

**SUMMARY REPORT OF THE JOINT OECD-SPANISH MINISTRY OF EDUCATION AND
SCIENCE WORKSHOP**

“RESEARCH CAREERS FOR THE 21ST CENTURY”

MADRID, 26-27 APRIL 2006

FOREWORD

On 26-27 April 2006 the OECD and the Spanish Ministry of Education and Science, together with support from the Spanish Foundation for Science and Technology (FECYT), organized a workshop in Madrid on “Research Careers for the 21st Century”. The objective of the one and a half day workshop which brought together decision makers, experts as well as business representatives and young researchers themselves, was to understand the challenges facing researcher careers at the beginning of the 21st century. It sought to identify different models for researcher careers and to take stock of the key challenges for making researcher careers attractive. It also explored the tensions in the labour market for researchers, including the need for balancing tenure type employment systems and flexibility. Finally, it explored the evidence on the diversification of S&T graduates’ career paths and discussed how education and training policies could better prepare S&T graduates for more diverse careers. This report presents the main findings from the workshop presentations and discussions. The Secretariat acknowledges support for the workshop from the Japanese Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Flanders, Belgium. It is released under the responsibility of the Secretary General of the OECD.

Recent developments in the supply and demand for researchers have raised concerns about the attractiveness of research careers in OECD countries. For one, there is some evidence that young people in several OECD countries are enrolling less and less in scientific studies which could have a negative effect on the future supply of researchers (*OECD - STI Outlook 2006*). Population ageing in OECD countries will result in an increase in the number of researchers exiting the workforce, especially in the higher education research sector, further reducing national supplies. On the demand-side, the working conditions of researchers in some countries are not considered sufficiently attractive to retain national talent and to attract foreign researchers. Changes in public and private R&D, including the growth of services, changes in public research funding and in academic employment arrangements also impact on the incentives to pursue research careers in one direction or the other. Finally, the globalisation of R&D and the emergence of new global players (*i.e.* Brazil, Russia, India, China) in the production of researchers have made the global outlook for the supply and demand for researchers more complex, notably because foreign researchers can boost the national supplies of OECD countries through immigration while the R&D activities of (multinational) firms can be more easily located abroad to where the pools of research talent are abundant.

To take stock of the emerging face of research careers, particularly in the higher education sector, the CSTP *ad hoc* working group on the Steering and Funding of Research Institutions (SFRI), together with the Spanish Ministry of Education and Science, held a workshop in Madrid in 2006 on “Research Careers for the 21st Century”. The aims of the workshop were to examine the emerging face of academic research careers and to discuss how research and training policies at the government and institution level could improve the attractiveness of research careers while better preparing S&T graduates and young researchers for more diverse and less linear career opportunities. This paper summarises the outcomes from the presentations and the discussion at the workshop.

Session 1: Research and Academic Careers in Universities and Public Research Organisations: National Models in OECD countries

Session 1 was Chaired by *Violeta Demonte*, Director General of the Spanish Ministry of Education and Science, and sought to examine the different national models for researcher careers in OECD countries and assess whether these models were tending to converge and if so, to identify the underlying drivers (market forces, changes in R&D performance and funding, reforms to universities and public research funding, etc). It also sought to explore the role of mobility (geographic or sectoral) in the career paths of researchers and the implications for policy.

According to *Manuel Heitor*, Secretary of State for Science, Technology and Higher Education in Portugal, public and private institutions play a key role in shaping and encouraging young people to pursue careers in research. The Portuguese government has undertaken a series of initiatives to boost demand for research by increasing public funding as well as incentives for business R&D. In addition, the government has provided funding for the creation of Research Chairs at higher education and R&D centres. The government is also attracting teams of S&T researchers from overseas to boost the teaching and research capacity in institutions, thereby improving quality and increasing the opportunities for young researchers. Furthermore, the government is encouraging international partnerships in higher education (*e.g.* university partnerships with foreign universities in the United States as well as the joint development of public R&D labs with Spain (*i.e.* in the area of nanotechnology). The government also envisages the reform of the State laboratories in order to improve working conditions and incentives for researchers.

For Professor *Ulrich Teichler* of the Centre for Research and Higher Education at the University of Kassel in Germany, the debate on research careers in Europe must be viewed in the context of three

converging public policy goals. The first is the focus on increasing the number of researchers to carry out (expected) higher levels of R&D in line with the Lisbon agenda. The second is the improvement in the level of mobility of researchers to enhance the commercialisation of public research. Increasing mobility of researchers is widely assumed to be beneficial for enhancing both the core research competences and the professional development of researchers in general and to be desirable for enhancing the quality of research in various European countries. Researcher mobility in Europe seems to be hampered by regulatory obstacles and risky or uncertain employment and living conditions for young researchers. There is also a policy concern about the “brain drain” of researchers out of Central and Eastern Europe to Western Europe or to other parts of the world or about the “brain drain” from Western Europe to the United States.

The third policy goal is ensuring the career conditions for young researchers are sufficiently attractive to them. In this context issues such as improving the monetary and non-monetary rewards, offering greater autonomy for early stage researchers, reducing job insecurity and balancing research careers and personal/family lives, become important.

A key challenge in addressing these policy goals is the lack of systematic information and data on the mobility and career paths of students, university graduates and researchers. Moreover, there are enormous differences between EU countries in the way they define researchers and collect data. Information is needed not only about the sector of employment (*e.g.* higher education) or the occupational category (*e.g.* researchers), but also about the main “tasks” of researchers such as teaching versus research but also supporting activities such as fund-raising, administration and research management.

Research careers are most selective at higher education institutions. As a rule, only a small proportion of young scholars will become senior academics (*e.g.* full professors). In many European countries, scholars do not only run the risk of a small success rate but also have to spend many years on short-term contracts while most of their colleagues from the same age cohort already enjoy stable employment conditions. A recent study on academic careers in European countries found that while employment conditions and career patterns for young academics vary substantially by country, short-term employment up to the age of about 40 and high selectivity is common to a large number of countries.

In some countries, for example Germany, the employment situation of young academics is often deplored with the argument that the employment conditions for young academics in the United States are relatively more favourable and that an additional brain drain to the United States is to be expected if the employment conditions in Germany do not improve. A recent study, however, which collected scattered pieces of information on academic careers in Germany and the United States, concluded that career conditions for young academics in Germany were not as unfavourable in comparison to the United States as public perception suggested. The study found, in addition, that about one tenth of graduates from German institutions of higher education will eventually be awarded a doctoral degree, and about one tenth of those awarded a doctoral degree eventually will become a professor. In the United States as well one out of about 100 graduates will become a professor, but the stages of selection are different: one out of about 20 students will be awarded a PhD, while one fifth of the PhD holders will become associate or full professors.

The argument is often made that careers could be made more attractive for young scholars at universities in Europe if job security were increased. One must bear in mind, however, that arguments in favour of risky employment during the early career stages continue to have strong support. Notably, talent for top academic positions can only be identified at relatively late stages of an academic career and the obsolescence of knowledge can be better offset by hiring new graduates than by re-training older scholars.

Clearly a more detailed analysis of academic careers is needed to move the debate beyond the state of sophisticated guesses. While there exist a variety of data sources for assessing the career paths and

mobility flows of researchers such data sources are not easy to exploit because in many countries they are difficult to trace and access. Countries also vary in the definitions and coverage of researchers, which makes the comparability of data a challenge. Finally, there is inherent selectivity in addressing policy issues. The varieties of approaches and findings reflect different national traditions of data collection, different roles in supervising and monitoring sub-groups of researchers, different concepts and interests of those establishing statistical data collections and surveys as well as different methods of inquiry. As a way forward, Professor Teichler suggested establishing a monitoring system comprised of three parts:

- Special reports that analyse the best available data sources in order to identify “best practice” for defining and measuring researcher mobility.
- A network of experts to examine how existing data sources could be harmonised/and or improved; and
- A new regular survey of the mobility and careers of researchers in Europe focusing on recent university graduates and PhDs.

In this way the best available data on the number of researchers, fields of research, employment conditions and career paths could be compiled according to the strengths and weaknesses of the different data sources.

The experience in the United States was presented by *Peter Henderson*, Director at the Board on Higher Education and Workforce at the United States National Research Council. The traditional notion of a research career in academic science and engineering in the United States has been evolving into a more complicated set of career pathways. The “traditional” model for a career in research, particularly an academic career, followed a linear progression in which the graduate student completed a doctorate, perhaps served briefly as a post-doctorate scholar, and then obtained a tenure-track faculty position which eventually led to tenure and promotion. The evolving model of science and engineering research careers in the United States consists of more diverse pathways attended by new challenges and opportunities. The model accounts for differences across and within research fields in the career steps researchers may have, the duration of time in each career stage, and the final career “destination” in terms of positions and sectors.

Of particular note have been developments in the biomedical sciences. In this area, but increasingly also in other fields, the post-doctorate is now a common and often lengthy career stage after graduate school. Many researchers have more than one and there has been considerable anxiety in the United States over the last decade about the number of biomedical researchers who appear stuck in a “holding pattern” of serial post-docs waiting for a potential faculty position to open up. As a result, time spent in the post-doctorate has been stretching to four years and beyond.

Moreover, career destinations have become increasingly diverse, due to the tight labour markets for faculty in certain fields, changes in the structure of academic research, and wider opportunities outside of academe. First, obtaining faculty positions and independence as an investigator is now more complicated and time-consuming. These positions are obtained later in one’s career when they are at all. Indeed, many researchers do not obtain tenure-track faculty appointments at all and are, rather, finding positions as research faculty on soft money, often in someone else’s laboratory. Finally, in parallel with the increasing difficulty of negotiating an academic career, career opportunities in industry have expanded, creating opportunities for those who are genuinely interested in non-academic careers and an outlet for those frustrated with academic tracks.

Changes in science also affect research careers. Over the last 25 years, the biomedical sciences have seen an increase in large scale projects and in the overall scale of research teams, even with the persistence of smaller research projects initiated and overseen by individual investigators. Large-scale science

typically involves the establishment of research centres and teams, many of which are interdisciplinary, and these have created new positions for science managers and staff for large-scale projects. Related to this trend toward large-scale science, there has been increasing use of post-doctorates and research faculty on soft money in the academic research workforce. The increase in the number of post-doctorate fellows in United States research and the increasing amount of time that researchers spend in postdoctoral positions have generated concern about the quality of this experience and its unevenness across institutions. As a result, a study committee under the aegis of the National Academies recommended, *inter alia*:

- The post-doctoral experience is a period of apprenticeship for the purpose of gaining skills that advance the professional career.
- Post-docs should receive appropriate recognition (including lead author credit) and compensation (including health and other fringe benefits).
- Post-docs should be provided formal performance evaluations and career guidance.
- Total time in postdoctoral appointments should not exceed five years; and
- Steps are needed to improve the transition of post-docs to regular career positions.

At the same time as the number of post-docs has increased, there has been increasing difficulty for young investigators in the biomedical sciences in obtaining research grants and faculty positions. Grants made by the National Institutes of Health are larger and the average age at which investigators obtain their first NIH Research Project Grant (R01) is now 42. Before 1980, 50% of individuals receiving their first R01 were under 40 years of age compared to just 17% in this decade.

Start-up costs for new S&E faculty at top research universities have also grown substantially in recent years. There is a payoff to the institutions to attract faculty who can obtain grants and produce new knowledge that reflects well on the quality of their programmes, so start-up costs are a wise investment in individuals who may contribute in this way. To afford such costs, however, many institutions – especially public ones – often leave faculty lines open for a time. Institutions in these situations cover teaching loads by hiring non-tenure track, part-time, faculty. The number of such faculty has increased across institutions and fields over the last two decades and has affected the doctoral labour market, faculty composition, and potentially the quality of teaching.

Compounding the differences in career paths within academia are differences by field in the distribution of the doctoral workforce across sectors. In the physical sciences, computer science, and engineering, more than 50% of doctorates work in industry. In the life sciences, which accounted for 20% of the overall increase in the doctoral S&E workforce from 1973 to 2001, 55% of doctorates are employed in academia. However, this has been shifting. There have been large increases in the number of doctoral life scientists in both the academic and industry sectors over the last three decades, but the growth rate of those working in the industrial sector has been higher. This suggests, if trends persist, that eventually more life scientists will work outside of academia.

What has led to these patterns? A recent Academies report on the nation's biomedical research workforce argues that "advances in molecular biology techniques and characterization of the human genome have provided basic biomedical researchers with the tools to understand molecular-, cellular-, and systems-level processes at unprecedented depth and rate" allowing basic biomedical research to play a central role in the discovery of mechanisms underlying human disease (*e.g.* genetic foundations of disease, stem cell research). These advances in science have led to increased demand for basic biomedical

researchers for academia but also, the report argues, “for large pharmaceutical companies, and smaller biotech and bioengineering firms.”

Where are careers for researchers in the United States headed? According to Henderson, projecting future trends in research careers is risky. In the late 1980s and early 1990s, for example, projections based on a demographic workforce model suggested a robust market for S&E faculty by mid-decade. In addition, the academic labour market in the United States is affected by external forces (*i.e.* increase/decreases in the number of non-US citizens in doctoral programmes, postdoctoral positions, the faculty, and the S&E workforce generally). Meanwhile, the decade saw significant opportunities for bright people elsewhere in the United States economy, particularly in such fields as business and information technology, thus reducing the relative attractiveness of S&E research. These two trends tended to balance out their impacts on the supply side of the labour market though the increases in non-US citizens in the life sciences may have contributed to an oversupply of PhDs in the field in the late 1990s. Each of these trends was tempered earlier in this decade. Tightening of application procedures for visas reduced graduate enrolment of non-US citizens. A short recession boosted graduate enrolment of United States students. At this juncture, the future trend lines are unclear as the pendulums continue to swing.

A key issue in raising the overall interest of domestic students in science and engineering research careers may be creating greater interest and opportunities for individuals from underrepresented groups – women and minorities – in these areas. Some observers argue that research resources in the United States are the best in the world and remain a huge lure to young researchers from around the globe. But the long-term trend remains unclear.

Akira Horoiwa, Affiliated Fellow at the National Institutes of Science and Technology Policy (NISTEP) in Japan, presented a New Model of Career-Path for Researchers on behalf of **Dr. Yukiko Miura**, also of NISTEP. As part of Japan’s 3rd Basic Plan for S&T, the government is promoting a new approach to academic research careers that focuses on boosting competitiveness; supporting the independence of young researchers and improving mobility by suppressing “inbreeding” in recruitment and promoting diversity. In practical terms, the 3rd Basic Plan (2006-2010) recommends open recruitment policies and a new organisation of faculty in Japanese universities. Under the new system assistant professor positions will be considered the first stage for young researchers. In addition, lecturers will be supported by assistant and technical support staff. This should provide more visibility in the system.

José Manuel Fernández de Labastida, Vice-President of the CSIC in Spain presented the current situation for research career paths at Spain’s largest public research organisation and identified areas for reform. According to Professor de Labastida, the current path for researchers at CSIC is very linear. Young researchers start off at the graduate level and continue towards the post-doctoral level and then move to the tenure-track level, hoping to reach tenure at the end. There are three categories of tenured staff, namely scientist (*científico titular*); researcher (*investigador científico*); and professor (*profesor de investigación*). At the CSIC, the development of research careers is entangled with teaching careers. Tenure positions carry civil servant status. Promotion to tenure is based on a competitive evaluation and salaries also are tied to evaluation of performance. Tenured staff can also benefit from co-operation contracts with the private sector. The main problem with the current system according to Professor Labastida, is that it begins too late, generally at 39 years of age. Furthermore, the tenured posts are restricted to EU citizens and Spanish validation of the PhD degree is required for foreigners. Furthermore, the range of salaries is not competitive and is becoming less and less attractive for young people.

The CSIC is therefore redefining research careers, promotion and access to civil servant contracts. The new tenure-track position will consist of a category of associated scientist (*científico asociado*) under a five-year contract with evaluation after the third year to become tenured as scientist. The salary for the

associated scientist will be in the range of the salary for scientists. The new tenure track positions proposed will include the previous categories (*i.e.* scientist, researcher and professor) as well as “Distinguished Professor: (“Profesor de Investigación Distinguido”). The new research career will fit in CISC new framework as a State Agency. A new status for civil servants in the area of R&D will be created. The goal of the reform is to enable the development of a new research career that is not tied to civil servant status. In addition, new government programmes such as the *I3 Programme* will reward the institutions (universities or PROs) that provide newly hired researchers (including *Ramon y Cajal* recipients) with longer term or permanent positions and employment security. Doctoral students will also get full health insurance coverage and successful fellows of the *Ramon y Cajal* programme will be eligible for indefinite employment contracts after five years. It is expected that such reforms will increase the attractiveness and visibility of research careers at the CSIC.

Session II: The Role of Tenure Systems and Flexible Employment Systems in the Development of Research Careers Today

The second session was chaired by *Andreu Mas Colell*, President of the European Economic Association and addressed the issue of the tension between tenure and flexible employment systems. Universities are under greater pressure to contribute to innovation. Part of the policy response has been to reform the employment arrangements governing researchers at universities and public research organisations. In addition, there are concerns in some countries that barriers to tenure or excessive precariousness of research jobs (*i.e.* post-doc positions) are forcing younger researchers to turn away from academic research careers.

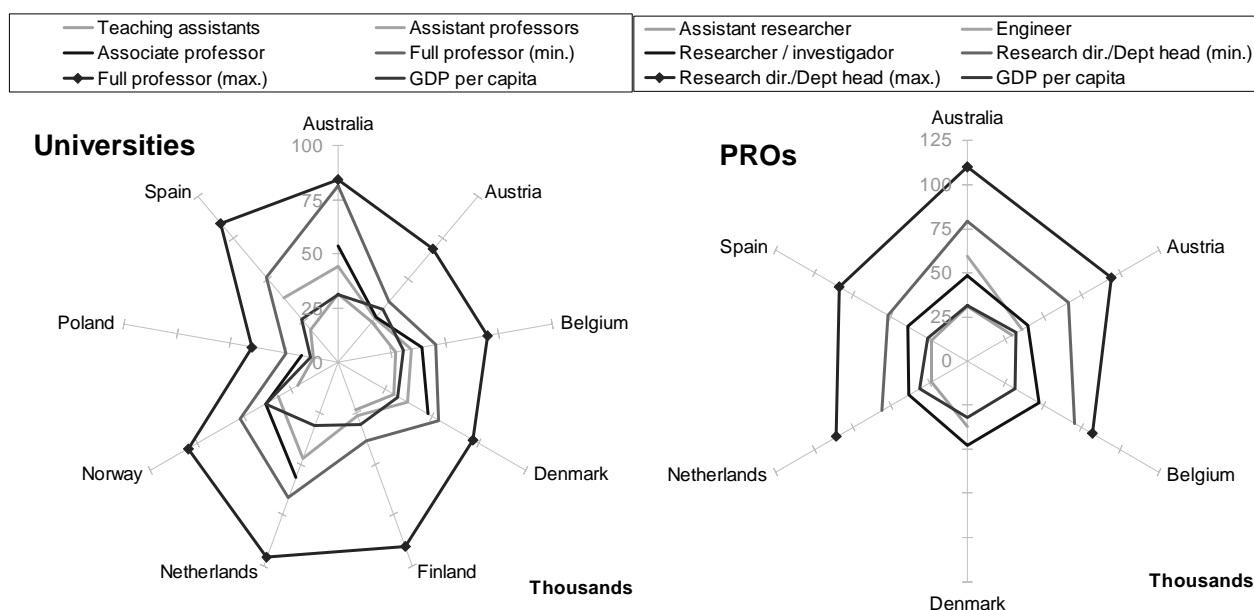
Sandrine Kergroach of the OECD Science and Technology Policy Division presented the results of an OECD survey of the legal and regulatory conditions that govern the employment of academic researchers, including early stage researchers (PhDs and Post-doctorates). The duration of PhD training is still 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 three and six 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. The survey also revealed that 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, the survey found that 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 employment 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.

Figure 1. Annual Statutory Salaries for Academic Researchers/Faculty in Universities and Public Research Organisations (PROs) in selected OECD countries, 2005



Notes: 1. Categories of academic researchers/faculty are aggregates of national categories by the OECD Secretariat. See: DSTI/STP/SFRI(2006)1 and DSTI/STP/SFRI(2006)1/Annex.
2. Statutory salaries as of 1.1.2005 in USD (PPPs) and reported to the Secretariat.

Compensation systems for academic researchers 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). At the same time, uncertainty in job prospects for early stage researchers is often viewed as part of the process of selection. Researchers are also facing an increase in their workload, partly as a result of the growth in higher education, and a decrease in the amount of support staff available to researchers and faculty. However, it is unclear to what extent this may affect working conditions and the quality and productivity of researchers. In summary, the employment conditions differ significantly across the public research sectors of OECD countries. Early stage researchers have in general more difficulty accessing longer term and stable careers in academia in the face of dual academic labour markets in several OECD countries. At the same time, PhD training remains very much geared towards academic labour markets. Without reforms to adapt employment

arrangements to new research models and working methods, combined with efforts to offer transparent recruitment processes and clear career prospects, research careers may continue to suffer from negative perceptions as well as real problems in attracting young people such as job insecurity and insufficient autonomy.

Professor H. Lorne Carmichael of Queen's University Kingston in Canada discussed the issue of tenure in academia. According to Professor Carmichael, there are several stages in an academic career, characterised by a series of short term contracts (post-docs) and followed by a long probationary period (five-ten years) before an "up or out" decision is taken and the young academic is granted tenure. The value of tenure is that it provides job security as well as independence. Researchers can choose their own topics for research and gain access to management responsibilities in a department. In some cases, they can also see tenure as a disincentive to continue pursuing high output levels.

For Professor Carmichael, the nature of academic research with its focus on excellence however, calls into question the primacy of tenure. Insofar as most universities have a fixed budget for faculty and a fixed number of slots, universities could try to use the market to effectively fill the slots. Drawing on the analogy of a professional sports team, Professor Carmichael suggested that universities should recruit the best research teams and renew their human capital by replacing older researchers as soon as better candidates are available. The principle of "up or out" allows universities to do this to some extent. If research potential is poor, posts and resources should be allocated to someone else. Another issue in tenure is the concept of job security. Universities must rely on incumbents to hire (and compete for) and train post-doctorates. They also rely on incumbents to determine who should be hired into the tenure stream and select who obtains tenure. This process reveals the productivity of researchers and allows universities to let go the least productive. However, incumbents need job security so this limits the ability of institutions to replace faculty.

The third concept inherent in the tenure principle is academic freedom. Tenure allows faculty the freedom to challenge conventional wisdom and freely express their views and opinions. Young researchers work within the existing paradigm (to earn tenure). Older researchers get to challenge it. For Professor Carmichael, tenure makes little sense for universities that carry out no research and concluded that "good universities don't support their bad departments" and "bad universities don't support their good departments."

For **Laura Cruz-Castro** of the Spanish National Research Centre (CSIC) the very existence of a "research career" should not be taken for granted. In Spain, access to academic tenure has meant becoming a civil servant. The selection devices are "Open Calls" in which applicants are evaluated through a public examination by an appointed committee. The degree of competition is not built-in the very selection device and it depends on how many candidates apply for one single position: there are no minimum or maximum limits. The only application requirement for full research and academic tenure is to hold a PhD. Positions are offered in particular scientific areas (and speciality profiles) by the universities and by the CSIC. The Spanish system is not an "up or out" one, and it is possible for an academic to settle down in non-tenured positions. There are few incentives to mobility and some obstacles. These are related to implicit contracts between the PhD students and their supervisors, the way universities are financed and their little room of manoeuvre for bargaining individually with their employees.

Dr. Cruz presented the results of an empirical study using micro-data at the level of the individual and at the level of the organisations. The study was based on a sample of the population of individuals who got their first tenure position (associate professor) at any public Spanish university between 1997 and 2001 or at the National Research Centre-CSIC (research fellow) between 1997 and 2004. The results show that the Spanish University and research system is characterised by a wide variety of possible academic and research trajectories up to the tenure and there is not a single or clear pattern. Moreover, one cannot talk

about the existence of a real “tenure track” but rather several possible trajectories up to long-life academic and research employment. The majority of the population in the study obtained their first degree at the age of 23 and their PhD at around 30, and finally, tenure at around 35-36 years of age. However, the average entry age into the centre where the individual finally gets his/her tenure is around 28 years; therefore the entry point in the academic market takes place very early in the research trajectory, and in the majority of the cases it takes place during the pre-doctoral period, a couple of years before the PhD.

During the pre-doctoral phase, more than half of the sample of associate professors had a research training fellowship but they also went through some other positions, and the proportion of those who, at some stage of the PhD, had teaching contracts is very high either as full-time lecturers (29.4%), part-time lecturers (14.4%), or assistant lecturers (29.2%), and even 13.1% had a position as permanent lecturers in undergraduate schools. This result is explained mainly by the nature of the expansion of the university system during the 1980s and 1990s, which was driven by the increase in the number of students entering higher education, and thus the proliferation of various types of teaching contracts rather than research contracts, which at the time did not exist.

During the postdoctoral phase, there exists a great variety of paths to tenure, both in the first job after the PhD and in the post-doctoral period as a whole. The most relevant fact here is that after the PhD, there are mainly three or four different possible entry positions and that they are almost the same type of contracts (and often conditions) as those held in the pre-doctoral period (with the exception of the post-doctoral fellowships). There is no tradition of post-doc fellow positions in Spanish Universities. In contrast it is quite common (82.4%) among those who finally got tenure at the National Research Centre (CSIC). Job to job mobility within the same centre is also high after the PhD. One possible explanation is that in a context of scarce alternative employment opportunities outside the university, young academics and scientists occupy temporary positions for several years, as a means not to lose human, but probably more importantly, social capital.

Despite the fact there is a rather high degree of job-to-job mobility within the same organisation, there is a very limited degree of early post-doctoral mobility across centres. Three out of four PhDs got their first postdoctoral position at the same university that awarded the PhD degree. The evidence shows more postdoctoral mobility around the CSIC, and also that PhDs from large universities are more mobile, a result that is related to the fact that smaller universities have grown more than larger ones in terms of employment opportunities.

Roughly half of the individuals who got the tenure in the period under study did not report any kind of international postdoctoral mobility: 26.3% had stays of more than six months whereas for 22.4% this experience was shorter. Thus, in general, the scope of this type of mobility was very limited. However, for those who moved abroad temporarily, access to tenure back in Spain was not direct. In almost all cases, they came back to a non-tenure position first, and got the tenure afterwards.

One of the most illustrative indicators of the existence of internal academic labour markets is the finding that almost half of the surveyed population stayed at the same university for their whole trajectory up to the tenure (degree, PhD and tenure at the same organisation), and almost two thirds (64%) got the tenure in a department located in the same university that awarded their PhD diploma.

Dr. Cruz identified three indicators of limited competition or closure of the academic labour markets. The first is the openness of the tenure competition to external candidates. In this respect almost all individuals who got tenure at universities (95.7%) were already employed by the centre at the moment of the competition. The figure is smaller for the CSIC (70%) that seems more open to external candidates. Moreover, the duration of the internal queues, measured by the number of consecutive years working at the same university before getting the tenure, is around eight years, depending on the size of the university.

This result would not be striking if the promotion system prevalent at Spanish universities was that of the tenure track, but it is not that type of system which exists in Spain but rather one based on open calls where one would expect to see more competition. The second indicator is the number of times a candidate has to compete until success. In this respect, more than half of the surveyed individuals obtained the tenure the first time they applied. Finally, a very interesting figure is the number of alternative candidates in each competition: in almost two thirds of the cases there was only one candidate. The percentage is higher for universities (70%) but very low at the CSIC (less than 10%) where the average number of candidates is around five. Likewise, competition is higher in the natural sciences than in other scientific areas.

The size of Spanish universities appears to be an important classifying variable in the analysis of the recruitment profile of universities as regards openness and mobility. Size is inversely correlated with growth (measured by the production of bachelors, PhDs and tenure positions): smaller universities have grown quite significantly while larger ones have not. In large universities, tenure positions are obtained by their own PhDs and the external market size is insignificant (8.3% of positions were won by individuals with a PhD granted from a different university).

Small (and growing) universities seem more open to the external market: more than half of the tenure positions offered by small universities were given to individuals who got their PhD in a different university. From that, one might conclude that *buoyant* markets somehow preclude the internal labour market dynamics. However, a closer look at the data suggests a negative answer. The smallest universities gave tenure to nine out of ten of their own PhDs who applied for a position. Therefore, internal market dynamics are kept and the surplus of job offers is filled in with the inflows of PhDs from the different universities. Therefore, growth allows for openness but it does not remove inbreeding.

One important point is that women tend to remain slightly longer in the internal queues of the departments, approximately one year more than men before they get the tenure. Finally, in a general context of very low mobility, women are slightly less mobile and, within the very small group of academics who got tenure at a different centre from that of the PhD award, there were more men than women.

Research training fellowships in Spain have traditionally been nationally or regionally competitive awards to individual students. In contrast to other countries, students do not obtain funding through their university. In this sense, fellowships have been quite portable, but obviously this fact has not led to a high mobility pattern. Moreover, the Spanish research training policies of the 1990s put great emphasis on international mobility of graduates and the limited proportion of PhDs from foreign universities represented in the tenured population of some years later is an indicator of a relative failure. There might be a dysfunction between a centralised training system at the national and regional levels where funding has not been decentralised down to the research organisations, and a system of recruitment and promotion that is built upon mainly an internal job market which does not favour institutional mobility. According to Dr. Cruz, policies should be designed to find ways to encourage research organisations to design and develop standard career patterns based on medium- to long-term planning of their academic and research staff.

The issue of temporary employment contracts is also of concern in Finland. *Pertuu Vartianen*, Rector of the Joensuu University in Finland discussed the problems of dual labour markets for researchers in his country. In Finland, the permanent civil servant status is increasingly difficult to obtain for the new generation of researchers, while a second labour market has emerged characterised by short-term employment relationships with little or no prospects of internal promotion. The current structure of academic staff in universities in Finland is a combination of three main layers. First, professors and lecturers are mainly civil servants in permanent (*de jure* open-ended) posts. Second, there is a group of

quasi-permanent early-stage or postdoctoral researchers on fixed-term (up to five years) posts with some possibilities of reappointment.

Third, there are a number of temporary researchers with fixed-term appointments which are typically financed by external sources. Since the 1990s, the third layer has been growing very rapidly (see Table 1). This development is connected, first, with a growing role of external sources of research funding, which now correspond to two thirds (64%) of completed person years in research in Finnish universities. Second, the growth in the number of fixed-term researchers is a product of a new policy emphasising research training in graduate (doctoral) schools since the mid-1990s.

Table 1. Academic staff members in Finnish universities

(1.) Academic posts mainly with a permanent civil servant status	
Professor	2 491 (17%)
Lecturer	2 601 (18%)
(2.) Fixed-term posts for early-stage or postdoctoral researchers	
Senior Assistant	658 (5%)
Assistant	1 288 (9%)
(3.) Researchers mainly with short-term appointments or contracts	
Researcher	7 536 (52%)

Source: Statistics Finland, 2004.

The academic labour market in Finland is characterised by a growing number of academic researchers without any permanent or even quasi-permanent posts. Only very few postdoctoral researchers can reach a permanent position in universities or state research institutions. One can also speak of a problem of a growing number of “over-qualified” research personnel in universities. The situation varies, of course, by subjects. The majority of fixed-term researchers are employed by successive contracts in universities. This also means increasing disputes on the legality of the employment relations of researchers. Some trade unions have called for permanent positions also in the early stages of the research career, which in turn, is an unrealistic goal from the universities’ point of view. The situation is aggravated by low mobility between sectors and regions. Universities are the main employers of new PhDs. Between 1997 and 1999, 41% of new PhDs of the three-year period were employed by universities at the end of the period. A total of 80% of new PhDs was employed by the public sector. This situation is noted in many evaluations of the Finnish innovation system. An international evaluation of the Academy of Finland in 2004 notes, for example, that “The uncertainty of a researcher’s career is a problem in Finland. To solve it, the Academy, universities and the Ministry of Education should draw up a proposal on how to improve the career prospects of researchers embarking on an academic career. One alternative could be to revise the tenure system in universities.”

Even if it seems that a genuine tenure system is difficult to create in Finland, one may ask whether the system can move from a rigid and unrealistic “civil servant post”-based model towards a more flexible model in employment relationships. In October 2004, the Ministry of Education appointed a committee on the Development of Research Careers. The committee saw that the greatest challenges of research careers in Finland are:

- Short terms of employment.
- Obstacles to inter-sectoral mobility.
- Difficulties in combining external research funding and career development.
- Career advancement of women researchers.
- A small number of foreign researchers in Finland.
- Attractiveness of researcher careers; and
- Volume of researcher training.

The committee proposed a reform of the academic career structure in Finland which is developed in accordance with the earlier proposal of the Finnish Council of University Rectors (Table 2). It is evident that more structured partnerships between universities, national research institutes, and funding bodies are needed to build this new comprehensive research career system in Finland.

Table 2. A proposal for a new academic career structure in Finland
Level I
Doctoral Student / Early-Stage Researcher (a 4-year post)
Level II
Postdoctoral Researcher / Scientist (a 3-5 year post)
Level III
University Researcher / Academy Research Fellow (a 5-year post with a possibility for renewal and / or tenure)
University Lecturer (as a rule a tenured post)
Level IV
Professor / Research Professor (as a rule a tenured post)
Academy Professor (as a rule a 5-year executive post for tenured professors)

According to *Sabine Beherenbeck* of the German Science Council, the situation in Germany has been characterised by a slow path to full professorship. To some observers, this model has been a handicap to the attractiveness of research careers in Germany. The assistant category was long viewed as unattractive because of the uncertainty in career prospects, the length of the qualification system and reliance on fixed-term employment contracts. In addition, the appointments were viewed as not being transparent. This situation contributed to the brain drain of young German academics to other countries, notably the United States and to the continued under representation of women among candidates. In 2001, the Research Council recommended replacing the "Assistant/Habilitation" category by a Junior Professorship status. The advantages of the reform were to grant young academics a faster track access to independence and autonomy. In principle, the Junior Professorship status provides early independence of young academics in teaching and research and early career perspectives. In addition, recruitment processes were made more

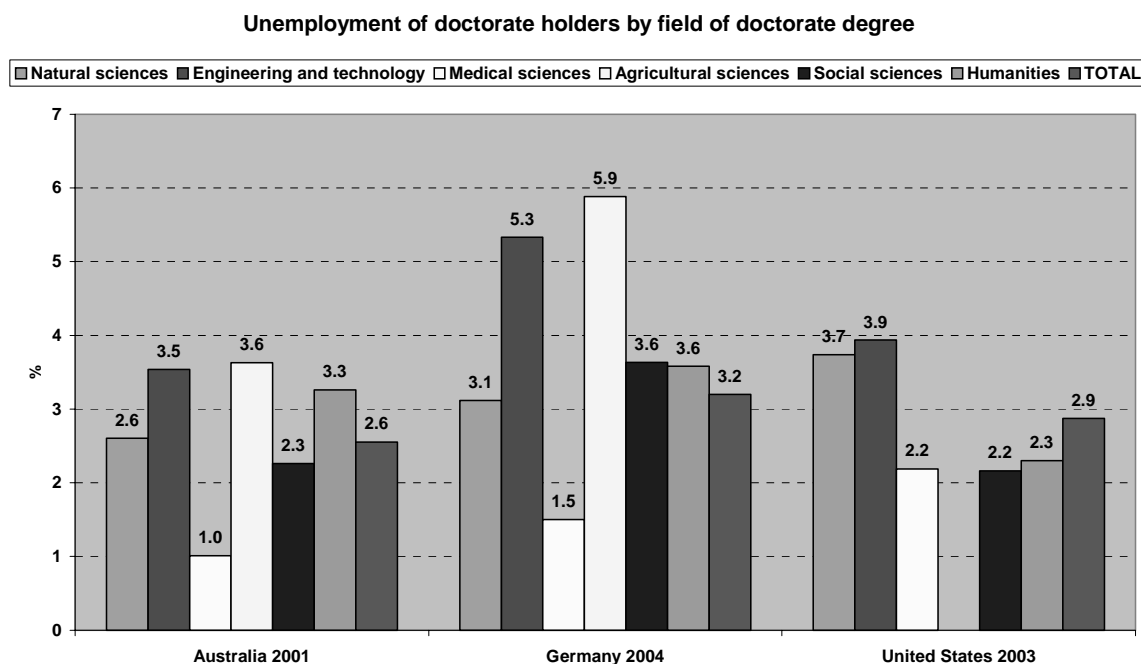
transparent through open competition procedures and appointment after the Doctorate. In 2005, additional recommendations on appointment and tenure procedures were implemented to make the entry into junior professorship by “regular” appointment. Job vacancies were to be posted publicly and internationally. An appointment commission was created involving internal and external evaluation by peers. To encourage mobility, appointment at the “home university” is allowed only once as junior professor or as full professor. To appoint a junior professor as full professor at the same university will require that an announcement be made according to state law and that a tenure commission deliberate and finally, that internal and external evaluations take place. In summary, the junior professorship opens up the path to tenure at German universities but tenure itself is not a guarantee of an attractive career but rather an opportunity.

Session III: Diversification of Career paths for S&T Graduates: empirical evidence and policy strategies

The third session was opened by *Shinichi Yamamoto* of the Research Centre for University Studies at the University of Tsukuba in Japan and focused on whether there was evidence that S&T graduates were choosing alternative or non-academic careers. It also sought to identify the barriers or incentives for career diversification and good government or institutional policies to improve the labour market integration of S&T graduates.

Laudeline Auriol of the OECD’s Economic Analysis and Statistics Division presented the first results of the OECD project on Careers of Doctorate Holders (CDH), a project carried out in collaboration with Eurostat and the UNESCO Institute for Statistics which aims to develop internationally comparable system of indicators on the careers and mobility of doctorate holders. The data builds on existing databases on demographics, education and the labour market in OECD and non-OECD countries. The results show in particular that the share of doctorate holders in the population or labour force is two or three times larger in Germany and Switzerland than in Australia, Canada and the United States. In these five countries, women represent only one-quarter to one-third of doctorate holders. The United States has an older population of doctorate holders than the other countries analysed in the paper and this population is still ageing, as is also the case in Canada. Unemployment rates of doctorate holders remain low, but are relatively higher in natural sciences and in engineering (Figure 2).

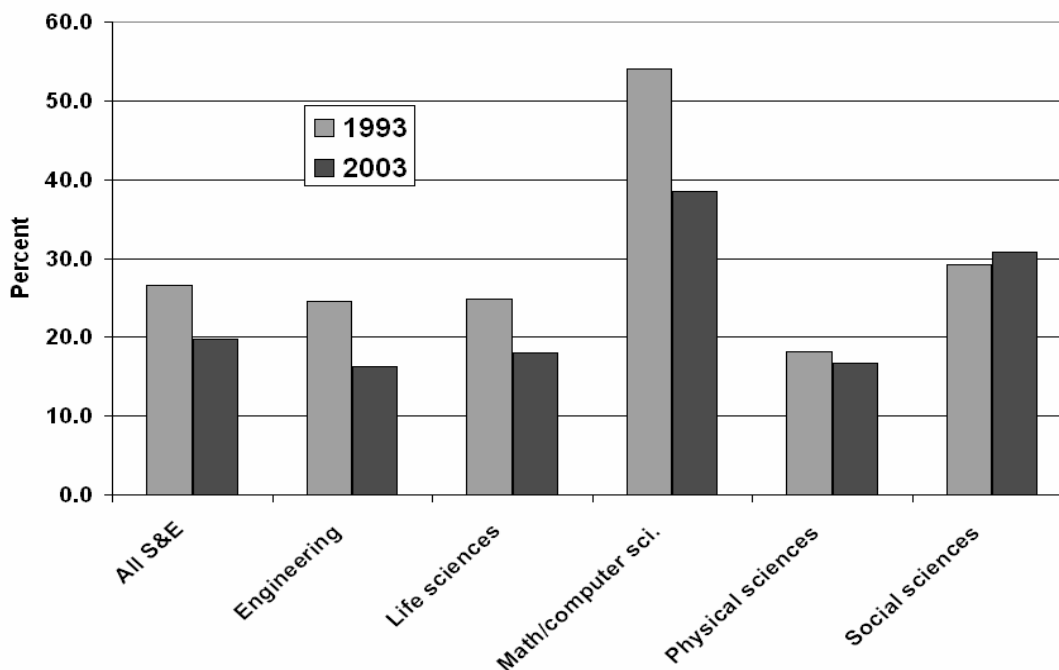
Figure 2. A significant number of PhDs experience unemployment but rates varies by field and country



There are important salary differences between men and women and across sectors, especially in the United States. In the United States, as well as in Portugal and Argentina, salary is one of the main reasons why doctoral graduates are dissatisfied with their employment situation. There is a high share of foreign doctorate holders in Switzerland and also a higher share of foreign-born doctorate holders in Canada and Australia than in the United States. Many foreigners, however, come to work to the United States having been trained for research abroad and this trend has grown stronger in recent years. On the other hand, very few doctorate holders from the United States are internationally mobile. Among mobile young Canadian citizens, three-quarters choose the United States as their next destination. Ms. Auriol noted that additional country responses to the CDH survey were forthcoming and would be essential in comparing career paths of PhDs across countries.

Mark Regets of the US National Science Foundation discussed the recent trends in the career paths for science and engineering PhDs in the United States. Data from the National Science Foundation shows that the time between a bachelor's degree and the PhD in the US has increased significantly between 1973 and 2003. The increase however has been greater in the social sciences followed by psychology and engineering. According to Mr. Regets, anecdotal evidence suggests many PhD students feel under social pressure to seek academic careers. However, access to such careers has become more difficult in some fields. Between 1993 and 2003, the share of US S&T PhD recipients in tenure or tenure track jobs four to six years after degree had fallen in the math and computer science fields, engineering, life sciences and to a lesser degree in the physical sciences (Figure 3). Nevertheless, the probability of getting tenure track in the life sciences is greater with a post-doctorate. The probability is lower in the physical sciences. Indeed, post-doctorate training is becoming a differentiating factor on the job market for researchers. According to Mr. Regets, 30% of PhD graduates undertaking a post-doc did so because it was expected in their field; 22% did so because their field required additional training at the post-doctorate level and 12% were undertaking post-doctorate training because other employment was not available.

Figure 3. Percent of US S&E Ph.D. recipients in tenure or tenure-track jobs 4-6 years after degree
(1993 and 2003)



Source: Science and Engineering Indicators 2006.

For *Yoshinobu Kitao*, Director, Knowledge Infrastructure Policy Division, S&T Policy Bureau Ministry of Education, Culture, Sports, Science & Technology (MEXT) in Japan, securing the supply of researchers is also of concern even if the number of PhD students has doubled in the last ten years. Postdoctoral fellows are contributing to research activities in Japan, but there are concerns that their career paths lack visibility and prospects, partly because the number of academic posts has not kept up with the supply of PhDs. In line with the 3rd Science & Technology Basic Plan (2006-2010), the MEXT has launched new programmes to help clarify the career path for researcher and to make careers more attractive to young people, in particular for women as well as for foreign researchers. In parallel, the MEXT has begun promoting the diversification of career paths for human resources in S&T since FY2006. The aim is to encourage PhD students to consider careers outside academia. A key element in Japan's policy is the promotion of post-doctoral fellows. Some research institutions will begin to utilise young researchers like postdoctoral fellows as a way to link universities and private companies. It is expected that young researchers will work in a variety of fields, especially in the private sector.

Another area of reform is the environment for researchers, including young researchers, women, and foreign researchers. The MEXT has started a new programme to support institutions that introduce frameworks to give young researchers opportunities for independence and to work within a competitive environment. From 2006, support for women in science will be provided to the institutions that act as role models for encouraging women researchers. Postdoctoral fellowships will be offered for researchers who return from parental leave. It is also important to foster human resources in response to society's needs. MEXT has run a long-term internship programme for graduate students since 2005. In 2006, MEXT started a new programme "Promoting diversification of Human Resource of Science and Technology's career" which aims to diversify career paths through partnerships between government and university research

institutes as well as private companies, and academic societies, etc. (with a budget of JPY 370 million in 2006). This programme is expected to identify good practices and contribute to changing the mindset of young researchers, their managers and private companies and people in other sectors.

The MEXT is also working on increasing the interest of youth in science. The MEXT is taking a comprehensive approach to policies by supporting science careers from the primary education stage to undergraduate college, graduate school and up until when a person becomes a working member of society. The MEXT also aims to strengthen the educational functions of graduate schools through collaborations between academia and industry and to expand programmes for enhancing young researchers' independence and/or diversification of career paths.

In France, the experience with measures to stimulate alternative career paths for PhDs was presented by *Sylvie Court* of the French National Association for Technological Research (ANRT). One key instrument is the CIFRE programme (*Contrats Industriels de Formation par la Recherche*) which has been in operation for 25 years. The CIFRE agreements are industrial contracts for training through research. The CIFRE programme has three broad aims: *i*) to give company executives an experience in research; *ii*) to develop co-operation between industry and academic research, and to encourage transfers of technology; *iii*) to increase the technological level of small firms by helping them to hire well trained-graduates and to encourage them to have long-term and strong links with good public research laboratories.

The CIFRE creates an association of three partners around an industrial project: a firm, a graduate engineer and an academic laboratory. During three years, the young graduate hired by a firm works towards a doctorate on an R&D subject, developed in collaboration with a laboratory situated outside the firm's premises. The subject must lead to a PhD degree. During these three years, the firm receives from the government through ANRT a subsidy of EUR 15 000 per year and pays the young graduate a minimum salary of roughly EUR 20 000 per year, excluding social security and company overheads. This company is the employer of the applicant, which ensures the commitment from the company and the recognition that the applicant is considered as a professional and no longer as a student. A collaboration contract between the firm and the laboratory is signed to evaluate the financial participation of the firm and the industrial property rights.

Firms wishing to contract a CIFRE can be of any size and in any field. About 50% of the contracts are awarded to small or medium-sized businesses with fewer than 500 employees. All industrial sectors – both high-tech companies and companies which are not high-tech – are eligible to participate and all research topics can be developed. Computer-related industries and chemical – pharmaceutical industries tend to dominate. About 15% of research topics now concern social sciences, economics, management and law. As for the graduate, he or she is usually under 26 years old, is generally a French national, (in 2005, 15% were foreigners) and must be strongly motivated to join industry. He or she is hired by industry, is considered to be a member of the staff and his or her close connection with the company during the three-year doctoral period is considered to be a key factor of success.

About one third of the CIFRE are women. Specific measures exist through the European Social Fund, one of the EU's four Structural Funds to improve women's participation in the labour market including their career development. At the end of the three-year contract, the firm sends back a questionnaire evaluating the quality of the R&D work performed leading to a PhD and the work performed applied (or being applied) on products/processes in the contracting firm or in industry. Some 82% of the CIFRE participants have contributed to immediate industrial results, such as equipment, patterns, processes, products and know-how and 78% of the graduates enter industrial firms with indefinite job contracts. Durable relationships are also established between the firm and the R&D public body.

The CIFRE programme is evaluated every three years by an independent organisation *Centre d'études et de recherches sur les qualifications* (CEREQ) which makes an audit of the labour market entry of all graduates, including doctorate holders. The evaluations show that the CIFRE salary is slightly superior to the salary of an engineer. The average annual salary is EUR 24 000 and depends on the size of the company, the sector and its human resources policy. At the end of the CIFRE, there are no salary differences between engineers and university graduates. After 25 years of existence, 15 000 CIFRE conventions have been awarded; 2 500 of these are underway; 95% have led to a PhD and 80% to a professional career in industry. Thus it can be said that the initial goal of training through research and creating links between academic and industrial research has been achieved.

José Jimenez, Director of Innovation Strategy at Telefónica R&D in Spain presented a view from industry. Like other knowledge-based companies, Telefónica R&D requires highly qualified, innovative and flexible staff who can adapt to change in order to carry out research that will lead to new services, improved processes and technologies. R&D projects are done under direct contract from the Business Units and in relation with the market. Presently, Telefónica is expanding and developing its network of Excellence Centres. This allows the firm to get closer to operating companies and adapt services to the needs of local clients. Access to Excellence Centres is important in order to attract local talent. Mr. Jimenez compared the approach of Telefónica with those underway in leading companies such as Google and IBM. At Google a bottom-up approach is adopted whereby original proposals from the staff are prioritised in a web page where everybody can contribute. Development groups are small and perform the entire process: design, coding, testing, launch plan. Projects communicate through “snippets” (weekly reports similar to blogs). Start-ups are encouraged from inside the firm and work is considered as a mixture of fun and business.

Microsoft Research's innovation model is based on an open academic model. Microsoft researchers work closely with product development groups to transfer research technology. Many of the researchers maintain their academic ties and continue to collaborate with the research community through participation and attendance at conferences, acting on committees, and publishing papers for peer review. British Telecom (BT) in contrast, has a differentiated approach to innovation. Regardless of the approaches, however, talent matters. What is important is flexibility in research staff and specialists. Mr. Jimenez identified five different profiles of talent necessary for innovation: *i*) researcher; *ii*) entrepreneur (venture); *iii*) innovator (ideas); *iv*) development; and *v*) deployment. Every profile requires different approaches to recruiting, education, competence creation and future evolutions require different approaches for every profile. But this may not be enough. New breakthroughs are produced when more than one technology is used. Therefore, collaboration and cross-fertilisation is needed. Collaborative projects are a good source of innovative ideas and training for young researchers. In summary, business organisations must be flexible in the way they use knowledge and staff in order to develop solutions to meet the specific needs of each customer.

Session IV: Policy Implications and Issues for Further Research

The final Panel aimed to assess how S&T policy can influence change in academic career structures so as to address some of the key concerns addressed. **Salvador Barbera**, Secretary General for S&T Policy, Ministry of Education and Science, Spain suggested that intermediary organisations such as incubators could help firms better appreciate the value of researchers as well as provide young PhD students with experience in interacting with industry. According to **Elena Bascones** a post-doctorate scholar, a balance must be struck between employment flexibility and job security. Research careers should be recognised as “careers” through contracts and the inclusion of social rights and obligations. Furthermore, career paths should not be step-based but rather there should be more opportunities for mobility and for moving back and forth between academia and other activities.

Panelists concluded that career systems in OECD countries were extremely diverse but that countries faced common challenges, such as working conditions, employment structures (rise in temporary positions, slower access to tenure) and the decline of the "linear career track" for academics were apparent. Many participants agreed that more flexibility was needed in the system but that security (of jobs or career prospects) remained important. A structural solution is needed that also keeps up intrinsic motivation so that researchers do not become functionaries. One solution suggested by *Peter Henderson* was to create bridging grants for young researchers (doctoral holders) to avoid extensive periods of post-doctoral training. Other measures to achieve a better balance were the role of guidelines by funding agencies (*e.g.* NIH in the US) as well as recent measures taken in the United Kingdom to limit the renewal of short-term contracts for post-docs. The business sector representatives stressed that firms had to also become more open and to create structures to receive doctoral holders.

Furthermore, recruitment and management practices have to evolve to move from creating profiles of researchers by grades to one of functions (*i.e.* teaching compared to research). Both public and private research performers stressed the importance of stimulating researchers by providing opportunities for creative and independent research activities in addition to adequate working conditions (including monetary rewards). Finally, the panelists agreed on the need for better data, including the use of micro data, to improve research on the careers of researchers in order to inform and improve policy making.

Conclusions

The workshop has shown that there is a large heterogeneity in the career paths of researchers according to the country and the institutions (universities, PROs, firms) in which they evolve. This situation makes international comparisons difficult. This is particularly the case for researchers in the public sector due to the variety of categories and their legal employment statuses as well as research funding arrangements. Nevertheless early stage researchers appear to have in general more difficulty accessing longer term and stable careers in academia in the face of dual academic labour markets in several OECD countries, which threatens the attractiveness of such careers. Flexibility however was not seen to be necessarily in contradiction with academic systems based on tenure which could be made more adaptive by granting researchers more autonomy early on and by improving incentives for established researchers (*e.g.* mobility, performance requirements). At the same time, participants agreed that researcher training remains very much geared towards preparing graduates for linear academic career paths. There was broad consensus among participants that improvements to employment arrangements in academia were required to improve transparency and career prospects, but that researchers themselves should be prepared for more complex and diverse career paths. Closer attention to PhD training and interaction between public and business R&D environments were viewed as critical to achieving this. While changes in employment systems are important to improve the attractiveness of research, policy responses are not limited to problems in career paths. Policies to encourage young people to pursue scientific studies at early stages of schooling remain important and perhaps could also be better linked with those to promote research careers.



JOINT OECD-SPANISH MINISTRY OF EDUCATION AND SCIENCE WORKSHOP

“RESEARCH CAREERS FOR THE 21ST CENTURY”

26-27 APRIL 2006

Ministry of Education and Science
Paseo de la Castellana 160, Madrid, Spain
Room F

Objectives This one and a half day workshop will aim to address the following key issues: What is the emerging face of researcher careers for the 21st century? Can we identify different models cross nationally? How are researcher careers changing and do they remain attractive options for S&T graduates? Is the tenure system an asset or impediment to enhancing the flexibility of researcher employment? What evidence is there on diversification of S&T graduates’ career paths? How can education and training policies prepare S&T graduates for more diverse and less linear career opportunities? Are there “good practices” at the government and institution level?

WEDNESDAY 26 APRIL (AFTERNOON)

Welcome:

13:00-14:00 REGISTRATION

14:00-14:30 Mercedes CABRERA CALVO-SOTELO, Minister of Education and Science, Spain
Nobuo TANAKA, Director, OECD Directorate for Science, Technology and Industry
Salvador BARBERA, Secretary General for S&T Policy, Ministry of Education and Science, Spain

14:30-16:00 **Session 1: Research and Academic Careers in Universities and Public Research Organisations: National Models in OECD countries**

Questions: What are the main models for researcher careers in OECD countries? Are these models tending to converge towards a common model? If so, what is the influence of market forces? What is the influence of government regulations and working conditions in the public sector on researcher career outcomes in OECD countries? What role does mobility (geographic or sectoral) play in researcher career paths? What are the implications for researcher training policies?

Chair: Violeta DEMONTE, Director General for Research, Ministry of Education and Science, Spain

Manuel HEITOR, Secretary of State for Science, Technology and Higher Education, Portugal *Fostering research careers through institutional building: learning from the Portuguese experience*

Ulrich TEICHLER, Professor, Centre for Research on Higher Education and Work at the Department for Social Sciences of the University of Kassel, Germany – *Research Careers in Europe*

Peter HENDERSON, Director, Board on Higher Education and Workforce, National Research Council, United States – *Research Careers in the United States*

16:00-16:15 Coffee Break

16:15-17:30 Akira HOROIWA, Affiliated Fellow, National Institute of Science and Technology Policy (NISTEP), Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan – *Research Careers in Japan*

José Manuel FERNANDEZ-LABASTIDA, Vice-President of the CSIC, *Research Careers at the Spanish CSIC*

General Discussion

17:30-18:30 **Policy Round-Table Discussion:**

Chair: Joan COMELLA, General Director of FECYT, Spain

Panellists:

- Dirk PILAT, Head of the Science and Technology Policy Division, OECD
- Yoshinobu KITAO, Director, Knowledge Infrastructure Policy Division, S&T Policy Bureau, MEXT, Japan
- Cees VIS, Senior Policy, Strategy and Policy Unit, DG-Research, European Commission

19:00-20:30 Reception sponsored by the Ministry of Flanders, Science and Innovation Administration

THURSDAY 27 APRIL

DAY 2

9:00-10:45 **Session 2: The Role of Tenure Systems and Flexible Employment Systems in the Development of Research Careers Today**

Questions: What role does tenure or civil servant status play in the labour market for researchers? Does tenure limit researcher mobility or enhance it? What are the effects on networking and research collaboration? Is the tenure system at odds with more flexible models of employment? Do limited opportunities for tenure force younger researchers (e.g. Post-Docs) to leave academic careers?

Chair: Andreu MAS COLELL, President of the European Economic Association

Sandrine KERGROACH and Mario CERVANTES, Science and Technology Policy Division, OECD – *Working Conditions and Attractiveness of Research Careers in Universities and Public Research Institutions in OECD countries: Results of a survey*

H. Lorne CARMICHAEL, Queen's University Kingston, Ontario, Canada – *On the issue of Tenure in Academia*

Laura CRUZ-CASTRO, Spanish National Research Centre (CSIC) – *Tenure and mobility in Spanish universities and public research centres: evidence from micro data*

10:45-11:00 Coffee Break

11:00-13:00 Perttu VARTIAINEN, Rector of Joensuu University, Finland – *Research careers in Finland: problems of dual labour markets*

Sabine BEHRENBECK, Head of Department “Higher Education and Scientific Careers” Science Council (Wissenschaftsrat), Germany – *Junior professorship, the German way of tenure track*

General Discussion

13:00– 14:00 **Lunch**

14:00-16:30 **Session 3: Diversification of Career paths for S&T Graduates: empirical evidence and policy strategies**

Questions: Is there evidence that S&T graduates are choosing alternative or non-academic careers? Is this a positive development or not? Where are they going? What are the barriers or incentives for career diversification? Are there good government or institutional policies to promote multiple, alternative and non-linear career paths? Can such policies improve the labour market integration of S&T graduates?

Chair: Dr. Shinichi YAMAMOTO, Director and Professor, Research Center for University Studies, University of Tsukuba, Japan

Laudeline AURIOL, Economic Analysis and Statistics Division, OECD – *Preliminary results of the OECD Careers of Doctorate Holders (CDH) Survey*

Mark REGETS, National Science Foundation, United States – *Evidence of the diversification of research career paths in the US*

Sylvie COURT, National Association for Technological Research (ANRT), France – *Measures to stimulate alternative career paths for PhDs in France*

José JIMENEZ, Director of Innovation Strategy, Telefónica R&D – *What do companies need? Requirements from industry*

General Discussion

16:30-16:45 **Coffee Break**

Session 4: Policy Implications and Issues for Further Research

16:45 -18:30. **Chair:** Paul SMAGLIK, **Editor,** *NatureJobs*

Salvador BARBERA, Secretary General for S&T Policy, Ministry of Education and Science, Spain

Peter HENDERSON, Director, Board on Higher Education and Workforce, National Research Council, United States

Elena BASCONES, Research Fellow, CSIC-ICMM / Spanish Federation of Young Researchers-EURODOC

Andrew DEARING, Secretary General of the European Industrial Research Management Association (EIRMA)

Roland SCHNEIDER, Trade Union Advisory Committee to the OECD (TUAC)

18:30 **Adjourn**

19:30-21:00 **Reception** sponsored by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT)

SFRI Delegates should note that a regular meeting of the SFRI Working Group will be held on the following day, 28 April 2006, at the same venue but in room E

With the collaboration and support of the Spanish Foundation for Science and Technology



And generous support from:

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Ministry of Education, Culture, Sports,
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