Ad Hoc Working Group on Steering and Funding of Research Institutions

Complete Results of the SFRI Questionnaire on the Working Conditions of Researchers in the Universities and Public Research Organisations

28 April 2006, Ministry of Education and Science, Madrid, Spain

Delegates will find attached a document summarising the results of the SFRI questionnaire on the working conditions and attractiveness of research careers in universities and public research institutions. Delegates are invited to discuss this document under Item 6b of the draft agenda of the SFRI meeting on 28 April 2006 to be held at the Spanish Ministry of Education and Science (Room E) in Madrid, Spain.

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1. OECD countries wish to ensure that research careers are attractive and competitive enough to attract young people into science and technology. Because the public sector employs a significant share of researchers in several OECD countries and because this is a sector where government policy influences both the demand and supply side, the CSTP ad hoc working group on the Steering and Funding of Research Institutions (SFRI) launched an inquiry into the legal and regulatory conditions that govern the employment of academic researchers, including early stage researchers (PhDs and Post-doctorates). This paper presents the synthesis of the responses to this inquiry. Among the findings are:

- The duration of PhD training is still quite long in a number of countries and could increase the social and private costs of producing new graduates as well as reduce the speed at which the system can respond to changes in demand.

- Post-doctorate training lasts between 3 and 6 years in some countries. In many fields, younger researchers have higher productivity so policies to promote training should be geared to helping them achieve independent research status as soon as possible.

- Many countries lack guidelines for PhD supervision and mentoring. This could be an area for policy action at the institution or government level, insofar as enhanced supervision can help steer candidates to areas where there are opportunities or demand. Such policy action could also help reduce the risk of drop-outs.

- In many countries, there is scope for matching PhD training closer to market needs and diversifying career paths through internships as well as allowing the portability of PhD fellowships to industry.

- Despite the growing importance of the commercialisation of research, new researchers are rarely recruited based on their performance in non-scientific areas (e.g. patenting, technology transfer, fund raising). Mobility does not appear to be of explicit value in recruitment but rather indirectly as scientific quality could be affected by time spent at other institutions or abroad. Part-time employment for researchers is possible in most countries but is viewed as a transitional measure (in response to family or personal reasons) rather than a career path model.

- Significant barriers exist to “permanent” or tenured employment (e.g. performance assessment and or public examinations). Several countries report delays or increases in the age at which researchers obtain tenured employment or “permanent” status.

- Only a few countries such as Australia and the United Kingdom promote researchers primarily based on performance. A mix of seniority and performance predominates in most other countries.

- The academic labour market is relatively open to foreign researchers who first undertake PhD or post-doctorate training in the host country. However, for those coming from abroad there are higher barriers to entry.
A “dual labour market” has emerged in the public research sector. Established researchers often have access to civil servant and public employee contracts – and hence a greater degree of employment protection. Temporary staff generally works under private employment law contracts. They may be better paid (at senior levels) but may also be less well paid (e.g. early stage researchers at universities). Most academic employments systems were not designed to accommodate the growing number of mobile researchers recruited with soft money at centres of excellence or on competitively-funded research projects.

Staff on fixed term contracts account for one out of two researchers in Spain and Italy. Two-thirds of Belgian researchers are on fixed term posts as are some 42% of researchers in Norway. In Finland, with two-thirds of professors on permanent posts, up to 35% of professors are on temporary positions. In many countries universities, and to a lesser extent PROs, rely on temporary positions to recruit new entrants or specialists in the face of strong rigidities in the labour market for established researchers.

Compensation systems are based on fixed wage scales negotiated through collective agreement with little room for individual bargaining, except for private law employees or temporary staff in a few countries. Some countries have adopted variable pay mechanisms at the margin – often determined by seniority and or research outputs.

Researcher salaries, especially for mid-level and senior staff are attractive, but salaries for early-stage researchers are rather low in many countries relative to per capita GDP. This could be at odds with policy measures to make research careers attractive for young people (e.g. increases in funding for PhDs and post-docs).

Several countries reported that researchers are facing an increase in their workload, partly as a result of the massification of higher education, and a decrease in the amount of support staff available to researchers and faculty. Questions can be raised as to how this could affect working conditions and the quality and productivity of researchers.

The following questions for discussion arise and could be a point of departure for the discussion of the SFRI working group at its meeting in Madrid.

1. Do the results of the questionnaire adequately reflect the situation in responding countries?

2. Is there a gap between the reality of the academic labour market (rigidities) and policies to increase the supply of young researchers? What is the risk that new graduates will find themselves excluded from career track positions?

3. Are human resource policies and career structures in line with the research priorities set at institutional and national levels?

4. How can institutions and governments address the imbalance between tenured or permanent staff and growing number of temporary staff?

5. To what extent can researcher compensation be better linked to performance, both individual and institutional? What role does the researcher evaluation system play in this (i.e. the link between evaluation and remuneration)?
Introduction

2. In the spring of 2005, the CSTP ad hoc working group on the Steering and Funding of Research Institutions (SFRI) launched an extensive questionnaire on the legal and regulatory frameworks governing the working conditions of researchers in universities and public research organisations (PROs) and on policies affected the attractiveness of research careers. The questionnaire was developed by the Secretariat on the basis of contributions from the lead countries of the SFRI sub-activity on the attractiveness of research careers, namely Belgium, Japan and Spain. The Bureau of the SFRI provided comments on the questionnaire and approved its diffusion to member countries.

3. The aim of the questionnaire is to help policy makers better understand the legal, regulatory structures and institutional arrangements that govern the employment and working conditions of PhD students, post-doctorates and researchers in the public research sector in OECD countries. The target population for the questionnaire is the government ministry or agency responsible for policies that more or less directly impact on researcher employment and working conditions in universities and public research institutions. This may include the Ministry for research but also may include other ministries such as the labour/employment ministry, the social affairs ministry, the education ministry or the public administration ministry. Over the course of 2005 and early 2006, 19 countries participated and responded to the questionnaires. This paper is organised as follows: the first part recalls some basic quantitative facts about the researcher population in OECD countries, the second part discusses some of the policy issues that gave rise to the request for information via the questionnaire and the third part presents the main findings of the questionnaire. Annex 1 to this document contains the detailed responses from the responding countries.

Basic facts about researchers in OECD countries

4. While innovation requires many types of talent – technical, managerial, marketing, and financial talent to name a few – it also requires highly trained researchers who can expand the frontiers of knowledge, generate new discoveries and solutions to problems and who can diffuse knowledge whether by tacit or codified means. According to OECD data, the stock of researchers in 2002 reached some 3.56 million persons, i.e. about 750 000 more than in 1995. 1.33 million researchers in the United States, 1.16 million in Europe and 646 000 in Japan were engaged in the conception and creation of new knowledge, products, processes, methods and systems. In Europe, Germany has the largest stock of human capital in research, almost as much as France and Spain combined. Korea and Canada also have more than 100 thousand researchers at work. Non-member countries are important producers and users of research talent, most notably China, India, Russia, and Brazil. China has become the third largest R&D performer behind the United States and in 2003 China accounted for the world’s second largest population of researchers (862 000 persons).

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1 These countries and regions are: Austria, Australia, Belgium and Belgium Wallonia, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Japan, Netherlands, Norway, Poland, Spain, United Kingdom, United States. Sweden replied in March 2006 and as such the Secretariat has not yet integrated the Swedish response it will do so at a later date.
5. In 2002 there were 8.3 researchers per 1,000 employees working in OECD countries. This represents a significant increase over the 1995 rate of 7.0 researchers and was driven by demand from the business sector that employs around two-thirds of the researcher population in the OECD area. The business sector employs the majority of researchers in the United States, Korea and Japan. On average in the OECD area barely one researcher in three is employed by universities or public research organisations. Nevertheless, in some countries, the public sector (higher education and government sectors) remains the main employer of researchers. This is the case in the EU-25 countries as a whole as well as in individual countries such as the Australia, the Czech Republic, Italy, the Netherlands, New Zealand, Poland, and Spain. Even in France and Norway, the public research sector employees over 45% of researcher population.
Policy concerns about researchers in OECD countries

6. There are many reasons why OECD governments are concerned about the research population in the public research sector. First, as illustrated in Figure 2, a significant share of researchers work in the government and higher education research sectors. Policy makers are thus keen to ensure that the public research workforce is both productive and efficient in accomplishing its various missions – teaching, research and, increasingly, the diffusion and commercialisation of public research results. There are also several secondary or related concerns:

- That the training and supply of young researchers (PhDs and post-doctorates) responds to qualitative and quantitative demands from both the public and private sectors so as to avoid skill mismatches, or an over-production or shortage of researchers.

- That the working conditions of young researchers in the public sector are competitive enough to attract and retain (national and foreign) researcher talent.

- That employment conditions are flexible enough to ensure that public research institutions can adapt to changes in research priorities and in levels of (public) research funding.

- That career paths in public research are attractive and dynamic enough to ensure the renewal or replacement of retiring faculty and researchers while promoting mobility between academia and other sectors of the economy.

7. In many OECD countries these concerns are made all the more salient because of evidence of a recent decline in the relative shares of enrolments in scientific studies among young people [see Global Science Forum study DSTI/STP/MS(2006)1]. Consequently, the issue of the attractiveness of research
careers, insofar as it may affect student interest in science studies and hence the career choices of graduates, moves higher up the policy agenda. For this reason, the SFRI working group decided to collect information on the legal and regulatory frameworks that govern the training, employment and working conditions of researchers as well as on the government or institutional policies to enhance the attractiveness of research careers. Although there has been a growing trend to grant universities and public research institutions in OECD countries greater autonomy with regard to the management and employment of researchers and faculty, governments, whether national or regional authorities still have considerable policy influence in shaping the working conditions and the attractiveness of research careers, particularly in the public research sector.

Responses to the OECD questionnaire

Duration of PhD study and post-doctorate training

8. Ensuring that the duration of training of young researchers is responsive to demand, whether from industry or academia, is an important issue for universities and government. Too long a duration may limit the number of years a researcher can contribute to active and independent research. It may also delay entry into the labour market and may contribute to a rise in drop-out rates. The country responses to the questionnaire show that the average duration of PhD programmes is variable across countries from a minimum of 3 years to a maximum of 6 or 7 years. In Italy, Austria, France and Germany the studies seldom exceed 3 or 4 years although the latter three offer a possible time extension of 1 to 2 years. In contrast, the duration of PhD studies exceeds 5 or 6 years in Spain or Canada. Spanish universities allow a further 3-year extension. Generally PhD studies are longer in humanities, social sciences or theology. However, in Spain and the Netherlands, PhD studies are longer in the S&T fields, as they are in engineering in Germany. Data for the United States show an average duration of 7.5 years but this data may not be comparable with other countries since the United States results are based on actual surveys of graduates while the responses for some of the other countries are based on the rules of universities and ministries. International differences in the duration of PhD studies may be due to a range of factors such as the availability and amount of funding for PhD studies, the structure of academic programmes, the labour force status of PhDs and post-doctorates (i.e. students versus employee).

9. Postdoctoral training is increasingly becoming part of the researcher training experience, even in the social sciences. In recent years, there have been concerns in many OECD countries that “post-docs” were becoming a permanent “temporary” research labour force, with an appointment leading to successive appointments so that some young researchers could spend up to 6 years as a post-docs on top of the four to five years of PhD training. In most countries, postdoctoral appointments last between 1-2 years to 3-5 years (with extremes of 6 months in Belgium and 6 years in Germany). Average duration varies little between universities and public research institutions. In addition in most countries, with the exception of the Australian universities and in Italy, post-doctorates can expect contract renewals. Restrictions are generally expressed in terms of the number of renewals and thus the total maximal duration. Austria, Denmark and the Netherlands also impose a break in contract/appointment. The United Kingdom is the only country to automatically convert postdoctoral appointments that exceed four years into permanent employment contracts. Universities in Norway impose teaching as a requirement during the 4th post-doctorate year.

10. As with PhD studies, excessive periods of post-doc training could delay the age at which a young researchers achieves autonomy and independence in his/her career path. Similarly, an excessive duration of training may reduce the average life-time earnings of researchers since post-doctoral appointments are generally not competitive with salaries for established academic staff in the same country. This subsequently increases the opportunity costs of pursuing research training and academic careers.
Figure 3. Duration of Full-time programmes, average number of years

<table>
<thead>
<tr>
<th>PhDs programmes¹</th>
<th>Post doctorate appointments</th>
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<tr>
<td></td>
<td>Maximum number of years</td>
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<tr>
<td>United States</td>
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<tr>
<td>Spain</td>
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<td>Canada</td>
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<td>United Kingdom</td>
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<td>Australia (univ.)</td>
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<td>Belgium (Wall.) (PRos)</td>
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<td>Belgium (Wall.) (univ)</td>
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</table>

1. Defined as the average duration of full-time PhD study from the point of admission into a Doctoral programme to completion of degree, excluding any period spent on prior university level studies. For the US, the data reflects the effective average duration based on surveys of actual graduates.

Source: SFRI Questionnaire, OECD 2006.

Drop-out risk

11. Drop outs of PhD programmes are a concern given the large public and private investments involved in PhD training. A few countries provide data on PhD drop-outs. In the United Kingdom and Belgium (Wallonia), the failure risk remains low with 10% of PhD students dropping before the completion of their doctorate. In the Czech Republic, Norway and Spain one student out of four or five withdraws. In Denmark, the drop out rate is equivalent to these countries for science doctorates but much larger in humanities, where more than half the students drop out.

Flexibility in the course of PhD study

12. One way institutions seek to reduce the risk of dropping out is by allowing PhD candidates to change supervisor in the course of their studies, either because of possible dissatisfaction with the supervisor or because of a change in research focus. In all countries except Italy there is a possibility to change supervisor during PhD studies but this is mainly done on an ad hoc basis. Belgium, France and Spain, however, have adopted a PhD policy providing a legal basis for the pursuit of doctoral studies. In the same way, the final decision is rarely left to a university, as it can be in Belgium, Norway, Poland or the Czech Republic. Both supervisors (the new and the former), the Rector or doctoral commission, the
Policies governing PhD supervision and mentoring

13. Adequate supervision is important in reducing the risk of drop outs among PhD and early stage researchers. In some countries, faculty is evaluated on their success in supervising PhD candidates. In an attempt to ensure greater transparency and coherence in PhD training, some countries have established policies or recommendations to institutions regarding the supervision of PhDs students and post-doctorates. Austria, Finland and the United Kingdom all report having nationally-based recommendations on PhD supervision. Supervision is enforced by law in Wallonia, Belgium, France, Poland and Spain. Half the countries (Belgium, the Czech Republic, Denmark, Italy, Japan or Norway) under review did not report any explicit policies or “recommendations”. Meanwhile, Austria, Finland and France integrate this issue into their main policy objectives regarding PhD and post doctorate training. In Australia, the issue is still under consideration. With regard to measures to promote the mentoring of young PhDs in order to provide them with more individualized training as well as advice on career opportunities, few countries have national initiatives with the exception of Germany and the United Kingdom. When measures do exist, they generally are left to the discretion of the universities or university departments (Australia, Austria, Canada, Czech Republic and Finland).

Linking PhD training to industry

14. Increasingly, universities and research ministries are keen to better link curricula and research training to industry needs so as to one the hand, ensure a better match between supply and demand and on the other hand, to help diversify career paths for researchers, especially in countries where the main employer of PhDs has been the public research sector. The most common means are industrial PhD fellowships/awards that allow students and graduates to pursue part of their research in industry. They cover personnel and occasionally facility costs. Industrial partners may contribute to total costs and fellows may be employees of the firm. Beneficiaries may have to perform part of their research in the industry/company facilities; this part is variable according to the countries and the programmes (from 10% in the British CASE awards to 100% in the Canadian IRD fellowships). Austria, Denmark, Japan and Norway have also implemented business-oriented trainings. Austria at Fachhochschulen, Denmark and Japan introduced industry aspects into PhD training and Norway one is developing a scheme to adapt an industrial PhD programme to national needs.

Status of PhDs and post-doctorates

15. PhDs and post-docs are part of the research workforce insofar as their activities have a direct impact on the output of institutions (e.g. teaching, publications, patents, spin-offs). However, these early stage researchers are also undertaking professional training. Are they students or employees? In many countries PhDs candidates are considered employees. In general, post-doctorates are considered “staff” of universities and the PROs, except in Denmark, Hungary, the Netherlands and Norway, where the legal treatment of young researchers does not change from PhDs studies to post-doctoral appointment. In the United Kingdom, Poland, or Australia, and in the Italian universities, PhDs are never considered employees. The legal status is often determined by the source of funding (as in Austrian, Belgian, Finnish and French universities, Germany, Japan, and Spain). In these cases, the beneficiaries of fellowships, scholarships, stipends are not considered employees. In Canada, Japan or the Netherlands, the legal position of PhDs students and post-doctorates is related to the type of research institutions (universities versus PROs). In Belgium (Walloon) or in Finland, PhDs students are employees of PROs, but in the universities their status depends on the source of financing. In the Netherlands, PhDs are considered
employees of Dutch universities while in the PROs their status depends on whether the PRO in question is a public or a civil institution.

**Table 1. Employee or student status of PhDs (X) and post-doctorates (O)**

<table>
<thead>
<tr>
<th>Sources of funding</th>
<th>Type of research institution</th>
<th>Not employee</th>
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<tbody>
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<td>at PROs</td>
<td>at universities</td>
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<td>Australia</td>
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<td>Belgium</td>
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<td>Belgium (Wallonia)</td>
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<td>Canada</td>
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<td>Czech Republic</td>
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<td>Denmark</td>
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<td>Finland</td>
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<td>France</td>
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<td>Germany</td>
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<td>Hungary</td>
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<td>United Kingdom</td>
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</tbody>
</table>

X is for the PhDs students and 0 for the postdoctorates.

**Notes:** see annexe.

**Funding of PhDs**

16. PhDs students and post-doctorates may be financed by scholarships/fellowships, by salaries if linked to the research institution by a labour contract or by self-funding. In Spain, PhDs under contract can expect a monthly salary ranging from USD 2 250 to USD 3 300 (in purchasing power parities -PPPs); Those at PROs in the Netherlands can expect between 2 000 and 2 585 USD.

**Social welfare and pension benefits**

17. PhD students typically benefit from universal access to health insurance especially when enrolled at a university (as compared to a PRO). Restrictions exist however. Entitlement conditions are related to the funding mechanisms. Self-funded PhDs students remain in many cases outside the national social benefits scheme, even basic health insurance, and must obtain insurance from private providers. At one end, Poland and the Czech Republic report less extensive social welfare coverage, with solely publicly funded students entitled to the national health insurance scheme. The exclusion of PhD students from pension schemes is frequent. Entitlement to the national unemployment scheme remains exceptional in most countries. The Netherlands and to a lesser extent Finland and Japan, offer the most comprehensive social welfare coverage by granting PhD students access to national unemployment and pension schemes as well as health insurance. The Netherlands has the most comprehensive system as all PhDs students are covered irrespective of their legal status. Finland and Japan also allow PhDs full access to the national pension system.
18. Very few countries offer university- or institution-based pension schemes to early-stage researchers. Dutch and Finnish PROs grant all doctoral students such social benefits. Universities in Denmark, Finland, Japan and Norway offer their PhDs students access to institution-based pension to the extent they are integrated in a funding mechanism. Institution specific schemes are more frequent in PROs and offer cumulative benefits to national ones, except in Australia where an institutional system compensates the lack of national scheme.

19. National social welfare schemes are more extensive for post-doctorates, probably because they are more often employees of the university or the public research organisation. Access to pension schemes is more frequent but entitlement to unemployment schemes remains restricted. With only a few differences, the observations made for PhDs students remain true for post-doctorates. Access to national health insurance is widespread, as a basic benefit. Entitlement is greater at PROs in Spain and the UK but less so at PROs in Austria, France or Germany. Entitlement to unemployment and national or institutional pension schemes has also been extended in many countries. Spain and the UK are the countries where the improvement of social benefits towards post-doctorates compared to PhDs students is the most striking. In contrast, in France, the situation of PhDs seems to decline when they enter post-doctoral training. The protection of self-funded post-doctorates raises some concerns and in several countries only researchers on public funding have the right to national social benefits. The Netherlands again offers the most comprehensive entitlements, followed by the UK, Finland and to some extent Japan. Some countries offer also additional social benefits, such as public allowances, family allowances, private insurance schemes, national illness and disability schemes, contract prolongation following parenthood or long-term sick leave.

**Taxability of PhD fellowships**

20. Governments also provide indirect funding for PhD studies via the fiscal treatment of fellowships. While PhD fellowships are taxable in Denmark, Canada, Italy or Norway, they are not in Australia, Belgium, the Czech Republic, Germany, Hungary and the United Kingdom. In other cases, the fiscal situation of PhD students depends on the type of funding they receive. Doctoral students with fellowships are exempt from income tax while those on labour contracts are taxable. Austria, Canada and Finland apply a ceiling of resources of over 1 000 euros per month. Italy and Poland report an approximate 20% deduction. Canada and Norway apply the same rate as applied to other public employees. The Danish tax authorities apply a tax rate of almost 50%.

21. For post-docs the fiscal situation is rather different. They are only tax exempt in Belgium and Germany. In other countries they are liable to tax, either according to the nature and origin of their resources, or as regular employees. But the ceiling of resources and the tax rate are identical. Fiscal incentives for research institutions are rare, only Belgium represents an exception.

**Portability and validation of social security contributions after PhD study**

22. Portability of PhD fellowships can help students choose or move to the institution that best fits their research training requirements. It may also help reduce the risk of dropping out if there is a mismatch between the student and the university or if the lack of portability is a barrier to mobility, whether self-selected or due to an objective constraint (e.g. to join a spouse working in another geographic region). Most universities and PROs in countries exclude any transfer of a PhD fellowship from one institution to another, from a university to a firm or from one country to another. However Australia and Spain allow for the portability of fellowships between PROs. In Belgium (Wallonia) Finland and the UK, PhD fellowships can be taken abroad. Portability of fellowships to the business sector is only authorised in Austria and Canada. With a few exceptions (Canada, Czech Republic, Hungary) the majority of countries allow young researchers to validate the time spent as PhDs or post-doctorates at universities or PROs for social security
benefits. In Austria, Japan and Spain the validation of time spent training is possible on a case-by-case basis.

**Career paths for academic researchers**

23. Academic research career paths – from PhD study to retirement – are highly hierarchical with clearly established levels along the way. For the purpose of this study, in addition to PhDs students and post-doctorates, four main categories of researchers – and their equivalents in member countries – have been identified at both universities (teaching assistants, assistant professors, associate professors and full professors) and PROs (assistant researchers, engineers, researchers, research directors or head of department).

**Employment status of researchers – civil servants, public employees or private employees?**

24. As universities and PROs have gained greater autonomy, the questionnaire sought to identify the types of labour contracts in use at institutions. In most countries, the status of public sector researchers depends on public employment law. In Italy and Finland researchers are considered civil servants. In Japan and Austria, private contracts, public engagement, and civil servant status co-exist for all categories of researchers. In other words, there may be full professors on temporary and private law contracts; there is no automatic progression from temporary to permanent employment. In Australia, Canada and the United Kingdom, university researchers are employed on private law contracts exclusively. In the Czech Republic and Germany permanent researchers are public employees and temporary researchers are employed on private law contracts. Public employment status remains thus more common and private contracts tend to be associated with temporary employment. *Disparities in legal status are more marked between temporary and permanent staff than between various categories of research staff*. This multiplicity of contracts appears to provide some flexibility but adds a level of complexity and *in fine* an opaque overview of the academic staff system, which can be a barrier to informing young people about the career prospects in the public research sector.

25. At PROs there are few disparities in the legal status between temporary and permanent staff. Public employee contracts also seem to be more systematic than at universities. In Australia and the UK researchers at PROs are public employees. At PROs in Japan and Austria, the co-existence of public, private and civil servant status is still the rule. The Dutch and Norwegian PROs employ researchers both on private and public employment contracts. In France and Spain, access to civil servant status comes with experience/seniority.

26. In most OECD countries that responded to the questionnaire, there appears to be the emergence of a “dual academic labour market” whereby some established researchers have access to civil servant and public employee contracts – and hence a greater degree of employment protection – and temporary staff who generally work under private employment law contracts.

**Recruitment**

27. Recruitment of new researchers is first the responsibility of the employing research institution. In general, they define the selection criteria, sometimes in conjunction with the national government, and in rare cases with an inter-institutional body (Czech Republic), regional authorities (Spain) or a Research Council (UK). But the research institution remains the sole responsible and decision-making authority in the recruitment process. It is noteworthy that in Spain national government and regional authorities, however, participate in recruitment. The final decision as regards recruitment of young researchers is made by an official committee in most countries except Poland and Denmark, or in the Dutch PROs. However such committees do not interfere for the recruitment of all categories of researchers (Australia, Japan,
Austrian and Hungarian universities, or Norwegian PROs). The composition of these committees may be set by rules at the national level. In Denmark, the government sets broad guidelines. In Finland, selection committees must have a compulsory gender balance. They must be made up with half students and half professors in Austria. In Italy they must be composed of university professors (at universities) or a steering committee (at PROs). In Poland the selection committee for a director post at a PRO is appointed by a minister. In Italy, Spain and to a lesser extent Germany, the committee composition is ruled by law. In the Netherlands all public universities follow a “selection code” adopted by the Association of Universities in the Netherlands (VSNU).

Internal and external labour markets

28. To assess the openness of the academic labour market and the degree to which it promotes mobility, the questionnaire raised the issue of whether institutions mainly recruit young researchers internally or externally. From the responses, at both universities and PROs, internal recruitments are never the rule while external hires may be. For instance, universities and PROs in Finland and in the United Kingdom, and PROs in France, always recruit externally. German universities also tend to recruit externally. In contrast, public research institutions in Belgium (Walloon), Denmark, Hungary or Spain and universities in the Czech Republic tend to recruit researchers internally.

29. Universities and PROs, except in Italy, use a large variety of media to publish vacancies and to recruit research staff. Although the use of labour market intermediaries is quite similar among universities and PROs, Finnish and Dutch PROs outsource recruitment to private employment agencies (head-hunters), and Belgian and Dutch universities rely on alumni associations. The intermediaries used most frequently are internal employment departments, especially within universities. Newspapers, magazines and internet remain traditional channels to advertise openings. Austrian universities are also allowed to form a search committee. In most countries, vacancies are published on an ad hoc basis, even if openings for permanent and tenure positions are likely to be more regular.

30. As regards the criteria for recruitment, all countries except for Poland report a set of requirements for selection. Researcher candidates are expected to provide evidence of their academic qualification, their experience and their research output. Criteria differ slightly between universities and PROs. The requirement most often mentioned by countries for future university researchers is a PhD degree, the second is the number and quality of publications and the third is the amount of teaching and research experience. At PROs, peer-reviewed publications come first and no other criterion is of such equivalent importance. Only PROs in Belgium-Wallonia and Spain exclusively employed graduates with PhD degrees. In general, recruitment processes give little weight to issues such as external professional experience, patenting, fund-raising abilities for funds and mobility, especially mobility from and towards the business sector. Belgian PROs are the only research institutions requiring that candidates have had institutional and international mobility.
From recruitment to tenure

31. The traditional career path from recruitment to tenure remains in place but there are significant differences between countries. Young researchers are recruited at universities between 27 and 33 years old. They are on average less than 30 in the former Central and Eastern European countries (Czech Republic, Hungary, Poland), between 30 and 32 in Germany, France or Japan, and over 35 in Belgium, Denmark, Finland and Italy. The age of first recruitment at PROs is different, although new recruits are likely to be younger in the Czech Republic, Finland and older in Italy. Spain identifies an important age gap between temporary (31) and permanent (38) hires, the former being on average six to seven years younger.

32. Researchers obtain research accreditation (e.g. habilitation in Germany, Austria) from universities themselves or from a national body (council, agency) at about 38-39 years old. The advancement of young researchers at universities is mainly based on competition for a vacant position and often on an assessment of a candidate’s performance. Denmark, Finland, Germany, Italy and Spain do not use this latter evaluation methods however.
33. In most countries, access to tenure employment is based on a pre-established system of performance assessment. Qualities of candidates are examined during the selection procedure. Conversely, researchers in Spain must pass public examinations. This is also the main condition governing the promotion to tenured jobs in the Czech Republic and in Poland as concerns medical positions. In Austria, researchers must pass an examination to become eligible for a tenured position and the waiting list is getting longer. In Finland status is associated with the post, as in Denmark.

34. Country disparities regarding career paths increase over time. The youngest tenured university researchers work in Belgium (Wallonia), the Czech Republic, France, the Netherlands or the UK. They are under or about 30 years old. Conversely, in Denmark, Germany, Hungary, Italy, Norway or Spain, tenured employment is obtained between age 35 and age 40. Finland is the country where the waiting period to obtain a tenured or permanent post is the longest since the average age is over 45 and the conversion is not systematic. Finnish universities and PROs do not have any tenure-track system and tenure employment is associated with the permanent post of full professor. Average ages are somewhat more similar at PROs, although researchers may expect a faster career evolution in the Czech Republic and Finland (they are also recruited earlier) and in Hungary.

35. Advancement of researchers is related to their performance or to performance and seniority. Two countries stand out as exceptions: Finland where there is no official career advancement scheme, and France where promotion is only based on seniority. The balance between promotion based on performance and seniority is variable across countries and depends on the legal status of researchers. In Australia and in the UK, researchers are primarily assessed on their performance. In Germany, Italy and Norway they must also apply for advancement. In these countries, the promotion system relies on the principle of applications to vacancies. In Belgium (Wallonia), researchers are evaluated on their publications portfolio, their abilities to manage a team and a project and advancement occurs after 8 years (4 years with a solid scientific publication) as a first step and every 4 years afterwards. In Austrian universities, private staff is evaluated on performance and public staff on seniority. This balance between performance and seniority may evolve also along a researchers career. In Poland, the system of assessment is rather oriented towards seniority in the first stages.

36. With the exception of Austria, the Czech Republic and Poland where there is no mandatory retirement age, all countries impose retirement to researchers beyond 63 years old. For most of them the limit age is between 65 and 70, and actually closer to 65. The maximum limits are seen in Denmark, Hungary, Italy, Norway, and Spain. Italy is also the only system where researchers at PROs retire before researchers at universities.

Evaluation of researchers

37. While the principles of the evaluation of researchers are common in most countries, the specific criteria reflect the national systems that have evolved over time in both universities and PROs. The Czech system assesses researchers based on their publications, grants, patents and academic qualifications. Italian researchers are assessed on research, teaching and economic results according to a national ranking system. In Poland, the evaluation rules are prepared at ministerial level (Ministry of Science and Information Society Technologies) and in case of universities by a State accreditation commission. The Spanish evaluation system is managed by a national commission on research activities (CNEAI). Researchers can apply every 6 years for recognition based on performance. Federal authorities have also created regional systems for their university researchers. The supervision of PhDs is rarely used as an official criterion. Only Australia, has set guidelines for the evaluation of PhD supervision.
38. As regards the impact of evaluation on career progression or salaries, there is no consistent pattern in many countries. In the Czech Republic, the number of publications, the volume of students or the work on grants determines bonuses; the base salary is determined by rank and seniority. In Belgium (Wallonia), Finland or Spain evaluations can affect increases in base salaries. In Finland, Poland or in Australian PROs, evaluation has a greater impact on bonuses. Evaluation results may also affect the pace of promotion or the redefinition of tasks. In France, Belgium and the UK, evaluation has a direct impact on promotion. Evaluations for Italian university researchers do not influence salaries or career but may be sanctioned with budget cuts at universities.

Training for senior researchers

39. Hungary is the only country to enforce training of senior research staff by law, and to compel universities to devote resources to this purpose. Several governments however provide funding for advanced researcher training (Austria, Belgium (Wallonia), France, Poland, Spain). Generally, however, training policies are the remit of research institutions which enjoy a total autonomy to define policy regarding the training of senior researchers (Australia, Austria, Belgium, Czech Republic, Netherlands, and Norway).

Rules on industry-science relationships

40. Many OECD countries encourage collaboration between academic researchers and the business sector and employment rules generally allow university and PROs researchers to work for or with the business sector concurrently with their full-time employment. The actual conditions vary among countries and by types of institutions. In Italy, for example there are no limits on the participation of researchers in industrial projects. Austria, Belgium, Denmark and Norway give unconditional priority to the academic activities of their researchers. In Canada, Czech Republic, and Japan the practice of dual employment for university researchers is regulated at the institution level while this is done at the national level in the UK. Regulations on the accumulation of posts (Belgium) and regulations on the accumulation of remuneration (Belgium-Wallonia), University Act also impact industry-science collaboration. In Canada, dual employment is governed by collective agreements. In Austria and the Netherlands, the dual employment of PROs researchers is negotiated individually and in Japan and Norway it is left at the discretion of the institution. In Spain work conditions are regulated by the Science Act for tenured professors while special leave arrangements can be established to work on spin-off companies.

41. In France, university researchers must formulate a request to their research institution while in Austria they must apply to the Rectorate. Similarly, the right to work concurrently with the business sector requires the approval of the university (Hungary, Belgium and Belgium-Walloon), the PRO (Belgium-Walloon, Czech Republic, Hungary) or by a State Ethics Committee (France).

42. With the exception of Italy, governments try to place safeguards or limits to the type or extent of collaboration according to different criteria. In Austria and Japan, the limitations depend on the function the researcher plans to occupy in the business sector. In Belgium-Wallonia, Finland or France limitations are expressed in terms of maximal time worked in the firm. In Denmark the criteria is the workload, whereas in Spain the criteria is the amount of income. France also restricts the amount of shares a researcher can hold in the capital of a company developing his/her work. Except at Dutch universities and Australian PROs, researchers are allowed to earn additional income from their work for/with industry. The Czech authorities are reforming rules to ban such accumulation for PROs researchers. But in many cases accumulation of earnings is authorised with the provision of the research institution’s approval (Austria, Hungary) and some other conditions. Additional earnings must respect collective agreements and institutional policy (Canada, Japan). The amount of additional salaries may be limited (France, Italy, and Spain). The threshold varies thus from 50% of the university base salary in France, to 3.5 times the
maximum salary of a full university professor in Spain. In Denmark, in Finland, in Austria and Norway (universities only), in Belgium (Wallonia) (PROs only) the accumulation of salaries is permitted. In the UK consultancy work and income from outside sources is regulated by individual employment contracts.

43. From a policy perspective, it appears that most countries have an *ad hoc* approach to allowing researchers to work and earn income from collaboration with industry. Some institutions or countries have nevertheless established clear guidelines and limitations. The challenge for institutions and policy makers is to provide incentives for collaboration while ensuring that researchers do not compromise their commitments to academic teaching and research or violate any ethical rules or limit academic freedom.

*Researcher compensation and remuneration*

44. Total compensation is comprised of a base salary and, for some countries, variable remuneration (*e.g.* performance pay bonuses). Basic compensation systems are often elaborated following collective negotiations between various actors, with a few differences for public or private law employees and between universities and PROs (Table 2). In Austria, Belgium (Wallonia), Hungary, France, and Italy pay scales for university personnel are established by law or decree. In Belgium and Poland they are also elaborated by government and the Ministry of Education. Pay scales may be established through collective agreements after negotiations at national level between governments and trade unions or a confederation of professional associations (Australia, Denmark, Finland, Germany, Netherlands, Norway and Spain). In Spain salaries of university staff are further endorsed by the Parliament following collective negotiations. Pay scales may be also negotiated locally between the university and the faculty unions (Canada). In the Czech Republic, the base salary is determined by the academic board and broken down among faculties according to the size of student population, the success rate of PhDs students, the number of grants, the output (publications), and co-operation with industry.

45. Wages for private employees at universities are negotiated in the same way, except in Hungary and Spain where wages are defined by individual bargaining. In Austria, individual bargaining exists also together with collective agreements.

46. At PROs, the employment of research staff follows the same rules with a few exceptions. In Germany researchers are allowed to earn additional extra-pay further to wage agreements. In Italy, wages are not established by the Parliament but negotiated at the national level between government and trade unions. In Poland, the remuneration system is managed by institutional rules. In Norway, the government’s role has been replaced by employers’ organisations in national collective negotiations.

47. Trade unions and national authorities are thus the main actors in wage negotiations especially for public employees. In Germany and Spain, regional authorities play a role too. Negotiations are left to the researchers themselves and the research institutes for engagements on private law. Differentiation in wages is thus easier for researchers on private law contracts.

48. Most countries consider their compensation system as transparent as wages are fixed by collective agreements. Scales and rules are established officially for all categories of staff without differentiation. The systems may be more bargaining-oriented at PROs (Czech Republic, Norway) and in agreeing to a variable share of remuneration (Czech Republic, Denmark, Netherlands). Some countries (Austria, Czech Republic, Denmark, Netherlands, and Norway) consider their compensation system complex because it includes many exceptions or particular cases, but dynamic, because it is built to evolve over time and adapt to researcher careers. Others (Belgium, Belgium Wallonia, Italy, Spain) are characterized by more rigid systems, that move by fixed and pre-established steps. In most cases, wages are revised annually, although no rule prevails in Poland and revisions occur rarely for scholars in Belgium and occasionally for scholars in Italy. In the latter case, pay scales for university researchers are modified
by the Italian Parliament. The pace for revisions is otherwise anticipated in collective agreements. The review time may extend to two years in Germany and the Netherlands and to three years in Canada and Denmark. Salaries for Italian researchers at PROs are revised every four years.

49. In summary, compensation systems at universities and PROs are managed by collective agreements and leave little room for individual bargaining, except for private law and temporary employees in Austria and to some degree in Spain. In Italy, the government still controls salaries leaving little room for institutions to respond quickly to local conditions. In most countries salary scales appear detached from performance considerations, at least for established staff on public employee or civil service contracts.

Table 2. Definition of basic compensation system for academic researchers

<table>
<thead>
<tr>
<th>Nature of negotiations</th>
<th>Public employees</th>
<th>Private employees</th>
<th>Public employees</th>
<th>Private employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Universities</td>
<td>Universities</td>
<td>PROs</td>
<td>PROs</td>
</tr>
<tr>
<td>Australia</td>
<td>Collective bargaining (1)</td>
<td>Base pay prescribed in industrial awards (2), increases are negotiated collectively as part of enterprise agreements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>Pay scales by law</td>
<td>Individual bargaining + collective agreement (Kollektivvertrag) (3)</td>
<td>Public employment law for administrative personnel</td>
<td>Private employment law = individual bargaining + collective agreement (3)</td>
</tr>
<tr>
<td>Belgium</td>
<td>Pay scales defined by govt and classification by univ.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Belgium (Wallon)</td>
<td>Pay scales fixed by royal decree</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Collective agreements negotiated between university and the faculty union</td>
<td>Collective agreements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Base determined by the academic board (4) and divided among faculties according to a wide range of criteria (5)</td>
<td>Base given by the State and bonus on the same rules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Base negotiated between the government and the Danish Confederation of professional associations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>National collective agreements</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>In the status (6)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Wage agreement (BAT) for public employees (non-civil servants) (7)</td>
<td>Wage agreement + additional extra pay (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>By general law</td>
<td>By contract</td>
<td>By general law</td>
<td>By contract</td>
</tr>
<tr>
<td>Italy</td>
<td>Law established by the Italian Parliament</td>
<td>Negotiation between national government authority (ARAN) and trade unions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>None</td>
<td>-</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Collective Labour agreement for personnel of universities</td>
<td>Collective Labour agreement for personnel of RIs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Negotiations between national government and trade unions</td>
<td>Negotiations between employers organisations and trade unions at national level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Ministry of National Education and internal institution rules</td>
<td>Internal institution rules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>National regulations for civil servants approved in Parliament with formal role for trade unions. Marginal differentiation possible with approval from regional authorities controlling universities</td>
<td>Bargaining negotiations for most salaries</td>
<td>National regulations for civil servants approved in Parliament with formal role for trade unions.</td>
<td>Bargaining negotiations for most salaries</td>
</tr>
</tbody>
</table>

Notes: see annex.
Figure 5. Monthly statutory wage for university researchers, by category of staff (01/01/2005)

Minimum and maximum in USD PPPs

(1) No breakdown for teaching assistants.
(2) No breakdown for associate professors.
(3) USD 11 115 is the maximum salary of a full professor as a private employee with an all inclusive salary. The salary for a full professor as a public employee is between EURO 3035 and EURO 5665 (without extra pay).
(4) No breakdown for assistant professors.

Remuneration

50. A young early-stage university researcher can expect to earn a minimum base salary of 1 609 USD (Spain) to 2,613 USD (Australia) per month. This represents a wage differential of 1 000 USD across countries. Minimum salaries are less than 2,000 USD in Finland, Norway, and Spain, between 2 000 and 2 500 USD in Austria, Belgium and Denmark, and over 2 500 USD in Australia. At the maximum they can earn around 2 500 USD in Spain, Denmark and Belgium, between 3 000 and 3 500 USD in Norway, Finland and Australia and to 4 800 USD in Austria.

51. Young researchers at PROs earn more than their university colleagues. Minimum base salaries are about 1 900 USD in the Netherlands and in Spain and can increase up to 3 000 USD in Denmark. The best-paid assistant researchers can expect to earn over 3 800 USD in Australia.

52. In Finland and Austria an assistant professor can expect a minimum base salary of about 2 200 USD compared to 3 662 and 3 934 USD in Australia and the Netherlands, i.e. a wage differential of 1 800 USD across countries. Otherwise wages range between 2 620 and 3 217 USD in other countries. Moving from teaching assistants to assistant professors at universities leads only to a small increase in base salaries in Austria where earnings at early stages are particularly high but substantials in Spain where they are particularly low. At the higher end, assistant professors earn nearly 3 500 USD in Australia are over 4 800 USD in Austria.
53. An associate professor can expect a minimum base salary of 2,200 USD in Austria, about 3,200 USD in Belgium and Norway, and up to 4,731 USD in the Netherlands, *i.e.* a wage differential of 1,500 USD across countries. Moving from assistant professor to associate professor, salaries increase between 500 to 1,000 USD in most countries. The strongest increases occur in Australia and the Netherlands. At the top end, associate professors earn over 5,500 USD in Belgium, Austria and Australia, to 6,625 USD in the Netherlands.

**Figure 6. Monthly statutory wage of PROs researchers, by category of staff (01/01/2005)**

Minimum and maximum in USD PPPs

(1) Minimum wage for researcher/investigator inferior to minimum wage of engineer.
(2) No breakdown for maximum.
(3) No breakdown for engineers.
(4) No breakdown for assistant researchers.
(5) No detail for assistant researchers and engineers.
(6) No breakdown for engineer and research director/head.
(7) No detail after assistant researcher.

*Source: OECD based on SFRI Questionnaire, 2006*

54. Engineers and researchers at PROs earn minimums between about 3,000 USD (Austria, Netherlands, and Spain) to over 4,000 USD (Australia). The remuneration of researchers at Italian PROs is less competitive than in other countries. Engineers cannot expect more than 1,500 USD at the best, *i.e.* two to three times less than in the Netherlands and in Australia. The best-paid countries for PRO researchers are Australia (6,100), the Netherlands and Spain (5,900).
55. A full professor can expect a minimum base salary of 3 000 or 3 200 USD in Austria and Finland, to 5 550 USD in the Netherlands and 6 800 USD in Australia, \textit{i.e.} a wage differential of 3 800 USD across countries. Wages otherwise range between 3 800 and 4 500 USD. Moving from associate professor to full professor increases wages about 1 000 to USD 1 500. The strongest increases occur in Finland and Australia and the smallest in Belgium and Denmark. At most, full professors earn a bit less than USD 6 000 in Austria, Belgium and Denmark to over USD 7 000 in Australia, USD 7 550 in Finland, and USD 8 000 in the Netherlands.

56. At the end of their careers, researchers at PROs can expect minimum base salaries ranging from 4 300 and 4 600 USD (Spain and Netherlands) to 6 600 USD (Australia). Monthly wages for research directors and department heads can rise to over 9 000 USD in Australia. Teaching assistants can get three times more in Austria, the best paid country for early stage researchers, and full professors earn twice more in the Netherlands, the best paid country at senior levels. In this ranking, Poland and the Czech Republic are treated separately, since average salaries at any stages of researcher career are significantly lower than in other countries. A full professor close to retirement earns less working at Polish universities than a young researcher could in Australia or in Austria. However, it is not uncommon for professors in many OECD countries to earn additional income in the context of business collaboration or international research collaborations.

\textbf{Figure 7. Range of statutory wages for researchers at universities and PROs, at early stage and end of career}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{range_wages.png}
\caption{Monthly salary in USD PPPs at 01/01/2005 (Ranking by descending order of maximum salaries at the end of career)}
\end{figure}
57. Researcher salaries are lower in universities than in PROs. Wage discrepancies across countries increase along the research career path. Early stage researchers earn about 2 000 USD in the majority of countries and can expect another 1 000 to 1 500 USD under the best conditions (albeit almost the double in Australian PROs). At the end of their careers, researchers earn at least around 4 000 USD but can expect between 2 500 and 3 500 USD more in the best conditions in the majority of countries. They are paid less however, in Austrian universities and more in Australian PROs and Dutch universities.

58. Wage differentials are substantial at each grade (Figure 8). The least well paid teaching assistants can earn over 40% (Finland and Norway) and up to 60% (Austria) less than their best paid colleagues, which represents a monthly gap of 1 300 USD for the two former countries and 2 800 USD for the latter. Teaching assistants can however expect more balanced treatment in Denmark or in Belgium. Wage differentials further increase over time in most countries. The difference between better paid and the lesser paid researchers ranges between 30 and 40% of the highest monthly salary in the majority of countries. This difference is maximal in the highest in Finland (57.1) and Austria (46.4). In contrast, it is striking that gaps between full professors are almost inexistent in Australia.

59. A few countries provided information on the frequency of salary increases at universities or the main criteria taken into account. In Belgium (Wallonia), France and Italy, wages increases are determined according to a fixed scale. Pay scales in Belgium are based on seniority and academic rank of the researchers. Scales are also used in Austria for public employees and revisions occur every two year. In Japan or Poland increases may be set by fixed scales too depending on the quality or the financing situation of the research institution. In most countries changes in remuneration may be negotiated individually, even if the margins of bargaining remains limited (Czech Republic, Denmark, Finland, and Norway). In the Czech Republic and Denmark seniority remains effectively the main criterion used. Results may however affect remuneration through bonuses (Finland) or via involvement in “contract research” (Spain). In Norway salary revisions are negotiated each year at the national level for a professional group and increases occur for the entire group.

Figure 8. Differentials in statutory wages, by category of research staff
As a percentage of maximum monthly salary
(Ranking by descending order of % for full professors)

<table>
<thead>
<tr>
<th>Country</th>
<th>Teaching assistant</th>
<th>Assistant professor</th>
<th>Associate professor</th>
<th>Full professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>7,556</td>
<td>5,665</td>
<td>3,323</td>
<td>6,971</td>
</tr>
<tr>
<td>Austria</td>
<td>6,642</td>
<td>5,829</td>
<td>6,042</td>
<td>8,002</td>
</tr>
<tr>
<td>Poland</td>
<td>5,951</td>
<td>7,012</td>
<td>5,895</td>
<td>8,002</td>
</tr>
<tr>
<td>Spain</td>
<td>5,951</td>
<td>7,012</td>
<td>5,895</td>
<td>8,002</td>
</tr>
<tr>
<td>Norway</td>
<td>5,951</td>
<td>7,012</td>
<td>5,895</td>
<td>8,002</td>
</tr>
<tr>
<td>Belgium</td>
<td>5,951</td>
<td>7,012</td>
<td>5,895</td>
<td>8,002</td>
</tr>
<tr>
<td>Netherlands</td>
<td>5,951</td>
<td>7,012</td>
<td>5,895</td>
<td>8,002</td>
</tr>
</tbody>
</table>

Note: Differentials in wages by category of research staff are calculated as the difference between maximum and minimum wages paid at each grade compared to the maximum X 100.
60. Little information was provided concerning policies towards salaries at PROs. Increases are granted annually in Australia and each fourth year in Italy. Increases are determined by fixed scales in Austria and France and decided through collective agreements at the institution level (Australia) or between trade unions and government agency (Italy). Individual negotiations remain possible in Australia and an assessment process may result in salary increases. Total remuneration may also include a variable part along with base pay. In all countries except France, universities and PROs determine variable remuneration according to the researchers’ position and/or seniority. French research institutions assess additional earnings on performance either based on research output (at PROs) or on both research output and teaching evaluation (at universities). Norway and Spain consider also performance in addition to seniority and position. Several countries (Austria, Belgium, Czech Republic, Denmark, and Spain) also integrate the nature of the jobs (task description) as an evaluation criterion.

61. From the above discussion on salary trends, several observations can be made. First, basic salaries are highest in two countries that provided data, namely Australia and the Netherlands while the lowest salaries are observed in Poland, Denmark and Austrian universities. Second, salaries are generally lower in universities than in PROs, except for universities in Finland and the Netherlands. Third, there is a wide gap in salaries between countries and within countries in terms of wage differentials for the same categories of staff. One possible reason for the wage differentials within categories may relate to the amount of time staff stay in a certain category. For example, the longer time spent in the senior categories (e.g. full professor) may explain the wider wage differential within categories. Finally, the variation between countries in the salaries of young early stage researchers raises the question whether the levels are consistent with policies to encourage young graduates to pursue research careers or whether the system favours the recruitment of experienced researchers or the promotion of researchers already in the system.

**Working conditions**

Figure 9. Legal duration of work week of researchers at universities and at PROs

Legal number of worked hours

- University minimum legal
- PROs minimum legal
- Additional hours at universities
- Additional hours at PROs

<table>
<thead>
<tr>
<th>Country</th>
<th>University Minimum Legal</th>
<th>PROs Minimum Legal</th>
<th>Additional Hours at Universities</th>
<th>Additional Hours at PROs</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia (1)</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland (2)</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy (3)</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain (4)</td>
<td>42</td>
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<td></td>
<td></td>
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<tr>
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(1) Depending on workplace awards. (2) Annual base of 1600 hours/year. Here: 1 year = 10 months (from September to June) X 4.5 weeks per month. (3) Mandatory 320h/y of teaching for university professors. No time fixed for research. (4) With max load for teaching of 12h/w + student assistance. (5) Based on collective agreement.
While most researchers likely work beyond the legal work week, the questionnaire nevertheless requested information on the legal or minimum duration of the research work week in Member countries. French and some Australian employees (depending on workplace awards) have the shortest legal work week with 35 hours per week whereas Dutch employees must work 10 more hours per week. Australian, Belgian, Canadian, Danish, Finnish, French, Italian and Norwegian workers can spend less than 40 hours/week at work. Austrian, Czech, German, Hungarian, Dutch and Spanish researchers must work over 40 hours. At both universities and at PROs the legal duration of work time is equivalent except in the Netherlands and the Spanish universities where the work week for researchers is reduced (38-40h and 37.5h). In Canada, working hours in practice are evaluated between 40 and 70h/week.

In terms of work tasks, researchers facing growing pressure to make time for research while some face an increasing teaching load or administrative duties related to obtaining funds or technology commercialisation. Austria and Norway provided data on breakdown of working time by tasks. In Austrian universities most working hours are devoted to research (40%) and teaching (30%). In Norway, university researchers share their time equally on these both tasks (45-45). Researchers spend the remaining part of their time on administrative tasks and supervision. In Norway, this breakdown remains identical over time but in Austria it evolves along the research career path. Time devoted to research and supervision increases slightly while the of administrative burden declines. At Austrian PROs the picture is much different, also because researchers have no teaching responsibilities. At the early stage, the bulk of working hours is dedicated to research (90%). Over time, PROs researchers become managers and most of their time is then spend on administration. In Norway, no standard applies for PROs.

Confronted with an increasing workload, university researchers also face a declining level of research support in most countries. One assistant is associated with two researchers in the Czech Republic and Denmark, and to almost four in Japan or in Norway. In Belgium and Austria each researcher is supported by little less than 1 assistant (0.6 and 0.78). In Australia and in Finland, universities provide as much support staff as they count research staff. Focusing on research activities only, Finnish universities assign two times more assistants to their researchers. Regarding research at PROs, few data are available. Comparisons can only be made for Australia and Austria, where support rates are lower than at universities. Support intensity may also vary according to the fields of research. Norwegian universities affect more support staff to researchers in medicine (0.31) or natural science and mathematics (0.25) than in humanities (0.18) or technology (0.18). Conclusions are similar at Hungarian PROs (0.45 for mathematics and 0.30 for natural and life sciences to 0.25 to social sciences). While the level of support staff has not changed in recent years in Australia, Austria, other countries recorded a reduction in support staff. Finland highlights a dramatic increase in the number of researchers at universities.

Countries provided little data concerning the supervision rate of PhDs students and no data for post-doctorates. At universities the number of PhDs students per supervisor varies a lot from about 1.6 in Belgium or Japan to five in Finland. But trends seem however similar, as Belgium, Finland and Japan report an increase of the workload with a growing amount of students per monitor. Norway provided also detailed rates by fields: senior researchers supervise between 1.2 or 1.4 PhDs students in economy and humanities to more than the double that rate in medicine or technology.

Work-family balance

Ensuring researchers can balance family and work is important for encouraging the participation of both men and women in the workforce. The legal treatment of parental leave reveals wide disparities across countries but strong similarities between universities and PROs. Japan is the only country to differentiate researchers from both sectors: at PROs women as well as men can expect three times longer leave than at universities (three years to one year). Belgium and Spain grant the shortest maternity leave, since mothers can be off work for only three or 3.5 months. Maternity leave is about six months in
Belgium (Wallonia), Italy and the Netherlands (but in this case, working half time). It Austria leave is
granted for two years, three years in France (and in the Japanese PROs) and four years in the Czech
Republic. Mothers get between nine to twelve months in other countries otherwise. Long parental leave
however, can make it more difficult for researchers to re-enter the workforce, especially since career
progression is competitive and often depends on publications and teaching.

67. Men are entitled to the same benefits in many countries. They share the twelve-month parental
leaves with women in Canada. But they are allowed shorter periods off in Denmark (four weeks less than
women) or Norway (four to nine weeks less). The gap is very important in Belgium (Wallonia) where
fathers only benefit from ten days of parental leave (to six months for mothers). The majority of countries
have not developed any specific work reinsertion programme at national level. One exception is the United
Kingdom while institutional ad hoc measures exist in Australia and Finland.

68. Part-time employment is another way to encourage greater participation of researchers with
family care responsibilities. In countries where wages are low, it is also a way for researchers to cumulate
other employment. All categories of staff in all countries are eligible to part-time arrangements. Canada
and Germany express reservations however, since part-time employment remains rare in the Canadian
research institutions and is prejudicial to the researcher career in the German research system. The Czech
Republic also expressed a preference for full-time employment and is preparing new rules to limit the
accumulation of part-time jobs (teaching, or teaching and firm ownership). Conditions on part-time may
also depend on the labour contracts (Japan, Spain) and legal status of researchers. In Austria, the legal
framework is fixed for public employees but conditions of part-time employment are left to individual
bargaining for private law employees. In many cases, conditions are negotiated and validated at
institutional level between the researcher and the employer research institution (Austria, Belgium and
Belgium-Walloon, Spain). Limits to part-time work may be fixed at national level through the adoption of
legal guidelines and laws (Austria, Italy, and Norway) or collective agreements (Germany). The majority
of countries allow researchers to shift from part-time to full-time employment, either depending on
vacancies (Austria, Belgium-Wallonia, Czech Republic, Hungary) or/and pending on approval from the
research institution (Australia, Austria, Czech Republic, Netherlands, Spain). Changes in work hours are
also limited by wage agreements (Germany, Netherlands) and the labour contract (Japan).

Temporary research employment

69. The issue of temporary researcher employment is high on the agenda in some countries.
Temporary employment offers institutions the flexibility they need to adapt research programmes to
changes in priorities and funding. It also allows young researchers to gain experience. However, there is a
risk that in some countries, the rigidities in the main labour market for academic researchers can lead to a
disproportionate increase in temporary employment contracts creating classical “insider-outsider”
problems. Most academic employment systems were not designed to accommodate the growing number
of researchers recruited with soft money at centres of excellence or on competitively-funded research
projects. Countries reported large differences in the share of temporary research staff. Less than 5% of
researchers are on temporary posts in Japan and Belgium (Wallonia), 16 and 25% in Hungary and
Australia and 42% in Norway. One researcher in two is employed on fixed-term contracts in Spain and
Italy and more than three quarters of research staff is on temporary contracts in Belgium. In Finland gaps
are also striking between categories of employees: two-thirds of professors are on permanent positions but
35% of professors are temporary staff. Age, gender and fields of research impact on the type of
employment. Early-stage researchers and women are more likely to be on temporary jobs. The share of
temporary researchers is also higher in exact sciences, humanities and medicine (Belgium) or social
sciences (Italy).
70. With the exception of Hungary and Spain, most countries have recorded a relative increase in temporary research staff. This increase is qualified as “strong” in Italy or steady in Norway. The development of more competitive project funding is the first explanation provided as it favours the increase in temporary positions (Australia, Belgium, Finland, Italy and Spain). The rigidities of the labour market for researchers are also noted by a few countries. Australia notes a low turnover of tenured staff. Labour costs associated with tenured posts hamper permanent employment in Belgian universities. Italy considers the suppression of tenured positions after retirement of permanent staff as the reason for the increase in temporary workers. Finland underlines huge problems of employment related to its career system. The second S&T Plan in Japan recommends hiring researchers under 30 years old as temporary staff.

Pension portability

71. The lack of pension portability has been raised as a potential barrier to the mobility of researchers, especially mid-level and senior researchers. The questionnaire reveals that at national level pension benefits for researchers at both universities and PROs are easily portable. Portability is universal between two public research institutions of the same nature, and between universities to PROs (except in Australia and in Belgium (Wallonia) from PROs to universities). Portability between the public and the private sector is not systematic. Benefits cannot be transferred to the business sector in Australia, nor from universities in Belgium or from PROs in France. Portability across borders is less systematic and data are missing to draw a clear picture (especially concerning researchers coming from abroad). In several countries (Czech Republic, Denmark, Finland, Hungary, Norway, Spain), researchers going abroad can transfer pension benefits with them. In the Czech Republic, Finland and Hungary foreign researchers can validate rights obtained in other pension schemes.

Rules on access to foreign talent

72. In all countries, foreigners are eligible to PhD and post-doctorates fellowships to the same extent as nationals. Funding of foreign PhDs students may however be limited to criteria of age or nationality, although the criterion of age is more common than that of nationality. PhD students must be less than 30 years old, or 35 for Japan. A few countries have adopted also nationality preferences. Belgian or Finnish universities favour EU citizens, while Hungarian research institutions encourage national Hungarian minorities living abroad to apply. Australia reports nationality preferences according to a wide set of reasons (reciprocal agreements with other EU or Asian countries, citizens from countries signatories to the nuclear non-proliferation treaty, etc). Finland and the Netherlands, both countries providing a high level of social protection to PhDs students, integrate the nationality criterion regarding access to social benefits. In general Australia does not entitle foreigners to social benefits. But as for nationals, in most countries the social welfare benefits granted to foreigners depends on their legal status. Foreign researchers do not benefit from a special tax treatment in any country, but Italy where they are exempt from income tax for a period of time and in Belgium (Wallonia) and Norway where they may enjoy tax incentives in the context of bilateral conventions.

73. For almost all countries foreign candidates, at least to permanent positions, must have a PhD degree, whatever the place of issue, and this PhD must be validated by the research institutions. In Belgium and Germany, instead of a PhD degree, the future university researcher must hold a national university degree. Moreover, a few countries mentioned the importance of the working language and requirements that foreign researchers be language proficient in order to be able to teach and/or publish in the language of the host country (France, Belgium (Wallon) or in English (Austria, UK).
Return migration programmes

74. Many countries have implemented return migration programmes for national researchers working abroad (Australia, Austria, Belgium, Finland through European grants, Norway). In Australia, return migration programmes also target PhDs students. Funding allocated may be customized and often according to the field of specialisation. In Australia, there is an emphasis on biomedical and health researchers, in Austria on all scientists and in Norway on natural sciences. Australia and Canada have created also programmes to help building an international research capacity, for instance in reimbursing travel expenses to foster networking and increase employment opportunities.

Conclusions

75. OECD countries are concerned with increasing the supply of researchers to meet anticipated demand in industry as well as to replace retiring researchers in the public research sector. Consequently policies in the majority of OECD countries are geared to increasing funding of PhD training and better linking training to industry and public sector needs. However, the duration of PhD training is still quite long in a number of countries and could increase the social and private costs of producing new graduates as well as reduce the speed at which the system can respond to changes in demand. In addition, post-doctorate training, while important, can last between 3 and 6 years in some countries. In many fields, younger researchers have a higher productivity so policies to promote training should be geared to helping them enter independent research status as soon as possible. Many countries lack guidelines for PhD supervision and mentoring and this could be an area for policy action at the institution or government level insofar as enhanced supervision can help steer candidates to areas where there are opportunities or demand as well as to reduce the risk of drop-outs.

76. Countries are also concerned with making PhD training more market-oriented and responsive to firms needs and thus providing future researchers with transferable skills. The most common channel remains industrial PhD fellowships but many of these fellowships are small in number. There may be scope for increasing industry training via other means such as internships as well as improving the portability of PhD fellowships towards industry.

77. Another area of policy concern is the academic research labour market. Recruitment is based on internal or external recruitments depending on the country. The criteria have evolved little (e.g. PhD degree, publications, etc) over time. Despite the growing importance of the commercialisation of research, new researchers are rarely recruited based on their performance in non-scientific areas (e.g. patenting, technology transfer, fund raising). Mobility does not appear to be of explicit value in recruitment but rather indirectly as scientific quality could be associated with periods at other institutions or abroad. The age of recruitment varies across countries and age tends to be higher in large countries with large research systems and lower in the Central and Eastern European OECD countries. Part-time employment for researchers is allowed in most countries but is viewed as a transitional measure (in response to family or personal reasons) rather than a career path model.

78. There exist significant barriers to “permanence” or tenured employment (e.g. performance assessment and or public examinations) and several countries report delays or increases in the age at which researchers obtain tenure or “permanence”. Depending on the country, advancement is often based on seniority or applications to vacancies. In a few countries such as Australia and the UK, the promotion of researchers is primarily based on their performance. With regard to access for foreign researchers, the labour market is open primarily to researchers who first undertake PhD or post-doctorate training in the host country. For others, significant barriers remain such as degree equivalency requirements, language as well as immigration rules.
79. The results of the questionnaire show that there has been an emergence of a “dual labour market” in the public research sector whereby established researchers have access to civil servant and public employee contracts – and hence a greater degree of employment protection. At the same time, temporary staff generally work under private employment law contracts but may be better paid (at senior levels) or less well paid (early stage researchers at universities). Staff on fixed term contracts account for one out of two researchers in Spain and Italy. Two-thirds of Belgian researchers are on fixed term posts as are some 42% of researchers in Norway. In Finland, while two-thirds of professors are on permanent posts, up to 35% of professors are on temporary positions. It would appear that universities, and to a lesser extent PROs, rely on temporary positions to recruit new entrants or specialists in the face of strong rigidities in the labour market for established researchers.

80. Compensation systems are based on fixed wage scales negotiated through collective agreement with little room for individual bargaining, except for private law employees or temporary staff in a few countries. In principle the system is designed to reduce inequalities in compensation across fields and departments. At the same time, the present system may generate its own inequalities. The questionnaire results show for example that there are large wage differentials within categories of faculty. If researchers salaries, especially for mid-level and senior staff are attractive, salaries for early-stage researchers are rather low in some countries relative to per capita GDP. This could be at odds with policy measures to make research careers attractive for young people (e.g. increase funding for PhDs and post-docs). At the same time, several countries have adopted variable pay mechanisms at the margin –often determined by seniority and or research outputs.

81. While it is widely assumed researchers work more hours than required by the legal work week, it nevertheless is true that researchers in some countries must work more hours than others. Working time is often divided up between various tasks including teaching, research and administrative duties. Several countries reported that researchers are facing an increase in the workload, partly as a result of the massification of higher education systems, and a decrease in the amount of support staff available to researchers and faculty.

**Main policy challenges**

82. With regard to the final question on where countries see their main policy challenges, many cited the funding of PhDs and post-doctorates training as a main policy issue. Access by early stage researchers to social welfare benefits ranked low since social protection is often attached to a funding scheme. A third of the countries expressed concern about the quality of training, while some put the emphasis on reducing the duration of researcher training so as to reduce the drop-out rate or to ensure an adequate supervision. About a third of respondents also consider the employment stability and the definition of career paths for researchers as an issue of high importance. Integration and recognition of young researchers, in terms of access to facilities, participation in laboratory works, or citation in publications is also of concern. Surprisingly, the employability of researchers by industry ranked as a lesser priority insofar as researcher training is expected to be market-oriented and fit firms’ needs.

83. The following questions for discussion arise and could be a point of departure for the discussion of the SFRI working group at its meeting in Madrid.

- *Do the results of the questionnaire adequately reflect the situation in responding countries?*
- *Is there a gap between the reality of the academic labour market (rigidities) and policies to increase the supply of young researchers? What is the risk that new graduates will find themselves excluded from career track positions?*
• Are human resource policies and career structures in line with the research priorities set at institutional and national levels?

• How can institutions and governments address the imbalance between tenured or permanent staff and growing number of temporary staff?

• To what extent can researcher compensation be better linked to performance, both individual and institutional? What role do researcher evaluation system play in this (i.e. what is the link between evaluation and remuneration)?