OCTOBER 2016

Postdoctoral Funding Schemes in Europe

SURVEY REPORT

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October 2016

'Postdoctoral Funding Schemes in Europe': D/2016/13.324/9

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Executive Summary

The postdoctoral period is a critical phase in a researcher´s career: it is when (s)he chooses whether or not to pursue a scientific career, and succeeds in achieving that goal, or not. Over recent decades, the number of postdoctoral researchers has increased, and the supply of tenured positions has become lower than the demand. Although many candidates embarking on a PhD aspire to an academic career, only a small proportion can actually expect to make one in research.[1]

The Science Europe Working Group on Research Careers has carried out a mapping of support opportunities for postdoctoral researchers, or 'postdocs', to improve understanding of what funders do to support researchers' careers after the completion of their PhD, and to learn whether existing funding schemes can be improved in terms of career support. The mapping covers 104 funding schemes dedicated to researchers at the career levels of R2 and R3 ('PhD holders or equivalent who are not yet fully independent' and 'researchers who have developed a level of independence', respectively[2]). While career development is the focus of the mapping, there are often other related objectives as well. The most frequent of these are: supporting international mobility, building up a research group/laboratory, developing new businesses, and developing leadership. The size of the schemes, the coverage of expenditure, the length of funding, and the working conditions and environment of the researcher are all important variables, but ones that can only be evaluated within each national context.

A grant is often regarded as the most important career-boosting factor. Additional career development measures (mentoring, skills training, and so on) are often not on offer, and when they are, in most cases their implementation depends on the host institution. It is rare that funding organisations verify if these measures have been effectively implemented. However, these organisations share the responsibility for the postdocs that they fund; they should therefore play an active role, demanding from employers a higher degree of commitment and a career development plan for these researchers, and giving support for career development measures. Host institutions should also provide good working conditions for the researchers, in order to make a research career attractive for the best candidates: for example, flexibility in social security options, measures to facilitate the compatibility of work and private life, and funding for when the researcher returns after a mobility phase.

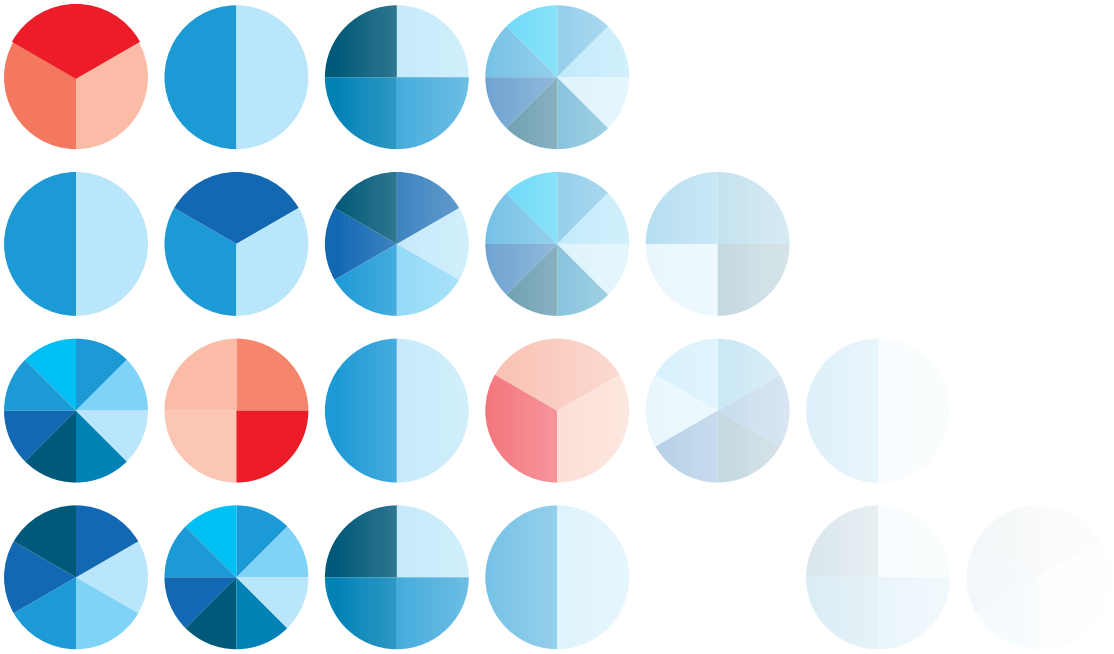
There is a growing concern that early-career researchers risk becoming a source of cheap labour without stable employment contracts, and worse, without sound career perspectives. In addition to the negative impact on the quality and quantity of the researcher's scientific productivity and on his or her career prospects,[3] this could also be a source of inefficiency for the research system as a whole.

An aspect which has so far received little attention from research organisations is how to prepare postdocs for a career outside of academia. Although research organisations could argue that this is not in their realm, at the very least they need to make efforts to identify the candidates best suited to an academic career, so that the others may focus on different opportunities. A small number of research organisations do offer special postdoc programmes for an industrial postdoc or for intersectoral mobility. A large pool of candidates induces a certain level of competition; the competition is needed to be able to select the best researchers, and to attract such a large pool, it is better to offer the potential of a career outside academia.

Nevertheless, when deciding about funding postdocs for a limited period of time, funding organisations should consider the availability of eventual permanent positions. National authorities, funders and research performing organisations must carefully monitor developments in the research sector, and must also co-operate for a more systematic and comprehensive approach to career development. For this purpose, stakeholders need to reach a joint understanding of what benefits a postdoc phase can bring, and what are a postdoc's legitimate needs for a rewarding career subsequently.

In addition to the mapping of funding opportunities for postdocs, this report includes a literature review focusing on the major challenges faced by doctorate holders when trying to acquire or maintain a position in the labour market (see page 73). Researchers at the postdoctoral stage of their careers face three main challenges when it comes to employment – adverse labour market conditions, gender inequity and barriers to mobility – as well as several other challenges such as institutional affiliation, and lack of mentoring or supervision offered to researchers.

The Research Careers Working Group would like to acknowledge the contribution of Filomena Parada from EURODOC, who was instrumental in producing the literature review.



1 Introduction

Research plays a vital role in the economy and international competitiveness of Europe. For Europe to maintain its leading position in global research it needs to continue to produce highly skilled, well-motivated and well-rewarded researchers. In this context, it is crucial to pay particular attention to researchers who are at the postdoctoral level: this is the decisive phase when a researcher chooses his or her career path. The opportunities given to researchers at this level, in combination with a well-balanced career structure, have substantial impact on the quality of the research system as a whole.

The postdoctoral phase plays a pivotal role in affecting the researcher's career perspectives. However, knowledge of the working conditions and career opportunities for postdoctoral researchers, or 'postdocs', in Europe is scarce. To obtain a more systematic overview, the Science Europe (SE) Working Group (WG) on Research Careers has carried out an exploratory mapping of funding opportunities for postdocs. As there are huge differences in and across countries in how postdoc funding policies take into account career considerations, the main aim was to map the variety of schemes, to identify common issues and bottlenecks, to learn whether existing funding schemes can be improved regarding career support, and to identify and spread good practice.

This survey provides funding and performing organisations with indispensable information that they require in order to take into account the new and changing needs and aspirations of postdocs. It also enables postdoc schemes throughout Europe to be compared, which should spark emulation and competition between funders and thus lead to improved funding policies and schemes.

This work is based on the SE Roadmap, of which improving the career opportunities for researchers in Europe is one of the nine priority action areas.[4] One of the main objectives of the SE WG on Research Careers was to understand what research performing organisations (RPOs) and research funding organisations (RFOs)[5] can achieve within their own remits. The WG is expected to make recommendations and to promote a number of relevant actions. This document represents the output of one of the WG's two task forces and addresses the WG's work plan aimed at "mapping, evaluating, improving and co-ordinating"[6] mobility and career structuring instruments and schemes, where appropriate.

The following sections briefly define the group that is the subject of this report (namely the population of postdocs at whom the funding programmes in this study are aimed), and outlines the different systems in which RFOs and RPOs act and in which researchers try to build their careers.

1.1 What is a Postdoc?

The definition of a postdoc varies, but the postdoctoral phase normally refers to the period in a researcher´s career between being awarded a PhD and entering a permanent position. It is a time when the researcher becomes independent, whilst still developing his or her scientific competences and professional skills. Postdocs can have different levels of independence and recognition, which are used as the defining feature in the European Framework for Research Careers.[7] Referring to this Framework, the postdoc period corresponds largely to phase R2 ('PhD holders or equivalent who are not yet fully independent') and the beginning of phase R3 ('researchers who have developed a level of independence'). The National Postdoc Association in the US uses another definition which stresses the transient quality of a phase, which is also characterised by training and mentoring whereas gaining independence is less prominently expressed: "A postdoctoral scholar [postdoc] is an individual holding a doctoral degree who is engaged in a temporary period of mentored research and/or scholarly training for the purpose of acquiring the professional skills needed to pursue a career path of his or her choosing."[8]

The postdoc phase is generally characterised by a temporary appointment, involving substantial research for the purpose of acquiring the professional skills needed to pursue a research career in a more permanent position. The appointment can vary regarding employment status (such as fellow, employee, or scholar), salary and duration. The postdoctoral phase has become, in many fields and countries, the compulsory career step following a doctoral degree for those wishing to stay in academia. Typically, postdocs carry out their research under the supervision and mentorship of a more senior researcher, whilst acquiring scientific independence. Under 'normal' circumstances, an academic position after a PhD can be regarded by scholars as the positive signal that they belong in academia. Thus

a postdoc position is associated with the privilege of being able to develop one's own research profile by broadening and deepening one's academic and professional skills. Those who enjoy opportunities to pursue their own ideas and develop their scientific networks will have a successful postdoctoral experience, which will strongly determine their future career opportunities.

Providing a long-term perspective can make a research career more attractive and, in that context, 'tenure track' is considered as a possible solution. Tenure track is a fixed-term contract publicised with the prospect of a permanent position (tenure) at a higher level, subject to positive evaluation of the candidate at the end of the contract. Currently, there seems to be a tendency to introduce tenure track as an alternative to traditional pathways to professorship.[9]

The academic systems in Europe are highly diverse: in some countries, researchers can obtain a permanent position very early in their career; in others, it will take them much longer (see Section 1.2 below).

In order to establish a detailed overview of the European landscape, the WG decided, for the purpose of this study and further work, to use the following broad definition of a postdoc:

> *The postdoc phase is the period after the PhD when the PhD holder is still not fully independent. It can vary in length, mentoring, supervision, degree of leadership, type of funding, and so on. Though temporary appointment is prevalent, in some countries a postdoc may hold a permanent position.*

1.2 National Career Structures

Many doctorate holders leave the academic system soon after having completed their doctorate.[10] In countries such as Germany, Switzerland and the United Kingdom where the number of PhD holders is high, the labour market absorbs them so well that their unemployment rates are usually rather low.[11] This is a clear sign that the skills and qualifications of PhD holders are needed and appreciated by industry and other sectors outside academia. However, the focus of this study is on those who remain in academia after obtaining their PhD.

The immediate period after completing a PhD is a turning point for many researchers when they choose to pursue an academic or scientific career, and succeed in achieving that goal, or not. Most early-stage researchers embark on a career with no secure permanent academic position in sight. They have to compete with other young talents as well as with more experienced researchers, and the majority will eventually continue their career outside academia. The career paths from doctorate to professorship or to another permanent position in academia differ widely across Europe. The League of European Research Universities (LERU) has defined three basic models which co-exist in Europe:

- The 'probation on-the-job model', prevalent in the United Kingdom, with permanent employment at an early career stage;
- The 'habilitation model' in central Europe, with permanent employment at a later career stage; and
- The 'centralised state approbation model' in France, which combines tenure and habilitation.

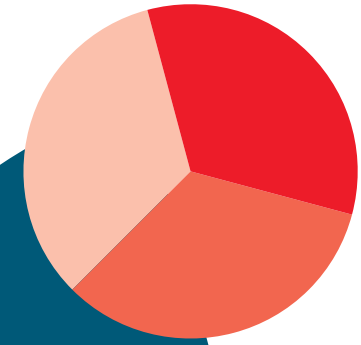
The variations within each model, however, differ greatly.[12]

Regardless of the diversity in national research and funding systems in Europe, funding opportunities generally become more competitive after PhD completion, and this phase is often regarded by early-career researchers as a bottleneck. Therefore from the funders' perspective, one needs to ask whether there are attractive and attainable funding and support opportunities for researchers at postdoctoral level. When designing funding and support, organisations should take into consideration several aspects: the demands from academia, industry and society as a whole; the aims, ambitions and qualifications of the researcher; and the objectives of the national academic system with its respective career structure – even though research is inherently international and researchers are mobile. Some schemes target a specific level in a research career, for example the postdoc stage. This may indicate that research organisations are aware of the challenges facing researchers at that level and aim to foster a new generation of researchers. Postdocs constitute a fundamental component of research teams and are necessary for the implementation of research projects. Too generous funding opportunities at the postdoctoral level might, however, attract more researchers than the system can actually absorb in

the long run, which could lead to a blocked system, or else attract candidates who may not be best qualified for an academic career.

Furthermore, the researchers' interests are not always in line with the priorities of the research institutions. The early-stage researcher´s need for employment security and academic freedom must be kept in balance with the institution's interest in the flexibility needed for recruiting the most talented, best qualified and most motivated researchers at all career levels. However, reliable and projectable careers for early-stage academics and access to high-level research infrastructures increase the attractiveness of a research career, and have an impact on the quality of research.

	Researcher´s perspective	Institution´s perspective
Permanent position early in a career	Academic freedom and employment security at an early stage → attractive and motivating, possible positive effect on quality. Less powerful external incentives for mobility and scientific development.	Opportunity to develop research staff according to institution´s strategy and priorities. Binding staff members for a lifetime may however have implications for efficiency and competitiveness in the long run.
Permanent position late in a career	Many years of uncertainty in fixed-term positions and a highly competitive system → high personal costs. May lead to demotivation and contribute to 'the leaky pipeline' (women dropping out of research careers because of poor work–life balance).	Opportunity to appoint the best candidates who have proven their competences over many years, but risk of losing highly qualified researchers to attractive offers outside academia.



"In order to keep the 'right' workers in the academic system, a research career has to be attractive"

1.3 Challenges Faced by Postdoctoral Researchers

The postdoctoral phase deserves special attention, as it seems that in recent years, careers in academia have become less and less attractive. Moreover, research systems could be at risk if they are no longer able to attract and retain the best suited people. This development is of concern to many observers and, of course, to those it directly affects.

Whilst doing his or her research, a postdoc faces a number of challenges that the research system also has to deal with in some way or another:[13]

Developing Academic Independence

It must be clear that independence and autonomy should increase as time goes by after the completion of the doctorate, and with growing qualification. Both the employer and the researcher share responsibility for developing the researcher's independence.

Preparing for a Permanent Position

In the qualification phase of an early research career, mobility and fixed-term contracts are often the norm and they can be, within limits, acceptable. However, at some point, the researcher – like all other workers – aspires to more stable employment with adequate social security. Researchers are often left unsure about their future in academia, the final decision often coming rather late when it is more difficult to change career. In order to be able to move successfully to another profession, it would be helpful for the researcher to be adequately prepared. Yet postdoctoral training is strongly biased towards academia, and intersectoral mobility is hindered by the lack of career planning. Moreover, to achieve professional recognition and advancement, researchers are faced with the obligation to publish in the best international peer-reviewed journals. Thus, they are simultaneously confronted with different requirements which are rarely compatible.

In spite of insecure prospects and presumed declining attractiveness, the number of PhD holders pursuing or wanting to pursue an academic career has risen in the last few decades. At the same time, the number of available permanent positions in the academic sector has not risen, or at least not at the same pace, and in some cases has actually declined.[14]

Consequently, early-stage researchers are competing for fewer attractive and/or permanent positions, meaning that pressure on funders has greatly increased. Funding systems are based on competition in order to support 'the best'. However, if the competition is too great, non- or extra-scientific factors tend to influence the outcome.

Mobility

Mobility is often necessary and beneficial for a researcher's career, but is not a goal in itself.[15] Researchers in the initial phase of their career can benefit significantly from experiencing different environments, widening their perspectives, expanding their international networks, and gaining new opportunities for cross-sectoral and/or multidisciplinary collaborations. Whilst most mobile researchers feel that extended periods spent abroad are highly rewarding,[16] international mobility can also prove very difficult due to the differences between academic systems, the possible loss of networks, the heterogeneity and incompatibility of social security systems, and the non-portability of pension rights. Mobility can also be very challenging when trying to combine family life and work.

Career Development

In order to keep the 'right' workers in the academic system, a research career has to be attractive. Early-stage researchers should develop a clear picture of their career ambitions and the opportunities offered to them. They should also develop their competences and skills in order to be competitive.

2 The Mapping: Procedure, Outreach and Limitations

As a basis for the mapping, the Working Group prepared a template,[17] inspired by a survey carried out in 2004 by the Steering Group for Human Resources and Mobility of the EU Commission. The WG members filled in this template for each 'funding scheme dedicated especially to individual career development for R2 and R3 researchers or equivalent'[18] offered by the relevant RPO or RFO within Science Europe's membership. The WG members also sent the template to any funding organisation in their country that was not a member of Science Europe but offered postdoc funding programmes, asking them for their co-operation. In that respect, the present survey is not exhaustive, because for many countries the WG received input from SE member organisations only.

The template includes 26 questions covering objectives, scale, working conditions, career perspectives, and monitoring. The mapping includes funding schemes targeted at the R2 and R3 research phases,[19] where the researcher can apply for his or her own salary/position and where the funding period is at least six months. The questions in the template and the different schemes are hereafter referred to by numbers which can be found in Appendices 1 and 2.

A total of 109 templates were returned: five were outside of the scope of the survey and thus not included in the analysis. Of the remaining 104 templates, 81 were targeted at postdocs, five were open to all career levels after a PhD (№ 7, 39, 40, 69, 92), 16 were targeted at R3 level only (№ 3, 5, 11–14, 30, 38, 43, 57, 62, 63, 87, 89, 99, 102), and two at postdocs but without salary (№ 2, 3). The latter were included because of their clear career development objectives. A total of 23 European countries and three international organisations are represented in the survey.[20]

The mapping reflects a very diverse academic landscape and funding structure in Europe. As career structures vary,[21] so do the time and content of a postdoc phase and the postdoc's status. Postdoc, R2 and R3 positions can be funded by an RPO or RFO through specific schemes, or as an element in a more comprehensive research project. As this mapping has concentrated on schemes especially targeted at individual career development for R2 and R3 researchers, it will not give a full picture of funding and career development opportunities for researchers at this stage. The WG has attempted to take into account the complexity of this context when analysing the templates.

2.1 The Characteristics of the Schemes

The WG asked for funding schemes dedicated especially to individual career development for R2 and R3 researchers. Consequently, the main objective mentioned in the templates is career development (54 out of 104), including career development at an early stage (44 out of 104), and at a more experienced stage (7 out of 104). Three schemes are targeted at career development for women (№ 10, 11, 86). Approximatively one in four schemes (28 out of 104) support international mobility, both outgoing and incoming, and two aim at promoting international co-operation (№ 32, 33). Two intersectoral mobility programmes were reported (№ 20, 55): the Danish National Advanced Technology Foundation offers an 'industrial postdoc', and the Postdoctoral Researcher Scheme of the Academy of Finland (№ 26) supports mobility of any kind. Eight schemes aim to build up a research group or laboratory (№ 2, 3, 5, 6, 12, 13, 30, 42), one to develop new businesses (№ 90), and 15 to develop leadership (№ 28, 30, 37, 38, 44–46, 88, 90–92, 99, 101, 102, 104).

The following objectives were mentioned in the templates:

- Enable talented, promising, creative, innovative researchers to develop their research career/ carry out research of their own choice
- Promote mobility: outgoing, incoming (including attracting researchers back to the home country), and intersectoral (public private partnership)
- Enable women to embark on an academic career/reintegrate/avoid dropouts after child birth or due to family obligations
- Develop independent researchers/research leaders
- Integrate early stage researchers within internationally recognised research teams
- Give opportunity to set up, manage and/or consolidate a research group
- Give opportunity to establish, or develop excellence in a (new) field
- Qualify for new, more ambitious grants
- Qualify for permanent and or/more advanced position
- Improve quality of postdoctoral training
- Qualify for leading position
- Qualify for habilitation
- Develop competitive researchers/research communities
- Provide creative opportunities for creative/ adventurous/innovative/pioneering researchers
- Develop new business
- Accommodate for dual clinical–research training career path

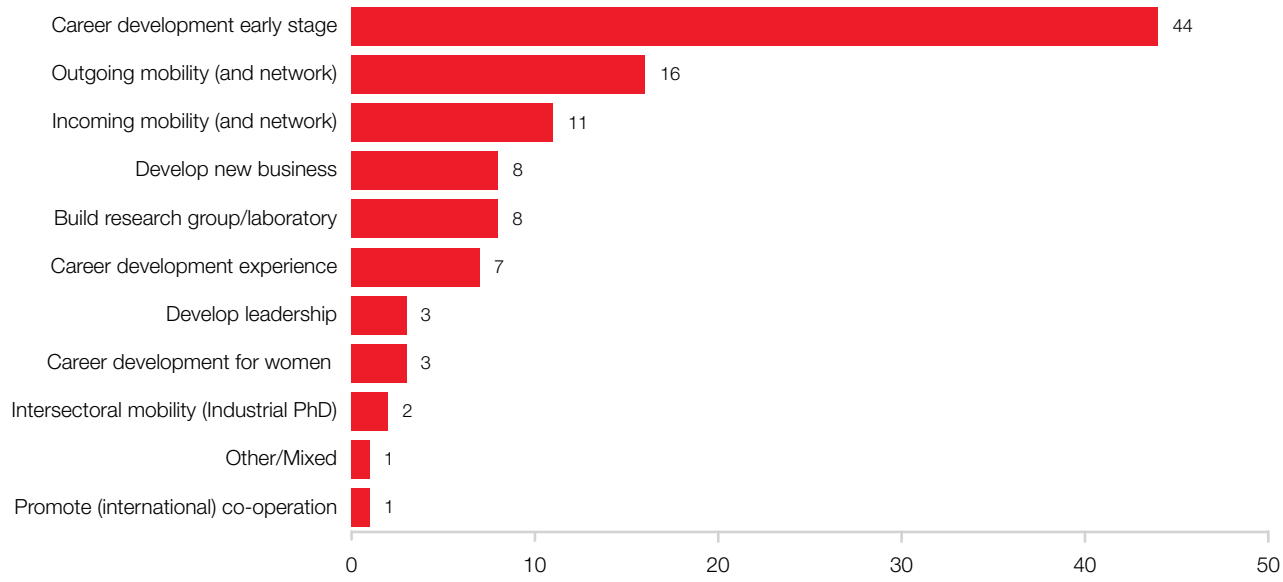


Figure 1 Objectives of funding schemes indicated by respondents

More than half of the schemes were targeted at all or most disciplines, 22 at medicine and health, and 12 at science and technology.[22]

2.2 Size of Financial Support

In this survey, there are a number of small programmes with only a handful of awards or grants per call or per year (about 25% offer ten awards or fewer per year). On the other hand, there are also several large schemes which attract a high number of applicants: 14 schemes have 1,000 or more applicants per year and eight schemes make 300 or more awards per year. The success rates vary considerably: a quarter of the schemes (26 out of 104) has a low rate of 15% or under (which indicates a high level of competition); about one-third (32 out of 104) has a 16–30% success rate; 17 schemes have a success rate of up to 50%; five have one of 50% or higher. For the remaining 21 schemes no success rate was given.

The volume of funding also varies widely: in more than half of the schemes the total grant is less than €500,000 (30 schemes award up to €200,000 and 27 up to €500,000), while only a few schemes (12) give more than €1,000,000 per application. These are usually long-term grants (five years) for junior research group leaders, in other words 'excellence' awards. Some schemes have no fixed limit, the amount of the grant depending on the applicant and the specifics of the project.

Funding schemes for individual researchers can be either 'bread-and-butter' grants or 'excellence' grants. The former provide the bulk means for scientific research, while the latter distinguish the excellent from the average. Postdoc grants can include both types, the purpose of funding a project overlapping with that of funding an outstanding researcher and his or her career development. In times of tight budgets and increasing numbers of grant proposals, funding rates tend to fall. Success rates in this sense can reflect the level of competition in this particular stage of a researcher's career. However, as the number of schemes differs, so does the number of funders per country (for example, there is one research council for all disciplines in both the Netherlands and Germany, but there are seven separate disciplinary research councils in the United Kingdom). Therefore, one cannot simply compare the schemes, their mandates and their success rates.

"Employers and funders must ensure that researchers are provided with the working conditions which guarantee them the flexibility considered to be essential for successful research"

3 Observations and Findings

The Working Group concentrated on the four core elements of the funding of an early-stage researcher: (i) the overall conditions under which researchers work; (ii) the gender issue; (iii) career development; and (iv) mobility. Other interesting topics, such as eligibility criteria and the review process, may be dealt with in subsequent studies.

3.1 Working Conditions

In accordance with the European Charter and Code for Researchers (C&C),[23] employers and funders must ensure that researchers are provided with the working conditions which guarantee them the flexibility considered to be essential for successful research. They must also endeavour to provide working conditions which allow both male and female researchers to combine personal and work life. The C&C explicitly states that researchers should benefit from stable employment contracts and "fair and attractive conditions of funding and/or salaries with adequate and equitable social security provisions."[24] Since the adoption of the Commission Recommendation on the C&C in 2005, more than 1,200 institutions from 35 European countries (and European/international organisations) have expressed their explicit support for the C&C and 232 institutions have obtained the Commission's 'HR Excellence in Research' logo (as of May 2016).

The survey template specifically asked for: the type of funding offered by the scheme (position or stipend, including social security coverage or not),[25] 'total grant', annual salary for the project leader, and what funding the scheme provided for. Regarding the funders' role, it is important to note that while funders usually provide the funds for the researchers' salaries, they do not employ the researcher. The contractual employment relationship is between the researcher and the host institution, so the way in which this relationship is organised depends largely on the RPO (university and non-university institution).

Level and Nature of Support

The funding schemes cover a wide range of expenditures, with personnel costs for the applicant and possibly for other personnel, often combined with one or more expenditures such as travel and living costs, infrastructure and equipment. Some schemes also fund activities (conferences, training courses, networking activities, and so on). A small number (10 out of 102[26]) fund only the applicant's subsistence.

The grant holders' salaries or stipends in the different funding schemes cannot be directly compared. First of all, net wages in working contracts, including social security contributions, differ from gross salaries (these were most likely indicated in the funding schemes) because the level of social security deductions, taxes, and so on vary from country to country.[27] Salaries cannot be directly compared to stipends, which are usually tax-free but often do not include social security. In addition, prices and cost of living also vary throughout Europe. Moreover, several funding schemes do not provide fixed sums for salaries but instead mention that the effective salaries will depend on the level of experience, the host institution's policies, and so on. Such variability is not necessarily to the disadvantage of the researcher and may be evidence of good practice, since it indicates compliance with legal requirements and institutional policies, and shows that the grant holder's qualifications are taken into account. On the other hand, in some cases variability may also mean lack of transparency. For instance, some funding schemes indicate that the level of salary is subject to the grant holder's negotiating of it with their employer, putting researchers less experienced in such negotiation (or coming from a country with other standards) at a potential disadvantage. Taking this into account, it is more useful to compare qualitative data, such as the type of support and what extras and/or benefits are offered.

A large majority of the schemes providing funding for the project leader's salary (82 out of 102) indicate that the grant holder has a 'position'. A total of 55 out of 102 schemes explicitly state (or confirm) that social security contributions are included, and in the remaining 27 schemes out of 102 there is also evidence for social coverage in the additional information provided ('working contracts' with the research institution, and so on). Positions for the grant holders are offered by funding schemes from all types of funders: ministries, research councils/ academies of science, private funds, foundations, funders at supranational level, and research performing organisations. Four schemes offer stipends with an option for at least partial social coverage such as health insurance and/or pension

insurance, and 11 schemes out of 102 provide stipends with no social coverage at all. Stipends are offered by different types of funders: research councils, as well as foundations. These data indicate that funders seem, in general, very supportive of the recommendations expressed in the C&C.

Only 18 schemes out of 102 offer stipends. Of these, 15 are for funding or facilitating mobility: ten for outgoing and five for incoming mobility. In fact, one of them offers a stipend (with optional pension insurance) for the outgoing phase but a working contract for the (optional) return phase to the home country (№ 8). The three other schemes are for career development of early-stage researchers, or for the development of leadership. When taking a closer look, there may be specific reasons to opt for a stipend instead of employment: a high degree of independence in selecting the host institution, freedom from administrative constraints, and being exempt from other (non-research related) obligations which an employment contract could potentially impose on the researcher. In view of limited or even absent portability of social security benefits when moving across Europe or world-wide, stipends might seem attractive. Funders may alleviate the disadvantages of stipends by various support measures. Indeed, 12 of the 15 schemes offer allowances for travel, six for family support, and two for pension insurance. One may therefore conclude that stipends are acceptable for mobility schemes, but are not the only option since there are also 13 mobility schemes (seven outgoing, six incoming) that offer a position.

In general, there is a preference for employment rather than stipends. Employment comes with social security, legal protection and representation in the institution's governing bodies. Therefore, this development is welcome and should continue.

Duration of Support

The postdoctoral stage is often characterised by fixed-term positions, and the researcher's further career in academia may depend on grants from highly competitive funds until a tenured or a permanent position is available. Short-term contracts oblige the researcher to write new applications frequently in order to secure the next career step, whilst a longer-term contract will provide him or her with more time and space to concentrate on his or her scientific and professional project. However, there might be good reasons for shorter funding periods due to the nature of the programme or project.

Almost half of the schemes (49 out of 104) offer funding for three to four years, whilst about a third (30 out of 104) provide funding for two years or less. Short-term funding is prevalent in mobility schemes. Several schemes have a flexible time limit: the duration of funding depends on the applicant, the project and/or the application itself. One in five schemes (22 out of 104) offer funding for five years or more. The objective of these 22 schemes is to enable the grant holder to set up a group or a laboratory, and these are often referred to as 'excellence' grants. That is to say, the excellent postdoc gets more time to develop his or her excellence even further. It also means that as the time between obtaining a doctorate and reaching a permanent position increases, there are only a few programmes that cover the whole postdoc stage. Most R2 and R3 researchers need more than one grant during that period.

3.2 Gender

During the postdoc phase, the 'leaky pipeline' effect (when women drop out of a career) is clearly apparent or, as some argue, women are instead retained at lower career stages. As the figure on the next page shows, during the postdoc phase the proportion of women decreases.[28] This makes it also a priority task for research organisations to ensure that women have the same chances as men for a successful academic career.

Without having explicitly asked a gender-related question in the survey template, the gender perspective can nevertheless be identified in seven schemes from four different countries (Austria, Germany, Norway and Switzerland). Two schemes, both initiated by the Austrian Science Fund, have gender balance as a primary focus (№ 10, 11). Both programmes are reserved for highly qualified female scientists at consecutive career levels R2 and R3. They aim to encourage women to embark on university careers and to increase the proportion of female lecturers and professors. The programmes also include publicity measures to enhance visibility of successful women in research. Conversely, the fact that a funder has no funding scheme dedicated to a particular issue, such as gender balance, does not mean that no attention is paid to it.

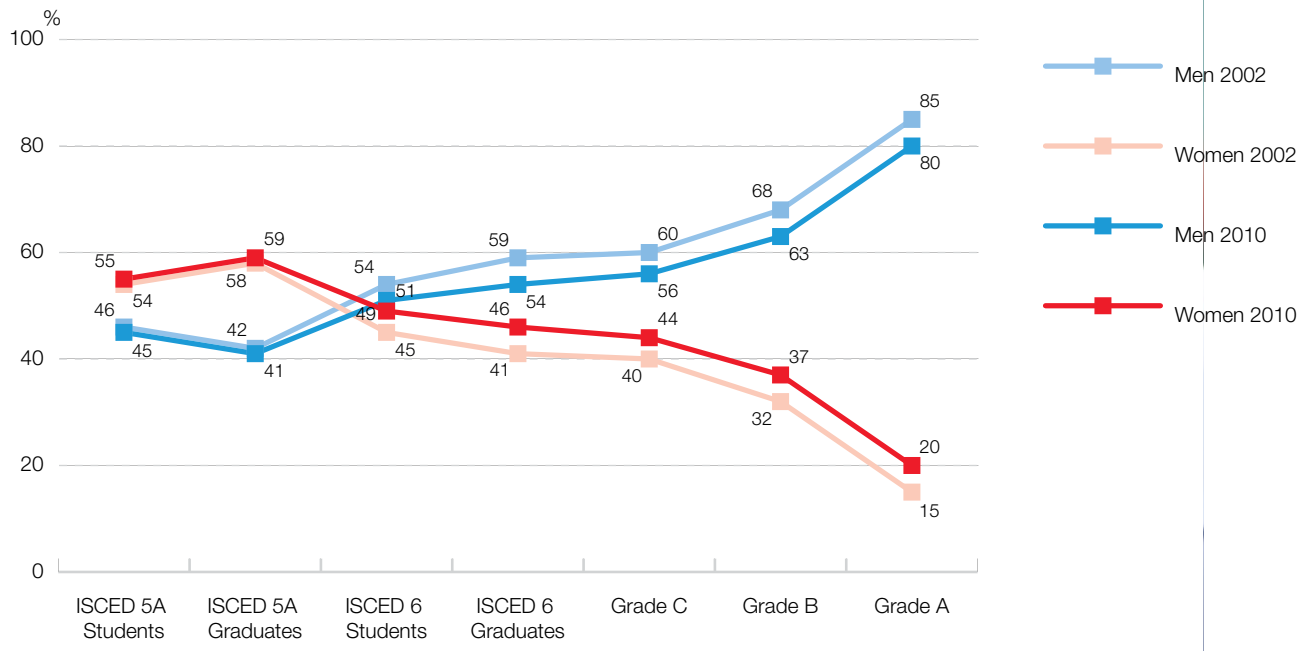


Figure 2 Proportions of men and women in a typical academic staff, EU-27, 2002–2010

There are even legal barriers in some countries, where, for example, funders are not allowed to offer special programmes for women because such schemes would be deemed to disadvantage male researchers.

Research funding and performing organisations have introduced a variety of measures to ensure that female researchers have equal access to funding. Measures taken are not always directly related to individual funding schemes. In Germany for example, a different far-reaching approach is used to improve the gender balance in science: the Research-Oriented Standards on Gender Equality, which also has implications for female postdocs, though it is not a specific programme.[29] In the United Kingdom the research councils have issued a 'statement of expectations',[30] while the Netherlands Organisation for Scientific Research (NWO) uses a different approach: the Dutch research council tops up the funding of its 'vidi' and 'vici' programmes (№ 62, 63) when the university promotes a female researcher to a higher position. In any event, all funders should have defined approaches aimed at increasing women's participation in the research system.

Two programmes promote the reintegration of female researchers at the R2 level after a delay or an interruption in their scientific career due to child care or due to the professional career of their partner (№ 4, 86). Other instruments for promoting better gender balance are the use of quotas and targeted information towards potential female applicants (№ 45), PR measures to enhance visibility of successful women in research (№ 33), and, finally, an obligation in the selection procedure to assess gender balance in the project and gender perspectives in the research (№ 65, 66).

Good Practice

Programmes that increase the visibility of successful female researchers fulfil a dual purpose: they help them to build a career and they provide valuable role models for women who are considering entering a research career. Information targeted at female researchers could raise the number of female applicants and, consequently, the number of female grantees.

This brief analysis supports the conclusions of the European Commission report on gender equality published in September 2014.[31] However, the low number of reported actions could also result from the fact that the WG selected schemes with focus on postdocs and not specifically on female researchers. This means that these results and conclusions need to be interpreted with caution and should be compared with the analyses carried out by the SE WG on Gender and Diversity.

3.3 Career Perspectives and Career Development Elements

Career development is not only about recruiting the best talent, but even more about developing and realising the potential of every researcher. The question is to what extent and in what ways European postdoctoral funding schemes reflect this ambition.

Assuming that the postdoctoral level is a transitory stage on the way to a permanent position, one would expect that this would be reflected in the design of programmes geared towards postdocs. The WG wanted to find out whether these programmes do indeed encompass elements which would help the grant recipients develop their careers and would give them a long-term perspective in academia. The WG therefore asked for:

- Long(er) term perspective/tenure/support for career development (Question 11)
- Training/mentoring/supervision (Question 16)

One conclusion is that funding as such is regarded as perhaps the most important career promoting element, in that the grant actually increases the possibility of the grant holder obtaining a permanent position. It is also clear that most schemes have several objectives, of which career development is only one. Other objectives mentioned which might be indirectly conducive to career advancement are:

- Building knowledge, competence and capacity in a scientific field or a thematic area
- Promoting excellence in science
- Increasing innovation and economic growth
- Enhancing co-operation and knowledge transfer between academia and industry/society

It is likely that the schemes highlighted in this mapping exercise, which are mostly offered by RFOs, reveal only part of the picture. In most countries, the host institutions and employers are RPOs. The role and mission of funders and performers in the career development for researchers are different, and vary between countries. Unfortunately, the number of RPOs that have responded to the survey is rather small. It would appear that the RPOs take a different and more extensive responsibility for career development activities. The funders, by contrast, often consider that this is not their responsibility and expect the host institution to take it on. It is already known from a 2012 survey analysis by the ESF Member Organisation Forum 'European Alliance on Research Career Development' (EARCD) that less than half of the organisations analysed had relevant policies for career development in place.[32]

Longer-term Perspective and Support for Career Development

Out of the 104 templates, roughly two-thirds (69 of 104) had entries for the question on whether the scheme offered longer-term perspectives (tenure or support for career development). From the answers, it became clear that the question was not understood in the same way by all respondents: many entries lacked detailed information on the kind of measure in place, on who is responsible and on whether the measures are voluntary or not. This may be due to the general phrasing of the question. It may also indicate a lack of attention to career development issues, or an indirect approach to them. It should also be noted that there might be activities in place that do not appear in this survey, since not all funders in Europe and very few RPOs provided responses on the survey template. Though the answers present a varied picture, it seems that the funding scheme is regarded as an important career-promoting factor: as part of a comprehensive funding chain, by the experience and qualification gathered during the funding period, or by the visibility or reputation of the programme. As mentioned above, the funding itself is regarded as playing an important role in the development of a research career. Finally, roughly one-third of the schemes provided no answer to the question. One can only guess whether, in those schemes, no measures are provided or whether the host institutions are expected to take responsibility for career development.

There is no precise legal definition of 'tenure'. In this survey, we have used 'tenure' to describe a 'permanent academic position' (not necessarily a professorship) and 'tenure track' as the promise to get a permanent position after a period of probation and a successful evaluation. It is noteworthy that only very few schemes (seven of 104) from two different countries (France and Germany) either include tenure or at least a tenure track option (№ 30, 31, 36, 38, 41–43). The most obvious explanation is that most of the schemes are proposed by funders, whereas schemes including tenure track prospects are

generally offered by RPOs as employers. It can hardly be the funders' mandate to challenge the universities' autonomy by committing them to employ the grant holder after the funding period has ended. Only RPOs, including universities, can offer permanent academic positions and can use tenure as a strategic tool, as do, for instance, the University of Aalto or the Technical University of Munich.[33] In Italy, Law 240/2010 introduced for universities a two-stage fixed-term position reserved for doctoral graduates which can be considered a peculiar example of tenure track. The first step has a duration of three years, which can be extended to a maximum of five. If considered successful by the RPO, the candidate can enter a second three-year fixed term stage. If during this period the candidate is successful in getting the so-called *'Abilitazione Scientifica Nazionale'*[34] he or she has the right to become a public servant in the RPO, with the qualification of associate professor (R3). Some universities offer professorships to researchers who have successfully competed for a prestigious grant, such as a European Research Council (ERC) Starting Grant. In this case, the funding itself is not a career advancing instrument. But, once again, the differences in national career structures and academic systems throughout Europe must be underlined. In an academic system where researchers obtain a permanent position at an early stage, the question of tenure does not arise. In other systems with a lack of qualified researchers – that is, where researchers are in high demand and can choose between several attractive options – the offer of a permanent position or tenure track is less enticing.

Apart from the long-term perspective, the WG wanted to learn more about career development support and service to the grantees. Nearly two-thirds of the schemes (69 out of 104) have additional career development measures, such as career planning, travel grants for interviews or coaching. Five schemes offer career development activities in co-operation with the host institution. A few of the funders make it a binding requirement for the host institutions to offer career support services (Health Research Board of Ireland and the National Research Fund of Luxembourg, № 52 and 60); others seem to hope that this happens but appear not to check if it does. Obviously, good career advice can come from different sources but it is important that early-stage researchers have access to a wide range of advice, regardless of where it comes from.

Training, Mentoring, Supervision

Professional development for researchers is an issue on the political agenda of many universities, funding bodies and governments. It has also been underlined in recent EU policy documents, notably the European Commission Communication 'Investing in skills for better socio-economic outcomes'[35] and the Communication 'A Reinforced European Research Area Partnership for Excellence and Growth'.[36] According to the European Research Area (ERA) Steering Group for Human Resources and Mobility (SGHRM), there appears to be a rising awareness of professional development issues; however, there are few systematic frameworks in place.[37]

A little more than half of the survey templates (58 of 104) had entries for Question 16, which means that almost half of the schemes do not offer any professional development activities. This does not necessarily signify that grantees do not benefit from some type of support, as the host institution can offer such activities without the knowledge of the funding organisation. However, in most cases, the respondents did not specify whether the activities are offered by the funder or a RPO. The relatively low number of reported activities also shows that the issue of professional development of researchers is still new in many countries referenced in the survey, and that some have a more established tradition than others. This leads to the important question of what the role of RFOs and RPOs in career development should be. It is clear that universities and other research performing institutions as employers have the main responsibility for career development, but how can funders support the universities and stimulate good practice? What is good practice for funders? In the view of the WG, while career development is the responsibility of the universities, funders use public money and have a responsibility to ensure that it is spent wisely. Funding organisations should monitor whether the early-stage researchers they fund do indeed receive appropriate support for career development. If not, the funder should intervene and emphasise that this is the employers' duty. There are also other players involved, namely the supervisors. It has generally been taken for granted that they – having the disciplinary 'know-how' – know what is best for the early-stage researchers in their working groups and laboratories. However, that does not necessarily mean that supervisors always use their know-how.

In the 58 schemes that have entries relating to career development, a varied set of opportunities are offered:

- Individual supervision, mentoring, coaching, counselling
- Training programmes including courses, professional competences/transferable skills, training in management/leadership skills
- Individual training plan (tailor-made) defined by grantee and hosting scientist/mentor
- Individual career plan
- Networking activities (seminars, workshops, conferences, cohort of grantees, national and/or international research networks)
- Career events such as fairs, symposiums, 'boot camp'
- Alumni membership and activities
- Option for teaching and supervision experience

In the schemes that include some kind of supervision, mentoring or training programme, 33 of these programmes are compulsory and 19 are optional; 30 schemes indicate that these activities are organised within the HR framework. These figures only refer to what is known to the funding organisations, and do not necessarily give the full picture of what is offered to the grantees. In Norway,[38] for instance, the ministry has regulated that each postdoc in the university sector must have a supervisor, whereas the host institution/university as an employer is responsible for follow-up. Other countries have similar regulations or are in the process of developing them.[39]

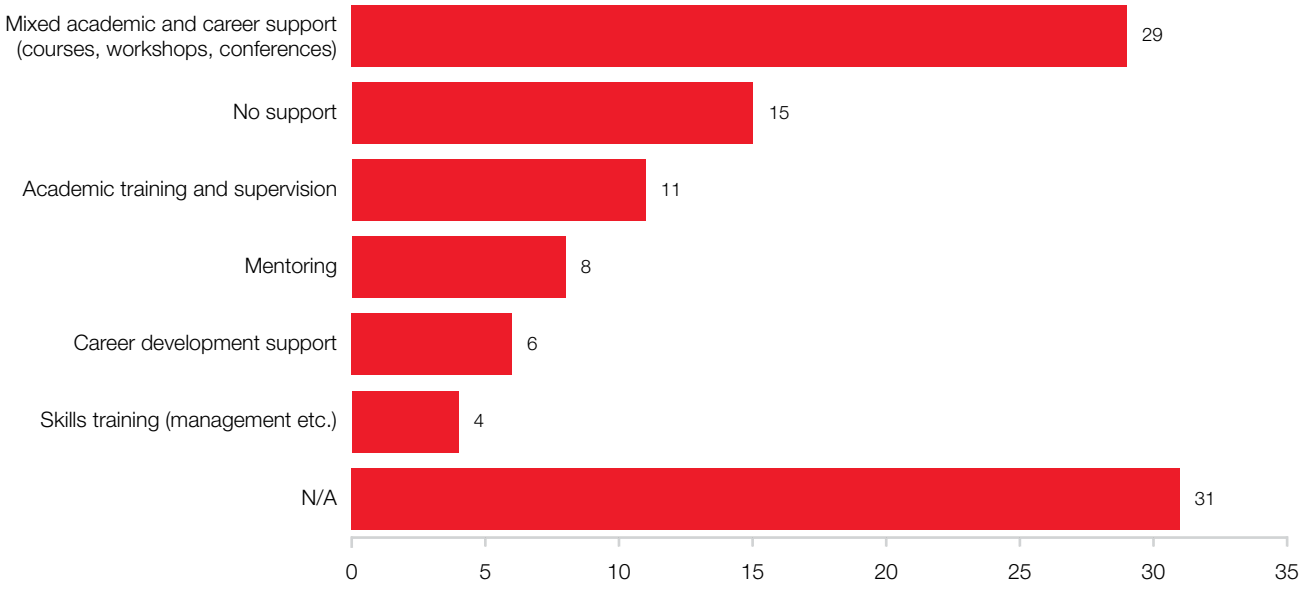
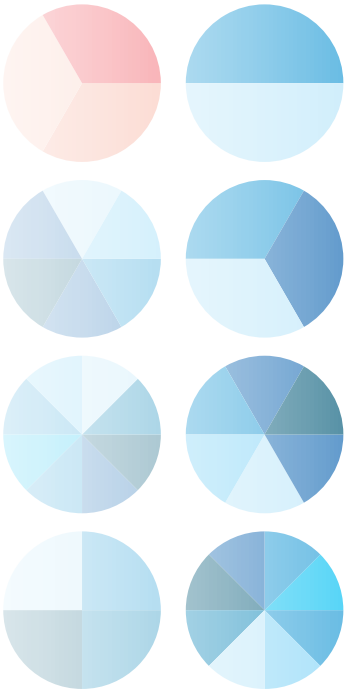


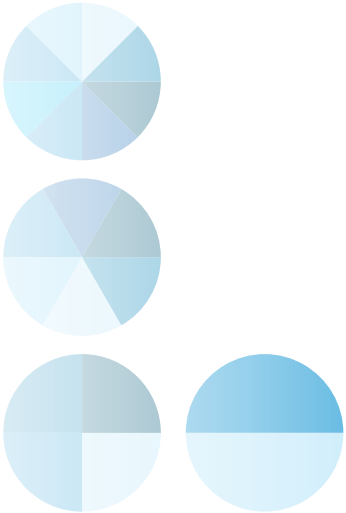
Figure 3 Training/Mentoring/Supervision support offered by funding schemes

Good Practice

It can be helpful for funding organisations to ask for the mandatory provision of an academic mentor for each early-career researcher they fund, as this adds a certain level of commitment (№ 10, 89, 92, 93). The same applies for mandatory career development plans (№ 10, 11, 61, 81). When the mentor, the host institution and the funded postdoc talk about the career development plan and sign such a document, each party is made aware of the issue. Hopefully in the long run it will become natural for supervisors to think in terms of career development for the early-career researchers in their groups.

Likewise, postdocs should be encouraged to approach the topic actively. In the Irish Research Council's 'Postdoctoral Fellowship & Enterprise Partnership Programmes' (№ 53, 55), the grant holder and the academic mentor are required to create a training and career development plan for the duration of the grant and period beyond. Grantees are obliged to report on their development progress at six-month intervals as part of their overall progress reports. In addition, the Irish Research Council hosts an annual symposium which focuses on funding opportunities and career development for researchers at all stages of their careers. In the FRICON mobility programme of the Research Council of Norway (№ 66), the postdoc is made responsible and is requested, in his or her application, to submit a Personal Career Development Plan "in order to aid the provision of the research training programme" which "will act as a reference for the researcher herself/himself to monitor the progress and take corrective actions when necessary."[40] An example of how to make the supervisors and host institutions aware of and involved in the future of their postdocs is for the funding organisations to introduce a code of practice for PhD and postdoc training which contains some basic principles on how to treat the early-career researcher (№ 61).





3.4 Mobility

Mobility is not a goal in itself, but rather a means for free exchange of ideas and knowledge across national borders, sectors and disciplines, with the ultimate aim of enhancing quality in research. Mobility is regarded as a core prerequisite for creating a successful and competitive ERA.[41] However, mobility has also important consequences for careers.

Whilst the experience gained through geographical and intersectoral mobility often plays a positive role in a researcher's career development, there are also obstacles when mobile researchers want to return to academia. These aspects somehow need to be addressed by the funding schemes, for example by including a return phase.

From the MORE2 Study[42] it is known that women perceive more barriers to mobility than men and that they are less inclined to be mobile at the higher career stages (R2–R4). By addressing issues about which women sometimes express more concern (such as social security or the challenge of combining family and career), mobility may be promoted more widely. Issues such as repatriation, employment rather than a stipend, social security, career support and mentoring may facilitate mobility for both women and men, and therefore, encourage both to be mobile.

Of the 104 postdoc schemes included in this study, 41 had either a prerequisite for (geographical) mobility or supported mobility. Of these, 28 aimed specifically to encourage international mobility. Several of the other funding schemes had the specific objective of supporting repatriation of researchers working abroad or of attracting international talent. Of the 41 schemes with a mobility-promoting objective, 16 were either preparing an application for, or had been co-financed by the European Union COFUND scheme.[43] In 15 programmes, prior mobility is an eligibility criterion and in two others the grant holder either has to change host country before or during the funding period.

In five countries, schemes aimed at supporting mobility finance a return phase for researchers who have been abroad, notably Austria (№ 8), Finland (№ 26), Germany (№ 32, 34, 35, 40), Ireland (№ 54) and Switzerland (№ 84). The same is true for the Marie Skłodowska-Curie Actions (MSCA)[44] (№ 4). In other programmes, the awardee has a position at an institution in his or her home country, but at least some part of the grant period must be spent abroad. This is the case for the International Career Grant of the Swedish Research Council (№ 80), P.R.I.M.E. in Germany (№ 36) and the FRICON Mobility programme in Norway (№ 66). Some programmes include the possibility for researchers to go abroad while retaining their employment contracts (№ 10, 14, 15, 28, 61) but the questionnaire did not specifically ask for this information. Other programmes are specifically aimed at encouraging researchers to relocate (or return) to their home country and the whole grant becomes a return phase. Such programmes may be found for instance in France (№ 29), Germany (№ 37) and Italy (№ 57).

In this survey, the number of programmes aimed at intersectoral mobility or developing businesses is comparatively low (three programmes from three different countries). This might indicate either that there are few such schemes or it could be a result of the schemes selected by the WG. However, the WG is publishing in parallel a separate overview on intersectoral mobility schemes entitled 'Intersectoral Mobility Schemes in Europe'.

Good Practice

What postdocs often deplore is the lack of a longer-term career perspective. It would therefore be helpful to include in the mobility programmes funding for a return phase or a continuation of the employment contract whilst the researcher is abroad. Likewise, a good network is very important for career development and it is not surprising that some funders mention 'networking opportunities' as a career development measure (most notably the German Alexander von Humboldt Foundation).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4 Evaluation and Monitoring

Out of the 104 responses received, 14 did not include an answer to Question 24 on monitoring and evaluation, and two of the answers were discarded for not being validt. A quarter of the responses stated that there was no programme evaluation in their schemes, but that the grantees were required to deliver project reports. A total of 29 programme evaluations were mentioned. Five of these were not made available to the WG, although for three of the missing reports comments were given in the template. In eight templates concerning relatively new programmes, it was announced that an evaluation was expected in the future.

In some countries, in particular Austria, Denmark, Germany, the Netherlands and Switzerland (№ 8, 10, 11, 32, 33, 64, 83, 87), as well as at the EU-level (№ 4), programmes have been thoroughly evaluated, and the success of the grantees has been monitored. In general, the evaluation reports are quite positive about the programmes and the effect they have on the researchers' careers and for the ERA. It appears that most if not all the grantees are now enjoying a very successful career. However, the evaluations draw attention to a few important points in the funding instruments that require continued attention and would need to be improved.

Gender

Many of the evaluation reports mention the imbalance between the number of grants awarded to male and female researchers. In most cases, the success rates are more or less equal, but the number of applications from female researchers seems to lag behind that of their male counterparts. Some recommendations are given in the reports on how to improve this situation, for example that maternity leave and part-time work should not impede funding. They also underline that there is still need for specific actions to promote the careers of female researchers. Mentoring and attempts to raise awareness of potential gender biases are examples of good practice. In the Netherlands, a recent study has shown that a possible cause for gender bias can be derived from the vocabulary used in evaluation criteria. A further study is being set up to analyse gender bias and gender neutral vocabulary. [45] More comments on gender issues in relation to mobility, can be found in the evaluation report of the Marie Curie Fellowships.[46]

Flexibility

When a programme evaluation included a survey completed by the grant holder, a number of reports state that there is a need for more flexibility with regard to the level of the grant, the duration of the project, the possibility for co-operation with other research groups, the setting up of the grantee's own research group and the research topic.

Support and Guidance

With regard to the selection procedure, there are frequent requests for improvement concerning transparency and information given during the selection procedure and on the reasons for rejection. More and better information is asked for on taxes, health insurance, fairness of the procedure, training opportunities, co-operation with third parties, and so on. There are also requests for more support from the RFO and/or RPO during the project and after its completion, especially with regard to long-term career development. Whenever networking events are organised they are highly appreciated. Furthermore, there are some comments on the fact that RFOs should promote their programmes more widely, especially across borders, and should seek to expand their marketing activities in order to increase the pool of potential applicants. The evaluation reports do not mention the EURAXESS website[47] (which provides a lot of the necessary guidance) and it is not clear whether the RFOs advertise their programmes there.

Mobility

The evaluation reports of the programmes involving mobility seem to agree that mobility has a positive effect on a research career. Still, many researchers are reluctant to move to a different institution because of personal reasons or because of uncertainties about the next step after the mobility project. One evaluation[48] particularly stressed that the postdoctoral stay abroad is part of professional life rather than education. Therefore, every effort should be made to couple the grant with social security and grantees should be made aware of this.

Another evaluation[49] stated that slightly less than half of the grantees who go abroad return immediately after the end of the grant period to a scientific position in their home country. It would appear that many excellent researchers only return if they can gain a different (higher) or tenured position. Of the incoming foreign grantees, only a quarter remain in a scientific position in the host country. Yet the results of another evaluation,[50] which were based on a bibliometric analysis of outgoing grantees, indicate that ongoing mobility does not necessarily need to be seen as a loss to the home country's research system. The grantees who did not return within twelve months following the end of the grant (about a third of all grant holders) assumed the role of 'bridgeheads', improving integration of their home country's researchers into international research networks. In addition, some of the grant holders returned at a later stage in their careers.

Finally, another evaluation[51] concluded that integration into the host institution is an issue. Some grantees regret the fact that there is no mandatory tenure track system related to the funding scheme and that they are considered as guests at their host institution. Nevertheless, grantees mostly find a position elsewhere. Return phases are included in some programmes aimed at early-career researchers in order to facilitate repatriation. In at least one case, this element was introduced in response to evaluation outcomes.[52]

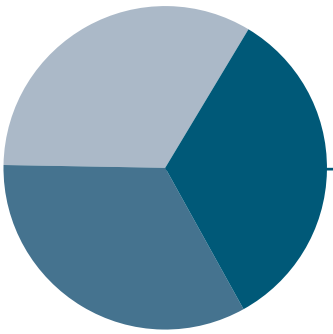
Indeed, a follow-up evaluation of this latter case showed that repatriation was no longer considered an issue by the grant holders. For around 60% of those who returned immediately to their home country at the end of their stay abroad, the return phase was the main reason for them to go home, and about a third even reported that it was also an important factor in their decision to stay in academia.

Inherent Delay

As a final comment it should be mentioned that most of the programme evaluation reports available date back some years, often six or seven. In many cases, the recommendations will have been implemented in subsequent submission rounds, but it is too soon to expect an evaluation of the impact that the changes have had. However, the conclusions and recommendations made are far from obsolete and are still very pertinent for setting up and developing programmes that address relevant career aspects and mobility issues. Furthermore, more programme evaluations are expected in the near future. This is a very good reason to continue collecting reports and for keeping an eye on what is happening in this field in Europe.

A list of the programme evaluation reports is included (Appendix 5).

"There is still need for specific actions to promote the careers of female researchers"



5 Conclusions, Recommendations and Looking Ahead

Postdocs deserve special attention as researchers who have embarked on the academic career track but who have not yet settled in. A great number of research funding organisations offer schemes which are specifically aimed at furthering the career of postdocs. This report represents the first mapping exercise aimed at obtaining a comparative overview of the postdoctoral funding schemes in Europe for career stages R2 and R3.

Research funding organisations and research performing organisations play different roles. Although researchers are usually employed by the RPOs, the answers to this survey came mostly from RFOs. As a consequence, this report reflects primarily the perspective of the RFO.

5.1 Conclusions

1. A postdoctoral researcher holds a PhD but is still not a fully independent researcher. The postdoc phase can vary in terms of length, mentoring, supervision, degree of leadership, type of funding, and so on. Temporary appointment is prevalent.
2. In spite of the fact that national career structures are different, there are common issues such as: mobility, level of academic independence, status, and attractiveness of a research career.
3. Postdocs are faced simultaneously with a number of different challenges. It is a phase in their career when they are required to develop academic independence while competition is intense, career prospects insecure and permanent positions rare. Mobility is often necessary for career advancement but comes at a price: it is difficult to combine it with establishing a family, and the different national career structures and social security systems present additional obstacles for leaving and returning.
4. With the increasing duration of the postdoc phase, more than one grant is usually necessary to cover it.
5. Funding schemes reveal a high degree of diversity according to most indicators (as would be expected from the diverse academic landscape). The funding schemes are part of a bigger picture, their role depending on the general research funding and career structure in each country.
6. The various schemes differ with regard to level and duration of support. Despite the variability, there are trends: the majority of schemes offer employment contracts and a funding duration of at least two years. Short-term funding is prevalent for mobility.
7. The few schemes which offer stipends are mostly for funding mobility.
8. The success rates for funding proposals vary widely, from around 10% up to more than 50% and, in individual programmes, up to 80%.
9. It seems that, in general, the funding programmes offered by an RFO for the early postdoc phase (R2) and the more advanced career phase (R3) are very similar, apart from the salary which depends on the level of experience – although there are exceptions.
10. Although there are some variations in the data, the schemes indicate that funders in general seem supportive of the recommendations expressed in the Charter & Code. Yet, none of the respondents referred to C&C or to the HRS4R.
11. Most of the programmes in the survey are accessible to foreign researchers as long as they are willing to move to the country where the grant is offered.
12. As there was no question included in the template regarding gender-specific offers, the survey did not yield valid results on the issue. On the one hand, a few programmes are specifically targeted at women or promote the gender balance by other measures. On the other hand, in certain countries special programmes for funding women are legally forbidden.
13. Not all schemes had career development as an explicit objective despite the postdoc phase being decisive for a researcher's career. Funding per se is seen as the most important career promoting element.
14. About half of the schemes contain some form of career development features, for example career planning, networking activities, travel grants for interviews, supervision, mentoring, training and alumni events. It was not always clear whether these opportunities were offered

by the funder or in co-operation with the host institution.

15. Career development is considered as a responsibility which lies primarily with the RPO. Despite this, only a few of the funders have made it a binding requirement for the host institutions to offer career support services. Even fewer have routines for following up whether expectations are met. In most cases, the RFOs do not seem to monitor this aspect at all.
16. Some postdocs obtain a permanent position early in their career. Tenure track is still rare. The vast majority of the schemes entail temporary contracts only.
17. Mobility is not a goal in itself. It is a well-integrated part of the postdoctoral phase. A large proportion of the schemes either fund mobility or have it as a prerequisite. Mobility components are also included in some general-purpose grants.
18. While mobility is important, additional support measures, such as the funding of a return-phase, are evidence that mobile researchers need support for their return.
19. Only about one-third of the programmes have been evaluated, either by independent agencies or by the RFOs themselves. In general, the evaluations are very positive and recommend that the programmes should be continued. Still, these evaluations yield important findings which can contribute to the design of schemes regarding particular aspects such as flexibility, support, guidance and mobility.

5.2 Recommendations

Policy makers and research performing institutions are, in most countries, the main actors in developing sustainable and attractive research careers. Funding organisations can mainly contribute in two ways: by giving policy advice and by defining criteria for funding. Funders may also play a role in giving administrative and career support throughout the funding period. It is important to note that the roles of national authorities, research institutions and funding organisations vary between countries; this may have consequences on the following recommendations and on how they can be implemented.

As discussed, the interests of the individual researchers and of research institutions are different, and sometimes even contradictory. Recommendations need to consider both sides, trying to reconcile interests for the benefit of the individuals concerned and for the benefit of science.

A Common Understanding as Basis for a Policy

What is the purpose of a postdoc phase? Who is responsible for what? What are the minimum conditions a postdoc can expect and what is expected of him or her? These questions need to be answered first before suitable measures for postdocs can be introduced.

Continuous Development of the Schemes Through Monitoring and Evaluation

Given the fact that only about a third of the programmes have been evaluated, a first important piece of advice is to carry out programme evaluations. The feedback and recommendations can be highly valuable for the future of a programme and for developing new ones.

It would be useful to know more about how funding programmes affect researchers' careers. In order to obtain answers to this question, career tracking is necessary. The (former) grantees should report on their career progress to show which type of support was beneficial.

Flexible Funding Schemes

- Researchers value flexibility in support of their ambitions and needs. Funding organisations should try to avoid regulations that unnecessarily restrict the grantees in the way they carry out their research.
- The duration of funding must correspond with its purpose. With respect to the possibility of co-operation, setting up one's own research group, choosing one's topic and resuming one's project after parental leave, there should be flexibility within a certain framework.

Good Working Conditions

- Stipends may have some practical advantages for funding mobility, but they also have disadvantages. All funders should try to minimise these disadvantages, in particular by offering optional insurances (pension, health) and allowances for travel, family support, and so on.

- The trend towards employment instead of stipends is welcome and should be continued. Where this is not yet the case, funding must offer social security, including maternity and parental leave.
- Measures to facilitate the combination of work and private life, such as support for dual career couples, parental leave and flexible work arrangements, increase the attractiveness of a research career.
- Improving working conditions for all, with special reference to the main bottlenecks that women seem to suffer more than men – challenges of combining work and private life, insecurity due to short-term contracts, and (forced) mobility) – might also be a helpful measure to increase equality between men and women.
- Adequate working conditions for researchers including appropriate research infrastructure.

Guidance Towards Independence

A postdoctoral researcher has already finished long and intensive training, and during his or her PhD has worked on his or her own research project. (S)he should therefore enjoy an adequate level of independence.

Nevertheless, a postdoc can benefit from the support of a supervisor, especially if the supervisor is also considerate of the postdoc's career prospects. A training programme for supervisors, aimed at raising their awareness of career issues and at enabling them to give better guidance to early stage researchers and postdocs, might help.

In addition to the (scientific) supervisor, whose primary function is to supervise the postdoc's research and who, as a rule is the postdoc's superior, a postdoc might also benefit from having a mentor (see the next recommendation). Mentor and mentee are not bound by any dependent relationship. A mentor gives advice and support with relevant to the postdoc's professional development.

More Support for Career Development

RPOs, as employers, are the main actors for researcher development and for recruitment to research positions. Although funding organisations should not interfere with the autonomy of RPOs, they may play an important role in supporting and complementing the research system as a whole.

Based on this mapping exercise, we believe that funders should be clear as to what role they actually play and want to play, and that they too have a responsibility and a role towards early-career researchers which could be developed further.

Funders should request from the host institutions a commitment to offer adequate career support services for different stages in a researcher's career. They might consider implementing relevant career development tools, including:

- A mandatory academic mentor for early career researcher (R2);
- A mandatory (career) development plan (individual career plans[53] should be embedded in the HR strategy of the host institutions); and
- A code of practice for postdoctoral training which contains the basic principles on how to support early career researchers, to be followed up by the host, the employer, and the supervisor.

Funders should co-operate with host institutions on career development issues in defining needs, relevant tools, and roles/responsibilities, and also by offering dedicated funding.

Funding organisations can complement host institutions' activities by offering networking activities, alumni work and seminars.

Greater Effort to Prepare and Train for Careers in Industry and Public Sector

As researchers are focused almost exclusively on academia, it would be helpful if they were made aware of the broad spectrum of careers in other sectors.

The same is true vice versa. Funders could more actively emphasise the researchers' professional competences and the relevance of these to a diversity of careers.

Career advice from an early stage onwards can help researchers to adjust to changing environments, opportunities and preferences. Intersectoral mobility schemes and industrial postdoctoral schemes represent an interesting approach to this challenge.[54]

Funding organisations should also consider measures to facilitate intersectoral mobility and career change at postdoctoral level, for example by funding intersectoral mobility and industrial postdoc schemes.

Geographic Mobility

For researchers, employment contracts are preferable to stipends. Funding organisations should consider ways to finance positions in ways other than through stipends even for mobility phases.

Measures such as family support, relocation support and return funding can reduce the drawbacks of mobility. A return phase has the dual advantage of attracting researchers to return home, and of facilitating their reintegration into the home country.

From the MORE2 Study it is known that women are less internationally mobile than men.[56] By addressing issues that are sometimes of greater concern to women (such as the challenge of combining family and career), openness to mobility may improve; issues such as repatriation, social security, career support and mentoring may facilitate mobility for both women and men, and thereby encourage both to be mobile.

Preserve Diversity

Funding programmes and funding decisions also reflect the value a nation attaches to certain issues. Attitudes and priorities differ among countries and may change over time. Therefore, a centralised or uniform funding system for the whole of Europe cannot be the goal.

5.3 Looking Ahead

For a competitive European Research Area, it is not sufficient to have a strong European Research Council. It is a prerequisite that, at the national level, research systems favour the careers of early-career researchers. How should these systems support these researchers? This survey has presented a number of programmes (or elements of programmes) that are geared towards postdocs with the objective of helping them to further their career. However, as well as funding programmes, supportive structures and conditions are needed, such as a research-friendly environments without obstacles for mobility, and more reliable career prospects.

It is often argued that too many postdocs are funded. Postdocs represent a substantial proportion of the scientific workforce, yet their prospects of a career in academia are low in many member states. It is therefore important that member states should carefully evaluate the need for (more) personnel at postdoc level, and that they support measures that provide researchers, at the earliest stage possible, with a clear picture of career prospects, including careers outside academia. It must be stressed that a career outside academia after the postdoctoral phase, with or without research, is not a failure – the competences of PhD holders are highly appreciated and needed in a knowledge society, even if not all employers seem to be aware of this.[57] If one takes into account the whole spectrum of careers outside academia, the number of postdocs (funded or not) does not seem too high, especially considering that it may take some time for a person to develop his or her talents and to find the right career path. Furthermore, in order to identify those researchers who are most qualified for a leading role in academia, a pool of competitors is needed. Whatever their future careers may be, PhD holders deserve that supervisors and employers, but also funders, pay (more) attention to the issue to avoid careers ending in a cul-de-sac.

Funding organisations strive to make research careers attractive and to keep the most suitably qualified researchers in academia. In some countries and in some disciplines, an academic career does not attract a sufficient number of motivated and suitable candidates, either because the career prospects appear to be poor and the salaries too low, or for other reasons. Interestingly, even though career prospects are often said to be bad, in many countries the number of early career researchers wanting to stay in academia is much higher than the available number of permanent jobs. This seems to contradict the perception that an academic career might not be attractive enough. However, as in any other sector, in academia it is important to attract the most suitable candidates and the task of recognising who is best suited deserves closer attention from all parties concerned: candidates, supervisors, mentors, career advisors and also, to a certain extent, reviewers. In this context, a researcher development framework could be helpful. Furthermore, funding organisations need to think about incentives which would help to channel funding to the candidates who are most appropriate for an academic career. This is an issue which needs to be dealt with in the future more thoroughly.

Notes and References

[1] The Scientific Century. Securing our Future Prosperity, The Royal Society, 2010.

[2] Towards a Framework for European Research Careers, The European Commission, 2011, pp. 2 and 6. http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_Research_Careers_final.pdf

[3] Career Tracking of Doctoral Holders, ESF, Pilot Project Report, May 2015, p. 26. http://www.esf.org/career-tracking-pilot

[4] http://scieur.org/roadmap

[5] RPOs: universities and non-university research institutions, hereafter also referred to as Performers. RFOs, hereafter also referred to as Funders.

[6] http://scieur.org/roadmap

[7] Towards a Framework for European Research Careers, The European Commission, 2011, pp. 2 and 6. http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_Research_Careers_final.pdf

[8] National Postdoc Association of the USA http://www.nationalpostdoc.org/?page=What_is_a_postdoc, 9 March 2015.

[9] Tenure and tenure track at LERU universities, LERU Advice paper n° 17, September 2014. http://www.leru.org/files/publications/LERU_AP17_tenure_track_final.pdf

[10] See Appendix 1: The Survey Template.

[11] See Laudeline AURIOL, Max MISU and Rebecca FREEMAN (OECD), Careers of Doctorate Holders: Analysis of Labour Market and Mobility Indicators, STI Working Papers 2013/4. http://www.oecd-ilibrary.org/science-and-technology/careers-of-doctorate-holders_5k43nxgs289w-en

[12] Harvesting talent: strengthening research careers in Europe, LERU, 2010 http://www.leru.org/files/publications/LERU_paper_Harvesting_talent.pdf

[13] Chapter 7 gives an overview of the relevant literature on the phenomenon. See also Kendall Powell, “The future of postdocs”, Nature, 2015, pp. 144–147.

[14] See ‘Education Indicators’ in Focus, issue 25, October 2014, http://dx.doi.org/10.1787/5jxv8xsvp1g2-en, which states a rise of new doctorates in OECD countries from 158,000 in 2000 to 247,000 in 2012. Again, it must be pointed out that the situation differs throughout Europe.

[15] See Developing Research Careers in and beyond Europe: Enabling – Observing – Guiding and Going Global. A Report by the ESF Member Organisation Forum ‘European Alliance on Research Career Development’ (EARCD), European Science Foundation, 2012, p. 18. http://www.esf.org/fileadmin/Public_documents/Publications/mof_research_careers.pdf

[16] Marie Curie researchers and their long-term career development: A comparative study. Final Report, European Union, 2014. http://ec.europa.eu/research/fp7/pdf/mca/marie_curie_researchers_and_their_long-term_career_development.pdf

[17] See Appendix 1: The Survey Template.

[18] In this text R1 signifies ‘doctoral candidates’, R2 ‘early postdocs’, and R3 ‘advanced postdocs’ (see p. 4 for the definitions given by the European Commission). It remains a problem for a joint approach that the career structures and the definitions of terms employed are so diverse throughout Europe.

[19] It was not always easy to categorise the schemes into the career phases proposed in the framework, not even for the research councils themselves.

[20] See the list of schemes in Appendix 4.

[21] See above 1.2. Extensive information on different countries can be found at: http://www.eui.eu/ProgrammesAndFellowships/AcademicCareersObservatory/AcademicCareersbyCountry/Index.aspx

[22] It must be remembered that in some countries the Research Council(s) covers all fields of research, whilst in others there are disciplinary councils.

[23] http://ec.europa.eu/euraxess/index.cfm/rights/whatIsAResearcher

[24] http://ec.europa.eu/euraxess/index.cfm/rights/whatIsAResearcher

[25] By stipend, the authors understand a lump sum of money that covers the researcher’s subsistence, usually without social security. A position is based on a contract which establishes an employment relationship between the host institution and the researcher.

[26] 102 is the number of schemes which provide employment.

[27] See http://ec.europa.eu/euraxess/index.cfm/services/researchPolicies for the MORE2 Country profiles on researchers' remuneration, and the MORE2 Remuneration – Cross-Country Report (W4), April 2013.

[28] She figures 2012, chapter 3, graph on p. 88. https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she-figures-2012_en.pdf

[29] www.dfg.de/en/research_funding/principles_dfg_funding/equal_opportunities/research_oriented/index.html

[30] http://www.rcuk.ac.uk/documents/skills/equalitystatement-pdf/

[31] Gender equality policies in public research. http://ec.europa.eu/research/pdf/199627_2014%202971_rtd_report.pdf

[32] http://www.esf.org/nc/coordinating-research/mo-fora/european-alliance-on-research-careers-development/cid/93546.html

[33] See http://www.aalto.fi/en/about/careers/tenure_track/ and http://www.tum.de/en/about-tum/working-at-tum/faculty-recruiting/tum-faculty-tenure-track/

[34] http://abilitazione.miur.it/public/index.php?lang=eng

[35] COM(2012) 669 final of 20 Nov 2012. See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0669&from=EN

[36] 4 COM(2012) 392 final of 17 July 2012. See http://ec.europa.eu/euraxess/pdf/research_policies/era-communication_en.pdf

[37] Report of the SGHRM WG on Professional Development of Researchers, 2014. See http://ec.europa.eu/euraxess/pdf/research_policies/Final%20Report%20of%20the%20ERA-SGHRM%20WG%20on%20Professional%20Development%20of%20Researchers%202014.pdf

[38] Ministry of Education and Research FOR-2006-01-31-102, https://lovdata.no/dokument/SF/forskrift/2006-01-31-102?q=postdoktor+stipendiat

[39] In May 2014, the German Rectors' Conference published Guidelines for the advancement of early career researchers, see http://www.hrk.de/resolutions-publications/resolutions/resolution/convention/guidelines-for-the-advancement-of-early-career-researchers-in-the-post-doctoral-phase-and-for-the-de/. Many universities in Germany, especially those successful in the Excellence Initiative, have recently established career development support structures. In Ireland, there is a National Framework for Doctoral Education. A policy for the post-PhD phase is currently being developed in Ireland and a number of universities have post-PhD research careers policies (UCD, UCC, UL, NUIG and DCU, see for example https://www.ucd.ie/hr/rcf/).

[40] http://cordis.europa.eu/project/rcn/186115_en.html

[41] See http://ec.europa.eu/research/era/pdf/era-communication/era-communication_en.pdf p. 3.

[42] For the 2013 final report, see http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf p. 210.

[43] http://ec.europa.eu/research/mariecurieactions/about-msca/actions/cofund/index_en.htm

[44] http://ec.europa.eu/research/mariecurieactions/index_en.htm

[45] http://www.nwo.nl/en/news-and-events/news/2015/gender-affects-awarding-of-research-funding.html

[46] Marie Curie Researchers and their Long-Term Career Development, see http://ec.europa.eu/research/fp7/pdf/mca/marie_curie_researchers_and_their_long-term_career_development.pdf

[47] http://ec.europa.eu/euraxess/

[48] Feodor Lynen Research Fellowship for postdoctoral researchers.

[49] Talent without borders - An evaluation of the Rubicon programme, Netherlands Organisation for Scientific Research, 2010. See also DFG Fellows – where are they now? http://www.dfg.de/download/pdf/dfg_im_profil/geschaeftsstelle/publikationen/infobriefe/ib02_2004en.pdf Eventually, 85% of the fellows came back.

[50] Erwin Schrödinger Programme.

[51] SNSF Professorships.

[52] Erwin Schrödinger Programme.

[53] See the example of a personal career development plan provided by the EU Commission. http://ec.europa.eu/research/mariecurieactions/funded-projects/how-to-manage/funded-projects/how-to-manage/itn/career_development_plan.doc

[54] See the results of the Science Europe Working Group on Research Careers' other subgroup on intersectoral mobility: most of the measures identified are for the doctoral level; so far there do not seem to be many activities geared especially towards postdocs.

[55] For the 2013 final report, see http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf p. 125.

[56] See Maica RUBIO and Tristam HOOLEY, Recruiting researchers: Survey of employer practice 2009, The Careers Research and Advisory Centre (CRAC), 2010, p. 4, https://www.vitae.ac.uk/vitae-publications/reports/recruiting-researchers-employer-survey-vitae-2009.pdf See also 'The Doctoral Impact Study', http://www.rcuk.ac.uk/innovation/impactdoctoral/ See also http://www.independent.co.uk/news/education/higher/postgraduate-doctoral-graduates-are-business-critical-10142046.html

Appendix 1 – The Survey Template

Name of programme	
1. Funding organisation	
2. Name of the programme	
3. Year the programme was initiated	
4. Objectives	
5. Target Group[a]	
6. Discipline(s)	
7. Host country[b]	
8. Host laboratory/institution[c]	
9. Requirements/eligibility[d]	
10. Duration of the funding[e]	
11. Long(er) term perspective/Tenure/support for career development[f]	
12. Total grant (€)	
13. Funding for[g]	
14. Position or stipend (incl. social security coverage or not)	
15. Annual salary of the applicant (€)	
16. Training/Mentoring/Supervision[h]	
17. Regular call(s) for proposals every year	
18. Application deadline[i]	
19. Beginning of the contract	
20. Selection procedure	
21. Number of applications and awards per year (and success rate)	
22. Web address	
23. Contact e-mail address	
24. Evaluation/Monitoring[j]	
25. COFUND	
26. Additional information	

[a] R2 (Recognized Researcher: PhD holders or equivalent who are not yet fully independent) or R3 (Established Researcher: researchers who have developed a level of independence). If there are other more specific definitions of target group, please add them, too, f.i. “highly talented researchers who wish to pursue a research career”.

[b] For example: in the home country (=RFO/RPO’s country), abroad,…

[c] For example: university, non-university research institute, RPO, industry,…

[d] For example: stays abroad, (biological) age limit or x years after PhD (= academic age limit),...

[e] Number of years. Please provide info whether the funding decreases of time, whether in includes an outgoing phase or other special features.

[f] Please give information and, if possible, web-link.

[g] For example: personnel, incl. salary of applicant or not, equipment,…

[h] Does the programme contain any provision or requirements for …, if so: brief information.

[i] Yes (if yes: when?) / No.

[j] Has this programme been evaluated, are the recipients of funding monitored (if so: what exactly?), are there other means to control the quality of the programme/of the support offered? Please provide info regarding the main outcomes of the evaluation, i.e. the strengths & weaknesses of the programme, problems encountered, impact on career, and so on, and regarding consequences of the evaluation/ the monitoring, like programme modifications; if available: give web-link to evaluation report.

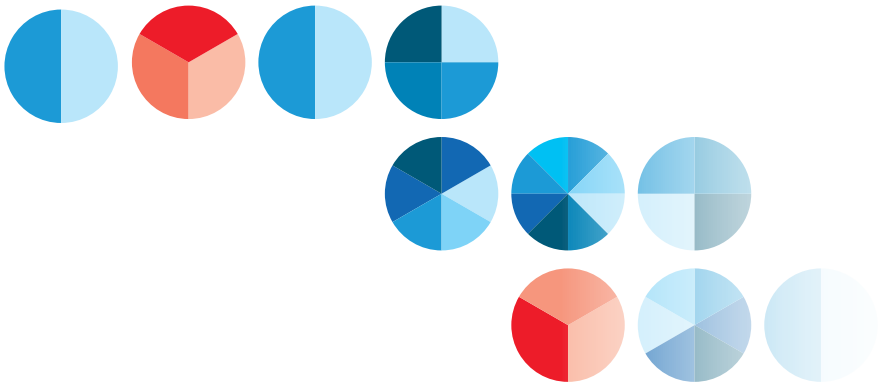
Appendix 2 – Characteristics of Postdoc Schemes: Synopsis

Chapter	Characteristics	No/very few	Some	About half	Many
3.1	Career development as main objective			x	
3.1	Career development for women as main objective	x			
3.1	Offering ten awards or less per year		x		
3.1	Offering 300 awards or more per year	x			
3.2	Success rate 15% or under		x		
3.2	Success rate 50% or higher	x			
4.1	Funding postdoc position				x
4.1	Social security contributions included				x
4.1	Option for social security contribution	x			
4.1	Stipends		x		
4.1	Duration 3–4 years			x	
4.1	Duration 2 years or less		x		
4.1	Duration 5 years or more		x		
4.3	Longer term perspective and support				x
4.1	Tenure or tenure track option	x			
4.3	Career development support and service			x	
4.3	Mandatory provision of academic mentor	x			
4.3	Mandatory career development plan	x			
4.4	Prerequisite for or support for geographical mobility		x		
4.4	Geographical mobility as main objective		x		
4.4	Finance for return phase		x		
4.4.	Possibility for keeping employment contract while abroad		x		
4.4	Intersectoral mobility or business development	x			
5	Schemes evaluated		x		

Appendix 3 – Number of Contributions by Organisation

Country	Name of organisation	No. of schemes
EU	European Molecular Biology Organisation (EMBO)	3
EU	European Commission	1
EU	European Research Council	3
Austria	Austrian Science Fund (FWF)	6
Belgium	Fund for Scientific Research (F.R.S.-FNRS)	3
Bulgaria	Human Resources Development	1
Croatia	Croatian Science Foundation (HRZZ)	1
Denmark	Lundbeck Foundation	2
Denmark	Danish National Advanced Technology Foundation	1
Denmark	The Danish Council for Independent Research (DFF)	2
Denmark	Novo Nordisk Foundations	3
Finland	Academy of Finland (AKA)	1
France	French National Research Agency (ANR)	2
France	INSERM	1
France	INSERM/CNRS	1
France	Institut de la Recherche pour le Développement (IRD)	1
Germany	Alexander von Humboldt Foundation	3
Germany	German Academic Exchange Service (DAAD)	2
Germany	German Academic Research Foundation	1
Germany	German Research Foundation (DFG)	3
Germany	Deutsche Krebshilfe	3
Germany	Fraunhofer Gesellschaft	1
Germany	Helmholtz Association	2
Germany	Leibniz Association	1
Germany	Volkswagen Foundation	2
Hungary	Hungarian Scientific Research Fund (OTKA)	1
Iceland	Iceland Centre for Research (Rannís)	1
Ireland	Health Research Board (HRB)	1
Ireland	Irish Research Council (IRC)	3
Italy	National Institute for Nuclear Physics (INFN)	1
Italy	Ministry of Education, Universities and Research (MIUR)	2

Country	Name of organisation	No. of schemes
Lithuania	Research Council of Lithuania (LMT)	1
Luxembourg	National Research Fund (FNR)	1
The Netherlands	Netherlands Organisation for Scientific Research (NWO)	4
Norway	Research Council of Norway (RCN)	2
Poland	National Science Centre (NCN)	4
Portugal	Foundation for Science and Technology (FCT)	2
Slovakia	Slovak Academy of Science (SAV)	1
Slovenia	Slovenian Research Agency (ARRS)	2
Sweden	Swedish Research Council for Environment, Agricultural Science and Spatial Planning (FORMAS)	1
Sweden	Swedish Research Council for Health, Working Life and Welfare (FORTE)	3
Sweden	Swedish Research Council (VR)	3
Switzerland	Swiss National Science Foundation (SNSF)	5
United Kingdom	Art and Humanities Research Council (AHRC)	1
United Kingdom	Biotechnology and Biological Sciences Research Council (BBSRC)	1
United Kingdom	Economic and Social Research Council (ESRC)	1
United Kingdom	The Engineering and Physical Sciences Research Council (ESPRC)	1
United Kingdom	Medical Research Council (MRC)	10
United Kingdom	Natural Environment Research Council (NERC)	1
United Kingdom	Science and Technology Facilities Council (STFC)	1



Appendix 4 – List of Schemes (in alphabetical order of country)

A) European/Supranational Programmes

1. EMBO Long-Term Fellowship Programme	
Funding organisation	European Molecular Biology Organisation (EMBO)
Target Group	R2
Discipline(s)	Molecular biology in the broadest terms
Web address	http://www.embo.org/funding-awards/fellowships

2. EMBO Installation Grants	
Funding organisation	European Molecular Biology Organisation (EMBO)
Target Group	R2
Discipline(s)	Life Sciences
Web address	http://www.embo.org/funding-awards/installation-grants/

3. EMBO Young Investigator Programme	
Funding organisation	European Molecular Biology Organisation (EMBO)
Target Group	R3
Discipline(s)	Life Sciences
Web address	http://www.embo.org/funding-awards/young-investigators

4. Marie Skłodowska-Curie Actions – Individual Fellowships	
Funding organisation	European Commission
Target Group	R2
Discipline(s)	All
Web address	http://ec.europa.eu/research/mariecurieactions/

5. Consolidator Grant	
Funding organisation	European Research Council
Target Group	R3
Discipline(s)	All
Web address	https://erc.europa.eu/funding-and-grants/funding-schemes/consolidator-grants

6. Starting Grant	
Funding organisation	European Research Council
Target Group	R2, R3
Discipline(s)	All
Web address	https://erc.europa.eu/funding-and-grants/funding-schemes/starting-grants

B) National Programmes

Austria

7. Stand-alone Projects	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R2–R4
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/stand-alone-projects/

8. Erwin Schrödinger Programme	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R2
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/schroedinger-programme/

9. Lise Meitner Programme	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R2, R3
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/meitner-programme

10. Hertha Firnberg Programme	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R2
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/firnberg-programme/

11. Elise Richter Programme	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R3
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/richter-programme-incl-richter-peek/

12. START Programme	
Funding organisation	Austrian Science Fund (FWF)
Target Group	R3
Discipline(s)	All
Web address	http://www.fwf.ac.at/en/research-funding/fwf-programmes/richter-programme-incl-richter-peek/

Belgium

13. MIS (Mandat d'Impulsion Scientifique)	
Funding organisation	Fund for Scientific Research (F.R.S.-FNRS)
Target Group	R3
Discipline(s)	All
Web address	http://www.frs-fnrs.be/en/index.php/funding/introduction

14. Research Associate (Chercheur Qualifié)	
Funding organisation	Fund for Scientific Research (F.R.S.-FNRS)
Target Group	R3
Discipline(s)	All
Web address	http://www.frs-fnrs.be/en/index.php/funding/introduction

15. Postdoctoral researcher (Chargé de recherches)	
Funding organisation	Fund for Scientific Research (F.R.S.-FNRS)
Target Group	R2
Discipline(s)	All
Web address	http://www.frs-fnrs.be/en/index.php/funding/introduction

Bulgaria

16. Human Resources Development	
Funding organisation	Ministry of Education and Science
Target Group	R1, R2
Discipline(s)	All
Additional information	The Operational Programme Human Resources Development was active until 2013–2014. During the period 2007–2013 beneficent for this programme was the Ministry of Education and Science (http://sf.mon.bg/?go=page&pageId=85).

Croatia

17. Programme Brain Gain "Postdoc"	
Funding organisation	Croatian Science Foundation (HRZZ)
Target Group	R2
Discipline(s)	Biomedicine and Health Sciences, Biotechnical Sciences, Social Sciences and Humanities, Natural Sciences, Technological Sciences
Web address	www.hrzz.hr

Denmark

18. Lundbeck Foundation Postdoc	
Funding organisation	Lundbeck Foundation
Target Group	R2, R3
Discipline(s)	Biomedical Research
Web address	http://www.lundbeckfonden.com/Funding-Schemes

19. Lundbeck Foundation International Postdoc Fellow	
Funding organisation	Lundbeck Foundation
Target Group	R2
Discipline(s)	Biomedical Research
Web address	http://www.lundbeckfonden.com/Funding-Schemes

20. Industrial Postdoc	
Funding organisation	Danish National Advanced Technology Foundation
Target Group	R2
Discipline(s)	Bio/medico, Production, Food, Environment, IT
Additional information	The Danish National Advanced Technology Foundation and the Danish Council for Strategic Research and the Danish Council for Technology and Innovation have been merged into the new Innovation Foundation in 2015.

21. DFF Individual Postdoctoral Grants	
Funding organisation	Danish Council for Independent Research (DFF)
Target Group	R2
Discipline(s)	All
Web address	http://fivu.dk/en/dff

22. DFF MOBILEX Mobility Grants	
Funding organisation	Danish Council for Independent Research (DFF)
Target Group	R2
Discipline(s)	All
Web address	http://fivu.dk/en/dff

23. Co-financed Postdoc Positions in Clinical Nursing	
Funding organisation	Novo Nordisk Foundation
Target Group	R2
Discipline(s)	Clinical Nursing Research
Web address	Call closed, see http://novonordiskfonden.dk/en/content/nursing-research

24. Mads Øvlisen Postdoc Fellowship within Art History, Practice-based Art, Curating and Art & Biosciences	
Funding organisation	Novo Nordisk Foundation
Target Group	R2
Discipline(s)	Clinical Nursing Research
Web address	Call closed, see http://novonordiskfonden.dk/en/content/nursing-research

25. Postdoctoral Fellowships in General Medicine	
Funding organisation	Novo Nordisk Foundation
Target Group	R2
Discipline(s)	Medicine
Web address	Call is closed; see http://novonordiskfonden.dk/en/content/general-practice-research

Finland

26. Funding for Researchers: Postdoctoral Researcher	
Funding organisation	Academy of Finland (AKA)
Target Group	R2
Discipline(s)	All
Web address	http://www.aka.fi/en/funding/apply-now/our-funding-opportunities/

France

27. Accueil de Chercheurs de Haut Niveau @RAction	
Funding organisation	French National Research Agency (ANR)
Target Group	R2
Discipline(s)	All
Web address	http://www.agence-nationale-recherche.fr/ATRaction-2014

28. Jeunes Chercheurs et Jeunes Chercheuses / Young Researchers	
Funding organisation	French National Research Agency (ANR)
Target Group	R2, R3
Discipline(s)	All
Web address	http://www.agence-nationale-recherche.fr

29. Junior Research Contract	
Funding organisation	French National Institute of Health and Medical Research (INSERM)
Target Group	R2, R3
Discipline(s)	Medical Research
Web address	http://english.inserm.fr/
Additional information	Final call in 2014

30. ATIP/Avenir	
Funding organisation	French National Institute of Health and Medical Research (INSERM) and National Centre for Scientific Research (CNRS)
Target Group	R3
Discipline(s)	Medical Research
Web address	https://www.eva2.inserm.fr/EVA/jsp/AppelsOffres/ATIP-AVENIR/index_INSERM_CNRS.jsp

31. Accueil de Post-doctorants	
Funding organisation	National Institute for Development (IRD)
Target Group	R2
Discipline(s)	Environment, Infectious and Tropical Diseases, Food Security, International Migrations, Social and Economical Dynamics
Web address	https://www.ird.fr/nous-rejoindre/l-ird-recrute/accueil-de-post-doctorants/accueil-de-post-doctorants-campagne-2015-resultats-disponibles

32. Feodor Lynen Research Fellowship for Postdoctoral Researchers	
Funding organisation	Alexander von Humboldt Foundation
Target Group	R2
Discipline(s)	All
Web address	https://www.humboldt-foundation.de/web/lynen-fellowship.html

33. Humboldt Research Fellowship (PostDocs)	
Funding organisation	Alexander von Humboldt Foundation
Target Group	R2
Discipline(s)	All
Web address	http://www.humboldt-foundation.de/web/771.html

34. Georg Forster Research Fellowship (Postdocs)	
Funding organisation	Alexander von Humboldt Foundation
Target Group	R2
Discipline(s)	All
Web address	https://www.humboldt-foundation.de/web/georg-forster-fellowship.html

35. DAAD Postdoktorandenprogramm (Postdoctoral Research Scholarships)	
Funding organisation	German Academic Exchange Service (DAAD)
Target Group	R2
Discipline(s)	All
Web address	https://www.daad.de/en/

36. P.R.I.M.E. (Postdoctoral Researchers International Mobility Experience)	
Funding organisation	German Academic Exchange Service (DAAD)
Target Group	R2
Discipline(s)	All
Web address	www.daad.de/prime

37. Emmy Noether Programme	
Funding organisation	German Research Foundation (DFG)
Target Group	R2, R3
Discipline(s)	All
Web address	www.dfg.de/emmy_noether/en

38. Heisenberg Programme	
Funding organisation	German Research Foundation (DFG)
Target Group	R3
Discipline(s)	All
Web address	www.dfg.de/heisenberg/en/

39. DFG Research Grant / Module Temporary Positions for Principal Investigators	
Funding organisation	German Research Foundation (DFG)
Target Group	R2(–R4)
Discipline(s)	All
Web address	www.dfg.de/research_grants/

40. Research fellowship	
Funding organisation	German Research Foundation (DFG)
Target Group	R2(–R4)
Discipline(s)	All
Web address	www.dfg.de/en/research_fellowships/

41. Mildred Scheel Postdoktorandenprogramm	
Funding organisation	Deutsche Krebshilfe
Target Group	R2
Discipline(s)	Life Sciences and Medicine
Web address	http://www.krebshilfe.de/wir-foerdern/foerderprogramme/nachwuchsfoerderung/mildred-scheel-postdoktoranden.html

42. Max Eder Nachwuchsgruppenprogramm

Funding organisation	Deutsche Krebshilfe
Target Group	R2
Discipline(s)	Oncology, Life Science
Web address	http://www.krebshilfe.de/wir-foerdern/foerderprogramme/nachwuchsfoerderung/max-eder-nachwuchsgruppen.html

43. Mildred Scheel Professurenprogramm

Funding organisation	Deutsche Krebshilfe
Target Group	R3
Discipline(s)	Oncology, Life Science
Web address	http://www.krebshilfe.de/wir-foerdern/foerderprogramme/nachwuchsfoerderung/mildred-scheel-professur.html

44. Fraunhofer Attract

Funding organisation	Fraunhofer Gesellschaft e.V.
Discipline(s)	Natural Sciences and Engineering
Web address	https://www.fraunhofer.de/en/jobs-and-career/seasoned-professionals/fraunhofer-attract.html

45. Helmholtz Postdoc Programme

Funding organisation	Helmholtz Association
Target Group	R2
Discipline(s)	Natural Sciences
Web address	https://www.helmholtz.de/en/jobs_talent/funding_programs/

46. Postdoctoral Fellowship Programme

Funding organisation	Helmholtz Centre Munich
Target Group	R2
Discipline(s)	Life Science
Web address	www.helmholtz-muenchen.de/fellows

47. Leibniz-DAAD Fellowship	
Funding organisation	Leibniz Association
Target Group	R2
Discipline(s)	All
Web address	http://www.leibniz-gemeinschaft.de/en/karriere/the-next-generation-of-researchers/leibniz-daad-research-fellowships/

48. Free-electron Laser Science: Peter Paul Ewald Fellowships at LCLS in Stanford	
Funding organisation	Volkswagen Foundation
Target Group	R2, R3
Discipline(s)	Physics, Chemistry, Biology, Engineering
Web address	https://www.volkswagenstiftung.de/en/funding/completed-initiatives/ewald-fellowships.html (Closing call in 2015)

49. "Freigeist" Fellowship	
Funding organisation	Volkswagen Foundation
Target Group	R2, R3
Discipline(s)	All
Web address	https://www.volkswagenstiftung.de/nc/en/funding/persons-and-structures/freigeist-fellowships.html

Hungary

50. Postdoctoral Proposals	
Funding organisation	Hungarian Scientific Research Fund (OTKA)
Target Group	R2
Discipline(s)	All
Additional information	OTKA was closed down at the end of 2014.

Iceland

51. Postdoctoral Fellowship	
Funding organisation	Iceland Centre for Research (Rannís)
Target Group	R2
Discipline(s)	All
Web address	http://en.rannis.is/funding/research/icelandic-research-fund/

Ireland

52. Marie Curie/HRB Post-doctoral mobility fellowship (MCPD)	
Funding organisation	Health Research Board (HRB)
Target Group	R2, R3
Discipline(s)	Health Research
Web address	http://www.hrb.ie/research-strategy-funding/grants-and-fellowships/hrb-grants-and-fellowships/grant/36/
Additional information	This scheme is no longer available. See page 63 for other HRB schemes.

53. Irish Research Council Government of Ireland Postdoctoral Fellowship (GOIPD Fellowship)	
Funding organisation	Irish Research Council (IRC)
Target Group	R2
Discipline(s)	All
Web address	http://www.research.ie/funding-opportunities

54. Irish Research Council International Career Development Fellowship (ELEVATE)	
Funding organisation	Irish Research Council (IRC)
Target Group	R2
Discipline(s)	All
Web address	http://www.research.ie/funding/postdoctoral-funding

55. Irish Research Council Enterprise Partnership Scheme Postdoctoral Fellowship	
Funding organisation	Irish Research Council (IRC)
Target Group	R2
Discipline(s)	All
Web address	http://www.research.ie/scheme/enterprise-partnership-scheme-postdoctoral-2015

Italy

56. Assegno di Ricerca (Research Grant)	
Funding organisation	RPO/RFO and Universities (e.g. Istituto Nazionale di Fisica Nucleare - INFN)
Target Group	R2
Discipline(s)	Particle, Astro-particle and Nuclear Physics
Web address	www.infn.it

57. Rita Levi Montalcini	
Funding organisation	Ministry of Education, Universities and Research (MIUR)
Target Group	R3
Discipline(s)	All
Web address	http://cervelli.cineca.it/

58. SIR (Scientific Independence of young Researchers)	
Funding organisation	Ministry of Education, Universities and Research (MIUR)
Target Group	R2, R3
Discipline(s)	All
Web address	http://sir.miur.it

Lithuania

59. Postdoctoral Fellowships	
Funding organisation	Research Council of Lithuania (LMT)
Target Group	R2
Discipline(s)	Social Sciences, Humanities, Physics, Biomedicine, Agriculture and Technologies
Web address	https://www.postdoc.lt/en/about-project

Luxembourg

60. AFR (Aides à la Formation-Recherche)	
Funding organisation	National Research Fund (FNR)
Target Group	R2, R3
Discipline(s)	All
Web address	www.fnr.lu/afr
Additional information	The AFR postdoc scheme is currently undergoing a reform. The scheme has been suspended from 2015 onward, with the exception of the AFR-PPP strand in collaboration with companies. The FNR offers two other programmes for postdocs not included in the survey: The CORE Junior (Target Group: R2, R3; National Priority Domains; www.fnr.lu/attract; frank.glod@fnr.lu.) and ATTRACT (Target Group: R3; Themes of Strategic Relevance; www.fnr.lu/core; sylvie.krier@fnr.lu).

The Netherlands

61. Veni	
Funding organisation	Netherlands Organisation for Scientific Research (NWO)
Target Group	R2
Discipline(s)	all
Web address	http://www.nwo.nl/en/funding/our-funding-instruments/nwo/innovational-research-incentives-scheme/veni/index.html

62. Vidi	
Funding organisation	Netherlands Organisation for Scientific Research (NWO)
Target Group	R3
Discipline(s)	all
Web address	http://www.nwo.nl/en/funding/our-funding-instruments/nwo/innovational-research-incentives-scheme/vidi/index.html

63. Vici	
Funding organisation	Netherlands Organisation for Scientific Research (NWO)
Target Group	R3, R4
Discipline(s)	All
Web address	http://www.nwo.nl/en/funding/our-funding-instruments/nwo/innovational-research-incentives-scheme/vici/index.html

64. Rubicon	
Funding organisation	Netherlands Organisation for Scientific Research (NWO)
Target Group	R2
Discipline(s)	All
Web address	http://www.nwo.nl/en/research-and-results/programmes/rubicon

Norway

65. Funding Scheme for Independent Basic Research Projects (FRIPRO) – Young Research Talent Initiative	
Funding organisation	Research Council of Norway (RCN)
Target Group	R2
Discipline(s)	All
Web address	http://www.forskningsradet.no/prognett-fripro/Home_page/1226994096426

66. Funding Scheme for Independent Basic Research Projects (FRIPRO) – FRICON mobility program	
Funding organisation	Research Council of Norway (RCN)
Target Group	R2
Discipline(s)	All
Web address	http://www.forskningsradet.no/prognett-fripro/Artikkel/More_about_FRIPRO_mobility_grant/1253995807729

Poland

67. FUGA

Funding organisation	National Science Centre (NCN)
Target Group	R2
Discipline(s)	All
Web address	http://www.ncn.gov.pl/finansowanie-nauki/konkursy/typy/6?language=en

68. SONATA BIS

Funding organisation	National Science Centre (NCN)
Target Group	R2
Discipline(s)	All
Web address	http://www.ncn.gov.pl/finansowanie-nauki/konkursy/typy/7?language=en

69. OPUS

Funding organisation	National Science Centre (NCN)
Target Group	R1–R4?
Discipline(s)	All
Web address	http://www.ncn.gov.pl/finansowanie-nauki/konkursy/typy/1?language=en

70. SONATA

Funding organisation	National Science Centre (NCN)
Target Group	R2
Discipline(s)	All
Web address	http://www.ncn.gov.pl/finansowanie-nauki/konkursy/typy/3?language=en

Portugal

71. FCT Investigator Programme

Funding organisation	Foundation for Science and Technology (FCT)
Target Group	R2, R3
Discipline(s)	All
Web address	https://www.fct.pt/apoios/contratacaodoutorados/investigador-fct/index.phtml.en

72. Post-Doctoral fellowships	
Funding organisation	Foundation for Science and Technology (FCT)
Target Group	R2
Discipline(s)	All
Web address	https://www.fct.pt/apoios/bolsas/index.phtml.en

Slovak Republic

73. Supporting Fund of Stefan Schwarz	
Funding organisation	Slovak Academy of Sciences (SAV)
Target Group	R2
Discipline(s)	All covered by SAV
Web address	www.urad.sav.sk/schwarz-fond (an English version is under construction)

Slovenia

74. Younger Doctor Projects (within the Call for Proposals to Receive (Co-)financing for Research Projects)	
Funding organisation	Slovenian Research Agency (ARRS)
Target Group	R2
Discipline(s)	Natural Sciences, Engineering, Medical Sciences, Biotechnology, Social Sciences, Humanities
Web address	http://www.arrs.gov.si/en/progproj/rproj/razpisi/ (calls for research projects (including those for postdoctoral projects)) http://www.arrs.gov.si/en/progproj/rproj/predstavitev.asp (types of projects) http://www.arrs.gov.si/en/progproj/poraba.asp (eligible costs for projects)

75. Postdoctoral Projects (within the Call for Proposals to Receive (Co-)financing for Research Projects)	
Funding organisation	Slovenian Research Agency (ARRS)
Target Group	R2
Discipline(s)	Natural Sciences, Engineering, Medical Sciences, Biotechnology, Social Sciences, Humanities
Web address	http://www.arrs.gov.si/en/progproj/rproj/razpisi (calls for research projects (incl. those for postdoctoral projects)) http://www.arrs.gov.si/en/progproj/rproj/predstavitev.asp (types of projects) http://www.arrs.gov.si/en/progproj/poraba.asp (eligible costs for projects)

76. FORMAS Mobility Starting Grant

Funding organisation	Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS)
Target Group	R2
Discipline(s)	Environment, Agricultural Sciences and Spatial Planning
Web address	http://www.formas.se/en/financing/calls-for-proposals/formas-annual-open-call-2015-for-mobility-starting-grants-for-young-researchers

77. Junior Research Grant

Funding organisation	Swedish Research Council for Health, Working Life and Welfare (FORTE)
Target Group	R2
Discipline(s)	Health, Working Life and Welfare
Web address	http://www.forte.se/en/Calls-for-proposals/

78. Postdoc

Funding organisation	Swedish Research Council for Health, Working Life and Welfare (FORTE)
Target Group	R2
Discipline(s)	Health, Working Life and Welfare
Web address	http://www.forte.se/en/Calls-for-proposals/

79. COFAS Marie Curie Postdoc

Funding organisation	FORTE and EU
Target Group	R2, R3
Discipline(s)	Health, Working Life and Welfare
Web address	http://www.forte.se/en/International-cooperation/COFAS-2/About-COFAS-2/
Additional information	Final call in 2015

80. International Career Grant

Funding organisation	Swedish Research Council (VR)
Target Group	R2
Discipline(s)	All
Web address	http://www.vr.se/inenglish/researchfunding/fundinggranted/marieskodowskacurieinternationalcareergrant.4.2c20f1c14882e0a8a6d67.html

81. International Postdoc	
Funding organisation	Swedish Research Council (VR)
Target Group	R2
Discipline(s)	Humanities and Social Sciences, Medicine and Health, Natural and Engineering Sciences, Educational Sciences, Artistic Research
Web address	http://www.vr.se/inenglish/researchfunding/applyforgrants/callforproposals/closedgrants/internationalpostdoc.5.45efcaac14d284ad5571c9e.html

82. Project Research Grant for Junior Researcher	
Funding organisation	Swedish Research Council (VR)
Target Group	R2
Discipline(s)	Medicine and Health, Engineering and Science
Web address	http://www.vr.se/inenglish/researchfunding/applyforgrants/callforproposals/closedgrants/projectresearchgrantforjuniorresearchersne.5.6155df4014b4dc21ce226a89.html

Switzerland

83. Ambizione	
Funding organisation	Swiss National Science Foundation (SNSF)
Target Group	R2
Discipline(s)	All
Web address	http://www.snf.ch/de/foerderung/karrieren/ambizione/Seiten/default.aspx

84. Advanced Postdoc.Mobility	
Funding organisation	Swiss National Science Foundation (SNSF)
Target Group	R2
Discipline(s)	http://www.snf.ch/SiteCollectionDocuments/allg_disziplinenliste.pdf
Web address	http://www.snf.ch/en/funding/careers/advanced-postdoc-mobility/Pages/default.aspx

85. Early Postdoc.Mobility	
Funding organisation	Swiss National Science Foundation (SNSF)
Target Group	R2
Discipline(s)	http://www.snf.ch/SiteCollectionDocuments/allg_disziplinenliste.pdf
Web address	http://www.snf.ch/en/funding/careers/early-postdoc-mobility/Pages/default.aspx

86. Marie Heim-Vögtlin Grants	
Funding organisation	Swiss National Science Foundation (SNSF)
Target Group	R2
Discipline(s)	All
Web address	http://www.snf.ch/en/funding/careers/mhv-grants/Pages/default.aspx

87. SNSF Professorships	
Funding organisation	Swiss National Science Foundation (SNSF)
Target Group	R3
Discipline(s)	All
Web address	http://www.snf.ch/en/funding/careers/snsf-professorships/Pages/default.aspx

United Kingdom

88. Fellowships Scheme – Early-career Route	
Funding organisation	Arts and Humanities Research Council (AHRC)
Target Group	R2, R3
Discipline(s)	Any within Arts and Humanities
Web address	http://www.ahrc.ac.uk/funding/opportunities/current/leadershipfellowsecr/
Additional information	On 1 May 2014, the AHRC's Fellowship scheme was renamed the Leadership Fellowship scheme.

89. David Phillips Fellowship	
Funding organisation	Biotechnology and Biological Science Research Council (BBSRC)
Target Group	R3
Discipline(s)	Bioscience
Web address	http://www.bbsrc.ac.uk/funding/fellowships/david-phillips.aspx

90. Royal Society of Edinburgh Enterprise Fellowship	
Funding organisation	Biotechnology and Biological Science Research Council (BBSRC)
Target Group	R2, R3
Discipline(s)	Bioscience
Web address	http://www.bbsrc.ac.uk/innovation/maximising-impact/enterprise-fellowships/

91. Future Research Leaders	
Funding organisation	Economic and Social Research Council (ESRC)
Target Group	R2
Discipline(s)	Any Social Science
Web address	http://www.esrc.ac.uk/funding/funding-opportunities/future-research-leaders/

92. EPSRC Fellowships	
Funding organisation	Engineering and Physical Sciences Research Council (EPSRC)
Target Group	R2–R4
Discipline(s)	All EPSRC remits – applications are accepted in identified priority areas, further details: https://www.epsrc.ac.uk/skills/fellows/areas/priorityareas/
Web address	https://www.epsrc.ac.uk/skills/fellows/overview/

93. Biomedical Informatics Fellowship	
Funding organisation	Medical Research Council (MRC)
Target Group	R2
Discipline(s)	Biomedical Informatics
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/skills-development-fellowships/

94. Career Development Award in Biostatistics	
Funding organisation	Medical Research Council (MRC)
Target Group	R2
Discipline(s)	Biostatistics
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/skills-development-fellowships/

95. Career Development Award (CDA)

Funding organisation	Medical Research Council (MRC)
Target Group	R2
Discipline(s)	All areas of MRC's remit
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/non-clinical-fellowships/career-development-award-cda-transition-to-independence/

96. Clinical Research Training Fellowship

Funding organisation	Medical Research Council (MRC)
Target Group	R1–R2
Discipline(s)	Medicine, Life Sciences
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/clinical-fellowships/clinical-research-training-fellowship-crtf/

97. Clinician Scientist Fellowship (CSF)

Funding organisation	Medical Research Council (MRC)
Target Group	R2
Discipline(s)	Medicine, Life Sciences
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/clinical-fellowships/clinician-scientist-fellowship-csf/

98. Early Career Fellowship in Economics of Health

Funding organisation	Medical Research Council (MRC)
Target Group	R2
Discipline(s)	Economics of Health
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/skills-development-fellowships/

99. Methodology Research Fellowship

Funding organisation	Medical Research Council (MRC)
Target Group	R3
Discipline(s)	Biomedicine and Health Research
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/skills-development-fellowships/

100. Population Health Scientist (PHS) Fellowship	
Funding organisation	Medical Research Council (MRC)
Target Group	R1, R2
Discipline(s)	Population Health Sciences
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/skills-development-fellowships/

101. Senior Clinical Fellowship (SCF)	
Funding organisation	Medical Research Council (MRC)
Target Group	R2, R3
Discipline(s)	Medicine, Life Sciences
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/clinical-fellowships/senior-clinical-fellowship-scf/

102. Senior Non-Clinical Fellowship (SNCF)	
Funding organisation	Medical Research Council (MRC)
Target Group	R3
Discipline(s)	All areas of MRC's remit
Web address	http://www.mrc.ac.uk/skills-careers/fellowships/non-clinical-fellowships/senior-non-clinical-fellowship-sncf/

103. NERC Independent Research Fellowships (IRF)	
Funding organisation	Natural Environment Research Council (NERC)
Target Group	R2
Discipline(s)	Environmental sciences
Web address	http://www.nerc.ac.uk/funding/available/fellowships/irf/

104. Ernest Rutherford Fellowship Scheme	
Funding organisation	Science and Technology Facilities Council (STFC)
Target Group	R2
Discipline(s)	Astronomy, Solar and Planetary Science, Particle Physics, Particle Astrophysics, Cosmology and Nuclear Physics
Web address	http://www.stfc.ac.uk/funding/fellowships/ernest-rutherford-fellowship/

Additional Schemes

Information regarding several additional schemes was received after the survey analysis had been completed. As such, the following schemes could not be included in the survey results, but are listed here for informational purposes only.

Ireland

Interdisciplinary Enhancement Awards (ICE)	
Funding organisation	Health Research Board (HRB)
Target Group	R2–R3
Discipline(s)	Health Service and Population Health Research
Web address	http://www.hrb.ie/research-strategy-funding/grants-and-fellowships/hrb-grants-and-fellowships/grant/131/

Cancer Prevention Fellowship	
Funding organisation	Health Research Board (HRB)
Target Group	R2–R3
Discipline(s)	Cancer epidemiology and prevention
Web address	http://www.hrb.ie/research-strategy-funding/grants-and-fellowships/hrb-grants-and-fellowships/grant/128/
Additional Information	Run in partnership with NHS and the Northern Ireland R&D Office.

Starting Investigator Research Grant (SIRG)	
Funding organisation	Science Foundation Ireland (SFI)
Target Group	R2
Discipline(s)	Oriented Basic and Applied research in all areas of STEM
Web address	http://www.sfi.ie/funding/funding-calls/programmes-for-early-and-mid-career-researchers.html

Career Development Award (CDA)	
Funding organisation	Science Foundation Ireland (SFI)
Target Group	R3
Discipline(s)	Oriented Basic and Applied research in all areas of STEM
Web address	http://www.sfi.ie/funding/funding-calls/programmes-for-early-and-mid-career-researchers.html

Future Research Leaders	
Funding organisation	Science Foundation Ireland (SFI)
Target Group	R3
Discipline(s)	Oriented Basic and Applied research in all areas of STEM
Web address	http://www.sfi.ie/funding/funding-calls/programmes-for-early-and-mid-career-researchers.html

Industry Fellowship	
Funding organisation	Science Foundation Ireland (SFI)
Target Group	R2–R3
Discipline(s)	Oriented Basic and Applied research in all areas of STEM
Web address	http://www.sfi.ie/funding/funding-calls/open-calls/industry-fellowship-programme-2016.html

Technology Innovation Development Award (TIDA)	
Funding organisation	Science Foundation Ireland (SFI)
Target Group	R2 & R3
Discipline(s)	Oriented Basic and Applied research in all areas of STEM
Web address	http://www.sfi.ie/funding/funding-calls/closed-calls/technology-innovation-development-award-2016.html

Appendix 5 – List of Evaluation Reports

1. Marie Curie researchers and their long-term career development: A comparative study, Final Report, Economisti Associati, March 2014
http://ec.europa.eu/research/fp7/pdf/mca/marie_curie_researchers_and_their_long-term_career_development.pdf

2. Annual Report on the ERC activities and achievements in 2013, ERC 2014
https://erc.europa.eu/sites/default/files/publication/files/erc_annual_report_2013.pdf

3. Understanding and Assessing the Impact and Outcomes of the ERC and its Funding Schemes (EURECIA), Final Synthesis Report, ERC, May 2012
https://erc.europa.eu/sites/default/files/document/file/eurecia_final_synthesis_report.pdf

4. The Austrian Science Fund: Ex Post Evaluation and Performance of FWF Funded Research Projects, Institute of Technology and Regional Policy InTeReg Research Report Series, Vienna, December 2005
http://www.fwf.ac.at/fileadmin/files/Dokumente/Ueber_den_FWF/Publikationen/FWF-relevante_Publikationen/InTeReg_RR_Nr_42.pdf

5. Evaluation of the FWF mobility programs Erwin Schrödinger and Lise Meitner, Technopolis, July 2006
http://www.fwf.ac.at/fileadmin/files/Dokumente/Ueber_den_FWF/Publikationen/FWF-relevante_Publikationen/fwf_mobility_report.pdf

6. Elita – Evaluierung der FWF Progamme Elise Richter und Hertha Firnberg, convelop cooperative knowledge design gmbh, November 2011
http://www.fwf.ac.at/fileadmin/files/Dokumente/Ueber_den_FWF/Publikationen/FWF-relevante_Publikationen/elita.pdf

7. Impact Evaluation of the Erwin Schrödinger Fellowships with Return Phase, Final Report for the Austrian Science Fund (FWF), Vienna Executive Summary, Fraunhofer ISI, May 2014
http://www.fwf.ac.at/fileadmin/files/Dokumente/Ueber_den_FWF/Publikationen/FWF-relevante_Publikationen/fraunhofer-isi_schroedinger-impact-evaluation.pdf

8. Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme, Final report, November 2014
http://www.snf.ch/SiteCollectionDocuments/Web-News/ambizione_evaluationsbericht_e.pdf

9. Evaluation of the Programme of fellowships of the Swiss National Science Foundation (SNSF), Summary of the report, September 2010
http://www.snf.ch/SiteCollectionDocuments/stip_bericht_evaluation_stipendien_zusammenfassung_e.pdf

10. Surveys on the professorships of the Swiss National Science Foundation, Report December 2014
http://www.snf.ch/SiteCollectionDocuments/Web-News/news_280515_bericht_snf_foerderungsprofessuren.pdf

11. Postdocs in Deutschland: Evaluation des Emmy Noether-Programms, iFQ-Working Paper No. 3, Mai 2008
http://www.forschungsinfo.de/Publikationen/Download/working_paper_3_2008.pdf

12. Evaluation of the Alexander von Humboldt Foundation's Feodor Lynen- Research Fellowship Programme, Technopolis, 2012 summary in English:
https://www.humboldt-foundation.de/pls/web/wt_show.text_page?p_text_id=1588367

13. Evaluation of the Danish Council for Independent Research, Research and Innovation: Analysis and Evaluation 17/2014, Danish Agency for Science, Technology and Innovation
http://ufm.dk/en/publications/2014/files-2014-1/evaluation-of-the-danish-council-for-independent-research.pdf

14. Evaluering af Postdocfinansering, Det Frie Forskningsråd, December 2012
http://ufm.dk/publikationer/2012/filer-2012/evaluering-af-postdocfinansiering-i-det-frie-forskningsraad.pdf

15. Evaluation of the Academy of Finland, Reports of the Ministry of Education and Culture, Finland 2013:14
http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2013/liitteet/okm14.pdf?lang=en

16. 1st Evaluation of FNR's AFR Programme, Final Report, Bonn 2010 (1st Evaluation of FNR's AFR Programme)

17. Evaluatie Vernieuwingsimpuls 2000 – 2006, Technopolis-Dialogic, June 2007
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Annex 1 - Data on the Careers of Doctorate Holders in Europe

Many doctorate holders leave university immediately after gaining their PhD, but the situation differs a lot throughout Europe. The following figures were provided by the members of the Working Group to give an indication of this variation:

- **Belgium:** The number of doctorate holders who are employed at university declines from almost 40% in the first year after graduation to approximately 30% ten years after graduation.
  Source: Annual Report on Science and Technology Indicators for Belgium, Belspo, 2013, pp. 109–10.

- **Bulgaria:** A study to track career development of PhD holders has been conducted by the Bulgarian Academy of Science (BAS) for the period 2002–2006. It shows that out of 495 candidates who obtained their PhD during that period, 40% were hired by the BAS, 50% have left BAS to work for universities, 5% left the country straight after gaining the PhD, 2% went to industry, and 3% took an administrative or other position. A narrow-scale study was conducted which covers the years 2013 to mid-2015. It shows that out of 387 candidates who obtained their PhD in the last three years, 37% have left BAS and 60% were hired by BAS.

- **Croatia:** The majority of PhD candidates are required to finish their PhD within a period of six years. Those who obtain their PhD within this period are most likely to stay in the scientific and higher education system. In the first six months of 2015, out of 1,918 young researchers holding a PhD, only 114 left the system. In the same period, 122 gained permanent employment within the scientific or higher education system. There is an insignificant number of researchers leaving the system at later stages of their careers; the mobility rate between the public research sector and the private sector is relatively low.

- **Estonia:** A recent study of PhD holders revealed that approximately 60% of PhD graduates continue an academic career, 30% combine academic and non-academic career, and 10 to 15% go into other careers.
  Source: The career of scientists: Estonia in the international system, March 2015 (in Estonian). http://tips.ut.ee/internationalisation

- **France:** In 2012, five years after having obtained their doctorate, 73% of the PhD holders worked in public (52%) or private research (25%). The 23% remaining did not work in research.

- **Germany:** Almost 60% leave university immediately after gaining their PhD; however, there are marked differences between disciplines.
  Source: Jürgen Enders, Lutz Bornmann, Karriere mit Doktortitel?, 2001, p. 114.

- **Norway:** About 40% stay in academia after graduation.
  Source: Terje Bruen OLSEN, Med doktorgrad i arbeidslivet. En undersøkelse basert på registerdata, NIFU Report 41/2012.

- **Sweden:** A study based on three cohorts of PhD graduates showed that on "average, one-third of a cohort of PhDs hold a teaching position at a higher education institution (HEI), with a somewhat higher proportion of women than men. This proportion varies greatly, however, from one discipline to another. In social sciences about 60 per cent of a cohort continue within higher education, but in natural sciences, medicine and engineering sciences, this rate is only about 20 per cent".
  Source: https://publikationer.vr.se/produkt/forskningens-framtid-karriarstruktur-och-karriarvagar-i-hogskolan/ (quoted from the English summary).

- **United Kingdom:** Data shows that typically 53% of PhD graduates are employed outside universities after they graduate. In 2012, a total of around 23,000 doctoral candidates graduated from UK Universities.

Annex 2 - Data on the Unemployment Rates of Doctorate Holders in Europe

With regard to the unemployment rates of doctorate holders, the picture in Europe also varies:

- **Austria:** "… the general employment situation of doctorate holders is relatively good. However, they are faced with a shortage of adequate positions, especially in research. Often doctorate holders have to compromise between the intellectual challenge of working in research and the higher job security outside of research. The employment situation and the sectors of employment depend primarily on the field of science and technology of the doctoral degree". Source: Markus SCHWABE, "The Career Paths of Doctoral Graduates in Austria", European Journal of Education, 2011, vol. 46, Issue 1, pp. 153–68, http://onlinelibrary.wiley.com/doi/10.1111/j.1465-3435.2010.01465.x/abstract

- **Belgium:** The study 'Careers of Doctoral Holders' indicates, on average, 2.8% unemployment within the active PhD population (as compared to a total unemployment rate of 7 to 8%), Source: Pierre MOORTGAT, CDH, 2011, http://www.belspo.be/belspo/organisation/publ/pub_ostc/ind/ind12_ nl.pdf

- **Croatia:** The unemployment rate for PhD holders was 0.7% in 2009, as compared to 9.1% for the population as a whole.

- **Estonia:** The unemployment rate was 7.4% in 2014; 30 people holding a PhD degree were unemployed (0.1% of the total unemployed population of 27,597).

- **France:** 6% of doctoral degree holders were unemployed when the total unemployment rate was almost 10% in 2012.

- **Germany:** The unemployment rate of PhD holders was 1.2 % in 2011 (as compared to 7.9% in total),
  Source: Statistisches Bundesamt, Hochqualifizierte in Deutschland 2011, 2013.

- **Netherlands:** 2% unemployed PhD holders in 2013. Source: Statistics Netherlands, Careers of Doctorate Holders in the Netherlands, 2014.

- **Norway:** Less than 1% of doctorate holders are registered as unemployed and 75% of doctorate holders have research related jobs. Source: Terje Bruen OLSEN, Med doktorgrad i arbeidslivet. En undersøkelse basert på registerdata, NIFU Report 41/2012.

- **Portugal:** PhD holders unemployed or inactive were 1.9% in 2009 and 6.0% in 2012; the overall unemployment rate were 9.4% in 2009 and 15.5% in 2012.

- **Sweden:** In 2007, the unemployment rate among PhD holders was 5%, as compared to 6% in general.

- **United Kingdom:** The unemployment rate of doctoral graduates was quoted at 2.4% in 2010, compared to 1.7% two years earlier, and compared to 8 or 5% respectively for the total population.
  Source: https://www.vitae.ac.uk/vitae-publications/reports/what-do-researchers-do-early-career-progression-2013.pdf, p. 7f.
  The unemployment rate 3.5 years after doctoral graduation is typically 0.5% lower than for first degrees and 0.9% lower than for Masters Degrees.
  Source: https://www.vitae.ac.uk/vitae-publications/reports/what-do-researchers-do-wdrd-3-years-on-soft-copy-vitae.pdf

Employment Challenges Faced by Postdoctoral Researchers: a Review

Employment Challenges Faced by Postdoctoral Researchers: a Review

In recent years, higher education and research systems across the world have continued to develop and expand (Auriol, Misu & Freeman, 2013). One of the most evident signs of such expansion is the steady increase in the number of researchers entering, or trying to enter, the labour market. Such developments have helped to make the situation of doctorate holders more visible, especially in terms of the purpose, relevance, and cost of the doctorate. It has also helped to transform postdoctoral employment and career trends into a relevant area of investigation (Neumann & Tan, 2011).

In this context, a number of key questions arise, including: what are the major challenges faced by early-stage researchers when trying to acquire or maintain a position in the labour market? What are the major challenges faced by such researchers when trying to progress in their careers, especially during the early stages of their career pathways? Although there is wide consensus around the notion that available "evidence is limited and sparse" (Auriol et al., 2013, p. 7), due to a scarcity of studies, and especially of studies allowing comparisons, three main topics tend to come up in the literature addressing the subject: adverse labour market conditions, gender inequity, barriers to mobility; other circumstances may operate as challenges to postdoctoral researchers' employment.

I. Adverse Labour Market Conditions

When considering the working conditions offered to doctorate holders who intend to pursue a research career, the following are mentioned as the main reasons for the labour market to be described as adverse: (1) lack or precariousness of employment and lengthening periods of training; (2) unattractiveness of working conditions offered to researchers.

Lack or Precariousness of Employment Opportunities and Lengthening of Training

In recent decades, especially since the late 1980s and early 1990s, the number of postdoctoral researchers has increased greatly (Stephan & Ma, 2005). Widely acknowledged reasons for such expansion concern both the global growth of doctorate holders and the increased imbalance between supply and demand for tenured positions in the academic sector: the supply of tenured positions is lower than the demand (Horta, 2009). As a result, there is a growth in the number of precarious fixed-term positions offered to early-career researchers, as well as in the duration of the postdoctoral experience. It has become more common for doctorate holders who wish to pursue a research career to prolong the period of their postdoctoral training and to occupy multiple postdoctoral positions (Bonnal & Giret, 2010; Wei, Levin & Sabik, 2012). These positions end up becoming a bottleneck, trapping postdoctoral researchers in temporary research or teaching appointments, and making it easier for them to accept employment in a job below their qualification level or unrelated to their doctoral degree (Grigolo, Lietart & Marimon, 2010).

Postdoctoral appointments are usually viewed as short-term, temporary positions, a "first step in the pipeline" (Auriol et al., 2013, p. 12) leading to tenure. These positions aim to help people who have recently been awarded a doctorate to consolidate or improve their training. However, the substantial increase in the length of the postdoctoral experience has transformed it into a phase that can cover one-third or more of a research career (Foote, 2010). Often, researchers began their doctoral training more than 15 years earlier, and have held a doctorate degree for more than ten years, before they access a secure or quasi-secure position, or are awarded their first important independent grant (Levitt, 2010).

Researchers who are not yet fully independent (that is, researchers at the R2 stage of their careers) "are becoming a source of cheap labour" (Zubieta, 2009, p. 109). Researchers who started their current employment less than five years ago are awarded permanent positions less often than before (IDEA Consult, 2013). Also, as shown by the Researchers' Report from 2013 and 2014, it is not uncommon for R1 (that is, first-stage researchers) and R2 researchers to work with no contract at all (Doherty & Chalsège, 2013, 2014). According to the Researchers' Reports, many researchers without stable employment contracts also lack social security coverage (e.g. statutory/supplementary pension

rights, healthcare, parental and unemployment benefits, sabbatical leaves) to varying degrees.

Not being able to take a permanent position may limit junior researchers' time horizons, and undermine their autonomy and opportunities for specialisation (Zubieta, 2009). Such circumstances may have a negative impact on the quality and the quantity of R2 researchers' scientific outputs, thus on their knowledge production and career prospects. This situation not only facilitates the inefficiency of the system at the institutional level, but also allows research units "to develop rather opportunistic behaviours" (Musselin, 2004, p. 69), where supervisors do not pay attention or free themselves of any responsibility regarding the future career of their staff. As Musselin (2004) pointed out, research centres – instead of welcoming postdoctoral researchers as a part of a future recruitment strategy – look only to the short-term benefits that may come from the use of this type of manpower.

Unattractiveness of Working Conditions Offered to Researchers

Adequate working conditions, including competitive salaries and opportunities for career advancement, are key factors in the ability of employers (universities, research institutions, funding agencies, and private sector companies) to attract highly motivated and productive researchers at all stages of their careers (Grigolo et al., 2010). However, even when salaries fall into the 'very high' remuneration level, European institutions cannot compete with wage levels offered in some non-European countries, especially the USA (Doherty & Chalsège, 2013, 2014; IDEA Consult, 2013).

There is not only a substantial heterogeneity in salary levels across countries in the EU-28, but also differences in payment persist across areas of knowledge. Specifically, early-stage researchers in the sciences tend to earn more than their counterparts in the social sciences or humanities (Canal-Dominguez & Wall, 2013). Furthermore, taking a postdoctoral position does not seem to pay off when it comes to doctorate holders' earnings in the private sector (Recotillet, 2007). Although it improves researchers' probabilities of finding a job, postdoctoral training does not seem to lead to higher remuneration. Also, a majority of participants at the Raising Researchers' Voices conference (Miller-Delaney, 2013) considered that not only was doctoral training not effective in preparing them for the multiple career choices they would face throughout their occupational pathways, especially in the short term, but also that postdoctoral training lacked opportunities for learning transferable skills.

However, according to Canal-Domínguez and Wall (2014), job satisfaction appears to be a main determinant of doctorate holders' self-perception as being successful in their careers and, by extension, of their commitment to work-related tasks and activities. The question therefore arises: how satisfied are postdoctoral researchers with different aspects of their job? Regardless of being asked about aspects unrelated to formal working conditions (e.g. level of responsibility/independence, opportunities for advancement), or about their degree of satisfaction with features such as job security, salary, and benefits, early career researchers appear to be rather unsatisfied with their situation, and to characterise working conditions and career prospects, especially in the public sector, as unattractive (IDEA Consult, 2013; Doherty & Chalsège, 2013, 2014).

To instability, low salary levels and poorly defined rights and responsibilities, it is often necessary to add long working hours and limited autonomy in carrying out research projects (Expert Group on the Research Profession, 2012). Furthermore, early-career researchers tend not to experience the same kind of treatment offered to more senior researchers when it comes to access to resources and opportunities. Specifically these relate to: (i) accommodation and access to facilities; (ii) general inclusion, participation and integration in the life of departments; (iii) access to training budgets, conference funding and related occupational extras; (iv) representation on email networks, websites and publicity material; and (v) opportunities for (internal) promotion and progression (including pay).

Among other things, more attention needs to be paid to all the relevant aspects that contribute to researchers' quality of life. This includes researchers' ability to restock their energy, and to maintain and work towards ensuring physical and emotional resources (McAlpine, 2012). Quality of life is a necessary although not decisive criterion that researchers consider when planning for a change of jobs, specifically when planning to move to another country. However, when thinking about career advancement, considerations of quality of life have more weight on researchers' job decisions

than improving their recent status (IDEA Consult, 2013). Researchers in the study seemed to be more concerned about quality of life than an increase in their status when making job decisions. However, maintaining or improving quality of life did not seem to have a big impact on a job decision, which may indicate that offering a higher quality of life may not compensate for other deficits in existing positions, such as low salaries. Other factors that may also influence job decisions concern career prospects and research autonomy offered to doctorate holders, especially at an early stage of their career.

II. Gender Inequity

Gender inequity in academia has been a recurrent theme in the literature on research careers for many years (Duberley & Cohen, 2010). A generalised consensus prevails around the notion that the nature, functioning, structure and ethos of the academic system does not favour equality among male and female scholars (Cruz-Castro & Sanz-Menéndez, 2010). Women entering or wishing to progress in an academic career tend to face numerous social and cultural barriers, placing them at a disadvantage (Padilla-Gonzalez, Metcalfe, Galaz-Fontes, Fisher & Snee, 2011). According to Padilla-Gonzalez and colleagues, “male privileges foster a chilly climate unaccommodating for women” (p. 653) that is maintained through a series of practices embedded in the academic culture and oriented towards the maintenance of male privileges.

Therefore, despite improvements made during the last decade, within the academic profession, women’s representation is still low and uneven (Grigolo et al., 2010). Although the proportion of women at the first two levels of tertiary education is higher than that of men, the opposite occurs at the doctoral level and not even recent trends pointing to an increase of female doctorate holders suggest that this imbalance is likely to be corrected any time soon (Doherty & Chalsège, 2013, 2014). In addition, as the Researchers’ Reports from 2013 and 2014 highlighted, a woman’s career is still strongly characterised by vertical segregation. Regardless of the steady growth in the proportion of female researchers at all levels of research careers, not only does the number of women persist in being lower than that of men, but there is also a much lower percentage of women in the top-level, more prestigious academic positions and in decision-making bodies. This is particularly true for the fields of science and technology, where women have a much lower representation than in the social sciences and humanities. Nonetheless, in all fields of research, men always outnumber women in the high-level, prestigious positions in research.

Not surprisingly, women in research appear to be less satisfied than their male counterparts with opportunities for advancement, mobility perspectives, job security and salary (IDEA Consult, 2013). Furthermore, although recent findings suggest that there is no difference in male versus female grant success rates and that an increasingly balanced percentage of men and women manage to secure tenure in academic research positions, women tend to drop out much more from a research career than men (Levitt, 2010). According to Levitt’s findings, this trend is much more salient when the only alternative available is a research career in industry. A much smaller fraction of women than men ends up in industry, which may suggest that women are more likely to opt out of a research career if industry is their only option.

Another relevant disparity concerns prevailing differences between male and female productivity rates. Although some recent research reports that differences between male and female productivity rates are decreasing, women tend to publish less than their male counterparts (Cruz-Castro & Sanz-Menéndez, 2010). According to Padilla et al. (2011), this may very well be connected to inequalities within the academic career, specifically with women's retention, mobility, promotion and compensation. Finally, recent research findings appear to show that children and the timing of pregnancy matter a great deal when it comes to achieving tenure: late mothers are more likely to achieve tenure than women who have children early in their careers (that is, the child is born up to five years after the mother has completed the doctoral degree). However, men who have children early in their careers are 38% more likely to achieve tenure than women in a similar position. (Puljak & Sharif, 2009). In addition, women who achieve tenure are twice as likely as men to be single (Mason and Goulden, 2002).

III. Barriers to Mobility

Mobility (including sectoral, institutional and geographical) has been a dominant theme in the literature about research careers and in European policies. Mobility is seen as fundamental for the development of an effective and competitive European Higher Education Area and European Research Area (Marimon, Lietart & Grigolo, 2009). For years, European policies have been strongly oriented towards the promotion of mobility of higher education teachers, researchers, students or graduates, as well as towards the creation of research networks and projects (Musselin, 2004).

However, important barriers to mobility persist and "convergences cannot hide the deep divergences" (Musselin, 2004, p. 58) existing at the national level, specifically in what concerns (1) the diversity of higher education systems and labour markets across Europe, (2) diversity in recruitment practices and policies, and mobility patterns and rewards, (3) diversification of doctoral candidates' profiles and relevance of training programmes for the labour market outside academia.

Diversity of Higher Education Systems and Labour Markets across Europe

In a period where a global higher education labour market is emerging, the strategic relevance of mobility for the attractiveness of Europe as a destination for highly qualified researchers increases (Marimon et al., 2009).

National policies and actions to date have not yet managed to overcome many of the problems faced by researchers when moving or trying to move between EU countries in areas such as: research funding, including portability of research grants; housing and accommodation, as well as support or resources that help ensure smoother relocation transitions for researchers' family members; bureaucratic procedures at the host institutions; employment services and employment legislation, including portability of pensions; immigration services and legislation (Ivancheva & Gourova, 2011). In addition, there are clear differences in income, including the social benefits attached to salaries or job security that researchers working or wishing to work in Europe have access to. The same applies to the recruitment procedures adopted by institutions and to the degree to which higher education systems and markets are open to external and non-national staff (Musselin, 2004).

Another important measure that increases the attractiveness of European research careers includes offering adequate salaries that are competitive within and outside of Europe. Non-European countries tend to outperform EU Member States in terms of purchasing power adjusted salaries in all career stages (Doherty & Chalsège, 2014). The remuneration gap between the EU and some of its main competitors at the R2 career stage is of five to ten percentage points, and at the R1 career level differences in salary can go up to 25 percentage points. The US is amongst the best paying countries, and researchers at the higher career levels working in the US are the best paid in comparison to all other countries.

There are also extremely high differences between researchers' salary levels within the European Research Area, and substantial variations occur in career progression remuneration across EU countries (European Commission, 2007). These variations in salary levels distort the European single labour market and accentuate gaps in academic systems' ability to attract and retain researchers (Doherty & Chalsège, 2014). While Eastern European and Mediterranean countries usually offer low and medium average salaries to researchers, Central European and Nordic countries remuneration levels tend to be high to very high. Although reduced, these gaps between levels of remuneration across the EU persist when considering the cost of living (European Commission, 2007).

In summary, deep structural reforms and the implementation of policies that minimise discrepancies that undermine diversity and increase Europe's attractiveness for researchers from the EU and beyond are required (Grigolo et al., 2010; Marimon et al., 2009).

Although mobility programmes have helped to strengthen the relationship among European research centres, they have not necessarily favoured the building of a European labour market for researchers, especially for early-career researchers. It is not clear that welcoming centres prefer European researchers and that they give priority to European countries or researchers when hiring. In fact, although the EU has more researchers in absolute numbers than its main trading competitors (the US,

China and Japan), it is well below these countries when it comes to the share of researchers in the total labour force (Doherty & Chalsège, 2014).

Diversity in Recruitment Practices and Policies, and Mobility Patterns and Rewards

Open, transparent and merit-based recruitment procedures in higher education and research institutions across Europe are a prerequisite for achieving a globally competitive European Research Area (Doherty & Chalsège, 2013, 2014). However, when asked about their opinion on recruitment policies at their institution, 34 to 40% of EU researchers in higher education institutions referred to being dissatisfied with the practised levels of openness, transparency and the degree of open recruitment (IDEA Consult, 2013). This is particularly true for early-career researchers, that is R1 and R2 researchers. R1 researchers were the least satisfied with levels of openness. R2 researchers were the least satisfied with the levels of transparency and the degree of merit-based recruitment.

According to the Researchers' Reports, the number of research-related jobs posted in international job portals such as the EURAXESS portal is one way of inferring the level of international transparency of a national academic and research system (Doherty & Chalsège, 2013, 2014). Specifically, the number of job postings in these portals serves as an indicator of improved accessibility of information on publicly funded research posts across Europe. Between 2009 and 2013 the number of job postings in the EURAXESS jobs portal increased from almost 5000 to slightly more than 40,200, including information from other national research job portals. Nevertheless, this general trend for an increasing number of job postings in international job portals must be treated with caution. As Doherty and Chalsège (2013, 2014) highlighted, the growth in the number of job postings was not accompanied by researchers' increased awareness about the existence of these international job portals. Furthermore, such general trends do not provide any precise indication of the degree of transparency existing at the national level.

Across Europe recruitment procedures "are anything but similar" (Musselin, 2004, p. 59). Recruitment periods tend to be diverse across countries and institutions, and candidates for vacant positions find it difficult to identify these posts because usually they are not visible. Such details not only play against candidates applying for positions in various countries, but they also make it hard for a researcher to knowledgeably compare (dis)advantages attached to different employment options. Additional barriers concern the more tacit or implicit mechanisms underlying recruitment procedures that arise from the embeddedness of higher education and research labour markets, the weight of socialisation, common knowledge or shared criteria. According to Musselin (2004), because of such obstacles, recruitment often relies primarily on personal interaction and networks, and new applications or recruitment procedures are not always independent from previous ones.

Furthermore, information about competitive advantages often is not explicitly known or disseminated, and external candidates find it difficult to identify or be aware of unofficially required criteria for a post. The opposite is also true: recruiters tend not to know enough about foreign candidates countries' rules and habits. This helps to make spontaneous applications from foreign candidates less likely to occur and even less likely to be successful (Musselin, 2004). In fact, the empirical data available shows that referrals and other personal search methods usually lead to better matches in employment than other job search methods, such as formal labour market intermediaries such job advertisements and head hunters (Wei et al., 2012). These better matches in employment usually lead to reduced turnover, higher wages and productivity, and higher job satisfaction.

Especially in countries at the early stages of development of academic systems or characterised by a low investment in R&D, 'inbreeding' practices tend to shape institutional arrangements directed towards the recruitment of researchers (Cruz-Castro & Sanz-Menéndez, 2010). In these countries, inbreeding – that is, the recruitment for their faculty of people who were granted a doctorate by the same institution – comes up as a response to the contextual constraints underlying universities' institutional arrangements. These arrangements tend to be linked to academic systems where universities cannot provide distinctive salaries or working conditions to their faculty to reward achievement, or where there is not much reputational institutional differentiation and little incentive to mobility.

Consequently, mobility patterns of doctorate holders show wide variations across countries, and mobility plays a complex role in the academic productivity and career development of researchers (Zubieta,

2009). However, a number of similar patterns of mobility can be identified across countries (Auriol et al., 2013). For example, doctorate holders who are not researchers tend to be more mobile than those occupying research positions. As highlighted in the Careers of Doctorate Holders report, mobility, measured by the percentage of doctorate holders who changed jobs over the previous ten years in total employment, tends to be mostly intra-sectoral and has the higher education sector as the most prominent point of origin and destination for researchers. For those doctorate holders not working as researchers, the business sector appears to be their main point of origin and destination. In contrast to the situation in many European countries, mobility destinations in the US tend to be more or less equally distributed between the business and the higher education sectors, for both researchers and non-researchers.

According to the MORE2 Study (IDEA Consult, 2013), 30% of the EU-27 postdoctoral researchers had intersectoral mobility experiences for a period of more than three months, which was 12% of the average share of those working in private industry. Lack of preparation in areas such as intellectual property and knowledge transfer help to explain why researchers hold themselves back in their interactions with the private sector (Doherty & Chalsège, 2014). The main reasons driving researchers to search a position in the private sector of employment were career progression, the possibility of gaining first-hand experience in industry, increased employability, availability of research funding and the ability to bring research to the market (IDEA Consult, 2013). Similar reasons were presented by researchers as being their drivers for international mobility. For international mobility, career progression and the opportunity to work with leading experts were presented as the main motivations for working abroad. Around 31% of EU researchers in the postdoctoral phase have been internationally mobile for at least three months in the last ten years.

However, for a significant minority of researchers (31%), international mobility for a period of time of more than three months was not beneficial (IDEA Consult, 2013). For this group of individuals, mobility experiences tended to decrease rather than increase job options in academia, as well as progression in remuneration and reputation. These results not only go against usual perceptions of the benefits of mobility for researchers and their careers, but also draw attention to mobility-related aspects often not discussed. Some of these aspects concern the drivers and circumstances of mobility: was mobility 'forced' because researchers had no other (employment) opportunities? What were the circumstances leading to mobility? Was there a previous knowledge of the staff or institution at the given relocation destination? Was the researcher a part of existing networks? Did the researchers have the support of his or her original host institution? What were the researchers' expectations towards the experience of mobility?

IV. Other Circumstances that Operate as Challenges to Postdoctoral Researchers' Employment

From the onset until the end of a research career, numerous events and circumstances contribute to accentuate imbalances in researchers' productivity and impact. Productivity and impact are often considered indicators of a researcher's degree of success, and tend to be measured by indicators such as the likelihood of having high rates of published papers in renowned journals, receiving prizes and honours, or being awarded major research grants (Garcia-Romero, 2012). 'Cumulative advantage' is the term given to the effect that comes from the strong, close relationships that exist between the numerous events or circumstances accentuating differences between researchers' access to opportunities and rewards, and consequently on researchers' career prospects and advancement.

As Cruz-Castro and Sanz-Menéndez (2010) highlighted, in the social structure of science the distribution of merit and rewards "is uneven and sometimes not coincident" (p. 29). Opportunities and symbolic and material rewards "tend to accumulate in few individuals and institutions" (Zubieta, 2009, p. 106). Therefore, there is the risk of generating a dynamic where groups or individuals coming from prestigious institutions (universities, departments, research centres or institutes, laboratories) secure a significant amount of the resources, which will result in even more opportunities and rewards allocated to these groups or individuals (Bornmann & Daniel, 2006; Zubieta, 2009). Amongst the most important cumulative (dis)advantages impacting

on opportunities and rewards available to early-career researchers are (1) institutional affiliation and networking opportunities, (2) mentoring or supervision, organisational climate of host institutions and field of research.

Early-career Researchers' Institutional Affiliation and Networking Opportunities

The choice of a doctoral programme is one of the first steps taken by doctoral candidates while building their research careers. Several studies have established that a positive relationship exists between acquiring a prestigious doctoral degree and being hired by an institution with a similar level of recognition (Zubieta, 2009). In particular, attending a doctoral programme in an institution recognised by its excellence seems to positively affect the quality of the opportunities doctoral holders have access to at the post-doctorate level. Furthermore, the quality of the doctoral programme together with the quality of the institution hiring doctoral degree holders at the postdoc level appears to increase the possibility for employment at a prestigious department at the end of the postdoctoral position (Garcia-Romero, 2012).

Several studies have also established that the quality of the doctoral programme or host institution has a stronger effect on the quality of the first position held by doctorate holders than their productivity (Zubieta, 2009). Specifically, it is the prestige of the doctoral programme or host institution, and not individuals' past performance assessed through prior scientific productivity, which is commonly used to predict candidates' perceived potential or future performance, and therefore their suitability for hiring (Cruz-Castro & Sanz-Menéndez, 2010). Hence there appears to exist an interaction between the prestige of the doctoral programme or host institution and the quality of opportunities or recognition of doctorate holders, where one reinforces the other in a process of cumulative advantage (Zubieta, 2009). The same happens between prestige and recognition of the doctorate holder or institution and productivity.

According to findings by Cruz-Castro and Sanz-Menéndez (2010), institutional research quality appeared to affect positively the academic performance of doctorate holders who are granted tenure. In addition, publications produced during the pre-doctorate stage together with the quality of the doctoral programme or host institution positively affect (i) researchers' scientific production over the ten years following the attainment of the doctoral degree; and (ii) the impact factor of the journals where researchers published during that same period of time (Garcia-Romero, 2012). Being affiliated with a research centre also appeared to impact positively on productivity. Centre-affiliated faculty members tend to have higher levels of research productivity than non-affiliated faculty members (Sabharwal & Hu, 2013). However, such effects seem to benefit more senior faculty members than untenured junior faculty members. For the latter, being affiliated with a research centre does not necessarily enhance productivity.

Recently, scientific output and productivity have grown globally and rapidly, and collaboration between institutions has intensified (OECD, 2013). These trends seem to point to changes in the structure of collaboration networks and the production of scientific research, which seem to have progressively shifted from individuals to groups, from single to multiple institutions, and from national to international networks. Notwithstanding this, European researchers (i) are more likely to collaborate with researchers at institutions within the same country; and (ii) appear to be involved in collaboration networks that are mainly inclusive, that is, researchers in Europe are more likely to collaborate with researchers in Europe than outside Europe (Kamalski & Plume, 2013).

Holding a postdoctoral position at an early stage of the academic career may be advantageous for researchers. As a study by Horta (2009) revealed, holding a postdoc position at an early stage of the academic career opens opportunities for promoting contact and collaboration with peers from other countries. Furthermore, it appears to increase the likelihood of engaging in information exchange with international peers and of being involved in stable international scientific networks in comparison to those who did not do a postdoc. Therefore, especially for the younger cohorts and for those who are internationally mobile, holding a postdoctoral position appears to not only lead to a greater integration into international scholarly communities, but also to foster greater production of scientific outputs later in the academic career (Horta, 2009).

However, this does not mean that the negative effects of international mobility identified in the MORE2 Study (IDEA Consult, 2013) do not prevail – that is, a decrease in job options in academia, and in

progression in remuneration and reputation. Not only Horta's (2009) findings corroborate to a large extent the MORE2 Study results, but also several other authors note that "applicants' local ties" (Bonnal & Giret, 2010, p. 456) play a significant role in early-career researchers' access to an academic career. Researchers with periods at institutions abroad that exhibit high performance levels are the ones who return afterwards, which usually indicates that such mobility experiences were sponsored by host institutions and that there were mutual expectations of the return of the researcher (Cruz-Castro & Sanz-Menéndez, 2010). As Cruz-Castro and Sanz-Menéndez highlighted, even when controlling for annual productivity, early tenure and all forms of mobility have a negative association.

Mentoring or Supervision, Organisational Climate Offered and Early Career Researchers' Field of Research

As Singer (2000) asserted, although many postdoctoral researchers have access to positions that are well supervised, stimulating and productive, for many others such experiences "could be significantly improved" (p. 2047). Often, the postdoc years provide researchers with only a narrow range of skills that make them feel they were not adequately prepared for the career option they seek to follow, either inside or outside academia (Foote, 2010). Sometimes, some supervisors also discourage supervisees from considering a career outside academia (LERU, 2014a).

The type and quality of career management support provided to early-career researchers also varies greatly across countries or institutions (DOCENT, 2010). Existing structures depend greatly on the importance the institution attributes to graduates' professional development, the budget available, or the personnel it can dedicate to the development and maintenance of these services. This does not seem to align with the Salzburg II Recommendations (EUA, 2010). According to these principles, institutions should provide support structures for the professional development of early-career researchers that, among other things, help to bridge communication gaps with potential employers and recruiters. This requires a more systematic, community-based approach viewing professional development of early career researchers as an intrinsic component of the role of departments, colleges, universities and disciplines (Foote, 2010).

The postdoctoral experience may take heterogeneous forms. These heterogeneous forms may induce a multiplicity of effects on expected wages (Recotillet, 2007). Consequently, another important role played by supervisors concerns their ability to provide early career researchers with access to resources, namely by assigning supervisees to quality, publishable research projects, or by contributing to and co-authoring supervisees' publications. Another important role played by supervisors concerns their ability to become models for early-career researchers' socialisation into science, for example by co-authoring supervisees' publications and sharing with them informal knowledge about how to structure a manuscript and communicate with editors and reviewers (Pinheiro, Melkers & Youtie, 2014). As Pinheiro et al. observed, co-authoring with one's supervisor is a major source of publications for early-career researchers.

The supervisors' publication record also appears to have a major effect on female researchers' future grant success (Levitt, 2010). Specifically, female researchers with supervisors with productivity rates that placed them in the top quartile of the distribution were three times more likely to receive a major grant than female researchers whose mentors' scientific impact located them in the bottom quartile. As Levitt (2010) highlighted, this effect was not observed for male researchers and may suggest some residual gender discrimination in tenure track hiring, which a prestigious doctorate may help to overturn. Early-career researchers may also be discriminated against or marginalised by supervisors or the institutions or departments hosting them on the basis of their gender, sexuality, age, family status, nationality, race, ethnicity or personal characteristics irrelevant to scholarly activity (Foote, 2010). Under such circumstances, it is not uncommon for early-career researchers to drop out of an academic career.

According to Foote (2010), there are also mismatches between the implicit knowledge and skills required to succeed and the explicit contents addressed by the curricula, advising or mentoring. Moreover, senior faculty are not always receptive to the idea that support provided to early-career researchers may need improvement. Not surprisingly, early-career researchers are often reported to experience isolation both within the department where they work and within academic society in general (DOCENT, 2010). As Puljak and Sharif (2009) asserted, institutions and supervisors need to be

sensitive to the needs of early-career researchers. Dominant, highly hierarchic relationships governing the careers of researchers also need to be revised because such relationships greatly restrict the autonomy of researchers, including experienced researchers (Expert Group on the Research Profession, 2012).

In addition, field-specific factors relating to productivity and visibility need to be considered, given their impact on opportunities and rewards (e.g. salary raises, tenure, promotion; Sabharwal, 2013). For example, in all scientific fields but engineering it appeared to be beneficial to hold a postdoctoral position at an early stage of the research career (Horta, 2009). Specifically, holding a postdoctoral position did not appear to lead to greater information exchange with international peers for faculty members in engineering. The opposite was observed for researchers from health sciences and humanities. For these researchers there were some particularly evident effects regarding the intensity of their behaviour relating to the exchange of information.

Social scientists usually publish less than researchers in other sciences (Sabharwal, 2013). These differences in productivity of social sciences researchers may result from the nature of the publishing process in the discipline (e.g. longer publication time, lengthier articles, fewer grants, difficulties in obtaining data). They may also result from the lower co-authorship rates that persist in the field in comparison to other domains of research. Early-career social scientists also spend a majority of their time teaching (Sabharwal, 2013). As Sabharwal argued, it is safe to consider that research productivity and time spent teaching are negatively correlated.

Finally, minor differences between fields of research also exist concerning doctorate holders' employment prospects. According to the Careers of Doctorate Holders report (Auriol et al., 2013), unemployment rates are the lowest for doctoral degree holders coming from engineering, social sciences and the medical sciences. The percentage of people unemployed with a doctoral degree from the natural sciences is above the overall unemployment rate of doctorate holders in a majority of countries. Humanities is the field of research with the highest unemployment rates in comparison to other fields of study.

V. Conclusions

The creation of nourishing and challenging research environments and of reliable and projectable career paths for postdoctoral researchers will enhance Europe's ability to not only attract the best and most creative minds, but also to maintain an advantage over international competitors. However, a generalised consensus exists around the notion that there is not enough information on a number of topics relating to early-career researchers' employment conditions. In particular, several questions remain unanswered regarding the existence of an appropriate research and academic environment that attracts and provides doctorate holders at an early stage of their careers with a nurturing environment capable of helping them to fully develop their capacities (Auriol et al., 2013).

With the recent significant changes in the structure of labour markets and research, traditional linear research paths have given way to more diverse career expectations and experiences. Doctorate holders 'job-hopping', the decrease of tenured academic positions in comparison to temporary or non-permanent ones, and the high growth in the number of doctoral awards has led some observers to wonder about the extent to which innovation systems are mature enough to create research positions that fully utilise doctoral degree holders' skills and competences (Auriol et al., 2013). Consequently, the underlying problem faced by Europe concerning postdoctoral researchers' challenges to employment may be that a large mass of research and academic potential is unused or misused (Grigolo et al., 2010). Trends identified in this review of the literature seem to suggest that much.

Policy-makers usually approach the creation of European research markets from the supply side of researchers, instead of looking into the organisational strategies and institutional factors affecting these markets (Cruz-Canal & Sanz-Menéndez, 2010). Once again, important questions remain unanswered. Specifically those questions concerning the effects that recent increases and prioritisation of doctorate graduates' rates have on the functioning of existing labour markets. These effects include but are not limited to: (i) mismatches between supply and demand of doctoral degree holders; (ii) the effects of providing new sectors of employment with academic-oriented and trained doctorate holders;

and (iii) patterns within and across employment sectors for doctorate holders (Pedersen, 2014). As Pedersen highlighted, more also needs to be known about the desirability of a research career, specifically about the attractiveness of the higher education employment sector for doctorate holders and the impact that existing mismatches between supply and demand of early career researchers have on their career outcomes and prospects.

Fundamental for the resolution of many of these unanswered issues will be the ability of Europe and of the European research community to overcome ongoing schisms in how higher education systems and research labour markets are organised and how they communicate amongst themselves. The same applies to the interactions and collaborations established between researchers and policy-makers. The European research community is "very fragmented and clearly lacks a strong voice" (Expert Group on the Research Profession, 2012, p. 9) when collaborating with policy makers and research funders. At the same time, persistent and ever-increasing R&D performance discrepancies exist between the EU-28 (e.g. in R&D expenditure, tertiary education, business R&D investment). These discrepancies need to be minimised in order not to hinder Europe's competitiveness. Specifically, the growing geographic divide between southern and eastern European and northern and western European countries represents a major challenge that may compromise Europe's investment in higher education and research, as well as its quest for excellence.

"The underlying problem faced by Europe concerning postdoctoral researchers' challenges to employment may be that a large mass of research and academic potential is unused or misused"

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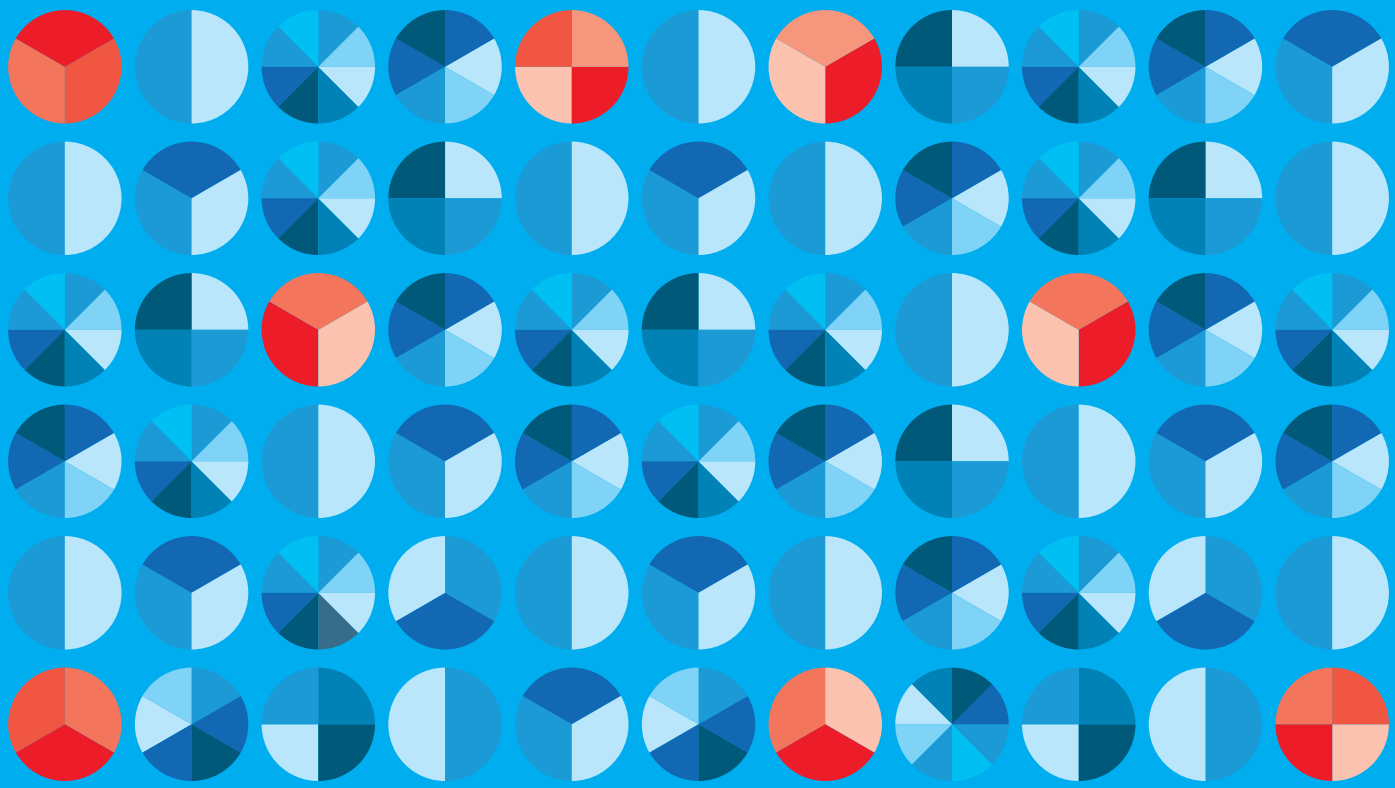

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