.

NB: The category "others" includes people who are single with children, separated, divorced or widowed, with or without children. These categories represent 6.5% of the sample, so we decided to include them all together in a single category.

GRAPH 39

COMPOSITION OF UNIVERSITY FACULTY AT ASSISTANT PROFESSOR LEVEL BY FAMILY SITUATION

Source: Human Resources in Science and Technology Survey 2006. **NB:** The category "others" includes people who are single with children, separated, divorced or widowed, with or without children. These categories represent 6.5% of the sample, so we decided to include them all together in a single category.



	University Teaching Statistics (2005-2006)	RRHH 2006	RRHH 2009
Total Doctors	71,817	48,230	46,305
Total Women (%)	23,907 (33,3 %)	22,042 (45,7 %)	20,447 (44,2 %)
		Distribution by level and gender	
% University Full Professor and University School Full Professor	15,5 %	3,3 %	4,5 %
% Women among the University Full Professors and University School Full Professors	18,1 %	20,6 %	25 %
Associate Professors (%)	39,1 %	54,4 %	59 %
% Women among Associate Professors	36,5 %	41 %	41,1 %
Other PhDs	45,4 %	42,3%	36,5 %
% Women among other PhDs	35,7 %	48,2 %	48,2 %

TABLE 13
DISTRIBUTION OF DOCTORS BY PROFESSIONAL CATEGORY, (MULTIPLE DATA SOURCES)
Notes: 1. The percentages of the two RRHH survey waves were calculated by weighting the observations. **2.** The "Other PhDs" category includes: (i) In the case of the University Teaching Statistics: Assistant Professors Lecturers, Tenured full-time lecturers and Visiting Professors. In the case of the Lecturers it is possible some do not have doctorates, but the University Teaching Statistics do not allow us to identify them. (ii) In the case of the two waves of the RRHH survey: Emeritus professors, visiting professors, senior lecturers, lecturers, Assistant Professors and similar, and others. In this case we can be sure that all of the individuals included in one of these categories are PhDs.

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