Zugänge, Barrieren und Potentiale für die internationale Mobilität von Wissenschaftlerinnen

Länderbericht Spanien

GESIS – Leibniz-Institut für Sozialwissenschaften

Kompetenzzentrum Frauen in Wissenschaft und Forschung CEWS

Country dossier Spain

Rachel Palmén

Open University of Catalonia

Table of Contents

1 Introduction

The overarching research question is: How high is the potential of female scientists in the individual country who could be attracted for a research stay in Germany due to their qualification and their willingness to be internationally mobile? This report is the in-depth country report for Spain. This report will discuss the context analysis of the higher education and research system, then gender participation in tertiary education and academic careers, followed by gender and international academic mobility.

The context analysis of the higher education and research system in Spain is characterised by the economic crisis that started in 2008 and the subsequent austerity policies that resulted in cuts to the education budget that have been maintained to date. The effects of these cuts have been felt particularly in the public universities, where the precarious situation for university teaching and research personnel has intensified. These budgetary cuts also led to a great outflux of highly qualified teaching and research staff from Spain. However, current political will at the national level to invest in science and higher education as well as gender equality leads to cautious optimism for the not too distant future.

Gender participation in tertiary education and academic careers is characterised by both horizontal and vertical segregation. Regarding vertical segregation, the glass ceiling has been highlighted as particularly severe in Spain. This is coupled with the highly competitive research environment whereby career progression (and even staying within the research system) is extremely difficult given the current lack of opportunities for tenure track positions.

In Spain, despite research findings that demonstrate that international mobility is perceived as a greater obstacle for women researchers in developing a research career than for men, statistics demonstrate that more women than men engage in international mobility during their early-stage research career. Research stays at institutions in different countries could therefore prove to be an attractive option for women researchers in early stages of their research careers. Germany is seen as an attractive destination – due mainly to prestigious research institutes and universities.

This report is based on various data sources, including academic literature, grey literature, semi-structured interviews with three renowned experts in the field,[1] as well as statistical data provided mainly by the UNESCO Institute for Statistics (UIS) database.

The semi-structured interview guide (see Annex 2 of this report) was developed in order to (a) fill in gaps where data and information had been difficult for the author to find, and (b) explore the expert opinions regarding the pull and push factors with regard to female researchers in Spain carrying out a research stay in Germany. Interviews were conducted with three experts in the field (two expert academics and one practitioner) – all of whom are authors of relevant reports and articles in the field. The responses to the interviews were

[1] See Annex 2 for the interview guide for experts in the field.

summarised into a synthesis document, and relevant elements were then integrated into the report.

2 Context Analysis of the Higher Education and Research System

Size and structures of research and development (R&D)

Since the economic crisis of 2008, Spain has suffered huge cuts in public expenditure on higher education. Public budgets for R&D from the State have plummeted from EUR 9,673 million in 2009 to EUR 6,406.5 million in 2015 – a decline from 2.52% to 1.46% of the total central budget – relatively less than what was allocated to R&D in 2001 (1.49%).[2] In Spain, between 2012 and 2018, gross domestic expenditure on research and development (GERD) as a percentage of GDP decreased slightly from 1.29% in 2012 to 1.24% in 2018. During this period, it was at its lowest in 2016, at 1.19%, and since then it has been increasing slightly.[3]

GERD performed by the business enterprise sector as a percentage of GDP increased very slightly from 0.68% in 2012 to 0.7% in 2018. GERD performed by the government sector decreased from 0.25% in 2012 to 0.21%; GERD performed by the higher education sector also slightly decreased during this period, from 0.36% to 0.33%. There are no UIS data for GERD performed by the non-profit sector in Spain.[4]

Regarding government expenditure on education as a percentage of GDP, we see how between 2013 and 2016 it fell slightly from 4.33% to 4.21%. Expenditure on tertiary education as a percentage of total government expenditure also slightly decreased, from 22.4% in 2013 to 21.8% in 2016.[5]

Participation in tertiary education

In Spain, in 2018, 21.9% of the population aged 25 years or older had at least a Bachelor's degree or equivalent (ISCED 6 or higher) compared with 20.9% in 2016. In Spain in 2017, 445,559 people graduated from tertiary education.[6]

In 2018, women were slightly more likely than men to hold a Bachelor's degree or equivalent (23.7% versus 20.1%). The gender parity index for these data was 1.17 in 2018.[7]

In 2017, among all graduates from tertiary education, 4.5% graduated from doctoral or equivalent programmes (ISCED 8), increasing from just 2.6% in 2013.[8]

Human Resources in Science and Research

The total number of R&D personnel (full-time equivalent, FTE) in Spain rose from 20,8831.38 in 2012 to 22,5696.00 in 2018. This translates into a slight growth from 4,437.27 R&D

[2] RIO Country Report, 2016: Spain, 6. https://publications.jrc.ec.europa.eu/repository/handle/JRC105983
[3] UIS database, 2020 (CEWS Template)
[4] UIS database, 2020 (CEWS Template)
[5] UIS database, 2020 (CEWS Template)
[6] UIS database, 2020 (CEWS Template)
[7] UIS database, 2020 (CEWS Template)
[8] UIS database, 2020 (CEWS Template)

personnel (FTE) per million inhabitants in 2012, to 4,833.63 R&D personnel (FTE) per million inhabitants in 2018. This slight growth is also reflected in total R&D personnel per thousand labour force (FTE), which rose from 8.8 in 2012 to 9.8 in 2018. However, a slight decline from 11.7 in 2012 to 11.6 in 2018 was observed in total R&D personnel (FTE) per thousand in total employment.[9]

A very slight increase was observed in researchers as a percentage of R&D personnel (FTE), which grew from 60.71% (2012) to 62.1% (2018).[10]

The composition of the R&D personnel by sector of employment has remained relatively constant measured both in FTE and headcounts (HC). In the business enterprise sector, we can see a slight increase, from 35.4% in 2012 to 38.8% in 2018 (FTE), whereas in the government sector, we observe a slight decrease, from 17.2% in 2012 to 15.3% in 2018 (FTE). In the higher education sector, we also observe a slight decrease, from 47.1% in 2012 to 45.7% in 2018. Regarding the private non-profit sector, this share remained constant at 0.2% or thereabouts between 2012 and 2018. Total R&D personnel (HC) remained relatively constant regarding sector distribution from 2012 to 2018: in the business enterprise sector, it rose slightly from 37.45% in 2012 to 38.69% in 2018; in the government sector, it rose from 16.43% in 2012 to 16.51% in 2018; and in higher education sector, we see a slight decrease, from 45.87% in 2012 to 44.54 % in 2018. Regarding the private non-profit sector, we see a very slight increase from 0.24% to 0.26% in 2018.

This pattern is also true of researchers (HC) in the business enterprise sector, where a very slight increase from 27.65% in 2012 to 28.99% in 2018 was observed; in the government sector, where the share increased from 14.93% in 2012 to 15.13% in 2017; and in the higher education sector, where there was an increase from 57.18% in 2012 to 55.63% in 2017.[11]

Basic characteristics of the higher education and research system

The Spanish System of Science, Technology and Innovation (SECTI) is composed of the public and private research, technology, development and innovation (RTDI) coordination, funding and implementing stakeholders and their organisations and entities.[12] The research and innovation (R&I) policy framework is defined by central government – through the development of national strategies and action plans, for example the Spanish Strategy for Science, Technology and Innovation 2021–2017 (EECTI) and the Plan Estatal de Investigación Científica, Técnica y de Innovación (PEICTI) 2021–2023.

The R&I structure includes the following main actors across policy roles:

[9] UIS database, 2020 (CEWS Template)

[10] UIS database, 2020 (CEWS Template)

[11] UIS database, 2020 (CEWS Template)

[12] https://www.ciencia.gob.es/portal/site/MICINN/menuitem.7eeac5cd345b4f34f09dfd1001432ea0/?vgnextoid=700e94273d0d4610VgnVCM1000001d04140aRCRD

Policy-making bodies:

- The Ministry of Science and Innovation is the department of the General State Administration in charge of the execution of the Government's policy on scientific and technical research, technological development and innovation in all sectors, including the direction of international relations in this area. It represents Spain in international and European Union programs, forums and organizations within its field of competence and authority.
- The Ministry of Universities (MIU) of Spain is the Department of the General State Administration responsible for the proposal and execution of the policies of the National Government related to university education, including representation and participation in the bodies of the European Union and beyond within its field of of competence and authority.

The main funding body involved in the implementation of R&I policies is the State Agency for Research: (AEI), which is responsible for the promotion of research.

The State Research Agency is an instrument for financing R&D&I activities with public funds. Its purpose is the promotion of scientific and technical research in all areas of knowledge through the efficient allocation of public resources, the promotion of collaboration between the agents of the R&D&I system, and the support for the generation of knowledge of high scientific and technical, economic and social impact, including knowledge oriented to the challenges of society and the monitoring of financed activities.

Structure of the research system: number of universities, sponsorship (private/state), types of universities, research institutions

The Public Research Organisations together with the universities constitute the basis of the Spanish System of Science, Technology and Innovation.

The main public research bodies that have been granted the status of Public Research Organisations include the following bodies: National Research Council (CSIC); National Centre for Energy, Environment and Technological Research (CIEMAT); Spanish Geological and Mining Institute (IGME); National Institute for Aerospace Technology (INTA); Spanish Institute of Oceanography (IEO); National Institute of Agrarian and Agro-Food Technology (INIA); National Health Institute Carlos III (ISCIII); Astrophysics Institute of Canarias (IAC). Regarding innovation, CDTI is a public corporate entity which is responsible for the promotion of innovation and technological development in companies.

In 2018–2019, the Spanish University System (SUE) comprised a total of 83 universities, of which 50 were public and 33 were private. 1,055 university centres were counted between schools and faculties, 525 university research institutes, 50 doctorate schools, 54 university

hospitals and 77 foundations.[13] From 2008 to 2016, the number of private universities increased by 33.3%.[14]

Funding and significance of the research system

The State Agency for Research (AEI) distributed EUR 2,604.456,739 between 2017 and 2020.[15] These funds are managed through various programmes:

1. State Programme to Promote Talent and Its Employability [Programa Estatal de Promoción del Talento y su Empleabilidad] made up of the following calls: predoctoral contracts to train doctors – FPI; Brief stays in R&D centres; Contracts for post-doctoral training; Open calls for Ramon y Cajal and Juan de la Cierva Fellowships; Technical Support Personnel; Promotion of youth employment; Training of doctors in companies; stable incorporation of doctors; Torres Quevado Fellowships]
2. R+D+I State Programme for Societal Challenges [Programa Estatal de I+D+I orientada a los retos de la sociedad] made up of the following programmes: R&D&I Challenge Projects; Collaboration Challenge Projects; Basic Research Projects and Complementary Actions (INIA); R&D&I Projects Young Researchers; Technological Platforms; International Programming Actions; COFUND Programming Actions; Actions to stimulate European Research
3. State Programme Company Leadership in R&D&I [Programa Estatal de Liderazgo Empresarial en I+D+I] made up of the Horizon Small and Medium Enterprise programme.
4. State Programme to Generate Knowledge and Strengthen Science and Technology [Programa Estatal de Generación de Conocimiento y Fortalecimiento Cientifico y Tecnológico], which is made up of the following programmes: R&D Projects Excellence/Generating Knowledge; Centres of Excellence Severo Ochoa and Maria de Maeztu Units; Explore Science & Technology Projects; European Excellence Projects; Acquiring Scientific and Technological Equipment (FEDER).

Important current political decisions in higher education and science policy

Higher education and science policy is currently being reformulated and reviewed in a an attempt to begin to reverse the decade of deep cuts that have left both higher education and science seriously underfunded.[16] Since June 2018, when the Socialist Workers Party (PSOE) (centre left) assumed power in coalition with the leftist party Podemos, there has been greater interest in both higher education and science policy, as well as a political will to increase funding for science and higher education.[17] Manuel Castells, a the world-leading sociologist and political activist (currently the Minister for Universities [Podemos]), is seeking to reform the higher education system. Increasing funding for science and stabilising the

[13] https://www.universidades.gob.es/stfls/universidades/Estadisticas/ficheros/Informe_Datos_Cifras_Sisttema_Universitario_Espanol_2019-2020.pdf

[14] RIO Country Report 2017: Spain, 10. https://publications.jrc.ec.europa.eu/repository/handle/JRC111466

[15] http://www.aei.gob.es/stfls/MICINN/AEI/ficheros/20201214_Ayudas_AEI_2017_2020.pdf

[16] https://www.nature.com/articles/d41586-020-03282-5

[17] https://www.nature.com/articles/d41586-020-03282-5

precarious positions of researchers and higher education lecturers is currently high on the political agenda in science policy.

A draft law is currently being circulated to reform the Science Act of 2011 in order to improve scientific careers and strengthen the transfer of R&D&I results. Pedro Duque, the Minister of Science and Innovation, has stated that Spain "needs stable financing that gives continuity to the increase that has already been obtained this year", with a budget that supposes "an increase of 60% with respect to 2020". To this end, the pact states that "public funding of the science and innovation system will increase steadily to reach 0.75% of GDP by 2024 and 1.25% in 2030," adding that the contribution of the private sector would result in "2% of our GDP in 2024 and 3% in 2030, as recently proposed by the European Union". The Minister of Science and Innovation stressed that the pact proposed that a "stable and predictable career in the public sphere be established for research and technical staff, equivalent to that of the most advanced countries, and that they have the material and administrative means suitable from the moment they start working". To this end, Duque has reported that "the first steps have been taken to improve the scientific career through the reform of the Science Law, which was opened to public consultation in the last two months of last year and which in a few weeks it will be presented to the Council of Ministers as a Preliminary Draft Law. Our model includes an entry figure in the scientific career known as 'tenure track', a formula that makes possible a predictable trajectory to permanent employment in the public system for those who exceed levels of dedication and excellence." This necessary fight against precariousness in science," said Duque, "will have a beneficial effect on our entire science and innovation system and in particular on women. We are well aware of the gender gaps that persist in our science, technology and innovation system, primarily to attract, retain and foster their talent, and we are working to eradicate these inequalities. We know that the greater weight of the care that women bear makes them more vulnerable to that precariousness and makes it difficult for us to take full advantage of the talent of half the population."[18]

Qualification and career structures for academic careers

Universities offer *grado* Bachelor's degree (; ISCED 2011, level 6) *Másters* (Master's degree; ISCED 2011, level 7) and *Doctorado* (PhD; ISCED 2011, level 8). The structure of university education in Spain, which allows obtaining official degrees, consists of two levels: (1) university degree programmes, which correspond to the first university cycle; 2) postgraduate programmes, which are made up of Master's programmes and doctoral programmes and correspond to the second and third cycle, respectively.

Bachelor's Degree: (Grado)

The term *título de grado* (Bachelor's degree) is the designation for a higher education qualification that is achieved at the end of a university degree programme of between three and six years' duration, depending on the university in Spain in which it is taught. The terms *título de*

[18] https://www.ciencia.gob.es/portal/site/MICINN/menuitem.edc7f2029a2be27d7010721001432ea0/?vgnextoid=32cdfa7281df7710VgnVCM1000001d04140aRCRD

grado, *título profesiona*', or simply *título* also refer to the document with which the obtaining of the degree is recorded .

The purpose of these university degrees is to prepare students for the exercise of professional activities. They and include basic teachings and general training in the following areas of knowledge: arts and humanities; health sciences; social sciences and law; engineering and architecture. The degrees consist of 240 ECTS credits, which is equivalent to four academic years, although in the case of degrees that follow European guidelines, such as medicine, they have a greater number of credits.

Postgraduate Degrees

The Master's degree corresponds to the second university cycle, dedicated to advanced, multidisciplinary and specialized training. The training objectives are more specific than those of the Bachelor's degree, and must be oriented towards a greater intellectual deepening, allowing a disciplinary and interdisciplinary academic development of scientific specialization, research orientation or advanced professional training.

The doctorate corresponds to the third cycle of university studies. To access this type of study, it is necessary to have completed the second cycle of university studies; according to the new organization of university education, this requires graduates to do a Master's degree. Subsequently, a research process is required to develop a doctoral thesis. Upon completion, a public defence must be conducted. The study and research process usually requires between three and four academic years. Students who complete the doctorate obtain the title of *Doctor*.[19] They may work as an *ayudante* (teaching assistant) during this time. There are various funding opportunities for this stage, including European funding MSCA grants in the ITN and COFUND modules, and the national level funding opportunities Formación de Doctores, PFIS, i-PFIS and FPU.[20]

Below, we include a breakdown of the academic career path by stage in Spain.[21] Whilst official 'institutionally' funded contracts can be made – the majority of contracts until tenure track is achieved are externally funded.

Postdoc Junior

After earning their doctorate, researchers go on to a postdoc. Postdoc grants in Spain are usually for two years and Grade C. A postdoc is a continuation of the researcher's training that allows them to further specialize in a particular field and learn new skills and techniques. It may also require them to take on some teaching responsibilities.

This is a key stage when it is necessary to find a research centre and to build a reputation as a researcher by publishing the greatest possible number of articles (Rodríguez-Bravo and Nicholas, 2019; Observatorio Mujeres, Ciencia e Innovación, OMCI, 2021). This stage lasts

[19] https://legalizaloya.com/que-es-grado-universitario-espana/

[20] https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Ficheros/Informe_situacion_jovenes_investigadoras_Espana.pdf

[21] This section is predominantly taken from https://academicpositions.com/career-advice/academic-job-titles-in-spain

approximately three years. At this stage, European funding opportunities include MSCA ITN and ERC StG (from the second postdoctoral year), and funding opportunities in Spain include Juan de la Cierva grants.[22]

Postdoc Senior

Researchers at this stage (on average 8 years) have the possibility of opting for the European grants identified in the previous stage as well as for ERC CoG from the seventh year that substitutes for the ERC StG. Spanish funding includes the following contracts and grants: Ramón Cajal, 13 Grants; JIN Projects; Miguel Servet I and II; Juan de la Cierva Incorporación; Sara Borrell; and Beatriz Galindo Junior. Regional help that forms part of the Science, Technology and Innovation System, for example, Attraction Salamanca in Castilla and León; Serra Húnter Tenure-Eligible Lecturer in Catalonia; GAIN Oportunius – ERC SG in Galicia; Attraction of Doctors with Experience in Madrid; IKERBASQUE Research Fellow in the Basque Country and in Valencia; CDEIGENT-19 Experienced Doctors; ACOND-19 Support to Ramon y Cajal; and SEJI_Excellence Junior. It is at this stage that personal mobility is a fundamental requirement in order to progress as a researcher due to the requirement of mobility regulated by the Science Law,[23] as well as to develop their own reputation and obtain sufficient references and opportunities for collaboration. This stage includes an intensive period of work, where the number of publications and the number of times that researchers are the first author is key in order to secure funding for the next stage of the researcher's career (Rodríguez-Bravo and Nicholas, 2019; OMCI, 2021). At this level, the following positions exist: Profesor/a Ayudante Doctor/a and Profesor/a Contratado/a Doctor/a in universities.

Profesor Ayudante Doctor

This is typically the entry-level academic position in Spain after earning a PhD. These are non-tenured, full time positions for one to five years. To apply for these positions, candidates must receive the *acreditación profesor ayudante doctor* from ANECA, the national accreditation agency.

Profesor Contratado Doctor

A *profesor contratado doctor* position is the next step in the career path. It is the most junior of the tenured positions, but unlike the two highest positions, it does not confer civil servant status. These academics have full capacity for teaching and research. Candidates need three years of postdoc experience to apply for the *acreditación profesor contratado doctor*, a qualification for these positions.

---

[22] https://www.cienc ia.gob.es/stfls/MICINN/Ciencia/Ficheros/Informe_situacion_jovenes_investigadoras_Espana.pdf

[23] ".The mobility and exchange of researchers between different executing agents, public and private, will be promoted in Spain, within the framework of the European Union and in that of international reciprocal cooperation agreements and public-private collaboration agreements , which will be developed within the framework of the Spanish Strategy for Science and Technology or the Spanish Strategy for Innovation, in accordance with the terms provided in this law and in the rest of the applicable regulations"
https://www.cienc ia.gob.es/stfls/MICINN/Ciencia/Ficheros/Informe_situacion_jovenes_investigadoras_Espana.pdf

Personal Titular

This position is equivalent to an associate professor, and involves passing to Grade B, a greater stabilization of the scientific career whether it be in a research centre or in a public university as *profesor/a titular de universidad* . It is a tenured, civil servant position with full capacity for teaching and research. About 40% of Spanish academics have this title, making it the most common position. In order to apply, the candidate's research, teaching, administrative, and supervisory experience needs to be evaluated for the *acreditación profesor titular de universidad*. In relation to public research organisations (PROs), the position *científico titular* (tenured scientist) is followed by *investigador científico* (research scientist). In PROs, there are various stages within this level, as researchers can start with a Ramon y Cajal grant followed by a *científico titular* (tenured scientist) position (which can include distinguished researchers) and finish this stage as an *investigador científico* (research scientist). European funding for this stage incudes MSCA IF, COFUND-FP and ERC CoG contracts (up to 12 years after the doctorate).[24] Candidates must also have EU citizenship.

Catedrático de Universidad

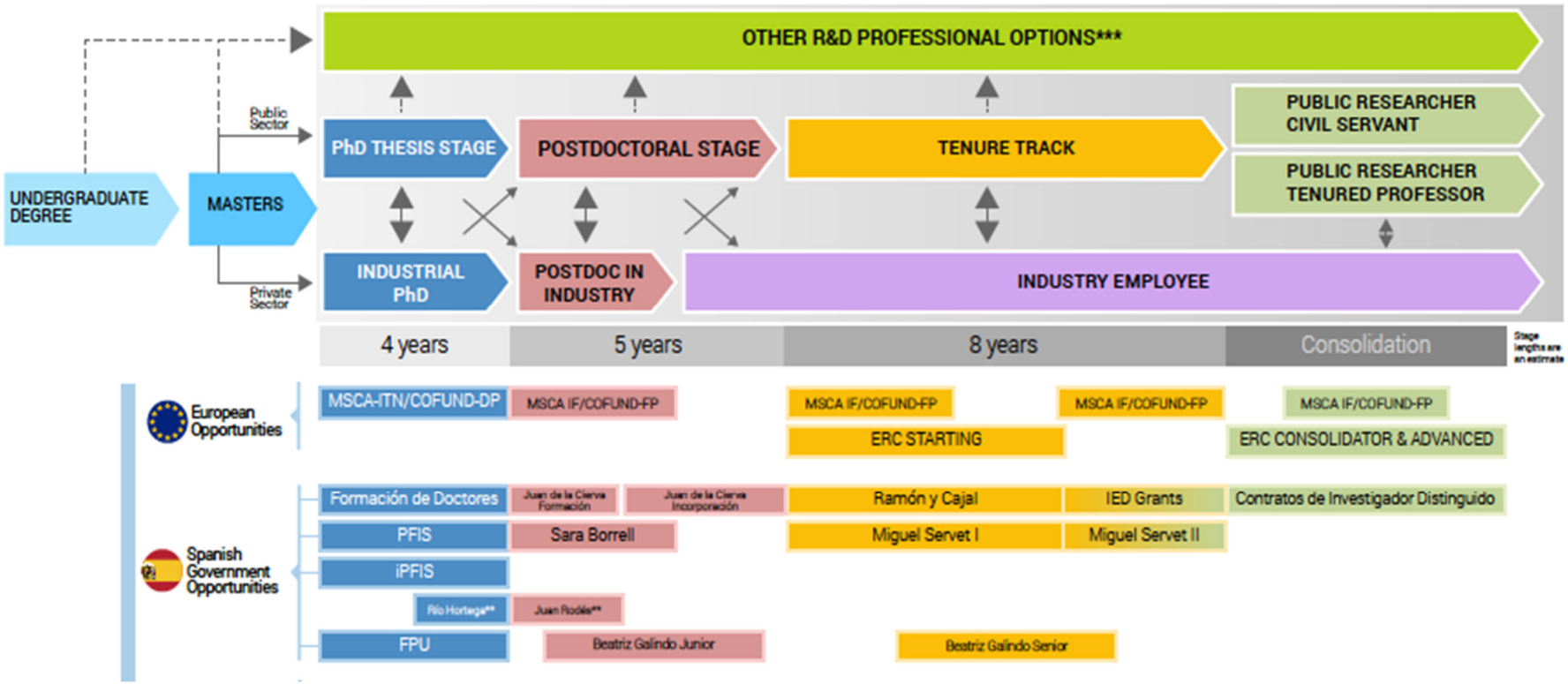
This is the highest ranking academic position in Spain and equivalent to Grade A. It is tenured, civil servant position with full capacity for teaching and research. A *profesor titular de universidad* needs to have been in their position for at least three years in order to apply for a vacant *catedrático de universidad* position. Before they can apply, the candidate's research, teaching, administrative, and supervisory experience needs to be evaluated for the *acreditación catedrático de universidad*. They must also have EU citizenship. This is the highest stage in the researcher's career, and European funding is the ERC AdG. In Spain, there are also *contratos de investigadores distinguidos* (distinguished researchers contracts), that is, contracts that can be concluded with Spanish or foreign research personnel with recognized prestige in the scientific and technical field, who hold a PhD or equivalent; the terms and conditions and duration are determined between the institution and the employed person.

Profesor Asociado

Similar to an adjunct professor, this is a part-time professorship for someone who has a professional career in industry.[25] This is currently a controversial position in the Spanish University System, as many courses at both undergraduate and Master's levels have been assigned to precariously contracted *profesores asociados* instead of being taught by tenure track faculty. In reality, these *profesores asociados* teach many courses and are contracted from one semester to the next with very poor pay. This matter is being dealt with in the new (third draft) Law for University Personnel, Teachers and Researchers, which is currently being circulated. It states that universities will have to employ at least 51% of their staff on permanent contracts.

[24] OMCI, 2021

[25] https://academicpositions.com/career-advice/academic-job-titles-in-spain



Source: Research Career Path in Spain at a Glance!
https://www.fecyt.es/es/publicacion/researcher-career-path-spain-glance-5th-edition

3 Gender Participation in Tertiary Education and Academic Careers

There has been a dramatic increase in the number of undergraduate degrees (ISCED level 6) conferred in Spain – from 118, 294 in 2012 to 177,419 in 2017 – with a major increase from 118, 294 in 2013 to 160, 488 in 2014. However, regarding Master's degrees (ISCED 7), the numbers have dropped substantially, from 165,403 in 2013 to 131,123 in 2017.[26]

Regarding the distribution of these academic degrees by sex, we see that, of the 118,294 academic undergraduate degrees (ISCED 6) awarded in 2013, 68,427 (57.84%) were awarded to women. Of the 177,419 undergraduate degrees (ISCED 6) awarded in 2017, 104,377 (58.83%) were awarded to women. Regarding Master's degrees (ISCED 7), of the 165,403 Master's degrees (ISCED 7) awarded in Spain in 2013, 94,671 (57.24%) were awarded to women. Of the 131,123 Master's degrees awarded in 2017, 75,042 (57.23%) were awarded to women.[27]

Regarding tertiary graduates by field of study and sex, in 2017 among the women who received tertiary degrees, 22.35% received these in education programmes, which were the most popular programmes. This was followed by health and welfare programmes, in which 21.3% of women graduates received their degrees; 18.94% in business, administration and law programmes; 9.6% in arts and humanities programmes; 8.12% in social sciences, journalism and information programmes; 6.1% in services programmes; 6.78% in engineering, manufacturing and construction programmes; 4.74% in natural sciences, mathematics and statistics programmes; 0.99% in agriculture, forestry, fisheries and veterinary programmes, and 0.92% in information and communication technologies programmes.[28]

The gender parity index (GPI) in tertiary education achievement is calculated by dividing the value for females by the value for males. The only data available for Spain are for the years 2016 and 2018. The GPI remained constant from 2016 until 2018, where the value was 1.17 in favour of women in the population aged 25 or over.[29]

Doctoral degrees (PhD)

In 2012, 9,483 people in Spain were awarded a doctoral degree (ISCED 8). This figure more than doubled, to 20,049, in 2017. In 2012, 4,604 (48.55%) of these doctoral graduates were women; in 2017, 10,104, (50.4%) were women.[30]

Scientific staff

In terms of academic staff, the percentage of women teachers in higher education rose very slightly, from 40.20% in 2012 to 43.44% in 2017.[31]

[26] UIS database, 2020.
[27] UIS database, 2020.
[28] UIS database, 2020.
[29] UIS database, 2020.
[30] UIS database, 2020.
[31] UIS- UNESCO Database, 2020.

Data for Spain demonstrate the gender scissors diagram, whereby the percentage of women declines progressively at the higher levels of the academic/research career ladder both in universities and in research performing organisations (RPOs). Drawing on the *Científicas en Cifras* [Female Scientists in Figures] *2021* report (Unidad de Mujeres y Ciencia del Ministerio de Ciencia e Innovación, 2020), we report the following data for different stages of the academic career:

Universities

In the 2018–2019 academic year, at the predoctoral stage, or Grade D,[32] the total number of research staff was 14,439 (47.6% women and 52.4% men). At the first postdoctoral stage, or Grade C,[33] there were 4,902 people (50% women and 50% men). At Grade B level,[34] there were 51,777 (44% women and 56% men). Finally, Grade A (full professors) comprised a total of 11,207 people (24.1% women and 76% men).[35]

Public Research Organisations (PROs)

In the 2018–2019 academic year, Grade D[36] in PROs comprised 1,304 people (52.9% women and 47.1% men). At Grade C,[37] there were 976 people (49.3% women and 49.7% men). At Grade B,[38] there were 3,174 people (40.3% women and 59.7% men). Finally, at Grade A, which corresponds to the PRO research professors scale, there were 652 people (26% women and 74% men).

Whilst data disaggregated by race/ethnicity are not available – data on age are increasingly available.

Regarding the distribution of university research staff by grade/professional category, sex and age, in the 2018–2019 academic year, for those under 45 years of age, the number of men (17,592) was only slightly higher than that of women (16,031), and the distribution by grade or professional category was similar between women and men: 46% of female researchers and university researchers under 44 were in Grade B; and 0.3% of female researchers were in Grade A compared to 0.8% of male researchers. However, in people over 44 years of age, men were in the majority (29,689 men compared to 19,013 women) and the

[32] Includes assistants from public universities and staff predoctoral researcher FPI and FPU

[33] [33] This corresponds to the first position doctor of university access/recent PhDs: PhD assistant from public universities; Juan de la Cierva research staff

[34] This is equivalent to professor, school professor, doctor, reader doctor, visiting doctor and contracted doctor of public universities; faculty with research capacity from attached centers / private universities: teaching staff doctor of faculties or higher technical schools with levels between I and II, teaching staff doctor of faculties or higher technical schools with level III, teaching staff doctor of university schools and other teachings with levels between I and II; Ramón y Cajal research staff, other postdoctoral fellows and visiting researcher.

[35] https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/Cientificas_en_Cifras_2021.pdf

[36] This is equivalent to research personnel in training FPI, FPU and other pre-doctoral contracts for competitive calls and the total staff

[37] This is equivalent to personnel with a contract from the “Juan de la Cierva” Programme, a contract from the "Miguel Servet" Programme, or work and service in charge of research projects

[38] This comprises staff on the scale of PRO scientific researchers, the scale of female scientists holding IPOs, distinguished researcher, or with a contract from the “Ramón and Cajal-

distribution by categories differed between men and women: the proportion of male professors was 28%, and thus double that of female professors (14%).[39]

The number of female researchers under 35 years of age in the PROs (727) was somewhat higher than the number of male researchers (708). However, the number of male researchers promoted to Grade C was greater than the number of female researchers (150 men compared to 131 women). As age increases, this pattern repeats itself: Women researchers are promoted at a slower pace than men.[40]

4 Gender-specific Aspects of Scientific Careers

Gender-related aspects of academic careers are not specific to Spain, and tend to be reflected in the international literature on this topic (see Caprile et al, 2012 for a meta-analysis of gender and science research; Xie and Shuman, 2005; Wennerås and Wold, 1997; Ceci & Williams, 2011). However, a recent report, *Estudio sobre la situación de las jóvenes investigadoras en España* (Study on the Situation of Young Female Researchers in Spain; OMCI, 2021),[41] highlighted factors and causes of inequalities and discrimination experienced by young female researchers in Spain. The study was based on a thorough literature review and a quantitative analysis through an online questionnaire addressed to research staff in public research organisations (PROs) and public and private universities. The questionnaire was organised into three thematic blocks:

1) Attracting talent
2) Retaining talent and developing a career in research
3) Gender bias and sexual harassment[42]

The quantitative technique was complemented with, six virtual focus groups on the above thematic blocks, with participants from PROs, public and private universities as well as from different disciplines, ages, research career stages, family status and from different Spanish cities. The following section is based mainly on the findings of this report, but is supplemented with other sources where relevant.

Attracting talent

The *Cientificas en Cifras* [Female Scientists in Figures] *2021* report (Unidad de Mujeres y Ciencia del Ministerio de Ciencia e Innovación, 2020) detected a lower presence of women students and researchers in the STEM (science, technology, engineering and mathematics) fields, and highlighted a particularly worrying decline in the presence of women in engineering and technology. While women represent more than half of the students enrolled in

[39] https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/Cientificas_en_Cifras_2021.pdf

[40] https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/Cientificas_en_Cifras_2021.pdf, data in Table 3.9 of Annex II.

[41] https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Noticias/Executive_summary_study_about_situation_young_women_researchers_in_Spain.pdf

[42] The survey had 5,606 respondents.

undergraduate studies, they continue to be especially underrepresented in areas such as engineering and architecture (25%). There is also a gradual decline in the proportion of women researchers in the higher education sector working in the area of engineering and technology: in 2019, only 12% of women researchers worked in this area, a percentage that had declined by almost seven percentage points since 2015. Horizontal segregation was also confirmed in the Study about the Situation of Young Female Researchers in Spain (*Estudio sobre la situación de las jóvenes investigadoras en España*; OMCI, 2021): at the first stage of the research career (Grade D), women accounted for 66% of research staff in health and medical sciences compared to 36% of research staff in engineering and technology. Asymmetrical attraction to different types of studies may be linked to various factors, including:

- Stereotypes (associating males with science; stereotype threat – i.e. the fear of confirming the stereotype that women are worse at mathematics than men)
- Hidden curriculum (less exposure to STEM subjects and hidden curriculum that can implicitly transmit sexist/traditional values)

Retaining talent and developing a career in research

Vertical segregation and the decreasing number of women in each stage of the academic/researcher career path can be linked to various factors, including roles, sense of belonging, and assignment of tasks in the research team.[43] For example, when analysing the assignment of administrative tasks, young female researchers were found to be assigned administrative tasks more 'frequently' in comparison to their male counterparts. This finding was confirmed in the focus groups, "where the participants alluded to the burden of administrative tasks and functions falling on their shoulders more regularly than their peers."[44]

Regarding other obstacles, a lack of funding was an obstacle for both men and women, whilst the precarious nature of research contracts was seen to be more problematic by women. In the focus groups, precariousness of the research career was seen as an important obstacle to developing a research career by more female researchers (35.5%) than male researchers (32.4%). Caring responsibilities were also deemed an obstacle – 8.8% of women identified caring for young dependents as the main obstacle (compared to only 4.4% of men).

Another obstacle identified was mobility demands (see section on Gender and International Academic Mobility).

Vertical segregation is particularly problematic in Spain, and may be considered a 'push' factor. The glass ceiling seems particularly hard to crack in Spain – despite recent advances in gender equality which have seen Spain leap 21 places in one year to rank 8th on the global scale in the Global Gender Gap report. Women's share on company boards of directors is still

[43] https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Noticias/Executive_summary_study_about_situation_young_women_researchers_in_Spain.pdf

[44] Ibid p6

only 22%.[45] The *She Figures 2018* report (European Commission, 2019) highlighted the problematic nature of the glass ceiling in R&I in Spain, where the Glass Ceiling Index (GCI) was 1.85 in 2016.[46]

Other obstacles identified in the Study on the Situation of Young Female Researchers in Spain (*Estudio sobre la situación de las jóvenes investigadoras en España*; OMCI, 2021) linked to developing a career in research include: evaluation criteria; a linear career path that is incompatible with childcare and time for oneself; and the distribution of caregiving and household tasks (see the report for a discussion of these issues).

Gender bias and sexual harassment

Gender bias in recruitment processes and evaluation for career progression were also identified as hindering career progression for young female researchers. For example, in the *Científicas en Cifras* [Female Scientists in Figures] *2017* report (Unidad de Mujeres y Ciencia del Ministerio de Ciencia e Innovación, 2018), inequalities favourable to male scientists were highlighted in the framework of grants via the State Plan for funding R&D&I projects. Specifically, the success rate of male principal investigators was 49%, whereas that of female principal investigators was only 42%. Whilst women accounted for 32% of the funding granted, they accounted for 35% of the total number of principal researchers.[47] As noted in *Científicas en Cifras 2021*, despite the increase in the number of women in science, not all of them were pursuing a research career and not all were progressing at the same pace as their male peers. In relation to the calls for R&D&I projects of the State Research Agency (AEI), the proportion of female principal investigators has grown each year both in grant applications (from 32% in 2017 to 37% in 2019) and in grant awards (from 29% in 2017 to 35% in 2019). However, women tend to have a lower success rate than men and to receive proportionately less funding than their male counterparts. The biggest gender gap is in the area of medical and health sciences (success rate of 44% for men compared to 37% for women).

Regarding sexual harassment, 14% of the women surveyed (compared to 1.7% of men surveyed) had suffered sexual harassment; 8.6% of these women and 1.2% of these men had been subjected to sexual harassment in the workplace. One of the women commented:

> *Although you suffer sexual/workplace harassment, people don't take it seriously, or these behaviours are normalized. The despotism of many bosses (men) towards their workers, treating them badly, insulting them, and making them doubt their capacities is very common in the scientific world. We need more education about the subject, action/behaviour protocols and protection for the victims (because in a great majority of cases they don't*

[45] https://www.forbes.com/sites/anagarciavaldivia/2019/12/20/spain-enters-the-worlds-top-10-for-gender-equality/

[46] "A GCI of 1 indicates that there is no difference between women and men in terms of their chances of being promoted. A score of less than 1 means that women are more represented at grade A level than in academia generally (grades A, B, and C) and a GCI score of more than 1 indicates the presence of a glass ceiling effect, meaning that women are less represented in grade A positions than in academia generally (grades A, B, and C). In other words, the interpretation of the GCI is that the higher the value, the stronger the glass ceiling effect and the more difficult it is for women to move into a higher position." *She Figures 2018* (European Commission, 2019: 125).

[47] pp. 57–58.

report it due to precarious working situation). Scientific researcher, woman, aged between 35 and 40 years old, natural sciences, PRO. (Translated from the Spanish.)

Spanish Gender Regime & Institutional Setting

Lombardo and Alonso, (2020: 454) described the Spanish welfare regime as "part of the Mediterranean type, [half way] between conservative, social democratic, and liberal types. This is because it mixes conservative elements of familism, another key legacy of the authoritarian period, whereby the main weight of care for children, elderly, and dependents is attributed to women within the family, with social democratic universal access to health and education, and liberal means-tested benefits (Del Pino 2013)." Spain has however been identified as a bit of an 'outlier' of the Southern Mediterranean type countries – for example, the country can be considered as being at the forefront of developing gender equality legislation. The European Science Foundation (ESF) classifies EU countries into four groups according to the differences in prevailing attitudes towards gender roles and in the cultural and political environments contributing to their definition. With the introduction of gender equality measures from the Zapatero period, Spain is considered to be an exception within the group of Southern European countries which show stereotypical attitudes towards gender roles (European Science Foundation, 2010). Lombardo and Alonso (2020) went on to explain the complex institutional setting and the distinct competences that the different levels of government exercise in Spain:

> "Spain is an EU Member State that features a complex institutional setting, where regions hold extensive competencies over key fields, including welfare and equality (Alonso and Verge, 2014)… The post crisis context of EU and state-level political priorities helps to understand how Spain's gender regime shifted toward a more neoliberal-conservative type through processes of Europeanization (Lombardo, 2017) and state recentralization justified in the name of austerity (Colino, 2013). However, left-wing regional cabinets and local governments emerging from civil society platforms showing a continued commitment to gender equality and responsiveness to the demands of the feminist movement played a key role in resetting neo-liberal – conservative changes." (Lombardo & Alonso, 2020: 450).

With the change in central government in 2018 and the increased push for greater investment in R&I coupled with a renewed interest in gender equality policies, things are looking up. Spain is once again leading the way in legislation for gender equality and science policy.[48]

5 Gender and International Academic Mobility

Gender-specific data on international mobility

A total of 44,297 outgoing international students from the Spanish University System participated in a mobility programme in the 2018–2019 academic year. These students tended to

[48] https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Ficheros/Informe_situacion_jovenes_investigadoras_Espana.pdf

be young adults: 64.7% of undergraduate students were aged between 18 and 21 years, and 80.5% of Master's students were under 26 years of age. The percentage of women among these students varied significantly according to the level of studies – at 61.9% for Bachelor's and 38.1% for Master's degrees. The European destination countries with the highest number of outgoing international students were Italy, France and Poland, with 7,659, 3,757 and 3,424 students, respectively.[49]

The international mobility rates of higher education sector researchers during their PhDs by sex in 2016 was a staggering 70.4% for women and only 37.7% for men – compared to the EU-28 average of 18.8% for women and 17.7% for men (Source, MORE3 Survey; cited in *She Figures 2018,* European Commission, 2019: 111). Thus, the sex difference in international mobility in Spain was 32.7% in favour of women. One possible explanation is the following:

> "Mobility may be a way for women to compensate for gender based practices in their national labour markets. In a context where temporary mobility is valued per se and where career progression is particularly difficult, women might perceive a stronger pressure to be more mobile than men, which may encourage their mobility rates." Cañibano et al (2015: 4).

In their study "Gender Patterns of Temporary Mobility among Researchers in Spain", Cañibano et al. highlighted that "women show systematically significantly higher mobility rates than men, going from 25% in 1979 to 43% in 2009. This increasing tendency for mobility among women is consistent with results found by others (González, Ramos, and Malpica-Lander, 2013; Docquier et al, 2021.)."

Regarding gender-specific participation in international research collaborations, the women to men ratio of authorships in all fields of R&D in the period 2013–2017 was 0.6, compared to the EU-28 average of 0.5.[50]

The international mobility rates of higher education sector researchers in post-PhD career stages by sex in 2016 were 28.0 for women and 29.8 for men.[51] The gender patterns of temporary mobility among researchers in Spain identified by Cañibano et al. (2015) in their study were as follows:

> "In their overall rates of mobility across fields, women are more internationally mobile than men. But compared to men: first women's frequency of international visits is lower; second their visits occur at earlier ages and stages in their careers; third their visits are

[49] Notes (1) Within the group of incoming international students, it distinguishes between those who access the SUE through a mobility program, such as the Erasmus + program and those who enroll in an ordinary programme. (2) Only students enrolled in the SUE are counted as outgoing international students who participate in a mobility programme to study some credits abroad." (p. 85 https://www.universidades.gob.es/stfls/universidades/Estadisticas/ficheros/Datos_y_Cifras_2020-21.pdf) Data base EDUCA base consulted: http://estadisticas.mecd.gob.es/EducaJaxiPx/Datos.htm?path=/Universitaria/Internacionalizacion/Estudiantes_Internacionales//l0/&file=Salida_Tot.px&type=pcaxis

[50] Data source: Computed by Elsevier using Scopus data and cited in *She Figures 2018* (European Commission, 2019: 145).

[51] Source: More3 Survey; cited in *She Figures 2018* (European Commission, 2019: 112).

shorter; and finally, their destinations are closer to home. In general these patterns hold across fields, with exceptions in engineering and health which may have different institutional structures and expectations that relate to stronger connections to industrial and non-academic (hospital) settings, depending on field. The patterns documented here support our conjections that women's international mobility occurs at times (ages and career stages) that are likely to be associated with lower caring responsibilities for children and other family members, and occurring in ways (frequency, duration, and destination) that permit women to fulfil both work and family responsibilities." (Cañibano et al., 2015: 10)[52]

Access to (international) networks and research cooperation

Regarding international collaboration in publications, a total of 84,333 papers were published in Spain in 2008–2009. Around 71% were produced in collaboration between two or more centres, and 41% included at least one foreign partner. Regarding internationally co-authored papers, multilateral collaboration was present in 12,094 papers (35% of internationally co-authored papers) whilst bilateral collaboration was the case in 22,515 papers (65%). The presence of collaboration varied by field: interestingly, the lowest values were found in the humanities and social sciences and the highest in physics, biomedicine and clinical medicine. Physics had the highest percentage of internationally co-authored papers (64%), followed by the multidisciplinary field (53%).[53]

In the Study on the Situation of Young Women Researchers in Spain (*Estudio sobre la situación de las jóvenes investigadoras en España*; OMCI, 2021), mobility was identified as an obstacle for progression in research careers. In this case, 7.5% of women researchers (compared to 5% of male researchers) saw demands for mobility (and the inability to fulfil these demands) as the 'main obstacle' hindering career advancement; 26% of women researchers (compared to 20.3% of men) identified demands for mobility as an 'important obstacle'; 28.6% of women (compared to 36.3% of men) said it was 'not an obstacle at all', and 38% of women (and 38.4% of men) said it was 'not an important obstacle'.[54]

Effects of COVID-19

The Women and Science Unit – part of the Ministry of Science and Innovation – published a paper in June 2020 on gender and science in the context of COVID-19.[55] In Spain, the pandemic and the subsequent lockdown has revealed aspects of the Spanish science and innovation system linked to gender (in)equalities. The paper noted that the time that women devoted to domestic activities and caregiving was three times higher, on average, compared to men in Spain and in Europe; gender-based violence had also increased. The paper therefore

[52] The data derive from PhD holders and their international research visits available in the Scientific Research Information System of Andalusia (SICA) as of 30 May, 2009. Andalusia employs approximately 20% of all Spanish researchers.

[53] Bordons, M., González-Albo, B., Aparico, J., & Moreno, L (2014) The Influence of R&D intensity of countries on the impact of international collaborative research: evidence from Spain, Scientometrics, 102, 1385-1400 (2015).

[54] https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Ficheros/Informe_situacion_jovenes_investigadoras_Espana.pdf p. 39

[55] https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/UMyC_GeneroyCienciafrentealCoronavirus.PDF

documents the increased difficulties for women scientists to carry out their work from home – putting a brake on opportunities for career development.[56]

The paper discusses the consequences of COVID-19, questioning the need for international mobility:

> There has been an obstacle to the careers of the scientists, directly related to conciliation, which during the pandemic has disappeared: national mobility and constant international mobility. This criterion of excellence consists in achieving an international projection of research outputs that, in practice, translates into trips for stays, visits, invited talks, congresses, meetings, etc. This requirement of impact and international visibility of the scientific results, especially in the postdoctoral stage – which matches the age that many people begin to have diverse family projects has had a negative gender impact. Since today our R+ D+I moves in a European and global circuit, this was one of the unquestionable aspects associated with a cutting-edge career in science. And yet when mobility was disrupted due to the pandemic, international research teams have remained in contact, and many face-to-face activities have been replaced by online modalities. It has become clear that reducing mobility is possible and the internationalization of science does not have to be synonymous with constant international mobility. The global science networks, the international consortia, and the internationalization of Spanish science have continued through the use of information technologies and communication, with varying degrees of difficulty depending on the cases.[11] (Translated from the Spanish.)

Significance of international mobility for a scientific career

There is a direct tension between the requirements of the accreditation agencies (both national and regional) for international mobility for a scientific career in Spain, with more idiosyncratic institutional mechanisms for career progression, defined by a highly competitive environment with very few tenure track positions available. Institutional loyalty in this instance may be highly rewarded with a permanent position.

International mobility that takes the form of temporary stays in other research institutions has been increasingly encouraged over the last 15 years, and is considered a form of achievement by the institutions that evaluate researchers (at national level, the National Quality Assessment and Accreditation Agency, ANECA). Specifically, in order for international stays to be 'accredited' towards permanent contracts and assistant lectureships (four-year contracts), these stays must be of at least three months' duration (ANECA, 2007). This is strengthened by the draft Law 14/2011 (currently under review) which establishes the recognition of mobility in the evaluation processes. It states: "the mobility of teaching and research staff, converting it into a requisite to access permanent positions and an incentive in certain phases of the professional career, and on the other hand promote the internationalization of the university system attracting international teachers (including Spanish teachers/researchers that are currently residing outside of Spain, stimulating their incorporation in the academic career in our universities and research centres." (Law 14/2011, p. 7; translated from the Spanish).

[56]https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/UMyC_GeneroyCienciafrentealCoronavirus.PDF

Despite these international mobility requirements, pressure remains to stay within known institutions, as competition is so high for permanent positions. As explained by Cañibano et al. (2015):

> "Over PhD training period, implicit contracts emerge between PhD candidates and their supervisors. [In some cases] the loyalty, dedication, and availability of young researchers towards their department or research team are eventually rewarded with a stable position that takes the form of a permanent contract or position as a civil servant. In this way the Spanish system is characterised by internal labor markets and inbreeding compared to openness and competition (Cruz-Castro and Sanz Menéndez, 2010) … In such an institutional context the risks associated with changing jobs and with international mobility are high for researchers who prioritize the stability of their professional situation in Spain."

Germany as a destination country for international mobile scientists

Germany is internationally recognised as one of the main references for high quality research in certain disciplines (e.g. biomedicine). This means that researchers (depending on their specific fields) could find the option of working in a high status working environment very attractive. Research institutes like Max Planck or Fraunhofer have a very high international status, and researchers could relish the opportunity to develop part of their academic career in a prestigious institution. It would also prove an exciting opportunity to develop international networks to be drawn on throughout the research career. This would be even more favourable if contracts offered were for a considerable duration, for example (at least two years). This is particularly important given that the precarious nature of the research career is one of the main reasons that women researchers decide to pursue another career.

Until now, the UK has been traditionally recognized in Europe as an attractive destination for carrying out a research stay. This may be linked to language, as scientists and researchers tend to be proficient in English and thus the barrier of learning another language does not have to be overcome. With Brexit, this will presumably change. Germany may now become more attractive as a destination. Regarding the German language as a potential barrier, the experts we interviewed for this study had differing views. Some regarded German as a considerable barrier, not so much in the formal workplace – given that English remains the de facto international scientific language – but in informal workplace settings. Others did not think that it would prove problematic. A proactive strategy on the part of German research funders could be to stress in advertisements for mobility funding programmes that knowledge of German would not be a requirement and that German courses would be available free of charge.

Need for support and change for women scientists

Structural support would be needed to attract women scientists and researchers.

One interesting idea for funding might be to have a three-year programme that would consist of two years' funding in an institution in Germany followed by one year's funding in an institution in Spain. This would enable smoother reintegration into the Spanish research system and could potentially mitigate fears of not being able to continue with a research career

in Spain. It would also move away from the redundant notion of 'brain drain' and be considered a win-win solution for both institutions. This would see increased research co-operation across research institutions in Spain and Germany – which could materialize into building partnerships for Horizon Europe funding.

Networking opportunities could be developed to ensure that those taking advantage of the mobility stay were able to integrate and get to know other researchers within the institute.

Enabling funding of dual-career couples would also help to ensure that families and not just individuals were able to relocate.

Family relocation packages as well as individual support packages could be provided to help to look for a flat, schools, etc.

Access to German courses could also be provided, which would serve two functions: firstly, to acquire a basic/working knowledge of German; secondly, to provide a forum to meet other researchers in a similar situation – which could then form part of an informal support network.

6 Conclusions

This conclusion is written in response to the question: How high is the potential of female scientists in Spain who could be attracted to a research stay in Germany due to their qualification and willingness to be internationally mobile? This report highlights how there are various push and pull factors that might make a research stay in Germany an attractive option for female scientists currently resident in Spain.

One of the main factors is that the higher education and research system in Spain is still characterised by the economic crisis that started in 2008 and subsequent austerity policies that have resulted in cuts to the education budget that have been maintained to date. The effects of these cuts have been felt particularly in the public universities, where the precarious situation for university teaching and research personnel has intensified. There is a lack of stable, tenure track research positions in the higher education and research and innovations systems in comparison to the highly qualified, skilled labour force looking for permanent positions in these sectors.

Gender participation in tertiary education and academic careers is characterised by both horizontal and vertical segregation. Regarding vertical segregation, the glass ceiling has been highlighted as particularly severe in Spain – which may prove a definitive 'push' factor for mid-career-level female researchers to look for research positions outside of Spain. This is coupled with the highly competitive research environment whereby career progression (and even staying within the research system) is extremely difficult given the current lack of opportunities for tenure track positions.

In Spain, despite research findings that demonstrate that more women researchers than men perceive international mobility to be an obstacle to developing a research career, statistics demonstrate that more women than men engage in international mobility during their early-stage research career. This could be due to the perceived lack of opportunities for

promotion for women within the Spanish research system. However, there seems to be a current political will to change this situation. Research stays in institutions in different countries could therefore prove to be an attractive option for women researchers in early stages of their research careers. Germany is seen as an attractive destination – mainly due to the large number of prestigious research institutes and universities. A policy for fostering greater research collaboration between Spanish and German research institutes may prove to be an attractive way to encourage Spanish researchers to carry out a research stay without the disadvantages of losing contact with their 'home' research institute in Spain.

Bibliography

ANECA [Agencia Nacional de Evaluación de la Calidad y Acreditación] (2007) Protocolo de evaluación para la Verificación de títulos Universitarios Oficiales, Unidad de Proyectos de Innovación.

Bordons, M., González-Albo, B., Aparico, J., & Moreno, L (2014) The Influence of R&D intensity of countries on the impact of international collaborative research: evidence from Spain, Scientometrics, 102, 1385-1400 (2015).

Caprile, M., Addis, E., Castaño, C., Klinge, I., Larios, M., Meulders, D., Muller,J. O'Dorchai, Palasik, S.M, Plasman, R., Roivas,S., Sagebiel,F. Schiebinger,L., Vallès, N. and Vazquez-Cupeiro, S. (2012) The Meta-analysis of Gender and Science Research, Brussels, European Commission.

Cañibano, C., Frank Fx, M., & Otamendi, J. (2015) Gender and patterns of temporary mobility among researchers, Science and Public Policy, 2015, 1-12.

Ceci, S. & Williams, W. (2011) Understanding current causes of women's underrepresentation in science, PNAS, 108, 8, pp3157-3162.

Del Pino, E. (2013) The Spanish welfare state from Zapatero to Rajoy: Recalibration to retrenchment. In Politics and society in contemporary Spain from Zapatero to Rajoy, ed. Bonnie N. Field and Alfonso Botti, 197–216. New York: Palgrave Macmillan.

European Commission (2019) She Figures 2018. Gender in Research and Innovation: Luxembourg.

European Science Foundation (2010). Southern European countries which show stereotypical attitudes towards gender roles

Fernández Zubieta A, Ramos Vielba I and Zacharewicz T. RIO Country Report 2016: Spain. EUR 28508 EN. Luxembourg (Luxembourg): Publications Office of the European Union; 2017. JRC105983

Fernández Zubieta, A., Ramos Vielba, I. and Zacharewicz, T., RIO Country Report 2017: Spain, EUR 29192 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-81829-5, doi:10.2760/976893, JRC111466.

Lombardo, E. & Alonso, A. (2020) Gender Regime Change in Decentralized States: The Case of Spain, Social Politics 2020, 27,3, pp 449-466.

Observatorio Mujeres, Ciencia e Innovación (OMCI), adscrito al Ministerio de Ciencia e Innovación. (2021). Estudio sobre la situación de las jóvenes investigadoras en España, Secretaria General Técnica del Ministerio de Ciencia e Innovación, Madrid.

Rodríguez-Bravo, B; Nicholas, D. (2019). "Reputación y comunicación científica: investigadores españoles en el inicio de su carrera". El profesional de la información, v. 28, n. 2, e280203. https://doi.org/10.3145/epi.2019.mar.03

Unidad de Mujeres y Ciencia del Ministerio de Ciencia e Innovación (2018) *Científicas en Cifras 2017.* Secretaria General Técnico del Ministerio de Ciencia e Innovación, Madrid

https://icp.csic.es/archivos/Igualdad/Legislacion/informes/Cientificas_cifras_2017.pdf

Unidad de Mujeres y Ciencia del Ministerio de Ciencia e Innovación, (2020) Científicas en Cifras 2021, Secretaria General Técnico del Ministerio de Ciencia e Innovación, Madrid. https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/Cientificas_en_Cifras_2021.pdf

Wennerås, C. & Wold, A. (1997) Nepotism and Sexism in Peer Review, 7, 4, pp46-52.

Xie, Y. & Shuman, K. (2005) Women in Science, Career Processes and Outcomes, Harvard University Press.

Annex 1: Tables

Table 1: Gross R&D expenditures (GERD) in Spain

	2012	2013	2014	2015	2016	2017	2018
GERD as a percentage of GDP: Spain	1.29	1.27	1.24	1.22	1.19	1.21	1.24

Source: http://data.uis.unesco.org/ (CEWS Template)

Table 2: GERD by sector of performance in Spain

	2012	2013	2014	2015	2016	2017	2018
BES	0.68	0.67	0.65	0.64	0.64	0.67	0.80
GOV	0.25	0.24	0.23	0.23	0.22	0.21	0.21
HES	0.36	0.36	0.35	0.34	0.33	0.33	0.33

Source: http://data.uis.unesco.org/ (CEWS Template)

Note: BES = business enterprise sector; GOV = government sector; HES = higher education sector

Table 3: Female Researchers as a percentage of total researchers in each sector in Spain

	2012	2013	2014	2015	2016	2017	2018
BES	29.37	30.25	30.62	30.67	30.45	30.92	-
GOV	48.46	48.73	48.54	50.22	50.96	51.23	
HES	40.81	41.32	41.67	41.91	42.09	42.49	
PNP	47.9	48.06	51.72	51.75	50	51.99	

Source: UIS (CEWS Template)

Note: BES = business enterprise sector; GOV = government sector; HES = higher education sector; PNP = private non-profit sector

Table 4: Tertiary graduates by level of education and sex in Spain

	2012	2013	2014	2015	2016	2017	2018
Total no. of graduates ISCED 6		118294	160488	175051	174629	177419	
Graduates ISCED 6 female number		68427	96720	103178	103435	104377	
Total no. of graduates ISCED 7		165403	151370	131253	129787	131123	

Graduates ISCED 7 female number		94671	84739	73073	73944	75042	
Total no. of graduates ISCED 8	9483	10504	10889	11316	14694	20049	
Graduates ISCED 8 female number	4604	5237	5361	5667	7463	10104	

Source:http://data.uis.unesco.org/

(CEWS Template)

Table 5: Proportion of women among academic staff by grade 2016 in Spain

Grade A	21%
Grade B	42%
Grade C	48%
Grade D	49%
Total	41%

Source: *She Figures 2018* (European Commission, 2019)

Annex 2: Expert Interview Guide

1) Are you aware of any data sources:
    a. Gender-specific participation in funding programmes for international mobility?
    b. Gender-specific participation in international research collaborations (research projects, publications)?
    c. Frequency and intensity of international mobility during the professional life of scientists?
2) What are the best sources to explain:
    a. The different ways that scientists are involved in international networks and research co-operations?
    b. The gender-specific differences in the size, internationality or types of networks and research cooperation?
3) Do you have knowledge of international mobility of Spanish researchers?
    a. Can you briefly describe some of the pull/ push factors that you are aware of?
4) Do you think carrying out an international mobility stay in a research institute or university in Germany would be an attractive option for Spanish researchers?
    a. Do you think this would be the same for both men and women researchers?
5) As far as you're aware what are the structural barriers and access to international mobility for Spanish post-doc researchers?
    a. Do you think these are different for male and female scientists?
        i. If so, how? Why?
        ii. Do you have evidence for this?
6) To what extent do you think the access to and effects of international mobility are gendered?
7) To what extent do you think that Germany is attractive as a destination country for researchers working in Spain?
8) What support structures and infrastructure would be needed to encourage female researchers to embark on international mobility stays in Germany? (institutional and individual levels)