

# Evidence on the main factors inhibiting mobility and career development of researchers

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Universities and Researchers

Assignment Manager

Deborah Cox

PREST, Manchester Institute of Innovation Research

Overall Coordinator

Arnold Verbeek

IDEA Consult



**EUROPEAN COMMISSION**

Directorate-General for Research  
Directorate C – European Research Area  
Unit: Universities and Researchers

Contact: Emmanuel Boudard  
European Commission

Office SDME 09/32  
B1049 Brussels  
Tel: (32-2) 29 85 119

E-mail: [emmanuel.boudard@ec.europa.eu](mailto:emmanuel.boudard@ec.europa.eu)

EUROPEAN COMMISSION

# **Evidence on the main factors inhibiting mobility and career development of researchers**

By

**IDEA CONSULT (Coordinator)**

**FRAUNHOFER-ISI, NIFU STEP, PREST, SPRU,  
TECHNOPOLIS**

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"*Peregrinato academica* – an academic pilgrimage – was the medieval Latin term for the students and teachers journey to the places where they could obtain wisdom. Today's educational systems ... function as providers of these places of wisdom and individuals extend their knowledge base in a continuous journey through these systems."(Graversen, 2001)

## Executive Summary

The importance of knowledge and research for innovation and economic performance in globalised and competitive economies is widely recognised. Knowledge and competences are partly embodied in people and, as a consequence, a flexible and transparent European labour market for researchers is widely viewed as highly desirable not only for improving employment and working conditions for researchers but also for research, innovation and growth in general. Enhancing the mobility of researchers has thus become an important goal of European research policy.

The aim of this study is to present evidence of the views of researchers on a range of factors that may inhibit researcher mobility and career development within the emerging European Research Area. An initial set of potential inhibiting factors were extracted from ongoing policy and scholarly debates about scientific mobility, namely:

- unsatisfactory current arrangements and practices concerning social security schemes (including statutory and supplementary pension rights, unemployment benefits)
- unattractive employment conditions
- the lack of competition-based internationally open recruitment
- the lack of recognition of mobility in recruitment and career development
- a lack of trans-national portability of grants/funding
- a lack of adequate training and skills development for researchers.

### THE STUDY

This study is primarily concerned with factors inhibiting transnational/cross-border mobility of academic researchers, particularly in STEM departments in universities and research institutes. Although there is some discussion of intersectoral (industry-academia) mobility this is not the major focus of this study. The study concerns researchers at all career stages. Our focus is on *factors inhibiting mobility* - which may in turn influence *career development* (or vice versa). We are not concerned with factors that may inhibit career development that are *not* linked to mobility.

### DEFINITIONS

A researcher can be a doctoral candidate, someone at post-doctoral level; or an experienced researcher, including those operating at a senior professional level, amongst others. Titles can vary depending on contractual or legal arrangements within countries and institutions and whether work is undertaken on a full time or fractional basis. This study is concerned with the mobility of academic researchers located within institutions of higher education or public research institutes within or closely associated with the higher education sectors. We have adopted the internationally recognised Frascati definition of research.

Mobility can be international, trans-national, cross border or within national borders, cross-sectoral and increasingly virtual. It can be motivated by employers and by individuals. Periods of mobility can last for a few months or years. Mobility can also be open-ended.

Neither the mobile researcher nor worker mobility in general should be considered a static, homogenous entity. The types and forms of mobility a researcher may demonstrate will be influenced by a variety of factors including experience and career

stage, discipline or specialism and salary levels. Influential in shaping propensity towards mobility are the trend towards dual income households and the challenges of achieving an appropriate work-life balance. Understanding the nature of the mobility demonstrated by a mobile researcher is a prerequisite to identifying the 'push-pull' factors operating as incentives or disincentives on levels and flows of researcher movements within academic and knowledge based labour markets.

## **SURVEY AND STUDY METHODOLOGY**

The study combines the use of quantitative and qualitative approaches in the form of a survey (quantitative and qualitative data) and interviews with individuals (qualitative data). The survey had a dual purpose: to capture the nature of EU researchers with regards to their *demographic data* and to identify the *factors* that inhibit researcher mobility and career development. Based on the initial specification and discussions with the EC the target population was identified as researchers at a range of institutions in selected European countries. At the country level a *purposive sampling* technique was adopted to satisfy the needs of the study. In view of complexity and time constraints the number of countries selected for inclusion was limited to eight (Hungary, France, Germany, The Netherlands, Norway, Poland, Spain and United Kingdom). The selection of countries was seen as broadly representative of European demography along a continuum of developing through to more mature research systems. The sample was intended to capture and reflect the heterogeneous nature of the research systems (and individual institutions) found across the ERA. At the institute level purposive sampling was again adopted, with the sample designed to include a mixture of institutes in terms of standing/reputation, a mixture of universities and non-university based research institutes (where feasible), and a geographically diverse (cross-country) selection of institutes.

At the level of the individual researcher *convenience sampling* was used for pragmatic reasons. Within each institute one or more STEM (science, technology, engineering and mathematics) and, where feasible, social science departments were identified and a range of research staff selected from these departments using websites or contacts in the institution. All selected researchers were invited to complete the online survey instrument. Invitees were also invited to nominate further respondents ('snowball sampling'). Finally, an identical survey instrument was made available via a prominent web-link on the European Researcher's mobility portal, which provides information on careers opportunities and assistance for researchers. Both surveys were run in parallel.

The gross sample of respondents consists of 1,164 persons in the purposive 'Rindicate' group and an additional 2,513 persons in the self-selecting 'E-carriers' group. 242 persons in the 'E-carriers' group and 70 persons in the 'Rindicate' group did not give information about their mobility status and were excluded from the analysis. Thus the total net sample consists of 3,365 researchers. Because of the use of a mixture of purposive and 'snowball' sampling for the 'Rindicate' survey and self-selection via a web link for the 'E-carriers' survey it is not possible to determine a response rate for either survey.

The survey instrument allowed for the collection of demographic data and responses to closed questions about the opinion of respondents concerning mobility issues. It also allowed for the collection of textual responses to open questions to gather richer qualitative data. Because of time constraints it was not possible to comprehensively analyse this rich body of qualitative data. However to complement the quantitative data 16 researcher 'profiles' were constructed to explore the qualitative responses of a selection of "highly mobile researchers" from our larger samples. Finally, we carried out telephone interviews with twelve people with responsibility for research management across a range of organisations in six European countries, in order to explore the institutional perspective on the main inhibiting factors of researcher mobility.

## THE RESPONDENTS

Across the two samples male researchers have a higher probability of having been mobile in the past compared to female researchers, but are more reluctant to be mobile in the future (this result is not controlled for the effect of possible age or research domain differences between the two gender groups). 46 per cent of researchers in our combined samples are either currently mobile or have been mobile in the past. About 35 per cent would like to be mobile in future, while 18 per cent are not currently interested in being mobile. **Thus, as much as 82 per cent of the respondents either have the experience of being a mobile researcher or would like to be mobile in the future whilst only 12% of the youngest researchers express no interest in mobility.**

The proportion of researchers who would like to be mobile in the future decreases with age group, while the proportion that has been mobile in the past increases with age group. **The share of researchers who are currently mobile is highest for the age group 25-30**, while this fraction is lower for younger and older researchers. The oldest age group has the highest fraction of researchers who are not currently interested in being mobile. Age and experience are closely related and, not surprisingly, the share of researchers who have been a mobile researcher in the past increases with years of experience, whilst the fraction who would like to be mobile in the future decreases with this characteristic on average. The fraction of researchers who have been mobile in the past increases with salary level, but this is also the situation for those who are not interested in being mobile at the moment. This is not surprising as age and income are generally likely to be highly correlated.

In our samples **the life sciences research domain has the highest share of mobile researchers, while the social sciences and humanities domain has the lowest.** The latter group also has the lowest fraction of those who have been mobile in the past, as well as the highest fraction of those who would like to be mobile in the future. **Researchers with a fixed term contract of greater than 2 years are more likely to have been mobile in the past or to be not currently interested in mobility compared with those with a shorter fixed term contract.** Mobility is more common in those with a fixed term contract of 1-2 years; whilst those with a fixed term contract of less than 1 year or other type of contract have the highest fraction of researchers who would like to be a mobile researcher in the future.

## CONCLUSIONS - FACTORS INHIBITING MOBILITY

Those respondents who would like to be mobile in the future mention a broad range of inhibiting factors such as funding for mobility, salary, lack of open recruitment, accommodation, misalignment in social security benefits, personal relationships and health insurance. All these factors can partly be addressed by adequate policies, but they also reflect mobility frictions due to the life situation of the respondents. An important finding is that **respondents considering future mobility express concern, more strongly than do currently mobile researchers, that there is a lack of recognition of, and lesser opportunities for, further career progression directly linked to mobility status.** Conversely to what might be expected, child care arrangements and other caring responsibilities seem to be a barrier of lesser importance compared to personal relationships. Those who have been mobile in the past have experienced much the same inhibiting factors as those who are currently mobile. **Funding for mobility is not surprisingly of great importance for those who would like to be mobile in the future, and is also seen as a significant potential obstacle by those researchers who are not currently interested in being mobile.** This is true of researchers from all geographical areas within our sample. Other important factors are personal relationships, accommodation, social security, salary, pension rights and health care insurance. **Immigration rules are of greatest significance for researchers from other countries outside Europe.** Child care arrangements are much more important for Nordic researchers than for respondents from other EU or non-EU countries.



We can identify several clusters of concerns expressed by respondents. At the most fundamental level these naturally involve 'quality of life' issues. For fifty per cent of respondents **accommodation** has presented a problem. Our findings have also illuminated the real concern that mobility has or could affect supplementary **pension** contributions and rights and so disadvantage researchers later in life. Our findings also show clusters of concern around issues of **career progression, nature of contracts, pay differentials, availability of posts, funding sources and maintenance of research funds**. Our findings suggest there may be a lack of transparency in these areas, which could to some degree be remedied by improving information flows. The availability of **funding** sources and maintenance of those sources presented difficulties to many respondents and raised particular difficulties for those who would like to be mobile. Our findings have clearly shown that it is at the early stage (by years experience) and up to 7 years experience that funding difficulties are most reported and are felt to be most acute by those who would like to be mobile in the future.

We have found that there are major concerns regarding researcher mobility and career progression relating to **the lack of job security and stability** for researchers. There is an issue whether mobility may compound these problems further. In many European countries the number of post-doctoral researchers has grown considerably over recent years whilst the number of permanent researcher positions has seldom kept pace. We have found evidence of measures being taken to reduce **the detrimental effect on researcher careers**; but more action, perhaps at EU level, is required to improve mobility, career development and stability of researcher careers.

In our study the interviewees were asked some exploratory questions regarding 'optimum levels of mobility' for their institution, both inward and outward. We found that there was **no overall consensus amongst interviewees as to an optimal level**. Differences between disciplines and career structures and expectations, size and orientation of research groups and prevailing funding models across countries and institutions mean that the optimal level for one institution or research group may be very different to that of another. Most respondents emphasised the need to strike a balance, and to have the most suitable researchers for the appropriate research positions.

The findings of the survey show that **patterns of mobility flows are skewed**. Among those who are currently mobile in our sample, *most mobility* happens within the EU5 countries, i.e. most of the respondents who are highly mobile moved from/to EU5 countries (UK, France, Germany, Italy, and Spain). Overall we can see that **a great deal of mobility of the EU researchers in our survey takes place within Europe**. Findings confirm that **there are often more specific and acute difficulties for third-country researchers in terms of visa / residence issues**.

The findings of this study confirm that **there are push and pull forces affecting mobility flows of researchers that have asymmetric consequences both for receiving and sending research institutions and for the professional and personal lives of individual researchers**. Our study has confirmed that **what may be an inhibiting factor for the career development of a mobile researcher may also be a push factor for mobility**.

In conclusion whilst a range of significant inhibiting factors were identified by our profiled highly mobile researchers and by our survey respondents more generally, the survey findings do suggest that, despite these serious problems **mobility is viewed in a positive way**. Many respondents stressed that mobility should never be encouraged for its own sake but only as a means to other ends. Our fieldwork findings show that there is **a great deal of support for efforts to address obstacles and inhibiting factors**. The personal and scientific benefits of mobility were frequently cited.

# 1. Introduction

The importance of knowledge and research for innovation and economic performance in globalised and competitive economies is widely recognised. Knowledge and competences are partly embodied in people and, as a consequence, a flexible and transparent European labour market for researchers is widely viewed as highly desirable not only for improving employment and working conditions for researchers but also for research, innovation and growth in general. Enhancing the mobility of researchers has thus become an important goal of European research policy.

Within this policy context, the aim of this study is to present evidence of the views of researchers on a range of factors that may inhibit researcher mobility and career development within the emerging European Research Area. An initial set of potential inhibiting factors were extracted from ongoing policy and scholarly debates about scientific mobility, namely:

- unsatisfactory current arrangements and practices concerning social security schemes (including statutory and supplementary pension rights, unemployment benefits)
- unattractive employment conditions
- the lack of competition-based internationally open recruitment
- the lack of recognition of mobility in recruitment and career development
- a lack of trans-national portability of grants/funding
- a lack of adequate training and skills development for researchers.

A European strategy for mobility and career development of researchers has been developing gradually for some time, with particular impetus from the concept of the 'European Research Area'. The changing global landscape in which research is conducted and the emergence of new scientific and technological loci attracting high-level research skills is exposing deficiencies in the fabric and functioning of the emergent European research system. Among the deficiencies identified are: relatively poor employment conditions including precarious employment; narrow career prospects; and mobility opportunities hampered by structural, institutional and national boundaries.

It is felt that Europe needs to rapidly increase its attractiveness to researchers by reducing administrative obstacles to mobility in the areas of social security entitlements, fast-track work permit and visa procedures and recognition of qualifications. To meet the Lisbon target a substantial number of researchers will be needed in both the public and private sectors. There are therefore concerns about how to make a career in research more attractive to the best people, how to encourage European researchers to stay in Europe, and how to attract the best researchers in the global marketplace.

A number of studies have found that many factors play a part in the mobility of young researchers, but the EU still has much to do if it is to attract and retain the best researchers. In engineering and social science, studies show that the mobility of young researchers is still fairly low, there are great disparities in remuneration between countries, networking is not effectively facilitated, and administrative barriers still hinder mobility (cf. ERAWATCH RESCAR Report, 2007; Robinson et al, 2007).

The Mobility Strategy adopted by the European Commission (COM, 2001a) aims to facilitate the mobility of researchers with the ultimate objective of enhancing the overall quality of researchers in Europe through increased trans-national competition. This is essential in helping to create the critical mass of researchers necessary to build the European Research Area.

This study is primarily concerned with factors inhibiting transnational/cross-border mobility of academic researchers, particularly in STEM departments in universities and research institutes. Although there is some discussion of intersectoral (industry-academia) mobility this is not a major focus of this study. The study concerns researchers at all career stages. Our focus is on *factors inhibiting mobility* - which may in turn influence *career development* (or vice versa). We are not concerned with factors that may inhibit career development that are *not* linked to mobility.

This report is structured as follows: first there is a focused review of debates and sources of data, followed by a short discussion of definitions and the concept of 'researcher mobility'. We then report on the implementation and outcomes of the survey. This is followed by results obtained from the qualitative analysis of open-answer responses to the survey (and in particular of sixteen highly mobile researchers profiled in some detail to illustrate specificities of individual cases) followed by our findings from interviews with 12 research managers from six European member states. Finally we draw some conclusions based on the data collected. Annexes present supplementary analyses and provide more information about the data collection instruments, respondents and informants.

## 2. Review

### Background

The importance of knowledge and research in innovation and economic performance in increasingly globalised and competitive economies is now well recognised. In concrete terms this has been expressed by many countries in setting their R&D spending targets as percentages of GDP (OECD, 2006): Canada has a target of 1.94% by 2010, China 2.5% by 2020 and the European Union 3% by 2010 (currently it is 2.9% in the United States). For the European Union, in terms of human resources, the Commission has estimated that in order to meet the 3% objective, a further 600,000 to 700,000 researchers will be needed. This would mean increasing the current level of researchers from 6 per 1000 labour force to 8 per 1000 (COM, 2004).

A more flexible and transparent European labour market for researchers is now viewed as highly desirable for research, innovation and growth in general and for improving employment and working conditions for researchers (COM, 2007a). In particular enhancing the mobility of researchers has thus become an important goal of European research policy (COM, 2000; Casey et al, 2001; Van de Sande et al., 2005). This policy approach is underpinned by the assumption that geographical mobility tends to lead to productive combination(s) of localised knowledge, efficient intellectual exchange to foster international research collaboration and dissemination of good practice and research excellence<sup>1</sup>.

However, the changing global landscape in which research is conducted and the emergence of new scientific and technological loci attracting high-level research skills is exposing deficiencies in the fabric and functioning of this emergent European research system. The deficiencies identified by commentators include: relatively poor employment conditions including precarious employment; narrow career prospects; and mobility opportunities hampered by structural, institutional and national boundaries. The Kok Report (EC, 2004a), in reviewing progress in accordance with the Lisbon agenda, particularly stressed the need for Europe to rapidly improve its attractiveness to researchers by reducing administrative obstacles to mobility in the areas of social security entitlements, fast-track work permit and visa procedures and recognition of qualifications.

Remedying these deficiencies, both quantitatively and qualitatively (EC, 2004b) the EC has been concerned with identifying how to make a career in research more attractive to the best researchers, how to incentivise people to enter the researcher's profession, how to encourage European researchers to stay in Europe, and how to attract the best researchers in the global marketplace to come to Europe.

In the context of the 3% objective the EC has adopted a **Mobility Strategy** aimed at facilitating mobility of researchers within and to Europe with the ultimate objectives of enhancing the overall quality of researchers in Europe through increased trans-national competition, and of helping to create the critical mass of researchers necessary to build the European Research Area. This strategy encompasses measures related to the dynamics required to set up and develop a more favourable environment for mobile researchers throughout their career, including legal improvements (admission, entry conditions, social security and taxation), better information and assistance services (advertising of vacancies, availability of practical information), an improved knowledge base and qualitative improvements (exchange of best practice, benchmarking). Additionally the Commission has sought to determine the different aspects that characterise the profession of researchers and define the various factors that condition their careers at European level. These factors include research training, recruitment

methods, the contractual and budgetary situations and evaluation mechanisms that allow career progress.

In 2001 and 2003 the Commission proposed measures to enhance mobility of researchers as a tool for further training, to improve career opportunities and to move towards a genuine European labour market for researchers (COM, 2001a; 2003). These measures included the adoption of a European Charter for Researchers and a Code of Conduct for the Recruitment of Researchers. These two documents provide Member States, employers, funders and researchers with an instrument to undertake, on a voluntary basis, further initiatives for the improvement and consolidation of researchers' career prospects in the European Union and for the creation of an open labour market for researchers. They attach to individual researchers the same rights and obligations wherever they may work throughout the European Union to counter the fact that research careers in Europe are fragmented at local, regional, national or sectoral level. The European Charter for Researchers addresses the roles, responsibilities and entitlements of researchers and their employers or funding organisations. It aims at ensuring that the relationship between these parties contributes to successful performance in the generation, transfer and sharing of knowledge and to the career development of researchers. The Code of Conduct aims to improve recruitment and make selection procedures fairer and more transparent and proposes different means of judging merit, measured not just on the number of publications but on a wider range of evaluation criteria, such as teaching, supervision, teamwork, knowledge transfer, management and public awareness activities.

However, subsequent findings outlined in the Green Paper on the Future on the European Research Area (COM, 2007a) have indicated that mobility measures have not proceeded as fast as expected because of limited Community competences in the area of social security for instance, and a lack of political willingness within Member States to accept Community measures in this area for specific categories of workers. Additionally, the take-up of voluntary measures addressing other mobility obstacles, for example, related to funding mechanisms and employment conditions, as well as career-related issues contained in the Commission's Recommendation on the European Charter for Researchers and the Code of conduct for their Recruitment (EC, 2005), have proved difficult in reality because of the different situations and states of advancement in the Member States.

The findings of the STRATA Expert Group (EC, 2003) with respect to barriers inhibiting researcher mobility have been summarised in the table below and they show some consonance with the ameliorative intentions of components found within the Mobility Strategy.

Figure 1: Summary of barriers at different decision stages of research career

Stage	Problem	Barriers
PG Training for research	Best doctoral candidates not continuing Numbers not sufficient for projected needs	Recruitment base inadequate Research training too daunting Commitment not justified by the rewards Supervision & support from senior academics too limited Resources not up to date or professionally supported Quality research time too time-consuming Financially disadvantageous Research training is difficult to combine with normal family life
Remaining in Research	Flight to other occupations, sectors or countries	Lack of satisfactory job opportunities Poor salary returns Career advancement difficult on a research track Obstacles to mobility Employment problems for two-researcher families Long term ageist problems
A career in research	Fall in quality and number of public sector researchers and failure to recruit and retain high quality researchers in academe	Uncompetitive & inflexible academic salaries Hierarchical & fixed employment structures Dominance of short-term & external funding mentality Mobility obstacles Poor working conditions and practices Bureaucratic culture

Source EC (2003): STRATA expert group

## Availability of data

There is much evidence available from a heterogeneous range of information sources about researchers and their mobility. However, the current absence of “joined-up” statistical data on a Europe-wide basis to provide an overview, in both the public and private sectors, of researcher stocks, inflows and outflows, career paths, geographical and inter-sectoral mobility flows is widely considered to be a major hindrance to effective implementation of a European mobility strategy. This is not particularly surprising. Developing evidence-based tools that can identify obstacles to mobility and characterise career development paths, gender differentials, and salary differentials is difficult and time-consuming.

The category of “Researcher” is not a defined occupation as such, in that the term itself is not ascribed a code under the International Standard Classification of Occupations (ISCO). This presents problems for data comparability and harmonisation. Doctoral candidates (who are students but also researchers and are often employed as such) are classified under the International Standard Classification of Education (ISCED97), which is used to define tertiary education programmes that lead to the award of an advanced research degree (ISCED Level 6). For the definition of this level this typically requires the submission of a thesis of publishable quality, representing the product of original research and a significant contribution to knowledge. In addition this level is also considered to prepare graduates (one assumes through training programmes) for faculty posts in institutions offering largely theoretically based taught programmes (ISCED level 5A). As doctoral candidates may also at the same time be employed in faculty posts, in differing institutions within differing educational systems, with differing employment

conditions and time lengths for completion of doctoral studies, difficulties again arise in terms of data harmonisation and comparability.

There is, however, an increasing amount of quantitative data becoming available which can provide some information about researchers coming in and out of the EU, intra-EU mobility of researchers, stock and forecasts of researchers in the EU, researchers still in training and post-doctoral phases. Some of these data are derived from the Eurostat education database but caution has to be exercised because the European education systems differ between countries, and for some countries duplications of degrees might exist.

The IPTS project “Human Resources in Research and development: Integrated Information System on the career paths and mobility flows of Researchers” which maps, collects and analyses available information with a view to setting up a fully operational transparency-based, Europe-wide information system is an example of a move towards overcoming the data harmonisation problem.

Eurostat and the OECD are also developing (often in cooperation) improved harmonised data collections in several areas. These include mobility flows of foreign researchers, where since 2005 incoming foreign researchers have been incorporated in Eurostat data collections (such as the R&D statistics questionnaire). Eurostat/OECD and UNESCO are involved in harmonising national surveys on the Careers of Doctorate Holders (CDH): currently 17 countries have such surveys but with various objectives, populations and frequencies which currently hamper comparability.

We know that much research in universities and colleges is funded on a fixed-term basis by companies, research charities, the European Union, Government Departments and the national research funding agencies. In turn, universities and institutes may employ staff through fixed-term or similar contracts to carry out the research, but these contractual arrangements can vary from country to country and institution to institution. There is recent evidence on earnings we can draw upon, for example the Research DG Study on the Remuneration of Researchers in the Public and Private Sectors (EC, 2007a), which gives information on the gross and net earnings of researchers (in the EU25) in these sectors and also discusses researchers’ career recognition (results compared against the situation of researchers in other countries: Australia, China, India, Japan and the USA).

## **Some trends**

### **Geographical mobility**

The findings of the RESCAR ERAWATCH (Robinson et al, 2007) survey offer some interesting indicators of geographical mobility, suggesting that the world is not a level playing field. The survey focused on university-based research teams in engineering and the social sciences across Europe. It covered 10 European countries: the Czech Republic, Germany, Spain, France, Hungary, Italy, Norway, Portugal, Sweden and the UK, and examined more than 5500 departments from 539 universities. Of these departments 1800 (32%) were classified as social science, 3700 (37%) as engineering and 47 (1%) as mixed social science and engineering.

The survey found that the mobility of young researchers within the EU as well as within Europe in general is low. At the level of PhD candidate 7.3% were born in another EU member state and another 2.5% in a European but non-EU country. More candidates from Asia, Africa and Latin America study for a PhD in engineering or social sciences in the 10 countries. The low rate of European PhD candidates was even more pronounced in the social sciences than in engineering. For post-docs, on average 13% are from another EU member state and 4% from a non-EU European country: a similar share of post-docs were born in Asia, Africa or Latin America. The UK showed a large inflow of

foreign researchers for both PhD and post-doc positions (and also into undergraduate education) and a large outflow when leaving the post (the same for France and Spain in the social sciences). This is an exchange of human capital that should be enriching to the target countries (UK, France, Spain), as they receive able and motivated young researchers coming from a different cultural and educational background who are willing to undertake a considerable effort to increase their knowledge and skills. At the same time, the sending countries – from Europe but particularly from emerging and developing nations from Asia, Africa and Latin America – receive some of the former doctoral candidates back with a PhD degree and in the case of post-docs even some work experience (though the rate of post-docs who move/return to countries outside of Europe is not too high). In the Czech Republic, Hungary and Portugal (particularly in engineering fields) there are relatively few PhD candidates who have come from other countries, but many former doctoral candidates who moved to other countries in Europe. This indicates a loss of human capital after the PhD. As very few foreign post-docs work in the Czech Republic and Hungary, the loss might indicate that insufficient post-doc positions are available. In the case of Portugal, where many (around 70%) of the engineering post-docs have been born in another country, it seems it may be more attractive to go there after the PhD for a post-doc than for PhD education. In terms of discipline, the geographical mobility of former doctoral candidates differs with regard to both the point in time and the destination chosen: in engineering more candidates move before entering the university, or between undergraduate and postgraduate education, than in the social sciences. In contrast, in the social sciences more former doctoral candidates move to another country after their PhD than in engineering. The target regions differ also: whereas around 85% of former engineering doctoral candidates stay in EU countries, this share is only 76% in the social sciences. Graduates in the latter domain moved to other continents more frequently, in particular to the US and Latin America, as well as to Asia.

Virtually no PhD candidates come from North America to any of the included countries and disciplines. Overall less than 1% of the PhD candidates in social sciences and engineering in the 10 countries were born in North America. The outflow of former doctoral candidates to North American countries – of course in particular the US – is larger, namely 8% in the social sciences and 5% in engineering. There is some migration from North America to Europe; in particular, re-migration, as 3% of the European post-docs obtained their PhD in North America compared to only 1.5% who were born there.

### **Sectoral mobility**

The RESCAR study suggests that the mobility between the universities and the private sector differs between engineering and the social sciences. More than half of PhD graduates in engineering left the universities (and other public research organisations) after the PhD and joined private firms. Perhaps not surprisingly, in the social sciences the figure is rather lower, with only around 20% of PhD graduates doing the same<sup>1</sup>. The same pattern appears for post-docs, only at a lower level<sup>ii</sup>. It is worth remembering that those moving to private sector do not necessarily cease being researchers, as many (of the engineers at least) presumably go to work as company researchers. Both for PhDs and post-docs, the ratio of intersectoral movers from university to industry is higher in older engineering groups than in younger ones.

### **Mobility into permanent employment**

The RESCAR study in this area shows a positive picture of employment for PhDs and post-docs in social science and engineering with a large majority of them finding

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<sup>1</sup> This intersectoral move (from university to the private sector) is more common in Germany (in both domains) and the Scandinavian countries (mostly in engineering).



permanent employment immediately after leaving a research field<sup>iii</sup>. PhD candidates leaving for the private sector are more likely to find permanent employment compared to those staying in the public sector<sup>iv</sup>. Doctoral candidates who stay in their country of origin to obtain their doctoral degree are more likely to obtain permanent employment soon after qualifying. Moreover, those remaining in the country in which they qualified have a slightly better chance of obtaining permanent employment soon after. However, recent PhD graduates who opt to take up further research have more difficulty in finding permanent employment posts than those who do something other than research<sup>v</sup>. The private sector is more likely than the public sector to offer permanent positions to post-docs, particularly to engineers, but the advantages vary between countries (for example, the situation in Germany is almost opposite to that in the UK). Former post-docs remaining in or moving back to their region of origin are more likely to find permanent employment there than if they seek employment in a new country where they are migrants. Post-docs coming from outside Europe and seeking employment in the EU countries seem to have a particularly high rate of temporary employment. Post-docs in social science seem to find permanent positions faster than engineering post-docs, contrary to the picture for PhDs. Post-docs from Germany, Spain and the UK get permanent posts faster, whereas French, Italian and Portuguese post-docs take longer to get permanent posts, with a high rate of Portuguese post-docs having to wait a year or more (Robinson et al., 2007, pp.77-78).

### **Summary**

In short, and as Mahroum (2000) notes, the issue of mobility is a complex one and there are a heterogeneous set of drivers and inhibitors which operate on what is a non-homogeneous group of people. The terminology surrounding research careers and researcher mobility can have different connotations in different contexts. For this reason in the next section we provide a short set of working definitions for the purposes of this study.

### 3. Study definitions

#### What is a researcher?

A researcher can be a doctoral candidate, someone at post-doctoral level, or a more experienced researcher. Titles can vary depending on contractual or legal arrangements within countries and institutions and whether work is undertaken on a full time or fractional basis. This study is concerned with the mobility of academic researchers located within institutions of higher education or public research institutes within or closely associated with the higher education sectors. We have adopted the internationally recognised Frascati definition of research. Consequently, researchers are described as:

*Professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned.* (OECD, 2002)

#### Early-Stage Researcher

The term Early-Stage Researcher refers to

*researchers in the first 4 years (full-time equivalent) of their research activity, including the period of research training.* (EC, 2006, p.42)

#### Experienced Researcher

Experienced Researchers are defined as

*researchers having at least 4 years of research experience (full-time equivalent) since gaining a university diploma giving them access to doctoral studies (the degree must entitle the holder to embark on doctoral studies, without having to acquire any further qualifications), in the country in which the degree/diploma was obtained or ii) researchers already in possession of a doctoral degree, independently of the time taken to acquire it.* (EC, 2006, p. 43)

#### Mobile Researcher

A mobile researcher is defined as someone who works as a researcher in a country where s/he is not a citizen or permanently resides (see below for more detailed explanation of what we mean by mobility, in the context of this study).

#### What is mobility?

Today, in its most general sense, labour mobility has many dimensions and facets and in the context of globalised knowledge flows, there is a growing demand for high skilled human resources, and new forms and approaches to mobility are taking shape. Mobility can be international, trans-national, cross border or within national borders, cross-sectoral and increasingly virtual. It can be motivated by employers and by individuals. Periods of mobility can last for a few months or years. Periods of mobility can also be open-ended from the perspective of the individual mobile researcher<sup>2</sup>.

Neither the mobile researcher nor worker mobility in general should be considered a static, homogenous entity. The types and forms of mobility a researcher may demonstrate will be influenced by a variety of factors including experience and career stage, discipline or specialism and salary levels. Influential in shaping propensity towards mobility are the trend towards dual income households and the challenges of achieving an appropriate work-life balance. Understanding the nature of the mobility

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<sup>2</sup> It is very difficult to distinguish 'permanent' moves from one country or system to another because in principle even the most permanent move can be reversed in the future. Thus we propose the term 'open-ended' mobility to distinguish from periods of mobility intended from the outset to have a limited duration.

demonstrated by a mobile researcher is a prerequisite to identifying the 'push-pull' factors operating as incentives or disincentives on levels and flows of researcher movements within academic and knowledge based labour markets. Whilst this study is focused on *physical* mobility, a researcher, depending on their seniority, experience, speciality, salary expectations, funding arrangements and overall levels of efficient functioning and requirements of the labour market may be mobile in numerous ways:

- They may be recruited in one country to work on local terms and conditions for a specific period of time in another, which is not their current place of residence. This can apply to highly specialised researchers and to doctoral candidates and post doctoral early stage researchers.
- They may move to live and work in a foreign country either long term (usually two to five years) or short term (usually between one and twelve months) but always with the expectation of returning "home". This can apply to all researchers from early stage to full professors.
- They may commute across borders: from their home to a place of work in another country, perhaps on a weekly or bi-weekly basis, while their place of residence remains unchanged in their home country.
- They may be a 'virtual worker' as part of a project team located in several countries but not needing to relocate: virtual working often involves periodic extensive travel to work with colleagues and is supported by wide use of information and communication technologies: this is typical for example of EU framework and other large scale international projects
- They may be a teleworker supported by ICT working from any location <sup>3</sup>.

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<sup>3</sup> We have mentioned virtual and teleworking because these are increasingly used forms of collaborative working (most apparent in the science, technology, engineering and mathematics, or STEM, domains) and which of course alter the relationship between the location of work and people.

## 4. Methodology

The study combines the use of quantitative and qualitative approaches. Combining these two approaches in the form of a survey (quantitative and qualitative) and interviews (qualitative) facilitates a more comprehensive and nuanced understanding of factors inhibiting researcher mobility. However we acknowledge that, even through deploying such an approach, the generalisation of the results can be no more than suggestive in the context of a rapidly designed and delivered policy-relevant study.

The differences between the two approaches are simple. Quantitative research is a process of inquiry into social and human problems based on testing a theory composed of variables, measured with statistical procedures in order to determine whether the predictive generalisations of the theory hold true (Creswell, 1994). Meanwhile, qualitative study is not meant to generalise findings, but aims to form a unique interpretation of events based on a holistic picture that documents detailed views of informants.

### 4.1 The Survey

#### Stage 1: Survey design

The survey had a dual purpose: to capture the nature of EU researchers with regards to their *demographic data* and mobility status and to identify the *factors* that inhibit researcher mobility and career development. The survey thus had three parts:

a. **Part one** collected data on the personal background of the respondents, i.e. gender, age, nationality, qualification, years of experience, marital status and family profile. The aim of these questions was to gather basic demographic data on the respondents.

b. **Part two** explored the employment status of the respondents, collecting data about the organisation where the researcher currently works (name and location), job title, type of contract, annual earnings and research domain. Respondents were asked to describe their current mobility status, classifying themselves into one of four (exclusive) categories, namely: (a) currently a mobile researcher; (b) have been a mobile researcher in the past; (c) would like to be a mobile researcher in the future; (d) not currently interested in being mobile. The answer to this particular question in the online web-mounted survey determines the questions presented in part three.

c. **Part three** examined the factors that affect mobility and career development. There are three branches in this part, allowing different categories of respondent to be separated, with each branch gathering similar information on: (a) country of past appointment, (b) duration of mobility period, (c) sponsor of the current mobility, (d) source of information on mobility, (e) frequency of mobility, (f) factors that support mobility, (g) factors that inhibit mobility, and (h) opinion on the importance and frequency of mobility for researchers.

The survey was designed to maximise the response rate. Therefore there was only one obligatory question (to distinguish those who are mobile, have been mobile, would like to be mobile and are not interested in being mobile). Throughout the remainder of the questionnaire, the respondents were, by default, allowed to give a 'no response' by leaving the question unanswered, or provided with the 'prefer not to disclose' option (when asked for example about marital status or salary). The rationale for this was to encourage the respondents to continue to participate in the study if they faced questions to which they did not wish to give a response. The number of questions in the survey was limited in order to encourage participants to complete the survey. The pilot indicated that 10 minutes should, in most circumstances, be sufficient time to complete it.

As the survey was designed to gather information about individual experiences, beliefs

and opinions, several of the questions were multiple choice but gave an additional space for participants to make further comments / elaborate on their answer. The purpose of including these 'free text' sections was to potentially develop a better understanding of individual views on researcher mobility and to allow respondents to give their own answer if they did not feel any of the options offered to them were fully appropriate to their own experience / opinion.

## **Stage 2: Identifying target population; sampling**

Based on the initial specification the target population was determined in collaboration with the EC: that is researchers at a range of institutions in eight selected European countries (Hungary, France, Germany, The Netherlands, Norway, Poland, Spain and United Kingdom). At this country level a *purposive sampling* technique was adopted to satisfy the needs of the study. In view of complexity and time constraints the number of countries selected for inclusion was limited to eight. The selection of countries was seen as broadly representative of European demography along a continuum of developing through to mature research systems and it was envisaged that the different institutional frameworks, landscapes and maturity of the selected countries would present the study with a wide cross-section of results from entities at different stages of development. The sample was thus designed to capture and reflect the heterogeneous nature of the research systems (and individual institutions) found across the ERA.

In short, the eight countries were selected on the basis that they offer:

- A useful geographical spread across Europe, including as they do Scandinavian, Western, Eastern and Southern European nations.
- A range of different levels of maturity and stages of development.
- Relatively large populations (Norway excepted) and a substantial population of research institutions from which we are able to draw a sample.
- Good coverage of the various research systems and institutional frameworks that operate across Europe.

At institution level, *purposive sampling* was once more used. From these countries, on average, 10 institutes were selected, to be broadly representative of the range of research-intensive institutions in that country. The number of institutions varies slightly from country to country, depending on the size and shape of the research system of that country. For example, Hungary has relatively few universities or research centres, so only 8 research performing organisations were selected (although this does include the very large, multi-institute Hungarian Academy of Sciences).

'Top ranked' universities in each country were selected using multiple ranking systems: the 'Shanghai ranking'<sup>4</sup>; the 'THES ranking'<sup>5</sup> and the 'Leiden ranking'<sup>6</sup>. Where there is a lack of alternative data sources or universities from a particular country do not feature in any rankings we have used the 'Webometrics Ranking of World Universities'<sup>7</sup> also. We have selected a number of 'leading' institutes from these lists, as this enables the inclusion of some of the most important employers of academic researchers in each country; the universities that rank highly are generally large, broadly-based institutions

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<sup>4</sup> The Academic Ranking of World Universities published by the Institute of Higher Education, Jiao Tong University in Shanghai. <http://ed.sjtu.edu.cn/ranking.htm>

<sup>5</sup> Rankings published by The Times Higher Education Supplement and Quacquarelli Symonds See THES website: <http://www.thes.co.uk/worldrankings/> and QS website: <http://www.topuniversities.com/worlduniversityrankings/>

<sup>6</sup> The set of lists published by The Center for Science and Technology Studies, Leiden University. Leiden ranking website: <http://www.cwts.nl/cwts/LeidenRankingWebSite.html>

<sup>7</sup> Carried out by the Cybermetrics Lab, a research group belonging to the Centro Superior de Investigaciones Científicas in Spain <http://www.webometrics.info/index.html>). The ranking in the Webometrics system is based on web indicators.

that can attract high-quality candidates and academics on the basis of their reputation and are likely to be the ones that receive the highest levels of research funding and thus undertake higher levels of research.

The sample was then expanded to be inclusive of other types of research organisations (i.e. non-university based) as well as universities ranked lower or not featuring in any ranking at all. The UNESCO based International Association of Universities (IAU) database<sup>8</sup> was used to expand the selection.

Our selection criteria overall was therefore designed to include:

- A mixture of institutes in terms of standing / reputation.
- A mixture of universities and non-university based research institutes (where feasible).
- A geographically diverse (cross-country) selection of institutes.

Our rationale for such a diverse selection is that it offers important benefits:

- It includes some of the major locations for research activity, both basic and applied.
- It includes large employers of researchers and those institutes which may attract researchers from outside the country.
- It offers the possibility of comparison between university and non-university based researchers.
- It is representative of institutes operating within different research systems across Europe.
- It includes institutes that are likely to employ both early-stage and experienced researchers – this allows coverage of and comparison between two crucial groups.
- It allows data gathering on training, contractual arrangements, researcher profiles and incentives / disincentives for mobility of researchers from a range of different types of employer.

The list of institutions was confirmed with the EC before proceeding.

Within each organisation, the project team selected one or more STEM (science, technology, engineering and mathematics) departments (and other social science departments where feasible) and then selected named research staff from these departments using websites or contacts in those institutions.

At this individual level, *convenience sampling*<sup>9</sup> was used for pragmatic reasons. Within the departments selected, a range of researchers were identified. Selection of the full range of researchers – from PhD candidates through to experienced and highly experienced senior researchers – was not feasible in every case due to the incomplete nature of many university websites and also due to variation in job titles according to the country and sometimes the protocol of the institution.

On the recommendation of the EC, an additional target population was identified and the same survey instrument made available to those accessing the European Researcher's mobility portal<sup>10</sup>, which provides information on careers opportunities and assistance for researchers (hereafter called 'E-carrier group').

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<sup>8</sup> See <http://www.unesco.org/iau/onlinedatabases/index.html>

<sup>9</sup> See <http://www.socialresearchmethods.net/kb/sampron.php> for further information on this sampling method

<sup>10</sup> <http://ec.europa.eu/eracareers> now rebranded and at <http://ec.europa.eu/euraxess>

The rationale for running two identical surveys was:

- to maximise the number of respondents
- to broaden the scope of the survey (to incorporate researchers from other countries in addition to the 8 selected countries)
- to (potentially) capture different segments of the researcher population (i.e. on the assumption that those accessing the Era-portal are interested in mobility, to some degree)
- to (potentially) enable a comparison between the target group and those accessing the Era-portal – to capture any differences arising

### Stage 3: Pilot

The survey instrument was piloted as extensively as possible given time constraints. Eight draft versions (paper/print versions) were developed by the project team. The final draft was then converted into an online version and piloted by 11 researchers in several of the partner institutes. Following a successful pilot phase minor modifications were incorporated in the instrument before launching the surveys.

### Stage 4: Launching the survey

The targeted, online survey (hereafter called the 'Rindicate' survey), developed using the Calibrum system<sup>11</sup> was distributed to the target population via an invitation e-mail. The 'e-carrier group' survey was mounted separately on the same server and prominently linked to from the European Researcher mobility portal as already described. A link was also placed on the Marie Curie website<sup>12</sup> and national ERACAREERS<sup>13</sup> websites. The e-carrier survey URL was also communicated via the national ERA-MORE newsletter to all national Mobility Centres and Local Service Centres and via the newsletter "IAM – Information on Academic Mobility". Both surveys were run in parallel but the response data from the two samples was held separately.

For the **Rindicate** survey the final number of invitations sent out via e-mail was just over 6000. Initial e-mails were sent out in late December 2007 and early January 2008, followed up by two reminder e-mails at two-week intervals. The aim was to send between 500 -1000 invitations to researchers in each country but the limitations of this were apparent. In some countries, obtaining valid e-mail addresses of researchers proved problematic, therefore in Hungary only 351 invites were sent out. In all other countries this target was achieved.

Utilising a 'snowballing' technique (a type of purposive sampling in which invitees are asked to pass on the invitation to other relevant parties) to extend the sample size renders it impossible to determine an objective "response rate" for the survey.

A major limitation of this study, as identified in the first interim report, is the time constraint. If the timescale were longer samples could have been selected and structured more rigorously (e.g. in proportion to the total researcher population and make-up of each country). Given the time constraint however, convenience sampling has been necessary in order to gather enough contact details with the aim of achieving a significant response.

For the **e-carriers** survey it is not possible to determine the number of 'invites' (as there were none) and therefore, once more, no 'response rate' can be calculated. Furthermore, the size of the total population of European researchers is unknown and only by knowing

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<sup>11</sup> A fully-featured web-based online survey platform, see <http://prest.admbs.mbs.ac.uk/surveylet>.

<sup>12</sup> <http://ec.europa.eu/research/mariecurieactions/index.htm>

<sup>13</sup> Rebranded EURAXESS as of 10 June 2008, <http://ec.europa.eu/euraxess>

the population size (N) can a representative sample be calculated and targeted. The respondents are employed in institutes in a broad range of countries including the eight countries that were targeted in the e-mail survey plus at least 20 other European countries and several non-European countries including Japan, Australia and the US (a detailed breakdown of the nationality of respondents is given in Annex 1).

## **4.2 Qualitative analysis and researcher profiles**

To complement our quantitative survey data we also carried out some qualitative assessment of free text responses to open questions in the survey and in particular profiled the qualitative responses of 16 highly mobile researchers (which can be found in annex 4).

The free text in the survey was qualitatively analysed with help of Computer Aided Qualitative Data Analysis Software (CAQDAS<sup>14</sup>), in this case NVivo™, particularly to organise the large amount of the data gathered from the survey.

We are aware of the uncritical adoption of a particular set of strategies as a consequence of adopting CAQDAS which offers a variety of useful ways of organising data in order to search it, including developing coding. But coding data using software is not analysis (Coffey and Atkinson, 1996). For this reason NVivo was used only as a data management tool.

The profiles selected are those we would describe as “highly mobile researchers”. They are persons who have described their situation as ‘I have been a mobile researcher in the past’ and who have been mobile several times (mainly 3-5 times and sometimes more than 5). Those profiled are also those who have indicated some views and opinions on mobility in their free text responses.

The aim of utilising such qualitative methods is to form an interpretation of events based on the reported experiences and views of individual respondents. The discussion of findings relating to the 16 profiled researchers in section 5 is a rudimentary ‘documentary’ which carries both advantages and disadvantages. The purpose of the qualitative data analysis employed here (in the form of the profiles and free text analysis and also in the interviews) is to supplement the quantitative analysis of factual and opinion data obtained in the surveys of researchers. The aim is not to provide a detailed and complex analysis of the large amounts of qualitative data collected in the open question sections of the surveys but to present anecdotal evidence on issues that arise relating to the aims of this study, with the aim of facilitating a better understanding of the common (and irregular) factors which emerge as key issues. The limitations of such an approach are well documented and relate to issues of ‘representativeness’, ‘availability’ and ‘weighting’ (See Nisbett and Ross, 1980). It must be accepted that responses are subjective and that issues of validity may be a cause for concern. However we acknowledge that the main purpose of our analysis in this section is to ‘add to’ and ‘illustrate’ the findings of the main survey.

As a methodological note it should be recorded that the profiled researchers are certainly not representative of the overall sample of respondents and do not present a demographic spread. We have selected highly mobile respondents who have provided rich answers to our open (free text) questions. In the dataset this group is dominated by males aged 41 and over. Furthermore, the respondents to our survey who have been the most mobile tend to be from the research domains of Life and Physical sciences.

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<sup>14</sup> The emerging use of Computer Assisted Qualitative Data Analysis Software (CAQDAS) has been evident as a subfield of expertise (Lee and Fielding, 1991). The research notes that software packages aimed at analysing qualitative data are now widespread and it is a fast-growing field. A full review of literatures and existing software has already been done elsewhere (Burgess, 1995; Tesch, 1990; Weaver and Atkinson, 1994; Weitzman and Miles, 1994).



There are significantly less from the Social Science and Humanities domain. We have however attempted to represent a balance in terms of geographical spread across Europe and as far as possible to provide a mix in terms of gender and age. For reasons already identified this concern with gender and age balance reduces the extent to which the profiled researchers are representative of the overall population of highly mobile researchers.

### ***4.3 Interviews with institutions***

We carried out telephone interviews with twelve people with responsibility for research management across a range of organisations in six European countries, in order to explore an institutional perspective of factors inhibiting researcher mobility (see annex 6 for a list of interviewees). Each interviewee had either indicated in their reply to a question in the survey that they held managerial responsibility for researchers and would be willing to be contacted, or they were contacts in institutions identified by the study team as useful persons to interview on this issue.

## 5. Survey results

### 5.1. Data set

In this analysis we use data from the E-carriers group of respondents and the Rindicate group of respondents. The gross sample of respondents consists of 2,513 persons in the E-carriers group and 1,164 persons in the Rindicate group. Therefore, the total gross sample consists of 3,677 persons. 242 persons in the E-carriers group and 70 persons in the Rindicate group have not answered the question about their mobility status, and therefore these persons are excluded from the further analysis. The total net sample, thus, consists of 3,365 persons. 2,271 persons in the net sample belong to the E-carriers group and 1,094 persons to the Rindicate group. A breakdown of respondents, by country, from both groups can be found in Annex 1.

#### 5.1.1. Significant differences between the E-carriers group & the Rindicate group of respondents

There are significant differences between the 'E-carriers group' and the 'Rindicate group' of respondents with respect to mobility status, gender, age and main research domain. The Rindicate group consists of older and thus more experienced researchers, there are significantly more men in this group, and there are more respondents in this group having their background in the Physical Sciences and Engineering domain (and less from Social Sciences and Humanities), compared to the E-carriers respondent group. The Rindicate group shows a lower level of current mobility and more reluctance to future mobility prospects than the E-carriers group. On the other hand, persons in the Rindicate group have to a larger degree been mobile in the past compared to persons in the E-carriers group. This is to be expected given that the E-carriers group represents a self-selected sample of respondents likely by definition either to be mobile or be highly motivated towards mobility.

Further, for each of the four mobility situations, we have also examined whether there are significant differences between respondents from different countries of origin. Here we use four main groups of countries:

- The Nordic countries (Denmark, Finland, Iceland, Norway and Sweden),
- EU5 (France, Germany, Italy, Spain and United Kingdom),
- other EU27 countries (i.e. EU27 countries not included in the Nordic and the EU5 groups), and
- other countries (i.e. countries not included in any of the three previous groups).

Based on the net sample of all 3,365 respondents, we find that Nordic researchers are to a larger degree not interested in being a mobile researcher at the moment compared to researchers from EU5 and other EU27 countries. We also find that Nordic researchers and researchers from EU5 are to a lesser degree than researchers from other EU27 countries interested in future mobility.

Moreover, we have examined whether there are significant differences between respondents from the Rindicate and the E-carriers groups with respect to mobility status and country of origin. If we use the same four main groups of countries as above, we find that researchers from EU5 show less current mobility in the Rindicate group than in the E-carriers group. Researchers from EU5 and other EU27 countries in the Rindicate group are less interested in future mobility than the corresponding categories in the E-carriers group, but have to a larger degree been mobile in the past. This is not surprising as it has already been established that the Rindicate group is older and more experienced. There are no significant differences between the two respondent groups for Nordic researchers.

All mentioned differences above are statistically significant at the 5 per cent level. Here we have applied the two binomial proportion comparison method in Bhattacharyya and Johnson (1977, p. 308-312).

Though from a statistical point of view these differences raise some methodological issues for the further analysis the two samples provide nevertheless complementary information on barriers and drivers of researchers' mobility status, since they capture relatively different segments of the overall population of researchers. We also found significant differences with respect to factors which seem to inhibit mobility between the two respondent groups.

The question now is whether there are significant differences between respondents from the Rindicate and the E-carriers groups with respect to mobility status if we control for several possible explanatory variables. These variables are: *gender, age, main research domain, type of contract, and country of origin*. Our test hypothesis is that after having controlled for gender, age, main research domain, type of contract and country of origin, differences between the two groups will be eliminated.

In Table A 1 in Annex 2 we have estimated the probability for being a person who is currently a mobile researcher. The explanatory variables are: gender (female), age group, main research domain, type of contract, and country of origin. In addition, we use the variable *Rindicate* in order to separate between researchers in the Rindicate group (*Rindicate*=1) and researchers in the E-carriers groups (*Rindicate*=0). We see from the Table A that the *Rindicate* variable is negative (significant at the 5 per cent level, but not at the 1 per cent level), which means that persons in the Rindicate group have a lower probability of being mobile compared to persons in the E-carriers group. However, if we also include interaction terms between all explanatory variables in the regression (the estimation results are not shown here), we find that the *Rindicate* variable is no longer significant at the 5 per cent level.

We also find that:

- The effect of the *Rindicate* variable on the probability of being a person who is not currently interested in mobility is significant at the 1 per cent level, even if we include interaction terms between all explanatory variables in the regression.
- The effect of the *Rindicate* variable on the probability of being a person who has been mobile in the past is significant at the 5 per cent level (but not at the 1 per cent level), even if we include interaction terms between all explanatory variables in the regression.
- The effect of the *Rindicate* variable on the probability of being a person who would like to be mobile in the future is significant at the 1 per cent level, even if we include interaction terms between all explanatory variables in the regression.

As noted, if we also control for all explanatory variables in the regression, including their interaction terms, we find that there are *no* significant differences between the Rindicate group and the E-carriers group with respect to *the currently mobile researchers* (at the 5 per cent significance level). See also Table A1 and Table B7 in Annexes 2 and 3 respectively. We find that *there are* significant differences between the Rindicate group and the E-carriers group with respect to those willing to be mobile researchers in the future (1 per cent significance level), those who have being mobile in the past (5 per cent significance level) and those who are not interested in being mobile at the moment (1 per cent significance level). Therefore, we can conclude that the Rindicate group is more reluctant in being mobile at the moment or in the future than the E-carriers group, and that the Rindicate group has to a larger degree been mobile in the past compared to the E-carriers group.

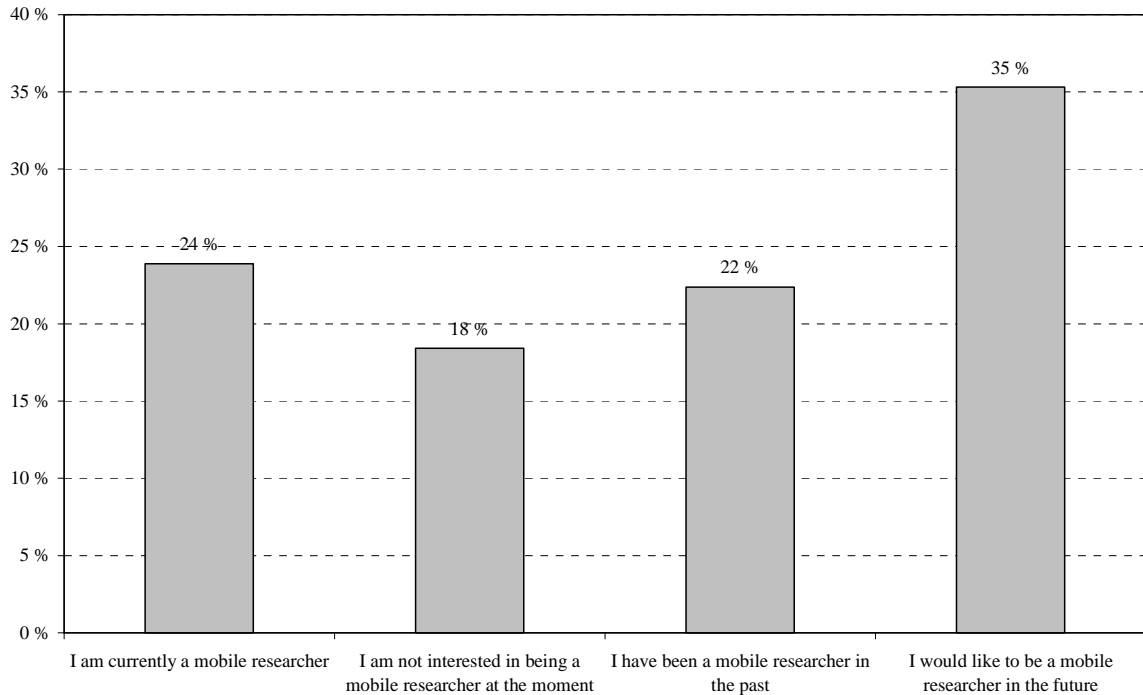
In the light of these findings we consider the two groups of respondents, selected on the one hand by purposive sampling and on the other through self-selection, as genuinely complementary to each other, that is, providing complementary information on researcher mobility behaviour even when we control for key background variables (age, gender, country of origin etc.).

In the following sections we provide a concise description of the main features and perceptions of the two sets of respondents taken together.

## 5.2. Mobility status

Figure 1 shows that 46 per cent of the researchers are either currently mobile or have been mobile in the past (see also Table A2 in Annex 2). About 35 per cent would like to be mobile in the future, while 18 per cent are not currently interested in being mobile. Thus, as much as 82 per cent of the respondents either have the experience of mobility or would like to mobile in the future. In particular the large group of researchers willing to become mobile in the future (35 per cent), indicates the potential for mobility policy instruments in the ERA.

Figure 1. The researchers' mobility situation. Both groups of respondents. N=3,365.



## 5.3. The location of current and previous institutional affiliation

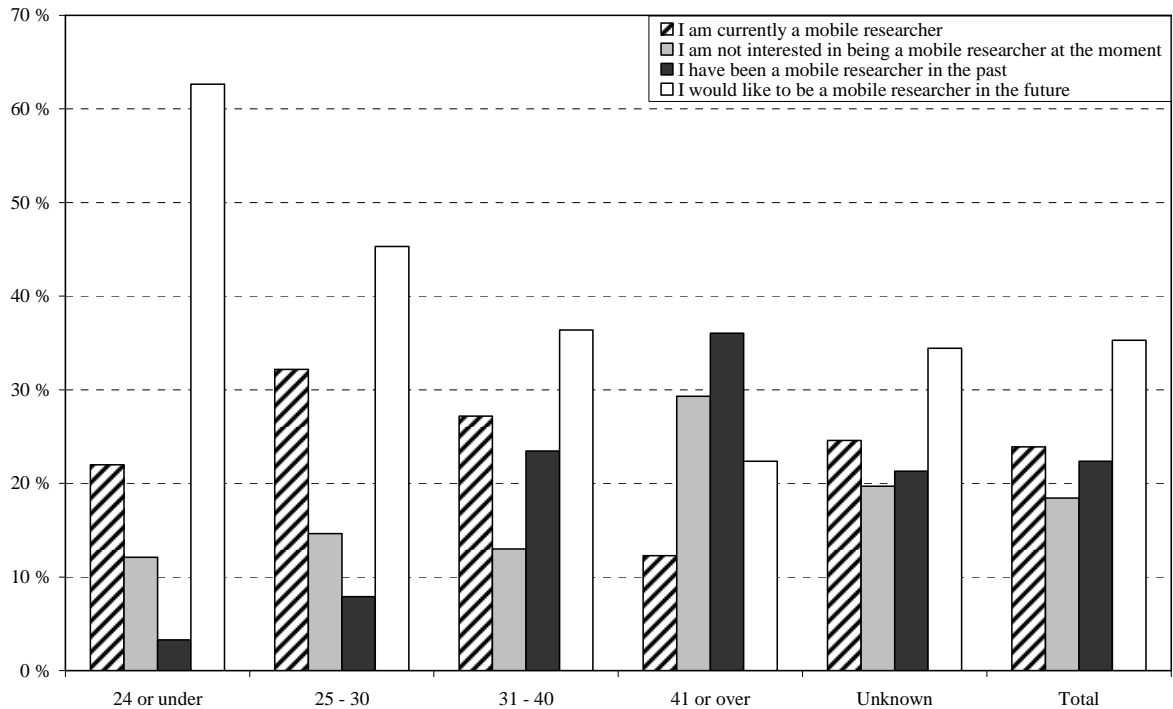
In this section we only focus on those respondents who are currently mobile and examine the location of their current and previous institutional affiliation. The location of a researcher's current institutional affiliation is the country where his or her current employing institution or organisation is located, and the location of a researcher's previous institutional affiliation is the country where the person worked before his or her current post.

Table A3 in Annex 2 provides information on the location of mobile researchers' current and previous institutional affiliation. We see that most of the researchers from EU5 and other EU27 countries go to other EU countries. Also the majority of researchers from Nordic and other countries go to EU countries. Only 9 per cent of the researchers from Nordic countries go to other Nordic countries, while 33 per cent of them go to countries within the group "other countries".

## 5.4. Mobility and age group

As expected, Figure 2 shows that the fraction of researchers who would like to be a mobile researcher in the future decreases with age group, while the fraction that have been mobile in the past increases with age group (see also Table A4). The share of researchers who are currently a mobile researcher is highest for the age group 25-30, while this fraction is lower for younger and older researchers. The oldest age group has the highest fraction of researchers who are not interested in being mobile at the moment.

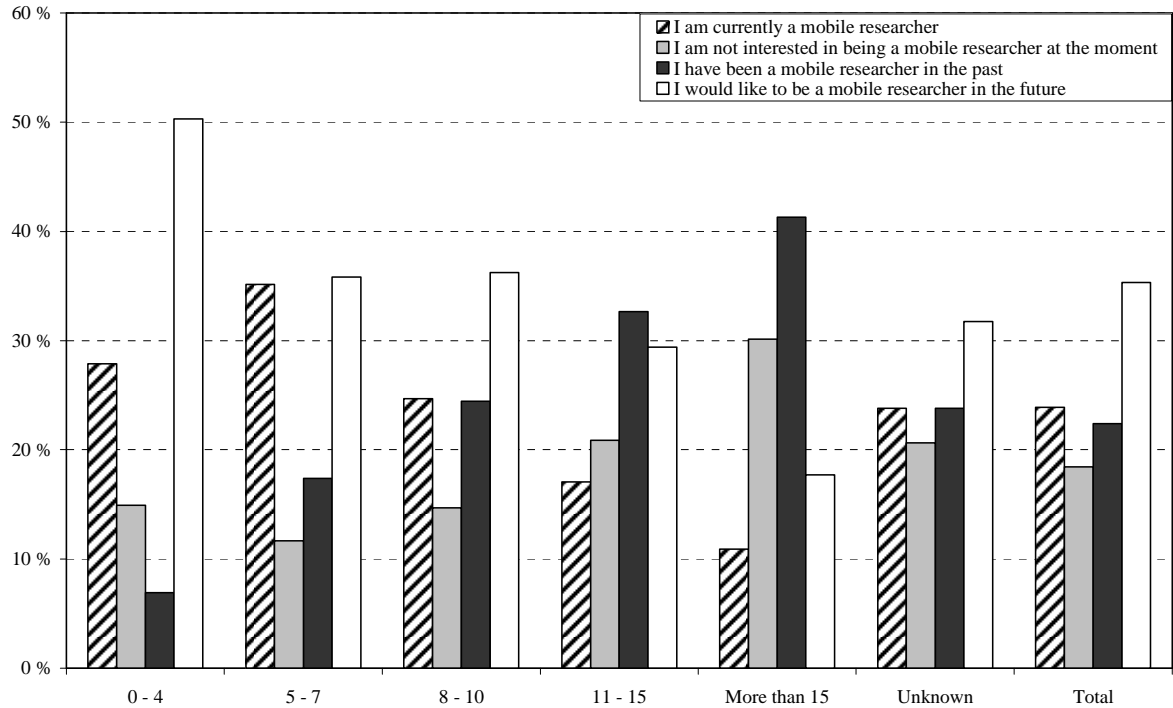
Figure 2. The researchers' mobility status by age group. Both groups of respondents. N=3,365.



## 5.5. Mobility and years of experience

The share of researchers who have been a mobile researcher in the past increases with years of experience, while the fraction who would like to be a mobile researcher in the future decreases with this characteristic on average. This is depicted in Figure 3 (see also Table A5 in Annex 2). We also see from Figure 3 that those with the longest experience are, to a larger degree, not interested in being a mobile researcher at the moment compared to other groups.

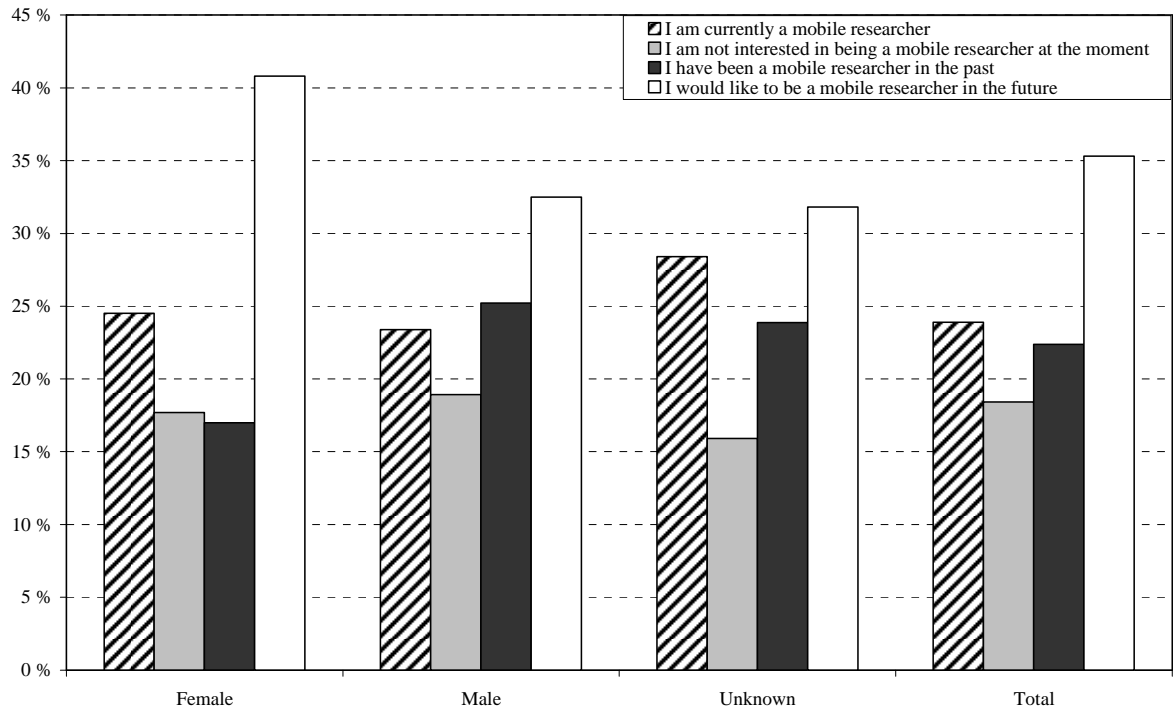
Figure 3. The researchers' mobility status by years of experience as researcher. Both groups of respondents. N=3,365.



## 5.6. Mobility and gender

Figure 4 shows that there are small differences with respect to gender among researchers who are currently mobile or are not interested to be in this situation at the moment (see also Table A6 in Annex 2). Male researchers have a higher probability of having been mobile in the past compared to female researchers, but they also are more reluctant to be a mobile researcher in the future. This result is not controlled for the effect of possible age or main research domain differences between the two gender groups.

Figure 4. The researchers' mobility status by gender. Both groups of respondents. N=3,365.



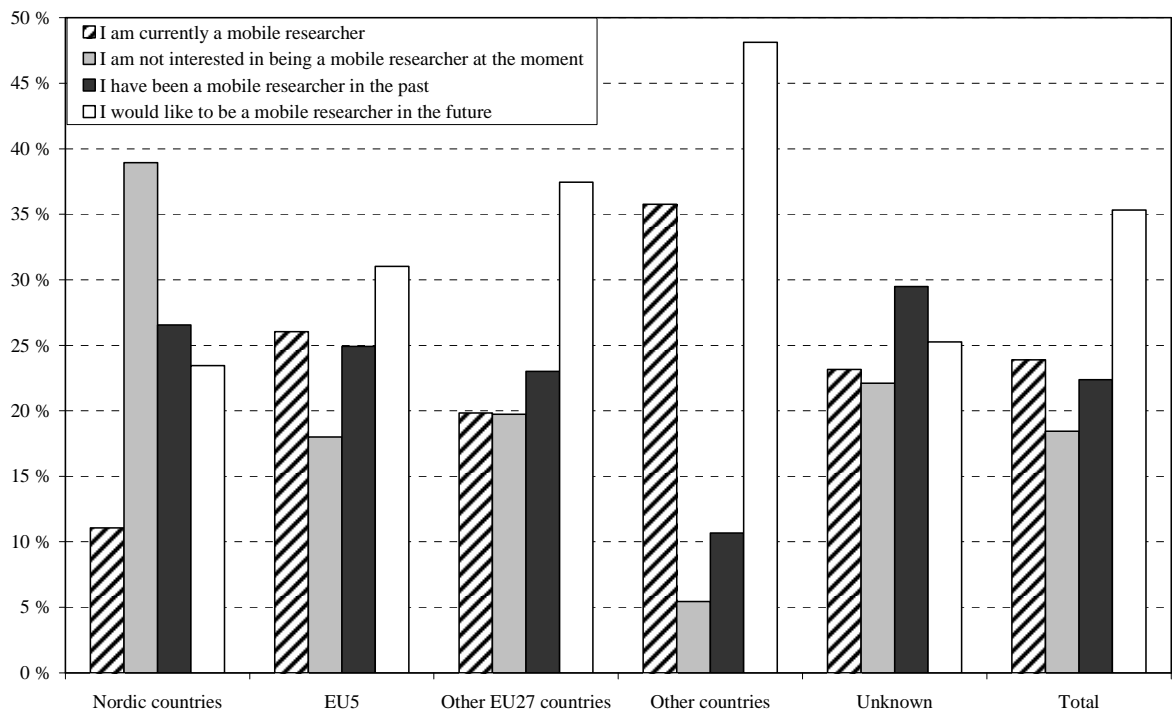


## 5.7. Mobility and country of origin

In Figure 5 we observe that researchers from Nordic countries have the lowest fraction of currently mobile researchers and the highest fraction of those who are not interested in being such a researcher at the moment, while researchers in the group "other countries" are in the opposite situations. We see from Table A7 in Annex 2 that researchers from Asia and North America are the largest groups of countries in the latter category, but in any case there are few respondents from North America (United States and Canada) in the sample.

Nordic researchers have the highest fraction of researchers who have been mobile in the past. This group also have the lowest fraction of those who would like to be mobile in the future, while – as expected - researchers from "other countries" have the highest fraction.

Figure 5. The researchers' mobility status by country of origin. Both groups of respondents. N=3,365.



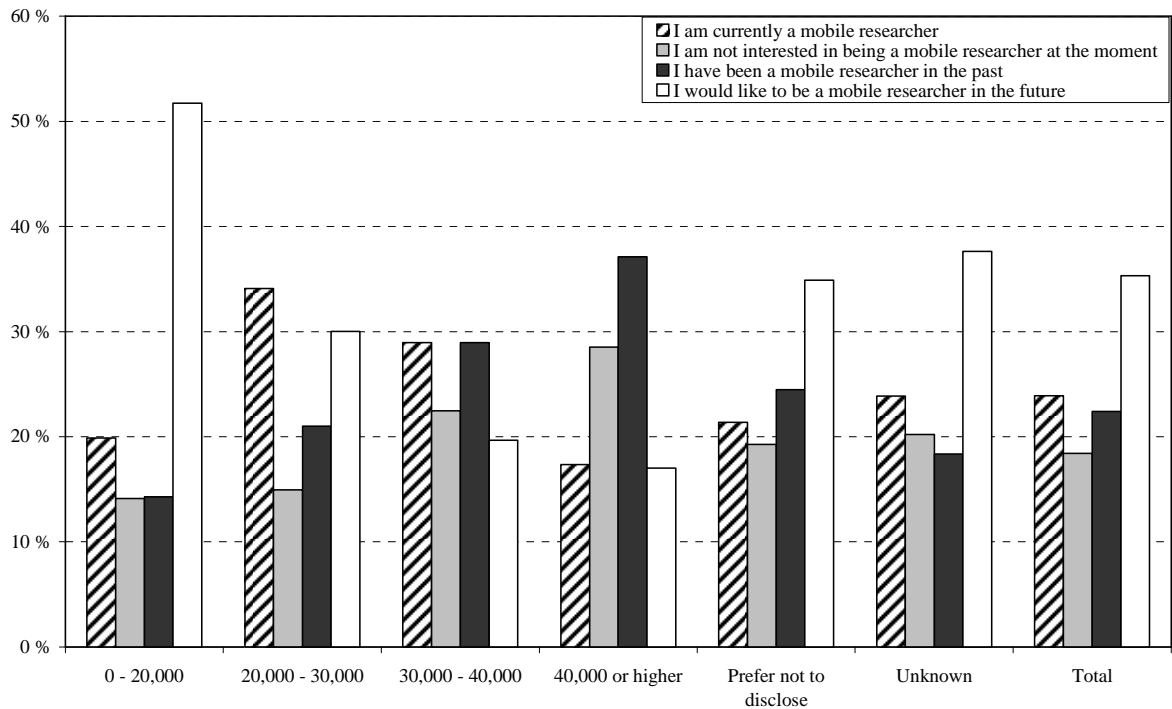
Notes: 1) Country of origin is the country of nationality. 2) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 3) EU5: France, Germany, Italy, Spain and United Kingdom. 4) Other EU27 countries: EU27 countries not included in the Nordic and the EU5 groups. 5) Other countries: countries not included in the Nordic group, EU5 or other EU27 countries.

## 5.8. Mobility and income

The fraction of researchers who have been a mobile researcher in the past increases with the salary level, but this is also the situation for those who are not interested in being a mobile researcher at the moment (see Figure 6 and Table A8). This is not surprising as age and income are generally likely to be highly correlated. Researchers with the highest and lowest salary level have a lower fraction of those who are currently a mobile researcher than other researchers.

Hence, one would assume that in the design of economic incentives for researchers' mobility status in Europe, both age and income level differences should be taken seriously into account.

Figure 6. The researchers' mobility status by salary. Both groups of respondents. N=3,365.

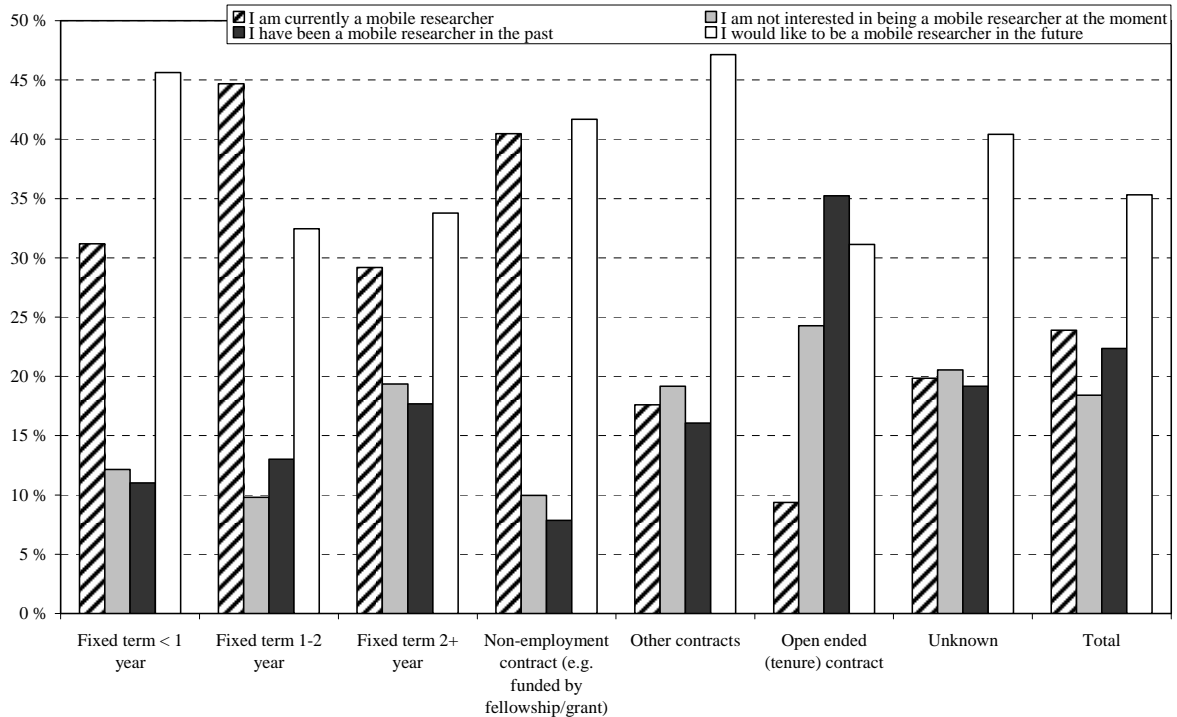


Note: Salary is the current annual NET salary (in EURO). NET salary is the 'take home' salary after tax and other deductions.

## 5.9. Mobility and type of contract

Researchers with a fixed term contract of greater than 2 years have, to a large degree, been a mobile researcher in the past, or are not currently interested in being mobile compared with those with a shorter fixed term contract (see Figure 7 and Table A9). Those with a fixed term contract of 1-2 years have the highest fraction of mobile researchers, while those with a fixed term contract of less than 1 year have the highest fraction of researchers who would like to be a mobile researcher in the future – together with those with other contracts.

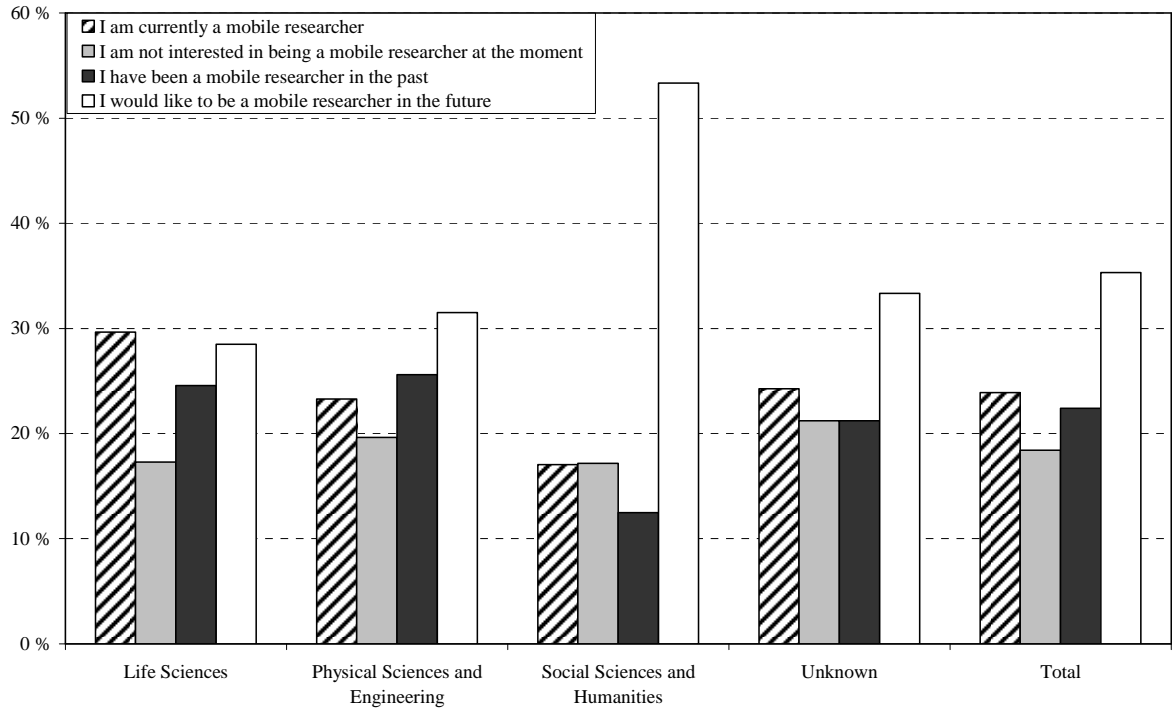
Figure 7. The researchers' mobility status by the researchers' currently type of contract. Both groups of respondents. N=3,365.



## 5.10. Mobility and main research domain

Figure 8 shows that the Life Sciences account for the highest share of mobile researchers in our samples, whilst Social Sciences and Humanities account for the smallest (see also Table A10 in Annex 2). The latter group has the lowest fraction of those who have been mobile in the past as well as the highest proportion of those who would like to be mobile in the future. This suggests that there is a clear demand for increased mobility in the ERA for researchers in Social Sciences, an issue which is more closely investigated in a recently launched study funded by the ERA-NET NORFACE.

Figure 8. The researchers' mobility status by main research domain. Both groups of respondents. N=3,365.



Note: We only distinguish between three main scientific domains in the survey: Life Sciences, Physical Sciences and Engineering, and Social Sciences and Humanities.

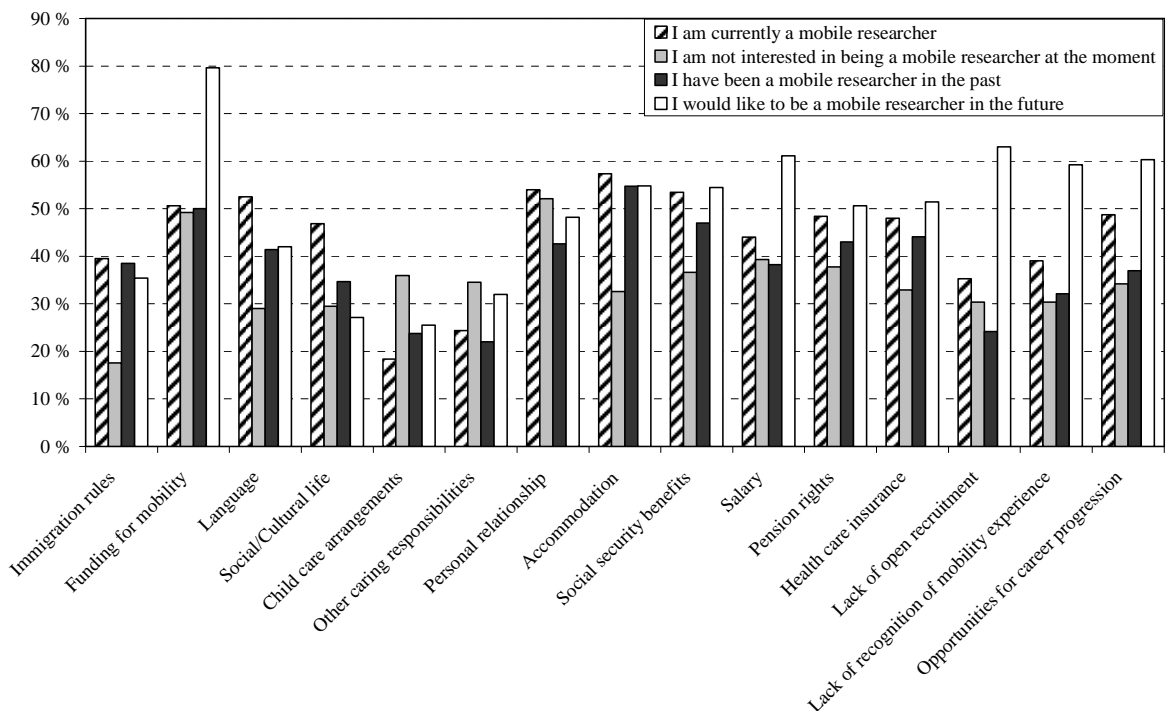
## 5.11. Mobility status, barriers and drivers

Figure 9 displays inhibiting mobility factors with respect to the mobility status of respondent researchers (see also Table A11 in Annex 2). We see that those who would like to be mobile in the future identify a broad range of perceived mobility barriers, such as funding for mobility, salary, lack of open recruitment, accommodation, misalignment in social security benefits, personal relationship and health insurance. All these factors are issues that can partly be addressed by policy intervention, but they also reflect mobility frictions due to the life situation of the respondents.

What is more interesting is that this group of respondents more strongly express the concern that there is a lack of recognition of mobility and there are lesser opportunities for further carrier progression for mobile researchers than do currently mobile researchers. This is an important finding and if it can be corroborated by more in-depth studies would suggest that ERA should also address more fundamental organisational and carrier promotion issues related to mobility.

Conversely to what might be expected, child care arrangements and other caring responsibilities seem to be a barrier of lesser importance compared to personal relationships. Thus, policy-makers interested in raising mobility levels might need to think not only about promoting opportunities for the individual researcher but also for his/her partner.

Figure 9. The researchers' mobility status by experienced difficulties in relation to specific factors. Both groups of respondents. N=3,365.



Note: The figure shows the fraction of researchers who have experienced major difficulty, difficulty or slightly difficulty in relation to each of the specific factors.

Those who have been a mobile researcher in the past have experienced much of the same inhibiting factors as those who are currently a mobile researcher. Funding for mobility is a major concern for those who would like to be mobile in the future, but also for those who are not currently interested in being mobile.

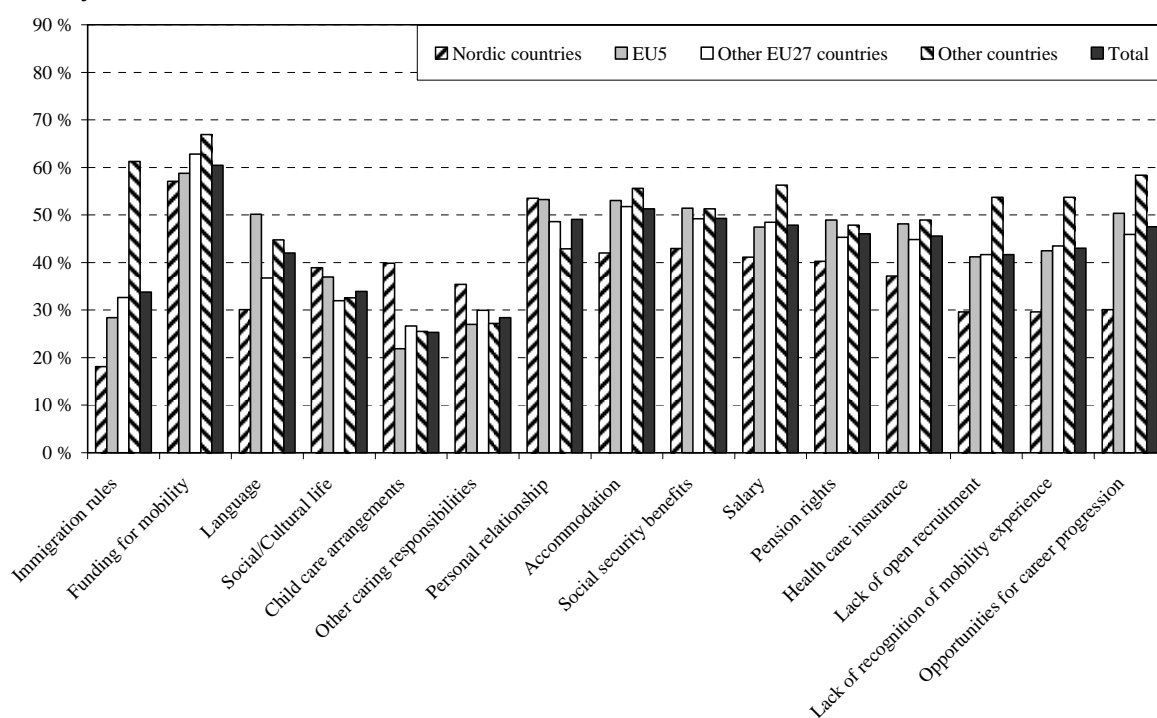
We have also examined whether the results so far in this section hold after controlling for gender (female), age, main research domain, type of contract, and country of origin. In Tables A12-A15 in Annex 2 we display the estimated effects of the barriers and drivers factors and other explanatory variables on the probability of being included in one of the four mobility status groups. The other explanatory variables are the same as in Table A1, except for the *Rindicate* variable.

Based on Tables A12-A15, we can conclude on the following as regards barrier and driver factors for researcher mobility (using a 5 per cent significant level):

- *Lack of funding for mobility and salary (differences)* reduce the probability of being a person who is currently mobile. At the same time these factors have a positive effect on the probability of being a person who would like to be mobile in the future.
- *Lack of competition-based internationally open recruitment* is a factor of lesser importance for researchers who are currently mobile or have been mobile in the past, but this factor is perceived as a significant barrier for those who wish to be mobile in the future.
- *Accommodation, language and immigration rules* (e.g. obtaining a work visa) proved to be serious obstacles to those researchers who are currently mobile or have been mobile in the past. However, these issues were not perceived to be significant barriers by those who are not currently interested in being mobile and/or those who would like to be mobile in the future. In other words respondents with experience of mobility rated these issues as more problematic than those without experience of mobility.
- *Social security benefits* are considered as a relatively more important barrier among those who are currently mobile compared to the rest of respondents.
- *Personal relationships* are a key issue for those who are not currently interested in mobility, but are perceived as a barrier of lesser importance amongst those who have been mobile in the past and/or those who would like to be mobile in the future suggesting that this factor is a fundamental determinant of a researcher's outlook towards mobility. However this factor has no significant effect on the probability of being a person who is *currently* a mobile researcher.
- *Child care arrangements and other caring responsibilities* is considered a more serious issue by those who are not currently interested in being mobile, and amongst those who have been mobile in the past.
- *Health care insurance* is a more serious issue for those who are not currently interested in being mobile, whilst *pension rights* are significantly more important barrier for those who would like to be mobile in the future.
- *Social / culture life* is an issue of more importance for those who are currently mobile.
- *Lack of recognition of mobility experience in recruitment and career development, and opportunities for career progression* seems to be considered an important issue by all four mobility groups.

Figures 10 and 11 show how inhibiting factors vary among the main groups of countries of origin. In Figure 10 we use all the four main categories of mobility status as a whole. We see from the latter figure that funding for mobility is a very important inhibiting factor for all main groups of countries. Other important factors are personal relationships, accommodation, social security, salary, pension rights and health care insurance. Immigration rules are of great importance for researchers from the residual group "other countries", but of less importance for researchers from Nordic countries. Factors such as lack of open recruitment, lack of recognition of mobility experience and opportunities for career progression are of much more importance for researchers from "other countries" than for Nordic researchers. On the other hand, child care arrangement is much more important for Nordic researchers than researchers from the other three groups.

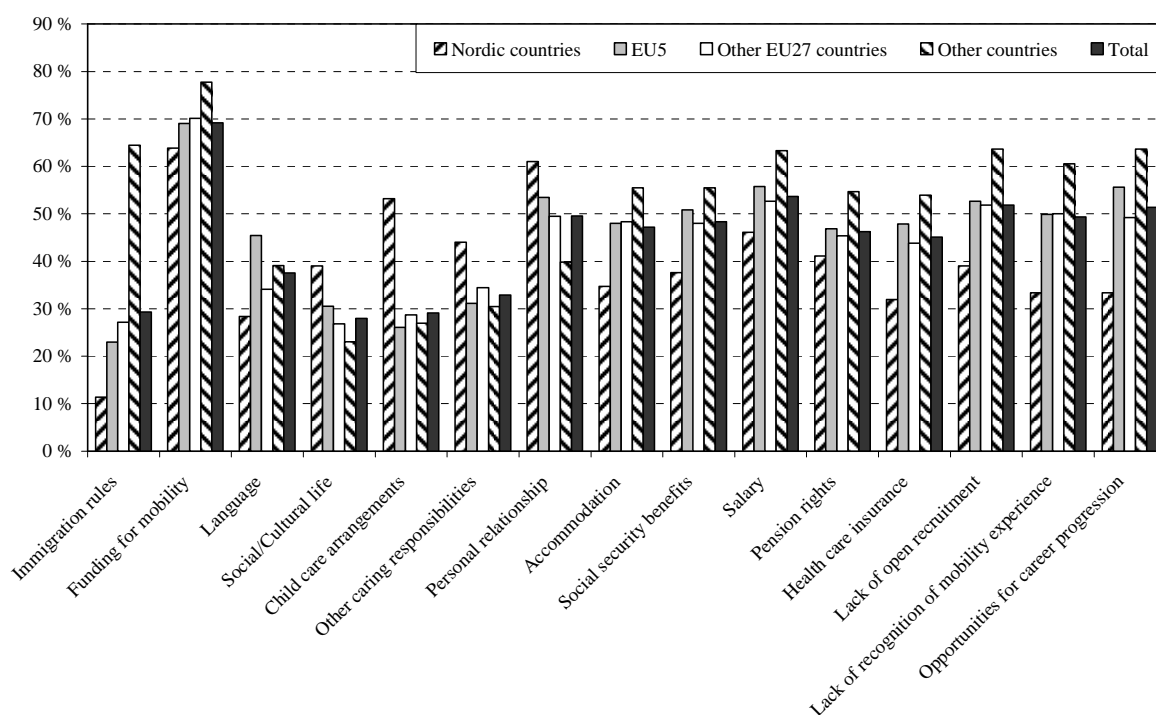
Figure 10. The researchers' country of origin by experienced difficulties in relation to specific factors. Both groups of respondents in all four groups of the researchers' mobility situation. N=3,365.



Notes: 1) The figure shows the fraction of researchers who have experienced major difficulty, difficulty or slightly difficulty in relation to each of the specific factors. 2) Country of origin is the country of nationality. 3) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 4) EU5: France, Germany, Italy, Spain and United Kingdom. 5) Other EU27 countries: EU27 countries not included in the Nordic and the EU5 groups. 6) Other countries: countries not included in the Nordic group, EU5 or other EU27 countries.

In Figure 11 we focus only on those who are not currently interested in being mobile and those who would like to be mobile in the future. Taking these two groups of respondent together, funding for mobility is more important for each main group of countries than across all categories of mobility status in Figure 10. We also see that other important factors are much the same as for all categories of mobility status, but salary is of greater importance in Figure 11 than in Figure 10 whilst for accommodation the situation is opposite. For researchers from Nordic countries personal relationships are more important for those with no experience of mobility (i.e. Figure 11) compared to those with such experience, while immigration rules are of less importance for those with no mobility experience. Factors such as lack of open recruitment, lack of recognition of mobility experience and opportunities for career progression are of greater importance for researchers from the group "other countries" than for Nordic researchers, but for both these main groups of researchers these factors are of greater importance in Figure 11 than in Figure 10.

Figure 11. The researchers' country of origin by experienced difficulties in relation to specific factors. Both groups of respondents in the following two groups of the researchers' mobility situation: those who are not interested in being a mobile researcher at the moment and those who would like to be it in the future. N=3,365.



Notes: 1) The figure shows the fraction of researchers who have experienced major difficulty, difficulty or slightly difficulty in relation to each of the specific factors. 2) Country of origin is the country of nationality. 3) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 4) EU5: France, Germany, Italy, Spain and United Kingdom. 5) Other EU27 countries: EU27 countries not included in the Nordic and the EU5 groups. 6) Other countries: countries not included in the Nordic group, EU5 or other EU27 countries.



## **5.12. Extrapolating the results to the broader researcher population**

In this section we attempt to infer propensity to mobility for the entire researcher population within the EU (including Norway, Iceland and Switzerland) by extrapolating the results of the survey (both respondent groups). We assume that EU researchers (the entire population) display the same mobility status patterns as those found in our net sample. A problem with this assumption is that there may be significant differences between the sample and the entire population with respect to several key variables such as gender, age, main research domain, etc. The researchers in the sample may for example be older (or younger) than the average EU researcher, which may have an effect on the number of mobile researchers in the population relative to the number of mobile researchers in the sample. Unfortunately we are not able to correct for such differences due to lack of information on the distribution of the EU27 research population with respect to age and scientific field.

Nevertheless, EUROSTAT (and OECD) provide (incomplete) information on the number of researchers by country, by sectors of performance and by gender both measured as head count and as full time equivalent (FTE). With these data we are able to correct for over/underrepresentation of researchers currently working in individual countries in the sample and provide EU-wide estimates for the following indicators:

- Number of researchers in EU27 (including Norway, Iceland and Switzerland) within Higher Education and in Government who are currently mobile
- Number of researchers in EU27 (including Norway, Iceland and Switzerland) within Higher Education and in Government who have been mobile in the past
- Number of researchers in EU27 (including Norway, Iceland and Switzerland) within Higher Education and in Government who are not interested in being mobile at the moment
- Number of researchers in EU27 (including Norway, Iceland and Switzerland) within Higher Education and in Government who interested in being mobile in the future
- 

The basic idea is to use respondent shares of the four mobility status groups with respect to the researchers' reported location of current institutional affiliation.

In the case of the United Kingdom there are no statistics on the number of researchers (head count) at all. The only information available is the number of researchers given as FTE in 1999. Thus, we estimated (head count) numbers of researchers in UK by using as benchmark the ratio of head count and FTE figures in 1999 and 2005 for France. Table A16 in Annex 2 shows our estimations. Of a researcher population estimated to be 1.2 million (note that in this extrapolation exercise we exclude the about 700 000 researchers who work in the business enterprise sector) a vast majority is, has been or wishes to be mobile in the future.

It is needless to emphasise the fact that future research on researcher mobility will greatly benefit from improvements in the statistical coverage and greater detail of the R&D human resources by country, age and research fields (for the entire EU27).

## **6. Qualitative analysis & Researcher profiles**

### **6.1 Overview**

In this section we present additional field data to support and add value to our study. This consists of profiles of selected highly mobile researchers and a brief discussion of interesting issues and comments from the open question (or 'free text') sections of the survey. The profiles of 16 highly mobile researchers are attached in Annex 4. It should be noted that the selection of these researchers and the qualitative analysis which follows is simply a 'snapshot' of what has emerged from the data and serves to give a descriptive view of mobility from the individual perspective and from persons with significant mobility experience.

The 16 researcher profiles selected are those who may be described as 'highly mobile researchers'. They are persons who have described their situation as 'I have been a mobile researcher in the past', have been mobile several times and are those who indicated some views and opinions on mobility in their free text responses. This was the only criteria for selection. They may (and in fact do) have varying patterns of mobility (over different time spans etc.). The majority (12) had been mobile 3-5 times; most recently more than 10 years ago (1 person); 6-10 years ago (7 people); 3-5 years ago (3 people); less than 3 years ago (5 people). Most had their most recent mobility period within Europe, with only 2 persons having been most recently to Asia and North America respectively. The duration of the most recent mobility period varied from less than 1 year (8 people) to more than 2 years (7 people). Survey respondents who identified themselves as 'I have been mobile researcher in the past' were only asked to give information on their most recent period of mobility, not all mobility experiences.

The opinions of the profiled researchers and other survey respondents can be analysed in terms of their comments on key issues such as career track models, optimal levels of mobility, funding issues and factors inhibiting mobility, and although analysis was not confined solely to these issues, in view of the limited time and resources available for analysis we have concentrated on them for the purposes of reporting.

### **6.2 Career track models**

The lack of widely-accepted 'career track models' which outline the likely shape of a professional career as a researcher has sometimes been highlighted as a gap which policy action could usefully fill. In some countries, such as the UK, research funding agencies have teamed up with research-performing institutions in order to clarify at least some aspects of a more structured research career in parallel to the more traditional academic (teaching + research) career path. The results of the surveys suggest that expected and actual career paths vary enormously from country to country. It is clear that different research system configurations, funding and employment practices and expectations across the EU-27 will impact on the career tracks of researchers, and this is also true across different disciplines.

What has emerged from the survey responses and from the interviews carried out (see next section) is that there is the possibility of developing an empirical typology of career track models, for which we are able to make a preliminary suggestion of at this stage (see box 1). We have found anecdotal evidence in the survey responses and researcher profiles to support each of the four types of career track model we have identified. A general lesson is that people have a very wide range of differing perceptions on the importance and impact of mobility on a research career.

### Box 1: Preliminary typology of career track models

- a. Models in which a period of mobility is an expectation or requirement;
- b. Models that actively promote the inclusion of mobility into the career development of researchers;
- c. Models that support, rather than actively promote, the inclusion of mobility in the career track of researchers;
- d. Models that do not take into account (or even discourage) mobility.

Some open text responses given by our profiled highly mobile researchers support the notion that in some countries, or even within individual institutions, there are explicit or implicit models that consider mobility to be a requirement in a career track (*model a* in box 1). The notion of 'enforced mobility' was mentioned by some researchers who felt that they were expected to be mobile as part of a researcher career. One of our profiled respondents felt that he was obliged to be mobile as part of a career track in his home country (Spain):

*I am forced to become a mobile researcher. The ideal curriculum for a person intended to enter in a Spanish University includes a two-year period [of] research developed in a University abroad. (Doctorate candidate from Spain- profile no.11)*

On the contrary, a respondent from Poland claimed that mobility was actually detrimental to a research career in their country; advocating *non-mobility* as the only way to progress one's career, which would seem to provide evidence for a completely opposite career track (*model d*) which does not take into account (or even discourages) mobility:

*[There was a] TOTAL lack of recognition of mobility experience in recruitment and career development after my return to Poland... each mobile period deteriorates my career opportunities in Poland (Researcher from Poland –profile no.15)*

Others feel they are forced to be mobile due to the relative lack of opportunities in their own home institute or national system. Thus conditions in the 'home' research system or institution can intentionally or unintentionally become 'push' factors in mobility. It is clear that even forced mobility driven by shortcomings in national systems could have some positive impacts, not just for the destination institute or system or for the researcher themselves but also potentially for the source system or institute (see for example Edler's (2007) study of German research institutes). However many of our respondents emphasise the negative side of enforced mobility as a signal of a broader lack of commitment towards new scientists and their personal and family life on the part of the employing institute or the national system.

Many respondents seemed to view an 'ideal' career track model as one in which the researcher completes a PhD, spends one or two post-doctoral positions abroad, then returns to the home country to take up a more senior permanent position. However, in practice this is not always possible. In most national systems expectations about appropriate career tracks are at best implicit and in many cases there is no consensus. Even where there is a growing consensus - as in the UK system - incentives and practices within institutions and the dynamics of funding systems may still mitigate against the likelihood of living out the model in a real career. In short, career development may be positively or negatively associated with mobility, dependent on the

country, the institution, or the research domain. Our findings suggest that there is no consensus across Europe. As one survey respondent suggested:

*In my experience, researchers move from their institution when they are unable to progress further/ work on projects in which they are interested. You are also more likely to find a lectureship etc if you are flexible and willing to move where the jobs are. I don't think there is a 'golden number' of times that someone should move; it varies considerably from person to person even in the same field. (Survey respondent)*

### **6.3 Optimal levels of mobility**

The survey asked the respondents to indicate what they thought was an 'optimum level of mobility' for an *individual* researcher in their own research domain at the various stages of a research career (early, mid and later stage). The responses to this question are clearly highly subjective and heavily influenced by a researcher's own mobility experiences.

The 16 profiled highly mobile researchers generally advocated mobility at all stages of the career (with a few exceptions). This is representative of the survey findings overall. As can be seen in figure 12, the majority of survey respondents who answered this question felt that 1-2 periods of mobility at each stage of a researcher career was optimal. The rationales behind individual responses varied enormously, but included the observation that international co-operation is based on mobility and therefore is a necessity inherent in the internationalised scientific process and that during the later career stage; short term periods of mobility are "very convenient and more compatible with PI responsibilities". In contrast some researchers particularly advocated mobility in the early stage of a career and suggested that this is what European funding should focus on:

*It is very fruitful to move from abroad when you are young. Most of the European research budget should go to PhD and postdoc fellowships (Researcher from France – profile no. 4)*

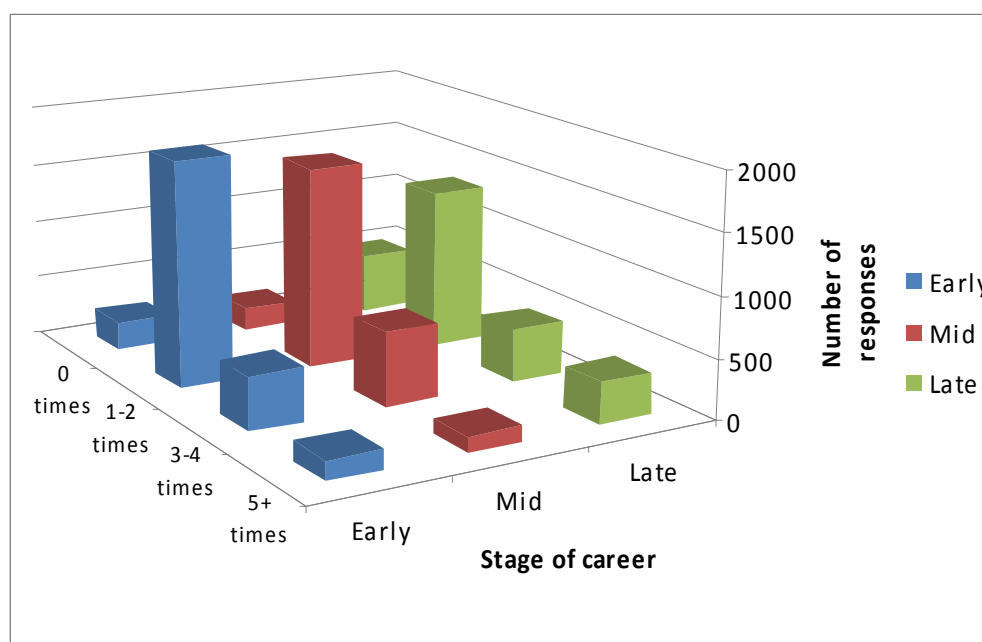
*In the early stage, seeing different research approaches may help to broaden your view of the field and give insight into the career. Mobility in middle stage should help acquire a number of varied skills and help in acquiring contacts. At a later stage, one should concentrate on getting a stable position and I don't see how being mobile can help since people who stay put in one place are often in a better position to snap up any open positions which may arise (Survey respondent)*

A small number of respondents felt that mobility might not be conducive to a research career at any stage. One respondent reasoned:

*Too much mobility does not allow you to concentrate on the PhD (early stage) or to plan a long term career (middle stage). A later stage researcher should have a permanent position and supervise his students and work together with mobile researchers (Survey respondent)*

Overall however, the majority of survey respondents (and the vast majority of the highly mobile researchers profiled) felt that mobility was of benefit. Many people advocated long term mobility (i.e. a period of years rather than months) as being more worthwhile in terms of research benefits than short term mobility, although the problems of longer term mobility (i.e. moving families etc.) were widely mentioned.

Figure 12: Survey response to question: 'In your opinion, how many times should you be mobile in your research career?' (Both groups of respondents. N=3,365)



## 6.4 Funding Issues

Both our survey data findings and free text responses indicated that funding is an acute area of difficulty for researchers, particularly for those with up to 7 years experience and there was much support amongst respondents for targeting early stage researchers with funding opportunities.

The complexities and lack of transparency in the application for EU funding were criticised by some, along with the restrictive nature of some funding/grant schemes. One respondent complained:

*[There is a] very inefficient and time-consuming procedure for applying for EU funds for funding mobility! Lack of transparency and competencies of reviewers for EU funds (no blind peer review!) (Survey respondent)*

While another suggested the need for a

*homogenous research funding system all over Europe. Not necessarily centralised, but transparent and internationally peer reviewed local funding procedures in each country (Survey respondent)*

Examples of programmes and opportunities only available to nationals of the host country were given. Restrictions in terms of years of experience were also cited as inhibiting factors. Mobility programmes focused on student exchanges, full doctorate programs, postdoctoral stages or Marie Curie Actions mean some researchers have found that they are ineligible to apply as they are too experienced for an early researcher but do not have the relevant qualifications (PhD) to apply for these schemes. As one respondent from Spain stated

*The only reason I am not mobile at the moment is the lack of funding for people in my situation. I got my degree 7 years ago but I started my doctorate 3 years ago. European projects cover three years of research, what is not enough to elaborate a thesis in my field in Spain. I find no opportunities to be mobile since the government of my country*

*offers grants only for young graduates with less than 3 year experience and with project fundings. The mobility programs of the European Union are focused on student exchanges, full doctorate programs, postdoctoral stages or Marie Curie Actions, of which none is adequate to my profile. I am too experienced for an early researcher but with a poor CV (not doctor) for an experienced one. (Survey respondent)*

It must be acknowledged that there is a distinction to be made between different schemes and national contexts – in some cases it was reported that mobility was the only way to secure funding, reminding us that availability (or lack thereof) of funding may play a role both as a driver (push factor) or an attractor (pull factor), and as a barrier or enabler of mobility motivated for other reasons. Individual experiences vary enormously.

## **6.5 Inhibiting factors**

Whilst not all the motivating and inhibiting factors mentioned by respondents can be documented here, it is our intention to report on some clear issues which emerged as being common factors. The subjectivity of these responses, interpreted in the light of individual experiences, must be taken into consideration. Nonetheless, some key issues can be identified which have provoked a lively response. ‘Clusters of concerns’ expressed by both EU and third country nationals, emerge from our survey findings. Much reference was made to ‘*quality of life*’ issues, including *accommodation* and *family life* concerns. The impact of mobility on one’s supplementary *pension* contributions and rights has also emerged as a key concern. Other ‘clusters of concern’ have emerged around the issues of *career progression*, nature of *contracts*, *pay differentials*’ *availability of posts* and *funding*. Not surprisingly our findings suggest that difficulties faced by *third country nationals* are often more specific and acute, in terms of visa / residence issues.

### **Quality of life issues**

There was a view among some of the highly mobile researchers profiled that mobility makes family life extremely difficult. The increasing necessity for dual income families, the difficulties in maintaining two careers and the problems encountered in moving families and partners abroad have emerged as clear inhibiting factors. The problem of having to ‘choose’ between a research career and family or relationship was frequently mentioned. Finding reasonably priced accommodation and associated moving costs were referred to as being a problem in some countries. Comments from our profiled researchers highlight these issues:

*Extreme difficulties for me right now are making family life and mobility compatible. [I] would need a supplemented salary to be able to have my family with me (Spanish researcher, profile no. 5)*

*[Mobility] opens up possibility for being involved in other type of research fields; on the other hand, [it] makes family life more difficult (Hungarian researcher, profile no. 7)*

Frequent mobility was cited by many as being extremely detrimental to quality of life as well as to research activities, and problems are compounded when there are other people (be it partners or children) to consider, as several respondents suggested:

*Being mobile at the beginning of the career is important to extend your knowledge and contacts, but after this time it makes it extremely hard to have a partner/family, mostly when your partner is a scientist as well and needs to move every 2-3 years. Having to find a position in the same country... several times during a few years is extremely hard and depressing. In addition, many positions are very short (1-2 years) and you need then to spend a lot of time constantly to apply for new grants/funding, which takes a big part of the time you should devote to your research. (Survey respondent)*

*In my situation, not being a permanent resident hurts my retirement pension plans and economical long-term forecast. At this moment I cannot even get life-insurance, which*

*makes me uneasy as I have a small child and no provisions in the case that I will no longer be able to provide for her. (Survey respondent)*

*It is hard and tiring to search for jobs in foreign countries (especially when your spouse also needs a job) and to move long distances, get to know local rules for pension/health care/childcare etc. (Survey respondent)*

The concern was expressed that current mobility support is not appropriate for many researchers. For example, one researcher complained:

*the support currently available is structured so as to attract only two types of researchers: 1. young/ unmarried/ without children; or 2. in a traditional relationship with one 'breadwinner' and one flexible partner. I do not think that this represents a large share of researchers!!! (Survey respondent)*

### **Pension, tax, pay and benefits issues**

Pension rights emerged as being a major concern for some individuals. One experienced profited researcher stated that whilst they believed mobility to be useful, it “would very likely be damaging to the pension if it is not part of a sabbatical” and another stated:

*you lose [pensions rights] every time you cross the borders of your country... that means that you are punished for mobility when you are old (Researcher, Austria, Profile no. 12)*

Similarly in the free text responses in the survey, a common concern expressed was that once a researcher leaves a country to undertake mobility, the pension they have built up there suffers as a result. The inability to transfer healthcare insurance and pension schemes across borders in the EU is (and has been) a major impediment to mobility for a significant number of researchers in our survey. The severity of the problem this presents varies across Europe. A number of respondents drew attention to the fact that mobility periods are often funded by grants, fellowships or stipends, which do not necessarily confer employee status on researchers, which may not come with pension provisions or social security rights and which mean that mobile researchers are not granted ‘permanent resident status’ in the country they are visiting:

*nowadays in Spain the young researchers are not considered as a workers, we are considered as a students (Survey respondent)*

*[There are] serious problems (!) with health/social insurance for those given a stipend, which is a "modern way" to treat young researchers (Survey respondent)*

‘Instability’ was a common concern, supporting other anecdotal accounts found elsewhere, outside of this study (e.g. see EC, 2007b, p.43). One respondent, for example, stated that

*major difficulties are Pension rights and social security benefits (unemployment, etc) that are non existent for many fellowships around Europe (Researcher, Portugal, Profile no. 13)*

The problems caused by varying tax schemes across countries and the distinct lack of recognition of a period out of one’s own country, in terms of contributing to national insurance and pension schemes was also mentioned as a problem in many of the free text responses. Transferring pension (including private pensions) and social security benefits, and the complex nature of organising these affairs if one has moved around, have emerged as clear problems. For these reasons many respondents concede a certain amount of ‘risk’ in being a mobile researcher, which some are not prepared to take, and which those who have find very frustrating, as two quotes taken from the survey responses below highlight:

*I'm currently employed on a fellowship with no social security, no health care, no pension which means that I can simply not afford to continue on a similar basis for a longer period (more than 3 years)...Pension plans seem not generally transferable and in any event future planning is difficult. After 11 years of work plus four years PhD, I have two years pension contributions in Britain (probably worthless) and so far 1 year in Germany (Survey respondent)*

*I am French. I have been working as an R&D engineer + researcher in four countries: Belgium, France, Germany, and Austria. After 6 years of administrative letter communication, my working experience in Belgium is still not properly recognised by the French authorities regarding the pension. My years in Germany and Austria have not been yet processed. It is a terrible mess between the national administrations that take years to validate your working period. (Survey respondent from France)*

Many respondents indicated that they would like more 'unification' across European countries, for example, one respondent suggested that

*mobility should be considered within a uniform scheme for health insurance, pension rights and future prospects for the whole extent of European Union (Survey respondent)*

While another stated

*I think one of the most important problems for researchers is the fact that each European country & institution offers a different salary package without pension, health care, social benefits. In every country I had to start from the beginning and integrate into the 'local system' (Survey respondent)*

This anecdotal evidence suggests that pension and social protection provisions are a hindrance to researcher mobility. This may endorse the preliminary suggestions in an earlier study carried out by Cox et al (2007, p.13). These issues are clearly complex ones. One survey respondent advocated a 'European social security, salary and pension scheme' for researchers. These are all generic Single Market issues but the nature of researcher mobility and the variance in the status of the 'researcher' makes them particularly challenging in this arena. The 'flexicurity' policies outlined by the Commission (COM, 2007b) may be of relevance here.

### **Career progression**

Whilst mobility is seen as important for personal and career development, its perceived lack of recognition in terms of that career development is clearly a discouraging factor for some researchers, according to our survey findings. Many respondents stated that a period of mobility would make it difficult to return to academia in one's home country. One example was provided by an experienced researcher in the survey:

*Looking back, I'm afraid becoming a mobile researcher has been my most important career error. Recognition of mobility and international experience is practically zero, even though "officially" (e.g. in advertisements) such things are often stated as requirements for scientific staff positions. In reality though, scientific jobs (in particular in Europe) are distributed almost exclusively through favouritism and old boys' networks. Mobility in that sense is a major handicap, because as a mobile researcher your "local network"... is inevitably less strong than that of others who never moved an inch... (Survey respondent)*

The importance of networks has emerged as key in a research career, and while there was a lot of support for the notion that mobility is an important way of expanding and increasing said networks, it makes it difficult to maintain them:

*Leaving a country also means leaving a network behind and in a new institution a new network must be established. These networks are key to get anything done! A number of studies have shown that leaving one's institutions for a couple of years has detrimental effects on one's career within that (home) institution, as the network is no longer there. Without support network careers get stuck! (Survey respondent)*



Another cited mobility as being a hindrance to career progression, stating:

*when a researcher is mobile and changes institution with some frequency, e.g. contract for 2 years, it is difficult for him/her to be fully considered as a member of the institution where him/he is working with regard to application for funding of projects; specially if his/her present position is funded by an institution from another country. (Survey respondent)*

Obviously these responses are by definition subjective and are based on individual experiences but it seems that there are different views of mobility in terms of its contribution (or lack of) to career progression in different countries across Europe. As another respondent explained:

*It is obviously important to go abroad and improve your international research contacts and network. It should be higher valued by Universities in your home country. In Austria, where I come from this is not a problem, but in Spain, where I worked before, I had the impression that going abroad is not considered as an advantage by many researchers, on the contrary my job opportunities in university research in Spain seem lower, coming from abroad, than for those [who] stay at their university all their career (Survey respondent)*

### **Availability of posts / information**

The lack of information regarding availability of positions and opportunities for mobility was cited by many as being an inhibiting factor. Whilst in some countries there may be a real lack of posts for researchers, in others it was felt that there might be some available but people did not know where to look. Access to information was perceived as a difficulty by some researchers who were working outside their home country:

*I was not considered a serious candidate for jobs I applied for as I was living on a different continent and I was unable to access relevant career advice. I felt very isolated from the academic community in my country of origin (Survey respondent)*

The lack of resources and access to information in individual institutions was also highlighted as an issue of concern:

*[P]ostgraduates/ doctoral researchers are still very dependent on their supervisor to gain access to relevant information on career opportunities. If that support isn't available, and the institution does not provide adequate services, it is not always easy to find out on your own (Survey respondent)*

### **Third country nationals**

The inhibiting factors that have been identified above are applicable to both EU and third country nationals; however specific problems related to the latter group were also identified. One respondent from our survey stated that

*As [non] EU national (Macedonian) having a PhD. degree from very well known EU institution - European University Institute I [am] not able to find a job in Brussels anywhere because I am Macedonian national and not a EU national as the first condition everywhere for applying for a job [is to be an EU national] (Survey respondent)*

## **6.6 Concluding remarks**

Whilst significant inhibiting factors were identified by our profiled highly mobile researchers and by our survey respondents more generally, the survey findings do suggest that, despite these serious problems mobility is viewed in a positive way. Many respondents stressed that mobility should never be encouraged for its own sake but only as a means to other ends. There was a great deal of support for efforts to address

obstacles and inhibiting factors. The personal and scientific benefits of mobility were frequently cited. As one of our highly mobile researchers put it:

*Mobility fosters creativity and the inspiration to go on in a demanding researcher job. International cooperation is still mainly based on mobility, despite all the electronic possibilities that exist (Norwegian researcher, profile no. 1)*

## **7. Interviews with Institutions**

### **7.1 Overview**

To complement the data gathered via the survey and in order to explore the institutional perspective on the main inhibiting factors of researcher mobility we interviewed twelve people with responsibility for research management, across a range of organisations in seven European countries: France, Estonia, Germany, Norway, Poland, Spain and the UK (see annex 6 for a list of interviewees). We have identified issues from these interviews particularly pertaining to researcher mobility including views on optimum levels of mobility, career track models, funding and inhibiting factors.

The main identified factors were discussed in a culturally specific context of the interviewee's organisation and country. Consequently, different factors emerged as key inhibitors to mobility depending upon the type of organisation the interviewee was representing and the country within which the institution was located. Certainly, twelve interviewees cannot be representative of the diversity of the entire European research system and thus the material is indicative but nonetheless highlights a range of interesting relevant issues.

### **7.2 Career track models**

As previously noted conceptions and understandings of a 'career track model' for researchers vary from country to country. From our interviews we have established a number of country-specific issues which influence the career path and development of a researcher. In Norway, for instance, as in a number of other European countries, the typical academic career path is to be educated, obtain a job and work in the same university until retirement. Norwegian universities allow academic staff to undertake sabbaticals of up to one year every sixth or seventh year and to facilitate short periods of mobility. Funding to go abroad during this period is available from the Norwegian Research Council. This in part compensates for a spouse or partner being unable to work during this period abroad. It is however a competitive process and resources are limited.

In France our interviewee indicated that mobility within the country may be seen as advantageous for career prospects. In some institutes, to maximise the benefit to the system of mobility, after a post-doc, a researcher is not expected to return to the laboratory where s/he did the PhD but must work in a different laboratory. We were also advised that there are limited jobs for researchers in academia in France, which means that conveying the benefits of an international experience to businesses and improving the integration of researchers in the private sector (i.e. to improve employability options outside of academia) are key aims (supporting earlier studies, cf. Technopolis, 2001).

In Estonia, our interviewee advised us that there is no active promotion of long term mobility because as a small country Estonia wants to retain as many researchers as possible<sup>vi</sup> but that for people who do choose to be mobile, at least from our interviewee's perspective, a neutral view is taken, that is that mobility neither helps nor harms career progression. In Estonia as elsewhere promotion is focused on publications and research output and mobility will only be a factor where it has been seen to have enhanced the level or quality of output achieved.

Belgium, like a number of other EU countries, is attempting to encourage Belgian researchers working overseas to return to the country. Belgian funders provide grants for five years for researchers in the physical sciences to build up their own research group although these are limited and competitive. Evidence from our interviews suggests that a

new regulatory framework means that to obtain a full professorship in the country one must have been mobile for at least two years (in line with our *model a*).

In the UK we find evidence of a number of 'career development posts' by certain funding bodies. The major biomedical research foundation the Wellcome Trust, for example, tries to encourage research institutions to take responsibility for the permanent employment of its funded researchers by providing tapered funding over a period of 5 years with the expectation that the university will take full responsibility for that person's career at the end of the period. However most UK universities remain reluctant to make such a commitment to researchers dependent on competitively won (soft) research funding. Thus, despite more than a decade of debate between policy makers, research funding agencies and research-performing institutions about career track models and despite European legislation limiting the successive use of fixed-term contracts, many UK research careers still involve a great deal of employment uncertainty. Certainly, the flexibility offered by a highly competitive funding system which constantly creates new researcher positions is also at the same time a 'pull factor' for inward mobility into the UK.

A number of UK institutions are taking measures in an attempt to reduce the uncertainty of a research career. At The University of Bristol, we were advised of a policy to try to re-deploy research staff to work on different projects, once their contract has ended, though the potential for this can vary between disciplines. As the interviewee explains:

*For Arts and Social Science we might have researchers who can be moved around from project to project as opposed to researchers in medicine in science who tend to be more specialised in their subject area and therefore it might be more difficult to move them around from project to project. (HR Manager, The University of Bristol, UK)*

In some countries we find anecdotal evidence of systems that do not encourage mobility in a career track (*model d* in our typology). For example, one Professor in Poland reported that mobility is often severely hampered by 'bureaucracy', although the situation seems to be improving over time. A relative lack of national programmes to support mobility has apparently meant that some individuals in that country have had to use their annual leave as a means to have a mobility period.

As in the analysis of survey responses in the previous section, our interviews with research managers brought up the issue of the lack of recognition of mobility in a career track; the problem being that once you have left a country, it may be difficult to re-enter the national discourse, although this varies across different research domains.

### **7.3 Optimum levels of mobility**

Interviewees were asked about what they considered to be 'optimum levels of mobility' for their institution, both inward and outward. There was no overall consensus amongst interviewees as to an optimal level. Differences between disciplines and career structures and expectations, size and orientation of research groups and prevailing funding models across countries and institutions mean that the optimal level for one institution or research group may be very different to that of another. Most respondents emphasised the need to strike a balance, and to have the right persons for the right positions.

As one interviewee put it:

*I think it is a question of balance. And if it is a question of balance I would have to say, yes, I think there must be an optimum level. I don't know what it is (Professor, Research Institute, Spain).*

A major concern, especially in smaller countries, was that an institute does not suffer as a consequence of either inward or outward mobility, in terms of research quality or capacity (human resources). As well as having to deal with the consequences of short-term outward mobility the fear remains that facilitating such mobility will mean that researchers are drawn permanently to major labs abroad, leaving countries trying to establish themselves in the world of research at a disadvantage. The much-touted 'brain circulation' benefits of outward mobility are of course dependent upon the willingness of researchers to return to or otherwise interact with their own national system. The amount of researchers an institute can 'afford to lose' through outward mobility or 'accommodate' through inward mobility, is very much dependent on the research being carried out and the resources available at that particular institute.

One interviewee from a Polish university suggested

*It would be optimal if from a group of 5-10 researchers 1-2 people go abroad. One comes back and then a next person goes. That's how I imagine it (Professor, Poland).*

While one of our Estonian interviewees suggested

*If you wanted to put it into numbers then I could well imagine 10% of a group be it the faculty within an institute or a narrow research project spending time abroad at any given semester... from our perspective large numbers going away would narrow the pool here and one cannot always replace them with non Estonians as teaching here has to be done in Estonian in most cases. (Research Manager, Estonia).*

Interviewees were asked about the existence of incentives to encourage the return of mobile researchers to their own institutions. People expressed a range of concerns about inward and outward flows of mobility. Efforts to encourage the return of researchers vary. Some people were not aware of any direct incentives or policies. One interviewee stressed that the distinction should be made between encouraging the *return* of mobile researchers and opening up a system to encourage *mobility per se*, as the two are very different in their philosophy and requirements.

At least one interviewee suggested that the focus should not be in recruiting back nationals that have left to go abroad, but on encouraging mobility so that people can go wherever in Europe they wish. Encouraging the return of researchers was highlighted as an area of particular concern in France, in that the French expatriated population apparently includes a large proportion of the very best French researchers. Measures to address this issue do seem to have been introduced (see EC, 2001; Technopolis, 2001). It can also be seen that there are a significant number of foreign researchers in large research institutes in France. Box 2 gives a profile of CNRS, a major French research organisation which includes a number of research centres.

## Box 2: Profile of CNRS, France (2007)



CNRS have 6 research departments, 2 national institutes, 19 regional offices, ensuring decentralized direct management of laboratories and 1,190 research and service units (83 % are joint laboratories with universities and industry).

Total number of employees: 31,000

Number of CNRS tenured employees: 26,100

Number of researchers: 11,700 researchers

Number of engineers and support staff: 14,400

**Number of visiting foreign scientists** (PhD candidates, post docs & visiting researchers): **5000**

CNRS have

80 exchange agreements (with 60 countries)

316 International Programs for Scientific Cooperation (PICS)

54 International Associated Laboratories (LEA/LIA)

56 International Research Groups (GDRE/GDRI)

10 International Joint Units (UMI)

8 CNRS offices abroad (Beijing, Brussels, Hanoi, Johannesburg, Moscow, Santiago de Chile, Tokyo and Washington)

4,000 contracts signed with industry

39 framework agreements and 34 joint research units with industrial partners

They generated 132 million Euros of revenues (EU contracts not included), have 2,657 research applications in effect. They received 53.3 million Euros in royalties. In 2007 CNRS received 2.834 billion Euros of which 513 million come from revenues generated by CNRS contracts

Source: [www.cnrs.fr/](http://www.cnrs.fr/)

## 7.4 Funding issues

Views and knowledge of funding varied. Some interviewees mentioned restrictions on funding in their own countries, for instance in terms of access for non nationals to national funding, but also in terms of limits on nationals in accessing national funding (for instance strict time limitations after graduation from first degree on eligibility for doctoral support in Spain), as was also highlighted in the survey analysis section. Cross border mobility may also be hampered by inflexible mobility funding systems. Our respondent from Poland, for example, cited long delays in decision making on Marie Curie applications in comparison to more flexible and efficient American funding systems which encourages some scientists to apply for opportunities in America as opposed to another European country<sup>15</sup>.

National funding schemes can facilitate researcher mobility, whether as a primary or a secondary objective. In Estonia, our respondent reported that opportunities for short term mobility were recently promoted via the disbursement of structural fund support to universities:

*On the short term level I don't believe there are any real impediments. Estonia as a country but also within our university ... things are relatively well organised in terms of short term (meaning 6 months) training visits, library stays or research tours. For instance, last year and this year Estonia gave part of its structural fund support directly to universities so that they could organise competitions for individual faculty members to*

<sup>15</sup> Generally we detect a latent demand for rapid access to flexible, non-bureaucratic national or European funding for shorter-term mobility (trips of a few days or weeks duration) for instance to use research facilities in another country.

*take up to 6 months leave and get basically all of the travel and living support that they would need to go off and spend time in some other institution as a sort of training. In this sense, it was a very active promotion of short term mobility. Long-term mobility is less promoted since Estonia being a small country is keen to keep as many people here as it can. At the same time, there is a state program, which offers 100% four-year doctoral stipends for Estonians wishing to do their degrees abroad if they are in so-called priority fields. This is clearly long-term mobility. (Research Manager, Estonia).*

## **7.5 Inhibiting factors**

Issues that emerged as being factors that inhibit researcher mobility to some degree resonated with what we found in our analysis of the survey responses; i.e. issues regarding quality of life; pension, tax, pay and benefits; career progression; availability of posts and information and those related specifically to third country nationals were all highlighted as problematic. However, as the interviews provided an institutional perspective, other issues such as lack of harmonisation across Europe, lack of portability of grants and problems with national practices were uncovered to a greater extent. The interviewees indicated some possible *explanations* for these problems and identified some *measures* that could - or are being - undertaken to address these in particular countries or individual institutions. Again, there were clear variations in the responses from country to country and across different types of institutes.

### **Pension, tax, pay and benefits issues**

The employment status of researchers can be a factor in incentivising or disincentivising mobility. For instance the civil service status of French researchers and the associated positive terms and conditions of employment may act as systemic disincentives to mobility. These may however be countered by other less direct incentives, for instance through participation in European international networks including Networks of Excellence. One of our respondents identified two distinct populations amongst the French research community, those at the cutting edge of research on an international basis and who are mobile in the international market, and the mass of researchers who do not have specific incentives to be mobile. This probably holds true for most national systems.

Similarly, the Norwegian model in which doctoral researchers are paid employees may be a disincentive for mobility. Employed doctoral candidates who receive a salary at their home institution may or may not need to substitute this by alternative income when going abroad. In other words salaried status for doctoral researchers could be an inhibiting or indeed an enabling factor for mobility depending on the terms, conditions and expectations associated with the salary. As our Norwegian interviewee noted:

*The problems are mainly due to differences in salary and working conditions. This is a problem for the PhD students because our Institute (NIFU-STEP) pays a salary. If a PhD student moves outside the grant system s/he will have to find a salary in the country that you are moving to and there is a big difference in some of the countries. The salary can be too low compared to that which is paid in Norway (Professor, Norway).*

The issues of language, pension and social security advice and transparency were highlighted in the interviews, as they were in the survey responses, especially in terms of longer term mobility. Our interview findings suggest that some view more access to information and increasing transparency as ways to improve the situation:

*Of course it would help if all these countries could agree about maybe an instrument or something which is very open and transparent. Now mobility is restricted because most of the people don't get the right information or know how to apply or where to apply to, and in practical terms pension and social security, and language are barriers (Programme Co-ordinator, Belgium).*

### Quality of life issues

As in the individual survey responses, our interviewees identified concerns amongst their staff with regard to family and quality of life issues, with some insights into why this is a problem across Europe. In Norway for example, the typical starting age for a doctoral candidate in Norway is 25-26 years old; these researchers may be more likely to be married/involved in a serious partnership and have families during the course of their doctoral studies than in some other European countries.

Lack of information about national practices emerged as a key issue of concern in our survey and in the interviews this was again acknowledged as a problem for visiting researchers. Practicalities like acquiring a social security number; getting children into school and finding accommodation emerged frequently as things that present problems for mobility. Action is being taken at individual institutions in a limited number of cases. (For instance the University of Bristol, which has an increasing number of international researchers, has recognised a need for action here - see box 3). There may be scope here for national level (or even a single EU-wide) advisory services to deal with these type of issues.

#### Box 3: International staff resources at the University of Bristol, UK

Number of research staff employed			
Year (as at 31 Jan)	Total All	Total Non UK	% All Non UK
2008	1085	393	36.22%
2007	1165	405	34.76%
2006	1144	370	32.34%
2005	1070	312	29.16%
2004	1038	293	28.23%

Due to increasing numbers of international research staff at Bristol University, year on year (see figures above) the institute has employed an *international staff advisor* and created a *website* (<http://www.bristol.ac.uk/internationalcentre/staffsupport/>) dedicated to giving advice on issues ranging from accommodation, childcare and medical care to English language tuition and driving in the UK. This is a relatively simple innovation for most UK universities who have been providing such advice and support to international *students* for many years.

Our interviews (as well as the survey data) provide some telling points regarding quality of life and pay. Pay differentials between countries may be both a motivating and inhibiting factor for mobility. For many Europeans perceptions about the prevailing quality of life both at home and in other member states are major influences on propensity to mobility. The attractiveness of some national research systems in terms of dynamism or facilities could be tempered by broader concerns about poor quality of life. In contrast researchers may be willing to accept lower than average working conditions in return for a perceived high quality of life. Other quality of life issues may be less about general perceptions and more about specifics. In Estonia, for example, wages may be low relative to many other member states but the cost of living is also low and most Estonians own their own homes. The promise of a higher salary abroad might be offset for many Estonians by the challenge of securing appropriate accommodation.



### **Career progression**

The lack of recognition of mobility in career development was highlighted as an inhibiting factor in the interviews, as it was in the survey findings and researcher profiles. Much of the evidence related to this issue can be seen in the 'career track model' discussion above. Anecdotal evidence from France suggests that researcher mobility may be undervalued by both public and private sector employers. Researchers may accumulate international experience but be unable to find a job when they return. The 'closed' nature of national networks was highlighted by many of our respondents; i.e. once you leave a certain country, re-integration may be very difficult.

Evidence gathered in our interviews suggests that the formalities imposed in some countries make it difficult for foreigners to compete for posts on an equal basis. Anecdotal evidence from Spain, for example, suggests administrative complexities make it very difficult for a foreigner to apply for a researcher position in a Spanish institute, and tenures are said to be 'un-advertisable'.

### **Availability of posts / information**

Some of our interviewees, like our survey respondents, identified a distinct lack of information regarding mobility opportunities. One Polish interviewee suggested that

*there is a need for administrative support. If there was a unit responsible for researchers mobility, a unit of experts who facilitate and encourage mobility, explain and organize at the university level... helpful people who know what they can do to improve mobility. But also one has to encourage people to look for offers. (Professor, Poland)*

### **Lack of harmonisation across Europe**

A further inhibiting factor is the lack of harmonisation and portability of research grants in Europe. Problems of data sharing and intellectual ownership also emerged as inhibiting factors, particularly in the life and physical sciences, which may mean people are reluctant to become mobile, even where a clear research benefit can be identified.

Lack of harmonisation across Europe in terms of working requirements and practices were highlighted in the interviews, with the problems being compounded for third country nationals. Several anecdotal responses provide evidence for this view:

*The main impediment is the lack of unified procedures within the EU. For example there is problem with work permits in different countries. Some countries require a work permit, some don't in case of researchers. For researchers from outside the EU this is a problem (Professor, Hungary)*

*The thing that really inhibits researcher mobility and this has tried to be addressed through the employment charter and code is radically different terms and conditions of employment throughout the EU. (HR Manager, Bristol University, UK)*

*The university should contact the embassy to support incoming researchers with visa procedures. The applications for work permits should be directly sent to the consuls responsible for research issues. Moreover, the regulations in all EU countries should be unified. (Professor, Hungary)*

*70% of all problems come from the variety of procedures in different countries. I think it will change when the EU constitution will be accepted. Although all countries understand that it has to change, each country resists to some aspects of such change. Some countries have their own programmes as they don't have enough researchers e.g. Germany, the Netherlands, Great Britain. These programmes are better than the EU programmes and it would not be good for these countries to have uniform regulations in the EU to make their own situation worse. Professor, Hungary)*

## **7.6 Concluding remarks**

Evidence from our interviews suggest that in many countries, the major concerns regarding researcher mobility and career progression are the lack of job security and stability for researchers and whether mobility may compound these problems further. In many European countries the number of post-doctoral researchers has grown considerably over recent years whilst the number of permanent researcher positions has seldom kept pace. We have found evidence of measures being taken to reduce the detrimental effect on researcher careers; for example re-employment policies in individual universities, such as the University of Bristol in the UK, but more action, perhaps at EU level, is required to improve mobility, career development and stability of researcher careers. Trying to improve career development, job security and mobility all at the same time is a major challenge for national and European policy-makers as improvements in one area may often come at the expense of another.

Generally though, as in the survey responses and the researcher profiles, mobility was viewed as largely positive and something which should be facilitated – though never for its own sake. As one UK Professor noted:

*You will get the best science and the best career development if people just take the best opportunities available without being constrained by which country it is in. (Professor, UK)*

## 8. Emerging issues and concluding remarks

This study was commissioned to contribute to the ongoing process of developing more effective strategies to inform policy aimed at stimulating mobility flows of researchers within the European Union. Mobility stimulating policies work from the premise that mobility per se is good for Europe and for individuals. Enhancing mobility of researchers is rooted in the notion that the development and use of research based knowledge requires access not only to codified knowledge but also to the tacit knowledge, skills and competences which are part of knowing how to interpret, evaluate and transform codified knowledge for use in various forms and contexts. Mobility of researchers between research performing institutions is an overarching requirement for enhancing those necessary scientific and technological competences (Jones and Miller, 2007).

This study has presented quantitative and qualitative data from a survey of researchers and from interviews with research managers about their mobility experiences and the difficulties they have encountered. In particular we present the perspectives of researchers who would like to be mobile but who perceive a range of potential barriers to mobility. It is important to note however, that notwithstanding difficulties our study **confirms a positive view from respondents towards mobility** – as many as 82% of the respondents either have been a mobile researcher in the past or would like to be one in the future. In particular a large group of respondent researchers (35 per cent overall – higher among those under 24 (60%) 25-30 age group (40+ %), 31-40 age group (45%)) were willing to become mobile in the future. This finding shows a great potential for evolving effective mobility policy instruments within the European Research Area.

Mobility should never be seen as an end in itself. A more effective European Research Area might be one in which absolute *levels* of mobility are lower but the *quality* of and *impacts* of mobility are greater. Mobility should always be seen as a means to improve the quality, coherence and relevance of European R&D activities. We know that mobility flows are complex and several factors seem to inhibit or motivate mobility at different stages of research careers. Some inhibiting factors could be addressed with a better coordination of policies between Member States. Others represent more serious challenges, such as child care and personal relationships. The latter are likely to be more difficult, or more costly, to address with policy measures than are other barriers.

To recap, the key findings from this survey<sup>16</sup> are:

- Thirty five percent of the respondent researchers wish to be mobile in the future. This indicates the vast potential and potential impact mobility policies may have on the ERA.
- Funding for mobility is a serious impediment to researcher mobility in Europe today. There is therefore, a clear need to specify what kind of expenses seem to represent the most important obstacles and how these could be addressed by adequate policy measures.
- Researchers from other countries than the EU report mobility funding and immigration rules as the two most important barriers for coming to Europe
- As expected, personal relationships and child care are perceived as serious barriers to mobility
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'Clusters of concern' expressed by respondents, both EU nationals and third country nationals, emerge from our findings. At the most fundamental level these naturally involve 'quality of life' issues. For fifty per cent of respondents **accommodation** was an area of difficulty. This is unsurprising as transaction costs in housing markets have

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<sup>16</sup> Both groups of respondents N=3365

indirect and direct effects on labour mobility, whether rented or owned. Some analysts have found that home ownership constrains labour mobility (Cameron and Muelbauer, 1998) but others have found opposite effects (Munch et al, 2006). Accepting a job outside a home region is only attractive if there is compensation for transaction costs incurred, e.g. better salary and prospects. Addressing this issue within the context of mobility stimulating programmes is difficult, especially due to the heterogeneous character of the European housing markets (Barcelo, 2003). It might be addressed through the provision of accommodation on the key worker principle for mobile academic researchers, through subsidised university/institution accommodation for the actual period of a contract and/or by higher salary compensation.

Our findings have also illuminated the real concern felt by researchers that mobility has - or could - affect their supplementary **pension** contributions and rights and may thus disadvantage them later in life. This is a highly problematic area as attempts to remove impediments involve fiscal and legal complexities, such as preventing tax-induced pension flight, across the different national sovereignties that make up the member states of the European Union. These complexities impinge on mobile researchers as they do on all mobile workers and the consequences are especially acute for those with short term contracts. National tax authorities may be resistant to the idea of their nationals moving pensions around, especially abroad. Some multinational corporations have taken measures to address the issue and have various ameliorative arrangements for their mobile/posted workers. Such arrangements are seldom not part of the employment conditions offered by HE entities – except on occasion for very senior academics.

This needs to be addressed by the research/HE sector, perhaps by ensuring retention of pension rights in the country in which they are accrued is guaranteed: or by enhancing the possibility of transferring entitlements internationally or by introducing the possibility of joining pension funds in other countries. Cross border protocols about these arrangements could probably be worked out between research-performing institutions together with trade unions and professional associations representing researchers. The role of the EC here may best be one of encouragement and facilitation. (Mortensen & Sauto, 2003; COM, 1997; COM, 2005, EC, 2008).

Our findings show other 'clusters of concern' around issues of career progression, nature of contracts, pay differentials, availability of posts, funding sources and maintenance of research funds. Again, these are areas of some complexity where harmonisation is difficult across different national research systems, organisational and governance structures. Our findings suggest there may be a lack of transparency in these areas, which could to some degree be remedied by improving information flows. There have been efforts to address this issue by the EC - including the European researcher mobility portal<sup>17</sup> which contains information about many researcher vacancies around Europe.

The availability of **funding** sources and maintenance of those sources presented difficulties to many respondents and raised particular difficulties for those who would like to be mobile. Some respondents cited not being aware of opportunities or not being eligible to apply for funding due to not being a national of the country of residence, or due to restrictions with regards to length of time since completing first degree (in some countries) as being barriers. Our findings have clearly shown that it is at the early stage (by years experience) and up to 7 years experience that funding difficulties are most reported and are most acute among those who would like to be mobile. This is an important interim finding and further work is needed to see if policy interventions should focus on these stages of research careers. This would need to be examined in the

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<sup>17</sup> <http://www.ec.europa.eu/euraxess>

context of how funding is actually deployed and what kind of research arrangements are operating – for instance whether individual researchers are acting alone, working as part of teams, or as adjuncts of professors or other senior staff.

The findings of the survey show that patterns of mobility flows are skewed. Among those who are currently mobile in our sample, *most mobility* happens within the EU5 countries, that is most of the respondents who are highly mobile moved from/to EU5 countries (UK, France, Germany, Italy, and Spain). Overall we can see that a great deal of mobility of the EU researchers in our survey takes place within Europe. Findings confirm that there are often more specific and acute difficulties for third-country researchers in terms of visa / residence issues. This finding might have some policy implications. If Europe wants to have the best mobile researchers through mobility schemes, it has to promote mobility, not only more evenly across European countries, but also to attract good researchers from outside Europe.

This takes us to the position of third country nationals. Survey findings confirm that there are often more specific and acute difficulties for these researchers in terms of visa/residence issues. The “Scientific Visa” is a measure to systematically address these problems and the scheme has positive implications for career tracks as it recognises and formalises the mobility experience for third country researchers. The directive also sets up a specific procedure for admitting third-country researchers to Europe to carry out a research project. The main concept is to create a specific residence permit for foreign researchers independently from their contractual status (see Council Directive 2005/71/EC, Council Recommendation 2005/762/EC, Recommendation 2005/761/EC). However, these schemes have not been implemented across the entire EU and perhaps may not be well understood by non-EU researchers, suggesting further work could be done in this area.

As the qualitative evidence drawn from the interviews suggests in many countries, the major concerns regarding researcher mobility and career progression are the **lack of job security and stability** for researchers. There is an issue whether mobility may compound these problems further. In many European countries the number of post-doctoral researchers has grown considerably over recent years whilst the number of permanent researcher positions has seldom kept pace. Research managers raised the issue of the lack of recognition of mobility in a career track; the problem being that once a research has left a country, it may be difficult to re-enter the national discourse, although this varies across different research domains. We have found evidence of measures being taken to reduce the detrimental effect on researcher careers; for example re-employment policies in individual universities, such as the University of Bristol in the UK, but more action, perhaps at EU level, is required to improve mobility, career development and stability of researcher careers. Trying to improve career development, job security and mobility all at the same time is a major challenge for national and European policy-makers as improvements in one area may often come at the expense of another.

In our study the interviewees were also asked some exploratory questions regarding ‘optimum levels of mobility’ for their institution, both inward and outward. The responses indicated that there was no overall consensus amongst interviewees as to an optimal level. Differences between disciplines and career structures and expectations, size and orientation of research groups and prevailing funding models across countries and institutions mean that the optimal level for one institution or research group may be very different to that of another. Most respondents emphasised the need to strike a balance, and to have the most suitable researchers for the appropriate research positions.

The findings of this study confirm that there are push and pull forces affecting mobility flows of researchers that have asymmetric consequences both for receiving and sending research institutions and for the professional and personal lives of individual researchers.

Our study has confirmed that what may be an inhibiting factor for the career development of a mobile researcher can also be a push factor for mobility. Furthermore mobility is a dynamic process lived out through the life-course of the individual researcher and will have 'positive' and 'negative' knowledge, capacity and personal effects at different times and places. Assessing the risks, costs and benefits from mobility, and determining 'optimum' levels of mobility depends entirely on perspective (Costs for whom? Benefits for whom? Impacts where?) and timeframe. In particular it should be remembered that push and pull factors and barriers may vary over time, from discipline to discipline, and between different kinds of research-performing institution and research system.

In conclusion whilst a range of significant inhibiting factors were identified by our profiled highly mobile researchers and by our survey respondents more generally, the survey findings do suggest that, despite these serious problems **mobility is viewed in a positive way**. Many respondents stressed that mobility should never be encouraged for its own sake but only as a means to other ends. There was a great deal of support for efforts to address obstacles and inhibiting factors. The personal and scientific benefits of mobility were frequently cited.

# Glossary

<b>CAQDAS</b>	Computer Aided Qualitative Data Analysis Software
<b>Early-Stage Researcher</b>	In the first four years (full-time equivalent) of research activity, including the period of research training.
<b>Employers</b>	All those public or private institutions which employ researchers on a contractual basis or which host them under other types of contracts or arrangements, including those without a direct financial relationship. The latter refers particularly to institutions of higher education, faculty departments, laboratories, foundations or private bodies where researchers either undergo their research training or carry out their research activities on the basis of funding provided by a third party.
<b>ERA</b>	European Research Area
<b>EU27</b>	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.
<b>EU5</b>	France, Germany, Italy, Spain, United Kingdom
<b>EURES</b>	European Employment Services
<b>EUROSTAT</b>	Statistical Office of the European Communities
<b>Experienced Researcher</b>	Having at least four years of research experience (full-time equivalent) since gaining a university diploma giving them access to doctoral studies, in the country in which the degree/diploma was obtained or researchers already in possession of a doctoral degree, regardless of the time taken to acquire it.
<b>Funders</b>	All those bodies which provide funding, (including stipends, awards, grants and fellowships) to public and private research institutions, including institutions for higher education.
<b>Higher Education sector</b>	All universities and other institutes of tertiary education whatever their course of finance or legal status: includes all research institutes, experimental stations & clinics operating under the direct control of or administered by or associated with higher education establishments (Frascati S.206)
<b>IAM</b>	Information on Academic Mobility
<b>IAU</b>	International Association of Universities
<b>Mobile Researcher</b>	Someone who works as a researcher in a country where s/he is not a citizen or permanently resides
<b>Nordic countries</b>	Denmark, Finland, Iceland, Norway, Sweden
<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>Researcher</b>	Professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned (Frascati Manual S.301)
<b>STEM</b>	Science, Technology, Engineering and Mathematics

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## Annex 1: Survey respondents by country of nationality

### Number of respondents, by country of nationality: ALL respondents

Country of Nationality	Frequency	Percent	Valid Percent	Cumulative Percent
Algeria	2	0.06	0.06	2.88
Andorra	1	0.03	0.03	2.91
Angola	1	0.03	0.03	2.94
Argentina	6	0.18	0.18	3.12
Armenia	3	0.09	0.09	3.21
Australia	12	0.36	0.36	3.57
Austria	221	6.57	6.57	10.13
Azerbaijan	3	0.09	0.09	10.22
Bangladesh	5	0.15	0.15	10.37
Barbados	1	0.03	0.03	10.40
Belarus	2	0.06	0.06	10.46
Belgium	84	2.50	2.50	12.96
Bolivia	1	0.03	0.03	12.99
Bosnia-Herzegovina	2	0.06	0.06	13.05
Brazil	15	0.45	0.45	13.49
Bulgaria	61	1.81	1.81	15.30
Cameroon	3	0.09	0.09	15.39
Canada	14	0.42	0.42	15.81
Chile	4	0.12	0.12	15.93
China	17	0.51	0.51	16.43
Colombia	3	0.09	0.09	16.52
Congo	1	0.03	0.03	16.55
Croatia	9	0.27	0.27	16.82
Cuba	1	0.03	0.03	16.85
Cyprus	56	1.66	1.66	18.51
Czech Republic	26	0.77	0.77	19.29
Denmark	14	0.42	0.42	19.70
Ecuador	1	0.03	0.03	19.73
Egypt	15	0.45	0.45	20.18
Estonia	4	0.12	0.12	20.30
Ethiopia	2	0.06	0.06	20.36
Finland	20	0.59	0.59	20.95
France	290	8.62	8.62	29.57
Gabon	2	0.06	0.06	29.63
Germany	226	6.72	6.72	36.34
Greece	66	1.96	1.96	38.31
Hong Kong	1	0.03	0.03	38.34
Hungary	98	2.91	2.91	41.25
Iceland	3	0.09	0.09	41.34
India	55	1.63	1.63	42.97
Indonesia	6	0.18	0.18	43.15
Iran	8	0.24	0.24	43.39
Iraq	1	0.03	0.03	43.42
Ireland	14	0.42	0.42	43.83
Israel	7	0.21	0.21	44.04
Italy	286	8.50	8.50	52.54
Japan	4	0.12	0.12	52.66
Jordan	1	0.03	0.03	52.69
Latvia	3	0.09	0.09	52.78
Lebanon	5	0.15	0.15	52.93
Liechtenstein	1	0.03	0.03	52.96
Lithuania	16	0.48	0.48	53.43
Luxembourg	1	0.03	0.03	53.46

Country of Nationality	Frequency	Percent	Valid Percent	Cumulative Percent
Macedonia	3	0.09	0.09	53.55
Malaysia	2	0.06	0.06	53.61
Malta	1	0.03	0.03	53.64
Mexico	8	0.24	0.24	53.88
Moldova	3	0.09	0.09	53.97
Morocco	5	0.15	0.15	54.12
Nepal	2	0.06	0.06	54.18
Netherlands	147	4.37	4.37	58.54
Nigeria	1	0.03	0.03	58.57
Norway	158	4.70	4.70	63.27
Pakistan	5	0.15	0.15	63.42
Peru	1	0.03	0.03	63.45
Philippines	2	0.06	0.06	63.51
Poland	226	6.72	6.72	70.22
Portugal	86	2.56	2.56	72.78
Romania	82	2.44	2.44	75.22
Russia	30	0.89	0.89	76.11
Rwanda	1	0.03	0.03	76.14
San Marino	1	0.03	0.03	76.17
Singapore	3	0.09	0.09	76.26
Slovakia	114	3.39	3.39	79.64
Slovenia	16	0.48	0.48	80.12
South Africa	1	0.03	0.03	80.15
South Korea	3	0.09	0.09	80.24
Spain	289	8.59	8.59	88.83
Sri Lanka	1	0.03	0.03	88.86
Sweden	31	0.92	0.92	89.78
Switzerland	12	0.36	0.36	90.13
Taiwan	2	0.06	0.06	90.19
Thailand	3	0.09	0.09	90.28
Tunisia	1	0.03	0.03	90.31
Turkey	122	3.63	3.63	93.94
Uganda	1	0.03	0.03	93.97
Ukraine	7	0.21	0.21	94.18
United Kingdom	153	4.55	4.55	98.72
United States	30	0.89	0.89	99.61
Uruguay	1	0.03	0.03	99.64
Venezuela	5	0.15	0.15	99.79
Yugoslavia	6	0.18	0.18	99.97
Zimbabwe	1	0.03	0.03	100.00
Unknown	95	2.82	2.82	2.82
Total	3365	100	100	

**Number of respondents, by country of nationality, in E-carriers group**

<b>Country of Nationality</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Algeria	2	0.09	0.09	2.69
Andorra	1	0.04	0.04	2.73
Angola	1	0.04	0.04	2.77
Argentina	4	0.18	0.18	2.95
Armenia	3	0.13	0.13	3.08
Australia	5	0.22	0.22	3.30
Austria	213	9.38	9.38	12.68
Azerbaijan	3	0.13	0.13	12.81
Bangladesh	5	0.22	0.22	13.03
Barbados	1	0.04	0.04	13.08
Belarus	2	0.09	0.09	13.17
Belgium	77	3.39	3.39	16.56
Bolivia	1	0.04	0.04	16.60
Bosnia-Herzegovina	2	0.09	0.09	16.69
Brazil	13	0.57	0.57	17.26
Bulgaria	61	2.69	2.69	19.95
Cameroon	3	0.13	0.13	20.08
Canada	4	0.18	0.18	20.26
Chile	3	0.13	0.13	20.39
China	15	0.66	0.66	21.05
Colombia	1	0.04	0.04	21.09
Congo	1	0.04	0.04	21.14
Croatia	9	0.40	0.40	21.53
Cyprus	56	2.47	2.47	24.00
Czech Republic	25	1.10	1.10	25.10
Denmark	11	0.48	0.48	25.58
Egypt	14	0.62	0.62	26.20
Estonia	4	0.18	0.18	26.38
Ethiopia	2	0.09	0.09	26.46
Finland	19	0.84	0.84	27.30
France	173	7.62	7.62	34.92
Gabon	1	0.04	0.04	34.96
Germany	95	4.18	4.18	39.15
Greece	57	2.51	2.51	41.66
Hungary	31	1.37	1.37	43.02
Iceland	1	0.04	0.04	43.06
India	51	2.25	2.25	45.31
Indonesia	5	0.22	0.22	45.53
Iran	6	0.26	0.26	45.79
Iraq	1	0.04	0.04	45.84
Ireland	8	0.35	0.35	46.19
Israel	5	0.22	0.22	46.41
Italy	267	11.76	11.76	58.17
Japan	3	0.13	0.13	58.30
Jordan	1	0.04	0.04	58.34
Latvia	3	0.13	0.13	58.48
Lebanon	4	0.18	0.18	58.65
Liechtenstein	1	0.04	0.04	58.70
Lithuania	14	0.62	0.62	59.31
Luxembourg	1	0.04	0.04	59.36
Macedonia	3	0.13	0.13	59.49
Malaysia	2	0.09	0.09	59.58
Malta	1	0.04	0.04	59.62
Mexico	5	0.22	0.22	59.84

Country of Nationality	Frequency	Percent	Valid Percent	Cumulative Percent
Moldova	2	0.09	0.09	59.93
Morocco	5	0.22	0.22	60.15
Nepal	2	0.09	0.09	60.24
Netherlands	40	1.76	1.76	62.00
Nigeria	1	0.04	0.04	62.04
Norway	3	0.13	0.13	62.18
Pakistan	5	0.22	0.22	62.40
Philippines	2	0.09	0.09	62.48
Poland	144	6.34	6.34	68.82
Portugal	80	3.52	3.52	72.35
Romania	75	3.30	3.30	75.65
Russia	23	1.01	1.01	76.66
Rwanda	1	0.04	0.04	76.71
San Marino	1	0.04	0.04	76.75
Slovakia	113	4.98	4.98	81.73
Slovenia	15	0.66	0.66	82.39
South Africa	1	0.04	0.04	82.43
South Korea	2	0.09	0.09	82.52
Spain	181	7.97	7.97	90.49
Sri Lanka	1	0.04	0.04	90.53
Sweden	22	0.97	0.97	91.50
Switzerland	10	0.44	0.44	91.94
Taiwan	2	0.09	0.09	92.03
Thailand	3	0.13	0.13	92.16
Tunisia	1	0.04	0.04	92.21
Turkey	118	5.20	5.20	97.40
Uganda	1	0.04	0.04	97.45
Ukraine	7	0.31	0.31	97.75
United Kingdom	27	1.19	1.19	98.94
United States	12	0.53	0.53	99.47
Uruguay	1	0.04	0.04	99.52
Venezuela	5	0.22	0.22	99.74
Yugoslavia	5	0.22	0.22	99.96
Zimbabwe	1	0.04	0.04	100.00
Unknown	59	2.60	2.60	2.60
Total	2271	100	100	

<b>Number of respondents, by country of nationality, in RINDICATE group</b>				
<b>Country of Nationality</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Argentina	2	0.18	0.18	3.47
Australia	7	0.64	0.64	4.11
Austria	8	0.73	0.73	4.84
Belgium	7	0.64	0.64	5.48
Brazil	2	0.18	0.18	5.67
Canada	10	0.91	0.91	6.58
Chile	1	0.09	0.09	6.67
China	2	0.18	0.18	6.86
Colombia	2	0.18	0.18	7.04
Cuba	1	0.09	0.09	7.13
Czech Republic	1	0.09	0.09	7.22
Denmark	3	0.27	0.27	7.50
Ecuador	1	0.09	0.09	7.59
Egypt	1	0.09	0.09	7.68
Finland	1	0.09	0.09	7.77
France	117	10.69	10.69	18.46
Gabon	1	0.09	0.09	18.56
Germany	131	11.97	11.97	30.53
Greece	9	0.82	0.82	31.35
Hong Kong	1	0.09	0.09	31.44
Hungary	67	6.12	6.12	37.57
Iceland	2	0.18	0.18	37.75
India	4	0.37	0.37	38.12
Indonesia	1	0.09	0.09	38.21
Iran	2	0.18	0.18	38.39
Ireland	6	0.55	0.55	38.94
Israel	2	0.18	0.18	39.12
Italy	19	1.74	1.74	40.86
Japan	1	0.09	0.09	40.95
Lebanon	1	0.09	0.09	41.04
Lithuania	2	0.18	0.18	41.22
Mexico	3	0.27	0.27	41.50
Moldova	1	0.09	0.09	41.59
Netherlands	107	9.78	9.78	51.37
Norway	155	14.17	14.17	65.54
Peru	1	0.09	0.09	65.63
Poland	82	7.50	7.50	73.13
Portugal	6	0.55	0.55	73.67
Romania	7	0.64	0.64	74.31
Russia	7	0.64	0.64	74.95
Singapore	3	0.27	0.27	75.23
Slovakia	1	0.09	0.09	75.32
Slovenia	1	0.09	0.09	75.41
South Korea	1	0.09	0.09	75.50
Spain	108	9.87	9.87	85.37
Sweden	9	0.82	0.82	86.20
Switzerland	2	0.18	0.18	86.38
Turkey	4	0.37	0.37	86.75
United Kingdom	126	11.52	11.52	98.26
United States	18	1.65	1.65	99.91
Yugoslavia	1	0.09	0.09	100.00
Unknown	36	3.29	3.29	3.29
Total	1094	100	100	



## Annex 2: Descriptive statistics of the survey results

Table A1. Estimates of logistic regression: the probability of being a person who is currently a mobile researcher.

	Coef.	St.dev.	Sig.
Constant	-1.825	0.141	0.000
<i>Rindicate</i>	-0.275	0.108	0.011
Female	-0.152	0.095	0.110
<b>Age group</b>			
24 or under	-0.675	0.272	0.013
25-30	-0.030	0.102	0.770
41 or over	-0.356	0.130	0.006
<b>Main research domain</b>			
Life sciences	0.237	0.100	0.018
Social sciences and humanities	-0.444	0.126	0.000
<b>Type of contract</b>			
Fixed term < 1 year	1.244	0.175	0.000
Fixed term 1-2 year	1.829	0.143	0.000
Fixed term 2+ year	1.197	0.139	0.000
Non-employment contract	1.636	0.163	0.000
Other type of contracts	0.550	0.218	0.012
<b>Country of origin</b>			
Nordic countries	-0.528	0.236	0.025
Other EU27 countries	-0.228	0.103	0.027
Other countries	0.373	0.125	0.003
-2 Log likelihood			3254.345
Cox & Snell R Square			0.124
Nagelkerke R Square			0.186
Number of observations			3,365

Notes: 1) The *Rindicate* variable is equal 1 if a researcher is included in the Rindicate group of respondents, and equal 0 if a researcher is included in the E-carriers group of respondents. 2) The reference person: male, age group 31-40, physical sciences and engineering as the main research domain, open ended (tenure) contract, and country of origin in EU5.

Table A2. The researchers' mobility situation. Both groups of respondents.

	Frequency	Per cent
I am currently a mobile researcher	804	24 %
I am not interested in being a mobile researcher at the moment	620	18 %
I have been a mobile researcher in the past	753	22 %
I would like to be a mobile researcher in the future	1 188	35 %
Total	3 365	100 %

Table A3. The location of researchers' current and previous institutional affiliation. Only persons who are currently mobile researcher.

Previous affiliation	Current affiliation					Total
	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	
Nordic countries	7	28	17	27	2	81
EU5	9	169	76	80	27	361
Other EU27 countries	8	65	67	31	16	187
Other countries	6	44	32	46	18	146
Unknown	1	5	2	4	17	29
Total	31	311	194	188	80	804
Per cent						
Nordic countries	9 %	35 %	21 %	33 %	2 %	100 %
EU5	2 %	47 %	21 %	22 %	7 %	100 %
Other EU27 countries	4 %	35 %	36 %	17 %	9 %	100 %
Other countries	4 %	30 %	22 %	32 %	12 %	100 %
Unknown	3 %	17 %	7 %	14 %	59 %	100 %
Total	4 %	39 %	24 %	23 %	10 %	100 %

Notes: 1) The location of current institutional affiliation is the country where a researcher's current employing institution or organisation is located. 2) The location of previous institutional affiliation is the country where a researcher worked before his or her current post. 3) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 4) EU5: France, Germany, Italy, Spain and United Kingdom. 5) Other EU27 countries: EU27 countries not included in the Nordic and the EU5 groups. 6) Other countries: countries not included in the other groups.

Table A4. The researchers' mobility status by age group. Both groups of respondents.

Frequency	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
24 or under	20	11	3	57	91
25 - 30	297	135	73	418	923
31 - 40	348	166	300	466	1 280
41 or over	124	296	364	226	1 010
Unknown	15	12	13	21	61
Total	804	620	753	1 188	3 365
Per cent					
24 or under	22 %	12 %	3 %	63 %	100 %
25 - 30	32 %	15 %	8 %	45 %	100 %
31 - 40	27 %	13 %	23 %	36 %	100 %
41 or over	12 %	29 %	36 %	22 %	100 %
Unknown	25 %	20 %	21 %	34 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Table A5. Mobility status by years of experience as researcher. Both groups of respondents.

Frequency	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
0 - 4	282	151	70	509	1 012
5 - 7	253	84	125	258	720
8 - 10	111	66	110	163	450
11 - 15	58	71	111	100	340
More than 15	85	235	322	138	780
Unknown	15	13	15	20	63
Total	804	620	753	1 188	3 365
Per cent					
0 - 4	28 %	15 %	7 %	50 %	100 %
5 - 7	35 %	12 %	17 %	36 %	100 %
8 - 10	25 %	15 %	24 %	36 %	100 %
11 - 15	17 %	21 %	33 %	29 %	100 %
More than 15	11 %	30 %	41 %	18 %	100 %
Unknown	24 %	21 %	24 %	32 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Table A6. The researchers' mobility status by gender. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
Female	281	203	195	468	1 147
Male	498	403	537	692	2 130
Unknown	25	14	21	28	88
Total	804	620	753	1 188	3 365
Per cent					
Female	24 %	18 %	17 %	41 %	100 %
Male	23 %	19 %	25 %	32 %	100 %
Unknown	28 %	16 %	24 %	32 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Table A7. The researchers' mobility status by country of origin. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
Nordic countries	25	88	60	53	226
EU5	324	224	310	386	1 244
Other EU27 countries	262	261	304	495	1 322
Asia	70	6	11	49	136
North America	24	0	12	8	44
Other countries	77	20	28	173	298
Unknown	22	21	28	24	95
Total	804	620	753	1 188	3 365
Per cent					
Nordic countries	11 %	39 %	27 %	23 %	100 %
EU5	26 %	18 %	25 %	31 %	100 %
Other EU27 countries	20 %	20 %	23 %	37 %	100 %
Asia	51 %	4 %	8 %	36 %	100 %
North America	55 %	0 %	27 %	18 %	100 %
Other countries	26 %	7 %	9 %	58 %	100 %
Unknown	23 %	22 %	29 %	25 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Notes: 1) Country of origin is the country of nationality. 2) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 3) EU5: France, Germany, Italy, Spain and United Kingdom. 4) Other EU27 countries: EU27 countries not included in the Nordic and the EU5 groups. 5) Other countries: countries not included in the other groups.

Table A8. The researchers' mobility status by salary. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
0 - 20,000	260	185	187	677	1 309
20,000 - 30,000	242	106	149	213	710
30,000 - 40,000	134	104	134	91	463
40,000 or higher	101	166	216	99	582
Prefer not to disclose	41	37	47	67	192
Unknown	26	22	20	41	109
Total	804	620	753	1 188	3 365
Per cent					
0 - 20,000	20 %	14 %	14 %	52 %	100 %
20,000 - 30,000	34 %	15 %	21 %	30 %	100 %
30,000 - 40,000	29 %	22 %	29 %	20 %	100 %
40,000 or higher	17 %	29 %	37 %	17 %	100 %
Prefer not to disclose	21 %	19 %	24 %	35 %	100 %
Unknown	24 %	20 %	18 %	38 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Note: Salary is the current annual NET salary (in EURO). NET salary is the 'take home' salary after tax and other deductions.

Table A9. The researchers' mobility status by the researchers' currently type of contract. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
Fixed term < 1 year	82	32	29	120	263
Fixed term 1-2 year	223	49	65	162	499
Fixed term 2+ year	178	118	108	206	610
Non-employment contract (e.g. funded by fellowship/grant)	134	33	26	138	331
Other contracts	34	37	31	91	193
Open ended (tenure) contract	124	321	466	412	1 323
Unknown	29	30	28	59	146
Total	804	620	753	1 188	3 365
Per cent					
Fixed term < 1 year	31 %	12 %	11 %	46 %	100 %
Fixed term 1-2 year	45 %	10 %	13 %	32 %	100 %
Fixed term 2+ year	29 %	19 %	18 %	34 %	100 %
Non-employment contract (e.g. funded by fellowship/grant)	40 %	10 %	8 %	42 %	100 %
Other contracts	18 %	19 %	16 %	47 %	100 %
Open ended (tenure) contract	9 %	24 %	35 %	31 %	100 %
Unknown	20 %	21 %	19 %	40 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Table A10. The researchers' mobility status by main research domain. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
Life Sciences	302	176	250	290	1 018
Physical Sciences and Engineering	363	306	399	491	1 559
Social Sciences and Humanities	123	124	90	385	722
Unknown	16	14	14	22	66
Total	804	620	753	1 188	3 365
<i>Per cent</i>					
Life Sciences	30 %	17 %	25 %	28 %	100 %
Physical Sciences and Engineering	23 %	20 %	26 %	31 %	100 %
Social Sciences and Humanities	17 %	17 %	12 %	53 %	100 %
Unknown	24 %	21 %	21 %	33 %	100 %
Total	24 %	18 %	22 %	35 %	100 %

Note: According to the European Research Council (ERC) there are three main scientific domains: Life Sciences, Physical Sciences and Engineering, and Social Sciences and Humanities.

Table A11. The researchers' mobility status by experienced difficulties in relation to specific factors. Both groups of respondents.

<i>Frequency</i>	<i>I am currently a mobile researcher</i>	<i>Not interested in being a mobile researcher</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>
Immigration rules (e.g. getting a work visa)	40 %	18 %	39 %	35 %
Funding for mobility	51 %	49 %	50 %	80 %
Language	52 %	29 %	41 %	42 %
Social/Cultural life	47 %	30 %	35 %	27 %
Child care arrangements	18 %	36 %	24 %	26 %
Other caring responsibilities	24 %	35 %	22 %	32 %
Personal relationship	54 %	52 %	43 %	48 %
Accommodation	57 %	33 %	55 %	55 %
Social security benefits (maintaining/transferring)	53 %	37 %	47 %	54 %
Salary (maintaining/transferring)	44 %	39 %	38 %	61 %
Pension rights (maintaining/transferring)	48 %	38 %	43 %	51 %
Health care insurance (maintaining/transferring)	48 %	33 %	44 %	51 %
Lack of competition-based internationally open recruitment	35 %	30 %	24 %	63 %
Lack of recognition of mobility experience in recruitment and career development	39 %	30 %	32 %	59 %
Opportunities for career progression	49 %	34 %	37 %	60 %

Note: The Table A shows the fraction of researchers who have experienced major difficulty, difficulty or slightly difficulty in relation to each of the specific factors.



Table A12. Estimates of logistic regression: the probability of being a person who is currently a mobile researcher.

	Coef.	St.dev.	Sig.
Constant	-2.122	0.161	0.000
Female	-0.168	0.100	0.094
<b>Age group</b>			
24 or under	-0.619	0.285	0.030
25-30	-0.045	0.109	0.678
41 or over	-0.367	0.134	0.006
<b>Main research domain</b>			
Life sciences	0.275	0.105	0.009
Social sciences and humanities	-0.259	0.131	0.048
<b>Type of contract</b>			
Fixed term < 1 year	1.363	0.183	0.000
Fixed term 1-2 year	1.935	0.150	0.000
Fixed term 2+ year	1.206	0.146	0.000
Non-employment contract	1.790	0.171	0.000
Other type of contracts	0.740	0.226	0.001
<b>Country of origin</b>			
Nordic countries	-0.543	0.248	0.029
Other EU27 countries	-0.064	0.107	0.552
Other countries	0.605	0.135	0.000
<b>Barriers and drivers</b>			
Immigration rules (e.g. getting a work visa)	0.326	0.106	0.002
Funding for mobility	-0.840	0.114	0.000
Language	0.333	0.104	0.001
Social/Cultural life	0.718	0.110	0.000
Child care arrangements	-0.396	0.134	0.003
Other caring responsibilities	-0.039	0.126	0.757
Personal relationship	0.019	0.108	0.861
Accommodation	0.340	0.114	0.003
Social security benefits (maintaining/transferring)	0.285	0.134	0.033
Salary (maintaining/transferring)	-0.391	0.126	0.002
Pension rights (maintaining/transferring)	0.123	0.131	0.348
Health care insurance (maintaining/transferring)	0.098	0.129	0.446
Lack of competition-based internationally open recruitment	-0.537	0.136	0.000
Lack of recognition of mobility experience in recruitment and career development	-0.161	0.139	0.247
Opportunities for career progression	0.154	0.125	0.218
-2 Log likelihood			3021.543
Cox & Snell R Square			0.183
Nagelkerke R Square			0.274
Number of observations			3,365

Note: The reference person: male, age group 31-40, physical sciences and engineering as the main research domain, open ended (tenure) contract, and country of origin in EU5.

Table A13. Estimates of logistic regression: the probability of being a person who is not interested in being a mobile researcher at the moment.

	Coef.	St.dev.	Sig.
Constant	-1.236	0.154	0.000
Female	0.062	0.110	0.573
<b>Age group</b>			
24 or under	0.144	0.360	0.689
25-30	0.460	0.140	0.001
41 or over	0.756	0.124	0.000
<b>Main research domain</b>			
Life sciences	-0.105	0.117	0.369
Social sciences and humanities	-0.109	0.133	0.412
<b>Type of contract</b>			
Fixed term < 1 year	-0.400	0.220	0.069
Fixed term 1-2 year	-0.651	0.185	0.000
Fixed term 2+ year	0.051	0.142	0.721
Non-employment contract	-0.423	0.220	0.055
Other type of contracts	0.078	0.218	0.719
<b>Country of origin</b>			
Nordic countries	0.525	0.175	0.003
Other EU27 countries	-0.008	0.110	0.941
Other countries	-1.100	0.225	0.000
<b>Barriers and drivers</b>			
Immigration rules (e.g. getting a work visa)	-0.659	0.128	0.000
Funding for mobility	-0.261	0.119	0.029
Language	-0.417	0.118	0.000
Social/Cultural life	-0.013	0.123	0.915
Child care arrangements	0.723	0.128	0.000
Other caring responsibilities	0.333	0.129	0.010
Personal relationship	0.571	0.117	0.000
Accommodation	-0.805	0.121	0.000
Social security benefits (maintaining/transferring)	-0.225	0.144	0.118
Salary (maintaining/transferring)	0.267	0.137	0.051
Pension rights (maintaining/transferring)	0.152	0.145	0.295
Health care insurance (maintaining/transferring)	-0.322	0.143	0.024
Lack of competition-based internationally open recruitment	0.005	0.147	0.973
Lack of recognition of mobility experience in recruitment and career development	-0.177	0.153	0.246
Opportunities for career progression	-0.208	0.134	0.119
-2 Log likelihood			2727.018
Cox & Snell R Square			0.135
Nagelkerke R Square			0.220
Number of observations			3,365

Note: The reference person: male, age group 31-40, physical sciences and engineering as the main research domain, open ended (tenure) contract, and country of origin in EU5.

Table A14. Estimates of logistic regression: the probability of being a person who has been a mobile researcher in the past.

	Coef.	St.dev.	Sig.
Constant	-0.199	0.140	0.155
Female	-0.146	0.108	0.177
<b>Age group</b>			
24 or under	-1.879	0.604	0.002
25-30	-1.207	0.150	0.000
41 or over	0.256	0.111	0.021
<b>Main research domain</b>			
Life sciences	0.101	0.107	0.347
Social sciences and humanities	-0.722	0.142	0.000
<b>Type of contract</b>			
Fixed term < 1 year	-1.202	0.227	0.000
Fixed term 1-2 year	-1.009	0.166	0.000
Fixed term 2+ year	-0.648	0.140	0.000
Non-employment contract	-1.376	0.236	0.000
Other type of contracts	-0.718	0.225	0.001
<b>Country of origin</b>			
Nordic countries	-0.222	0.185	0.230
Other EU27 countries	-0.126	0.106	0.238
Other countries	-0.974	0.178	0.000
<b>Barriers and drivers</b>			
Immigration rules (e.g. getting a work visa)	0.573	0.108	0.000
Funding for mobility	-0.327	0.113	0.004
Language	0.239	0.109	0.028
Social/Cultural life	0.152	0.116	0.189
Child care arrangements	-0.333	0.127	0.009
Other caring responsibilities	-0.448	0.130	0.001
Personal relationship	-0.257	0.109	0.019
Accommodation	0.838	0.117	0.000
Social security benefits (maintaining/transferring)	-0.017	0.135	0.897
Salary (maintaining/transferring)	-0.358	0.128	0.005
Pension rights (maintaining/transferring)	0.058	0.131	0.657
Health care insurance (maintaining/transferring)	0.246	0.131	0.060
Lack of competition-based internationally open recruitment	-1.033	0.139	0.000
Lack of recognition of mobility experience in recruitment and career development	0.130	0.143	0.365
Opportunities for career progression	-0.059	0.128	0.646
-2 Log likelihood			2894.271
Cox & Snell R Square			0.184
Nagelkerke R Square			0.281
Number of observations			3,365

Note: The reference person: male, age group 31-40, physical sciences and engineering as the main research domain, open ended (tenure) contract, and country of origin in EU5.

Table A15. Estimates of logistic regression: the probability of being a person who would like to be a mobile researcher in the future.

	Coef.	St.dev.	Sig.
Constant	-1.505	0.141	0.000
Female	0.224	0.093	0.016
<b>Age group</b>			
24 or under	1.172	0.256	0.000
25-30	0.444	0.106	0.000
41 or over	-0.712	0.114	0.000
<b>Main research domain</b>			
Life sciences	-0.266	0.103	0.010
Social sciences and humanities	0.697	0.109	0.000
<b>Type of contract</b>			
Fixed term < 1 year	0.220	0.166	0.187
Fixed term 1-2 year	-0.458	0.141	0.001
Fixed term 2+ year	-0.227	0.129	0.078
Non-employment contract	-0.227	0.159	0.154
Other type of contracts	0.189	0.185	0.307
<b>Country of origin</b>			
Nordic countries	-0.222	0.195	0.256
Other EU27 countries	0.142	0.099	0.150
Other countries	0.598	0.132	0.000
<b>Barriers and drivers</b>			
Immigration rules (e.g. getting a work visa)	-0.406	0.099	0.000
Funding for mobility	1.236	0.113	0.000
Language	-0.205	0.096	0.034
Social/Cultural life	-0.744	0.104	0.000
Child care arrangements	-0.019	0.115	0.867
Other caring responsibilities	0.190	0.112	0.090
Personal relationship	-0.287	0.099	0.004
Accommodation	-0.334	0.105	0.001
Social security benefits (maintaining/transferring)	-0.111	0.123	0.367
Salary (maintaining/transferring)	0.421	0.117	0.000
Pension rights (maintaining/transferring)	-0.277	0.124	0.026
Health care insurance (maintaining/transferring)	-0.050	0.121	0.679
Lack of competition-based internationally open recruitment	1.160	0.120	0.000
Lack of recognition of mobility experience in recruitment and career development	0.198	0.124	0.111
Opportunities for career progression	-0.006	0.114	0.960
-2 Log likelihood			3443.694
Cox & Snell R Square			0.241
Nagelkerke R Square			0.331
Number of observations			3,365

Note: The reference person: male, age group 31-40, physical sciences and engineering as the main research domain, open ended (tenure) contract, and country of origin in EU5.

Table A16. The estimated population proportions based on the location of researchers' previous institutional affiliation in the net sample.

<i>Previous affiliation</i>	<i>I am currently a mobile researcher</i>	<i>I am not interested in being a mobile researcher at the moment</i>	<i>I have been a mobile researcher in the past</i>	<i>I would like to be a mobile researcher in the future</i>	<i>Total</i>
Nordic countries	27 216	33 600	25 200	21 504	107 520
EU5	210 344	123 526	186 454	224 911	745 235
Other EU27 countries	54 882	74 546	85 992	138 232	353 652
Total	292 442	231 672	297 646	384 647	1 206 407

Notes: 1) The location of previous institutional affiliation is the country where a researcher worked before his or her current post. 2) Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. 3) EU5: France, Germany, Italy, Spain and United Kingdom. 4) Other EU27 countries (plus Switzerland): EU27 countries not included in the Nordic and the EU5 groups.

## Annex 3 - Additional tables

### 1. Differences between the two survey samples

In the main body of the report we note that there are significant differences between the E-carriers group and the Rindicate group of respondents with respect to mobility status, gender, age and main research domain. Here further details are provided of the analysis. Table B1 below shows the number of researchers by mobility situation without controlling for explanatory variables. In the same table we also present estimated confidence intervals (calculations based on the two binomial proportion comparison method in Bhattacharyya and Johnson (1977, p. 308-312)). The second last column shows the difference between the fraction of researchers in the E-carriers group (E-group in the Tables) and the Rindicate group (R-group in the Tables).

For example, for currently mobile researchers we find that the difference between the two groups is  $27.5\% - 16.5\% = 11.0\%$ , etc. Based on the proportion comparison method, we have then estimated a 95 % confidence interval for this difference in the last column for each mobility group. For currently mobile researchers a 95 % confidence interval for the difference 11.0 % is (7.9 %, 14.1 %).

We see that all the confidence intervals only consist of either negative or positive values. This implies that there are significant differences between the two groups with respect to each mobility status: Researchers in the Rindicate group are less inclined currently a mobile researcher and more reluctant to mobility prospects, they are in a larger degree not interested of being a mobile researcher at the moment, and they have in a larger degree been mobile in the past, compared to those in the E-carriers group.

Table B1. The researchers' mobility situation. The E-carriers group and the Rindicate group.

Mobility status	Number of researchers			Per cent			Proportion method 95 % confidenc e interval	
	E-group	R-group	Total	E-group	R-group	Total	Diff	
I am currently a mobile researcher	624	180	804	27.5 %	16.5 %	23.9 %	11.0 %	(7.9 %, 14.1 %)
I am not interested in being a mobile researcher at the moment	269	351	620	11.8 %	32.1 %	18.4 %	-20.2 %	(-23.0 %, -17.4 %)
I have been a mobile researcher in the past	405	348	753	17.8 %	31.8 %	22.4 %	-14.0 %	(-17.0 %, -11.0 %)
I would like to be a mobile researcher in the future	973	215	1 188	42.8 %	19.7 %	35.3 %	23.2 %	(19.7 %, 26.6 %)
Total	2 271	1 094	3 365	100 %	100 %	100 %		

From Table B2 we see that there are significant differences between the E-carriers group and the Rindicate group with respect to age group, since the confidence intervals only consist of either positive or negative values (except for those with unknown age). We see that about 50 per cent of the researchers in the Rindicate group are 41 years or older, while the same fraction for the other group is only about 20 per cent. Therefore, the Rindicate group consists of older and thus more experienced researchers than the E-carriers group.

Table B2. The researchers' age. The E-carriers group and the Rindicate group.

Age group	Number of researchers			Per cent			Proportion method	
	E-group	R-group	Total	E-group	R-group	Total	Diff.	95 % confidence interval
24 or under	72	19	91	3.2 %	1.7 %	2.7 %	1.4 %	(0.3 %, 2.6 %)
25 – 30	728	195	923	32.1 %	17.8 %	27.4 %	14.2 %	(11.0 %, 17.5 %)
31 – 40	967	313	1 280	42.6 %	28.6 %	38.0 %	14.0 %	(10.5 %, 17.5 %)
41 or over	457	553	1 010	20.1 %	50.5 %	30.0 %	-30.4 %	(-33.7 %, -27.1 %)
Unknown	47	14	61	2.1 %	1.3 %	1.8 %	0.8 %	(-0.2 %, 1.8 %)
Total	2 271	1 094	3 365	100 %	100 %	100 %		

There are significant differences between the E-carriers group and the Rindicate group for those having their background in the Physical Sciences and Engineering, and for those from Social Sciences and Humanities, but not for those from Life Sciences. See Table B3. There are more researchers in the Rindicate group from Physical Sciences and Engineering, and less from Social Sciences and Humanities, compared to the E-carriers group.

Table B3. The researchers' main research domain. The E-carriers group and the Rindicate group.

Main research domain	Number of researchers			Per cent			Proportion method	
	E-group	R-group	Total	E-group	R-group	Total	Diff	95 % confidence interval
Life Sciences	703	315	1 018	31.0 %	28.8 %	30.3 %	2.2 %	(-1.2 %, 5.5 %)
Physical Sciences and Engineering	934	625	1 559	41.1 %	57.1 %	46.3 %	-16.0 %	(-19.6 %, -12.4%)
Social Sciences and Humanities	578	144	722	25.5 %	13.2 %	21.5 %	12.3 %	(9.3 %, 15.2 %)
Unknown	56	10	66	2.5 %	0.9 %	2.0 %	1.6 %	(0.6 %, 2.6 %)
Total	2 271	1 094	3 365	100 %	100 %	100 %		

There are also significant differences between the two groups with respect to gender (except for those with unknown gender). This is seen from Table B4. We see from the table that there are more men (and thus lesser women) in the Rindicate group than in the E-carriers group.

Table B4. The researchers' gender. The E-carriers group and the Rindicate group.

Gender	Number of researchers			Per cent			Proportion method	
	E-group	R-group	Total	E-group	R-group	Total	Diff	95 % confidence interval
Female	846	301	1 147	37.3 %	27.5 %	34.1 %	9.7 %	(6.3 %, 13.2 %)
Male	1 359	771	2 130	59.8 %	70.5 %	63.3 %	-10.6 %	(-14.1 %, -7.2 %)
Unknown	66	22	88	2.9 %	2.0 %	2.6 %	0.9 %	(-0.3 %, 2.0 %)
Total	2 271	1 094	3 365	100.0 %	100.0 %	100.0 %		

Tables B5.1-B5.4 show differences between the Rindicate group and the E-carriers group with respect to mobility status and country of origin. First, from Table B5.1 we see that researchers from EU5 are less currently mobile in the Rindicate group than in the other group. We then see from Table B5.2 that researchers from EU5 and other EU27 countries in the Rindicate group are in a larger degree not interested in being a mobile researcher at the moment. Moreover, Tables B5.3 and B5.4 show that researchers from EU5 and other EU27 countries in the Rindicate group are less interested to be a mobile researcher in the future, but have to a larger degree been a mobile researcher in the past, compared to the corresponding categories in the E-carriers group.

*Table B5.1. The researchers' country of origin by mobility situation. Only researchers who are currently a mobile researcher. The E-carriers group and the Rindicate group.*

Country of origin	E-group		R-group		Proportion method 95 % confidence interval	
	Number	Per cent	Number	Per cent	Difference	
Nordic countries	17	30.4 %	8	4.7 %	25.7 %	(-9.2 %, 60.5 %)
EU5	259	34.9 %	65	13.0 %	21.9 %	(9.4 %, 34.4 %)
Other EU27 countries	209	20.5 %	53	17.4 %	3.1 %	(-8.9 %, 15.1 %)
Other countries	125	31.6 %	46	55.4 %	-23.8 %	(-40.2 %, -7.4 %)
Unknown	14	23.7 %	8	22.2 %	1.5 %	(-35.2 %, 38.2 %)
Total	624	27.5 %	180	16.5 %		

*Table B5.2. The researchers' country of origin by mobility situation. Only researchers who are not interested in being a mobile researcher at the moment. The E-carriers group and the Rindicate group.*

Country of origin	E-group		R-group		Proportion method 95 % confidence interval	
	Number	Per cent	Number	Per cent	Difference	
Nordic countries	7	12.5 %	81	47.6 %	-35.1 %	(-73.5 %, 3.3 %)
EU5	68	9.2 %	156	31.1 %	-22.0 %	(-34.2 %, -9.7 %)
Other EU27 countries	166	16.3 %	95	31.3 %	-14.9 %	(-25.3 %, -4.5 %)
Other countries	17	4.3 %	9	10.8 %	-6.5 %	(-26.6 %, 13.5 %)
Unknown	11	18.6 %	10	27.8 %	-9.1 %	(-45.2 %, 26.9 %)
Total	269	11.8 %	351	32.1 %		

*Table B5.3. The researchers' country of origin by mobility situation. Only researchers who have been a mobile researcher in the past. The E-carriers group and the Rindicate group.*

Country of origin	E-group		R-group		Proportion method 95 % confidence interval	
	Number	Per cent	Number	Per cent	Difference	
Nordic countries	19	33.9 %	41	24.1 %	9.8 %	(-14.4 %, 34.0 %)
EU5	132	17.8 %	178	35.5 %	-17.8 %	(-27.9 %, -7.7 %)
Other EU27 countries	209	20.5 %	95	31.3 %	-10.7 %	(-21.1 %, -0.4 %)
Other countries	32	8.1 %	19	22.9 %	-14.8 %	(-34.3 %, 4.7 %)
Unknown	13	22.0 %	15	41.7 %	-19.6 %	(-54.4 %, 15.2 %)
Total	405	17.8 %	348	31.8 %		



Table B5.4. The researchers' country of origin by mobility situation. Only researchers who would like to be a mobile researcher in the future. The E-carriers group and the Rindicate group.

Country of origin	E-group		R-group		Proportion method	
	Number	Per cent	Number	Per cent	Difference	95 % confidence interval
Nordic countries	13	23.2 %	40	23.5 %	-0.3 %	(-26.8 %, 26.2 %)
EU5	284	38.2 %	102	20.4 %	17.9 %	(7.2 %, 28.5 %)
Other EU27 countries	434	42.6 %	61	20.1 %	22.6 %	(9.4 %, 35.7 %)
Other countries	221	55.9 %	9	10.8 %	45.1 %	(11.9 %, 78.3 %)
Unknown	21	35.6 %	3	8.3 %	27.3 %	(-29.3 %, 83.8 %)
Total	973	42.8 %	215	19.7 %		

We have also examined whether there are significant differences between respondents from the Rindicate and the E-carriers groups with respect to mobility status *if we control for several explanatory variables*.

In Table A1 in Annex A we have estimated the probability for being a person who is currently a mobile researcher, where we do not include any of the interaction terms between the explanatory variables in the regression. Table B6 shows the results from the *Rindicate* variable for each of the four mobility groups where we account for interaction terms between all the explanatory variables in the regression. The table only shows the estimated results for the *Rindicate* variable.

It follows from Table B6 that we have a negative effect of the *Rindicate* variable on the probability for being a person who is currently a mobile researcher, but the last column in the table (i.e. the Sig. column) shows that the effect of this variable is not significant at the 5 per cent significance level (since the value in the cell is greater than 5 % = 0.05). The effect of the *Rindicate* variable on the probability of being a person who is not interested in being a mobile researcher at the moment is positive and significant at the 1 per cent level. We also find that the effect of this variable on the probability of being a person who has been a mobile researcher in the past is positive and significant at the 5 per cent level (but not at the 1 per cent level, since the value in the cell is 2.3 % = 0.023, which is between 1 % = 0.01 and 5 % = 0.05). Moreover, the effect of the *Rindicate* variable on the probability of being a person who would like to be a mobile researcher in the future is negative and significant at the 1 per cent level.

These results show that researchers in the Rindicate group have a higher probability of being a person who is *not* interested in being a mobile researcher at the moment, a higher probability of being a person who has been a mobile researcher in the past, and a lower probability of being a person who would like to be a mobile researcher in the future, compared to researchers in the E-carriers group.

Table B6. Estimates of logistic regression for the *Rindicate* variable: the probability of being a person by mobility status.

<i>Mobility situation</i>	<i>Coef.</i>	<i>St.dev.</i>	<i>Sig.</i>
I am currently a mobile researcher	-0.188	0.113	0.097
I am not interested in being a mobile researcher at the moment	1.007	0.112	0.000
I have been a mobile researcher in the past	0.241	0.106	0.023
I would like to be a mobile researcher in the future	-0.903	0.105	0.000
Number of observations			3,365

Notes: 1) The table only shows the estimated results for the *Rindicate* variable. 2) The *Rindicate* variable and the reference person are defined in the same way as in Table A1 (see the notes in Table A1).

## 2. Selected analyses by region of origin

In the following tables we provide further analysis by country of origin (broken into the four groups explained in the main text).

Table C1. The researchers' country of origin by type of contract. Only researchers who are currently a mobile researcher. The *E-carriers* group and the *Rindicate* group.

	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	Total
Fixed term < 1 year	8 %	11 %	10 %	8 %	23 %	10 %
Fixed term 1-2 year	20 %	30 %	30 %	25 %	0 %	28 %
Fixed term 2+ year	16 %	23 %	22 %	24 %	9 %	22 %
Non-employment contract	20 %	18 %	13 %	22 %	0 %	17 %
Open ended (tenure) contract	36 %	13 %	19 %	12 %	14 %	15 %
Other type of contracts	0 %	5 %	4 %	5 %	0 %	4 %
Unknown contracts	0 %	1 %	2 %	4 %	55 %	4 %
Total	100 %	100 %	100 %	100 %	100 %	100 %
Number	25	324	262	171	22	804

*Table C2. The researchers' country of origin by type of contract. Only researchers who are not interested in being a mobile researcher at the moment. The E-carriers group and the Rindicate group.*

	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	Total
Fixed term < 1 year	2 %	9 %	3 %	4 %	5 %	5 %
Fixed term 1-2 year	5 %	10 %	8 %	12 %	0 %	8 %
Fixed term 2+ year	15 %	17 %	23 %	27 %	0 %	19 %
Non-employment contract	1 %	9 %	4 %	4 %	5 %	5 %
Open ended (tenure) contract	63 %	44 %	57 %	42 %	38 %	52 %
Other type of contracts	11 %	7 %	3 %	12 %	0 %	6 %
Unknown contracts	3 %	4 %	3 %	0 %	52 %	5 %
Total	100 %	100 %	100 %	100 %	100 %	100 %
Number	88	224	261	26	21	620

*Table C3. The researchers' country of origin by type of contract. Only researchers who have been a mobile researcher in the past. The E-carriers group and the Rindicate group.*

	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	Total
Fixed term < 1 year	10 %	5 %	3 %	2 %	0 %	4 %
Fixed term 1-2 year	7 %	11 %	6 %	14 %	0 %	9 %
Fixed term 2+ year	10 %	15 %	16 %	14 %	4 %	14 %
Non-employment contract	0 %	3 %	4 %	6 %	0 %	3 %
Open ended (tenure) contract	62 %	60 %	65 %	57 %	54 %	62 %
Other type of contracts	8 %	4 %	3 %	6 %	7 %	4 %
Unknown contracts	3 %	2 %	3 %	2 %	36 %	4 %
Total	100 %	100 %	100 %	100 %	100 %	100 %
Number	60	310	304	51	28	753


*Table C4. The researchers' country of origin by type of contract. Only researchers who would like to be a mobile researcher in the future. The E-carriers group and the Rindicate group.*


	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	Total
Fixed term < 1 year	6 %	13 %	9 %	9 %	8 %	10 %
Fixed term 1-2 year	9 %	14 %	13 %	18 %	4 %	14 %
Fixed term 2+ year	9 %	17 %	18 %	20 %	0 %	17 %
Non-employment contract	2 %	15 %	11 %	11 %	0 %	12 %
Open ended (tenure) contract	64 %	31 %	38 %	28 %	17 %	35 %
Other type of contracts	6 %	7 %	7 %	10 %	4 %	8 %
Unknown contracts	4 %	3 %	5 %	3 %	67 %	5 %
Total	100 %	100 %	100 %	100 %	100 %	100 %
Number	53	386	495	230	24	1 188


*Table C5. The researchers' country of origin by type of contract. All researchers. The E-carriers group and the Rindicate group.*


	Nordic countries	EU5	Other EU27 countries	Other countries	Unknown	Total
Fixed term < 1 year	6 %	10 %	7 %	8 %	8 %	8 %
Fixed term 1-2 year	8 %	17 %	14 %	20 %	1 %	15 %
Fixed term 2+ year	12 %	18 %	19 %	21 %	3 %	18 %
Non-employment contract	3 %	12 %	8 %	14 %	1 %	10 %
Open ended (tenure) contract	60 %	36 %	44 %	26 %	32 %	39 %
Other type of contracts	8 %	6 %	5 %	8 %	3 %	6 %
Unknown contracts	3 %	2 %	3 %	3 %	52 %	4 %
Total	100 %	100 %	100 %	100 %	100 %	100 %
Number	226	1 244	1 322	478	95	3 365

## Annex 4: Profiles of 16 Highly Mobile Researchers


	<p><b>Profile 1</b>  Male, age 41 or over  Norwegian  Married with children</p>
Professional status	Professor with more than 15 yrs experience
Contract	Full time, open ended contract at University in <b>Norway</b>
Salary	€40,000+
Scientific domain	Physical Sciences and Engineering
History of mobility	Been mobile 3-5 times. Most recent period of mobility 6-10 yrs ago in <b>North America for less than 1 year</b>
Source of funding for recent mobility	1) Funding from home institute and The Research Council of Norway (extra mobility grant)
Most important factors that influenced recent mobility	Availability of research facilities/equipment, to increase network of contacts, personal development and other (Sabbatical every 5th year at present employer) were <b>very important</b> . Career opportunities and personal relationship reasons were <b>important</b> .
Difficulties encountered	<b>Slight difficulty</b> with Immigration rules (e.g. getting a work visa), Child care arrangements, other caring responsibilities and maintaining/ transferring social security benefits and health care insurance. No other difficulties.
Opinion on optimum levels of mobility	Thinks should be mobile 1-2 times in early stage, 1-2 times in mid-stage and 3-4 times in later stage - as " <i>Mobility fosters creativity and the inspiration to go on in a demanding researcher job. International cooperation is still mainly based on mobility, despite all the electronic possibilities that exist</i> "
General views on mobility	Thinks mobility is of great benefit as " <i>Very few researchers can remain productive without discussion and the stimulation provided by researcher mobility</i> ".


	<p><b>Profile 2</b>  Female, age 41+  UK  Single with 1 child</p>
Professional status	Senior Lecturer with more than 15 yrs experience
Contract	Full time, open ended contract at University in <b>UK</b>
Salary	€40,000+
Scientific domain	Life Sciences
History of mobility	Been mobile 3-5 times. Most recent mobility was 3-5 years ago for longer than 2 years, <b>within UK.</b>
Source of funding for recent mobility	Unknown
Most important factors that influenced recent mobility	Availability of research facilities/equipment, To enter a new area of research, Career opportunities, Obligated to be mobile as part of my contract were <b>very important</b>
Difficulties encountered	Funding for mobility, Personal relationship, maintaining/ transferring Pension rights and Health care insurance were <b>major difficulties.</b> Child care arrangements were a <b>difficulty</b> and social/ cultural life and maintaining/ transferring social security benefits have been a <b>slight difficulty</b>
Opinion on optimum levels of mobility	Thinks optimum levels of mobility are 1-2 times at all stages of career for "exposure to other research practices" and "widening cultural experience"
General views on mobility	Would consider another mobility for promotional opportunities. Considers mobility to be of some benefit and that <i>"cannot maintain research profile without exposure to other research regimes"</i>


	<p><b>Profile 3</b>  Female, age 31-40  Danish  Married with children</p>
Professional status	Associate professor with 5-7 years experience
Contract	Full time, open ended contract at University in <b>Norway</b>
Salary	Unknown
Scientific domain	Physical Sciences and Engineering
History of mobility	Most recently mobile 3-5 years ago in <b>Denmark</b> for <b>longer than 2 years</b> . Source of information was colleagues/ personal network.
Source of funding for recent mobility	The Danish Natural Research Council and Carlsbergfondet (Denmark)
Most important factors that influenced recent mobility	To increase network of contacts, personal development and availability of research facilities/equipment were <b>very important</b> . Obligated to be mobile as part of contract, personal relationship reasons, career opportunities and to enter a new area of research were <b>important</b> . Better economic opportunities were <b>slightly important</b> .
Difficulties encountered	Maintaining / transferring pension rights was a <b>difficulty</b> . Child care arrangements, other caring responsibilities, Personal relationship and accommodation were <b>slight difficulties</b>
Opinion on optimum levels of mobility	Thinks optimum levels of mobility are 1-2 times at all stages of career because: " <i>mobility in early stage career is needed in order to get a good start in research work after completing a doctorate degree.. "(in my opinion postdoctoral grants for 6 months are useless for most people). I hold the same view about mobility in middle stage of career, namely 1 at most 2 longer periods. Here the focus would be on building a network of collaborators, and entering well into specific topics of research"</i> .
General views on mobility	Would not consider another mobility as would not wish to " <i>force husband to find an interesting job in a new country. But perhaps later, in 10 years or so, I would consider visiting a different institution as a guest researcher (as part of a sabbatical) for a shorter length of time, say 6 months"</i> ...voluntarily chosen mobility is of personal benefit to researchers, as mobility is more or less a prerequisite for developing a good network of research collaborators and for getting a permanent job in academia. Too much and perhaps forced mobility dictated by economic interests from the part of the institutions need not be beneficial for the individual researcher".


	<p><b>Profile 4</b>  Male, age 41+  French  Married with grown-up children</p>
Professional status	Research Director in <b>French</b> Research Institute
Contract	Open ended, full time
Salary	€40,000 or higher
Scientific domain	Life Sciences
History of mobility	Been mobile 3-5 times. Last period of mobility was 6-10 years ago within <b>France</b> for <b>longer than 2 years</b>
Source of funding for recent mobility	Various (research councils, research institute)
Most important factors that influenced recent mobility	To enter a new area of research and Personal development were <b>very important</b> . Availability of research facilities/equipment, career opportunities, personal relationship reasons and increasing network of contacts were all <b>important</b> .
Difficulties encountered	Lack of recognition of mobility experience in recruitment and career development, maintaining / transferring pension rights were <b>major difficulties</b> . Immigration rules (e.g. getting a work visa) was <b>slight difficulty</b>
Opinion on optimum levels of mobility	Thinks optimum levels of mobility are 1-2 times at all stages of career as <i>"it is very fruitful to move from abroad when you are young. Most of the European research budget should go to PhD and postdoc fellowships, not to fashion thematic for which all the national agencies launch calls simultaneously. Mixing people early in their career is easier (no kids) and much more fruitful to build a solid and long-term networking. Later on, it may strengthen collaborations"</i> .
General views on mobility	Is of great benefit





	<p><b>Profile 5</b>  Female, age 41+  Spanish  Married with 4 children</p>
Professional status	Senior Scientist in research institute in <b>Spain</b> . More than 15 years experience
Contract	Full time, open ended
Salary	30-40k
Scientific domain	Life Sciences
History of mobility	Been mobile 3-5 times. Last period was 6-10 years ago in the <b>UK</b> for <b>less than 3 months</b> . Through colleagues/ personal network
Source of funding for recent mobility	National Government
Most important factors that influenced recent mobility	Career opportunities and personal development were <b>very important</b> ; Availability of research facilities/equipment, To enter a new area of research and to increase network of contacts were <b>important</b> . Social / cultural life, personal relationship reasons were <b>slightly important</b>
Difficulties encountered	Child care arrangements were a <b>major difficulty</b> . Salary (maintaining/transferring) was a <b>difficulty</b> . Immigration rules (e.g. getting a work visa), Funding for mobility, Other caring responsibilities, Accommodation, Social security benefits and Health care insurance (maintaining/transferring) were <b>slight difficulties</b> . Would consider another mobility but " <i>Extreme difficulties for me right now are making family life and mobility compatible. Would need a supplemented salary to be able to have my family with me</i> ".
Opinion on optimum levels of mobility	Thinks optimum levels of mobility are 1-2 times in early stage; 3-4 mid and later stage: " <i>Moving too much can be detrimental. During the late stage short term mobilities are very convenient and more compatible with PI responsibilities. 1 or 2 long term mobilities are also conceivable during the late stage</i> ".
General views on mobility	<i>"Gives new perspectives. Is good for learning new technologies and approaches. Provides opening of the mind and motivation for experienced scientists. Improves opportunities for international collaboration...convenient for being professionally mature. Promotes collaboration and networking. Important to see science from different perspectives and to learn multiple methodologies and approaches"</i> .


	<p><b>Profile 6</b>  Male, age 41+  US  Married with 2 children</p>
Professional status	Professor, employed at University in <b>Germany</b>
Contract	Full time, open ended
Salary	40k+
Scientific domain	Physical Sciences and Engineering
History of mobility	Been mobile 3-5 times. Most recently in <b>UK</b> , 6-10 years ago for <b>more than 2 years</b>
Source of funding for recent mobility	Unknown
Most important factors that influenced recent mobility	Career opportunities and personal development were very important and <i>"it was the only way to get a job". "In my field... it is necessary to put in 3-6 years of postdoc time, typically abroad"</i> .
Difficulties encountered	Personal relationship was a <b>major difficulty</b> and <i>"was not allowed to vote in UK national elections, which decided my taxes"...It is difficult to maintain two careers in a family while being a mobile researcher"</i> .
Opinion on optimum levels of mobility	1-2 times in early & mid stages. 3-4 times in later stage: <i>"Postdocs abroad broaden the (mental) horizon. But also as a permanent staff one should be able to go elsewhere to establish new contacts and develop new ideas"</i> .
General views on mobility	<i>"It is very good for the development of research ideas and projects to be able to go abroad regularly... If you always stay in the same place you stagnate intellectually"</i> .


	<p><b>Profile 7</b>  Male, age 41+  Hungarian  Married with child/children</p>
Professional status	Senior Research Fellow in <b>Hungary</b> - more than 15 years experience
Contract	Open ended, part time (less than 50%)
Salary	Less than 20,000
Scientific domain	Physical Sciences & Engineering (Nuclear Research)
History of mobility	Been mobile more than 5 times. Most recently more than 10 years ago in <b>France</b> for <b>up to 1 year</b> . Through colleagues/ personal network
Source of funding for recent mobility	Other (unspecified)
Most important factors that influenced recent mobility	Availability of research facilities/equipment was <b>very important</b> ; to enter a new area of research and better economic opportunities were <b>important</b> ; career opportunities, personal relationship reasons and to increase network of contacts were <b>slightly important</b>
Difficulties encountered	Funding for mobility was a <b>difficulty</b> ; Immigration rules (e.g. getting a work visa). Language, child care arrangements, Lack of competition-based internationally open recruitment and Lack of recognition of mobility experience in recruitment and career development were <b>slight difficulties</b>
Opinion on optimum levels of mobility	Would consider another mobility as " <i>better conditions for experimental research of my field exist abroad</i> ". Thinks optimum levels of mobility are 1-2 times in early & mid stage career and 3-4 times in later stage: " <i>too many times of being mobile makes family life and creation of social existence difficult, on the other hand, not being mobile at all would prevent us from being part of international research</i> ".
General views on mobility	<i>"Opens up possibility for being involved in other type of research fields, on the other hand, makes family life more difficult"</i> .

	<p><b>Profile 8</b>  Male, age 25-30  Spanish  Single, no children</p>
Professional status	Researcher at Research Institute in <b>France</b>
Contract	Open ended, full time
Salary	20-30K
Scientific domain	Physical Sciences and Engineering
History of mobility	Been mobile researcher 3-5 times. Most recently in <b>Germany for longer than 2 years</b> , less than 3 years ago. Through colleagues / personal network.
Source of funding for recent mobility	Other (not specified)
Most important factors that influenced recent mobility	To enter a new area of research and Personal development were <b>very important</b> ; Availability of research facilities/equipment was <b>important</b> ; career, better economic opportunities, for personal relationship reasons, to increase network of contacts were <b>slightly important</b>
Difficulties encountered	<b>Major difficulties</b> were Pension rights (maintaining/transferring), Lack of competition-based internationally open recruitment and Lack of recognition of mobility experience in recruitment and career development. <b>Difficulties</b> were Personal relationship, Social security benefits (maintaining/transferring) and Health care insurance (maintaining/transferring). Language, accommodation, Salary (maintaining/transferring) were <b>slight difficulties</b> .
Opinion on optimum levels of mobility	Thinks optimum levels of mobility are 1-2 times in early & mid stages of career and 3-4 times in later stages. Reason given: <i>"Important to improve mobility among senior researchers for LONG periods. During early stage[...] important to enable solid and lasting research activities. One year funding is sometimes not enough to develop a good research activity, considering moving and settling down"</i> .
General views on mobility	Would consider another mobility as does not see self <i>"as settled completely and I can conceive moving on after some years, even if the current position is life-long. Says mobility is of great benefit.</i>


	<p><b>Profile 9</b>  Female, age 31-40  Austrian  Single, no children</p>
Professional status	Works at University in <b>France</b> ; 8-10 years experience
Contract	Open ended, full time
Salary	20,000 - 30,000
Scientific domain	Physical Sciences and Engineering
History of mobility	Been mobile researcher 1-2 times. Most recently less than 3 years ago in <b>France</b> for <b>less than 6 months</b> . Through contacts at previous department/ institution
Source of funding for recent mobility	EU Programme
Most important factors that influenced recent mobility	To enter a new area of research, Career opportunities, To increase my network of contacts were all <b>very important</b> . Personal development was <b>important</b> . Better economic opportunities and Availability of research facilities/equipment were <b>slightly important</b>
Difficulties encountered	Language, social / cultural life, maintaining/ transferring social security benefits and pension rights were <b>major difficulties</b> . Accommodation, Lack of recognition of mobility experience in recruitment and career development and opportunities for career progression were <b>difficulties</b> . Personal relationship was <b>slight difficulty</b>
Opinion on optimum levels of mobility	1-2 times at early-mid stage; 3-4 times at later stage - as thinks <i>"it is useful to be mobile in the beginning and then after, say, every 5 years. But I don't see that working well while having under-age children and it would very likely be damaging to the pension if it is not part of a sabbatical"</i> .
General views on mobility	Thinks mobility is <i>"certainly of benefit but being forced to be mobile at a precise time leads to big financial and personal problems that also impact the research"</i> .


	<p><b>Profile 10</b>  Male, age 31-40  UK  Married with child</p>
Professional status	Reader in Research at <b>UK</b> university with 11-15 years of experience
Contract	Open ended, full time
Salary	40,000 or higher
Scientific domain	Life Sciences
History of mobility	Been mobile researcher 1-2 times; most recently in <b>Germany</b> 6-10 years ago, for <b>more than 2 years</b> . Through colleagues/ personal network
Source of funding for recent mobility	Other (not specified)
Most important factors that influenced recent mobility	Availability of research facilities/equipment was <b>very important</b> . To enter a new area of research, social /cultural life, to increase network of contacts and career opportunities were <b>important</b> . Better economic opportunities and personal development were <b>slightly important</b> .
Difficulties encountered	Pension rights (maintaining/transferring) was a <b>major difficulty</b> . Social/Cultural life and Personal relationship were <b>difficulties</b> . Funding for mobility, language and Social security benefits (maintaining/transferring) were <b>slight difficulties</b>
Opinion on optimum levels of mobility	None in early stage, 1-2 times in mid stage and none in late stage of career. Reasoning is that: <i>"There are typically more opportunities in ones "home" country for funding for graduate studies. It gets harder as you get older. Once or twice is plenty. It should NEVER be a requirement - scientific excellence is all that matters - it's not where but what you do. You won't become an internationally competitive scientist by moving around"</i> .
General views on mobility	<i>"... a great opportunity for professional and personal development. It could also be a great thing for the family for 1-2 year.. gives huge benefits to the person in terms of both science and cultural aspects"</i>


	<p><b>Profile 11</b>  Male, age 25-30  Spanish  Unspecified, no children</p>
Professional status	Doctorate student, funded by grant
Contract	N/A
Salary	0-20,000
Scientific domain	Physical Sciences and Engineering
History of mobility	Has been mobile researcher 1-2 times, most recently in <b>Sweden for less than 3 months</b> ; less than 3 years ago. Through current department/ institution
Source of funding for recent mobility	Current employer
Most important factors that influenced recent mobility	Personal development was very important. To increase network of contacts and availability of research facilities/equipment were important. To enter a new area of research was slightly important
Difficulties encountered	Salary (maintaining/transferring) and lack of recognition of mobility experience in recruitment and career development were <b>major difficulties</b> . Personal relationship, accommodation, lack of competition-based internationally open recruitment and opportunities for career progression were <b>difficulties</b> . Funding, language, social security benefits (maintaining/transferring) were <b>slight difficulties</b>
Opinion on optimum levels of mobility	1-2 times in early and mid stage career; 3-4 times in later stage
General views on mobility	<p><i>"I am forced to become a mobile research. The ideal curriculum for a person intended to enter in a Spanish University includes a two-years period research developed in a University abroad. From my personals experience, the main issues here [include...] The lack of grants/fellowships programmes...from the scientific point of view, mobility provides great benefits to the researcher. From the personal point of view, it is sometimes hard to spend a large period outside your country/home. The situation becomes worst when you add the lack of funding and that, as for my area of research, there are almost no options to stay in Europe. Consequently, I found myself force to leave to the United States (something that I dislike)" (sic).</i></p>


	<p><b>Profile 12</b>  Female, age 41+  Austrian  Single, no children</p>
Professional status	Professor at university in <b>Austria</b>
Contract	Full time, open ended
Salary	40,000 +
Scientific domain	Social Sciences and humanities
History of mobility	Been mobile 3-5 times. Most recently in <b>Asia for up to 3 months</b> , 6-10 years ago. Through colleagues/ personal network
Source of funding for recent mobility	Unspecified
Most important factors that influenced recent mobility	To enter a new area of research, Career opportunities, To increase my network of contacts and personal development were <b>very important</b> . Social/ cultural life was <b>important and</b> personal relationship reasons were <b>slightly important</b> .
Difficulties encountered	Pension right were major difficulty, immigration rules, social/cultural life, social security benefits, salary, health care insurance and lack of recognition of mobility experience in recruitment and career development were <b>slight difficulties</b>
Opinion on optimum levels of mobility	1-2 times early stage, 3-4 times, mid stage and 1-2 times later stage.
General views on mobility	<i>"Although mobility is not easy in the EU (you loose every time you cross the borders of your country pensions rights, that means that you are punished for mobility when you are old!), but international contacts and experiences are very important for an academic career"</i>



	<p><b>Profile 13</b>  Female, age 31-40  Portuguese  Single, no children</p>
Professional status	Manager for funding agency in <b>Portugal</b>
Contract	Fixed term < 1 year
Salary	20-30,000
Scientific domain	Life sciences
Mobility experience	Been mobile 3-5 times. Most recently mobile less than 3 years ago. In <b>Germany</b> for more than 2 years. Found through newspapers / magazines
Funding for recent mobility	National Government:
Most important factors influencing mobility	Obliged to be mobile as part of contract was <b>very important</b> . Availability of research facilities/equipment, to enter a new area of research, career and better economic opportunities and personal relationship reasons were <b>important</b> . Social/ cultural life was <b>slightly important</b> .
Difficulties encountered	Accommodation, maintaining/ transferring salary, pension rights and healthcare insurance and opportunities for career progression were <b>major difficulties</b> . Lack of recognition of mobility experience in recruitment and career development, funding, language. social / cultural life, other caring responsibilities, personal relationships and maintaining/ transferring social security benefits were <b>difficulties</b> . Immigration rules were a <b>slight difficulty</b> . States: " <i>The major difficulties are Pension rights and social security benefits (unemployment, etc) that are non existent for many fellowships around Europe..</i> "
Views on mobility	<i>"... my choice was due to an opportunity to change career... I consider mobility for career development, better payment and personal reasons".</i>

	<p><b>Profile 14</b>  Male, 31-40  Slovakian  Married with 2 children</p>
Professional status	Employed at Academy of Sciences in <b>Slovakia</b> . 8-10 years experience.
Contract	Full time, open ended contract
Salary	< 20,000
Scientific domain	Life Sciences
Mobility experience	Been mobile 3-5 times. Most recently in The <b>Netherlands</b> for up to 3 months, less than 3 years ago. through current department / institute.
Funding for recent mobility	EU programme
Most important factors influencing mobility	Availability of research facilities/equipment, For personal relationship reasons, personal development and "better financial sources for research as in home country" were <b>very important</b> . To increase network of contacts was <b>important</b> and to enter a new area of research, career opportunities and better economic opportunities were <b>slightly important</b> .
Difficulties encountered	Childcare arrangements were a <b>major difficulty</b> , lack of competition-based internationally open recruitment and funding for mobility were <b>difficulties</b> . Lack of recognition of mobility experience in recruitment and career development and opportunities for career progression were <b>slight difficulties</b> .
Opinion on optimum levels of mobility	5+ times at all stages of career
Views on mobility	Would consider another mobility because " <i>started projects with foreign colleagues, sharing of material, work and outputs, weak financial support in home country, weak granting of equipment of laboratories in home institution...</i> " <i>my profession is rather rare and therefore contact with foreign colleagues have crucial importance, there are few people in Europe or all the world working on such topic, exchange of knowledge personally will improve my personal experience and support accepting of publications and results"</i>

	<p><b>Profile 15</b>  Female, age 41+  Polish  Single, no children</p>
Professional status	Associate Professor in <b>Poland</b>
Contract	Full time, 3 year contract funded by EU fellowship
Salary	0-20,000
Scientific domain	Physical sciences and engineering
Mobility experience	Been mobile 3-5 times. Most recently in the UK, 6-10 years ago for 1-2 years
Funding for recent mobility	University funds
Most important factors influencing mobility	Personal development was <b>very important</b> , Availability of research facilities/equipment, to enter a new area of research and career opportunities were <b>important</b> . To increase network and better economic opportunities were <b>slightly important</b> .
Difficulties encountered	<p><i>"No openings and lack of possibilities of personal development at Polish universities after my return" Major difficulty was "TOTAL lack of recognition of mobility experience in recruitment and career development after my return to Poland". Other difficulties were maintaining / transferring healthcare insurance, pension rights and social security benefits. "Due to my previous mobility... I DO have MAJOR problems in Poland. Those who have never left Poland or have been 'on leave' all the time are in much better career position in spite of having worse credentials... There are NO OPENINGS for mobile people, I still do not have truly stable position"</i></p>
Opinion on optimum levels of mobility	Does not advocate mobility: <i>"That is not normal, however (according to my personal experience) that gives the best career opportunities in Poland".</i>
Views on mobility	<p><i>"... my choice was due to an opportunity to change career [...] I consider mobility for career development, better payment and personal reasons". Would not consider another period of mobility because "each mobile period deteriorates my career opportunities in Poland".</i></p>

	<p><b>Profile 16</b>  Female, age 25-30  Italian  Married, no children</p>
Professional status	Researcher at university in <b>Italy</b>
Contract	Fixed term 1-2 years
Salary	0-20,000
Scientific domain	Social Sciences and humanities
Mobility experience	Been mobile 3-5 times. Most recently in the UK less than 3 years ago, for up to 6 months, through colleagues / personal network.
Funding for recent mobility	Current employer
Most important factors influencing mobility	Availability of research facilities/equipment, to enter new area of research, career opportunities and personal relationship reasons were <b>very important</b> . Better economic opportunities, social/ cultural life, to increase network of contacts and personal development were <b>important</b> .
Difficulties encountered	Maintaining/ transferring social security benefits was a <b>major difficulty</b> , lack of competition-based internationally open recruitment and lack of recognition of mobility experience in recruitment and career development were <b>difficulties</b> : <i>"The major problem for being hired in the UK is related to opening a NI number. It is a clear obstacle for contracts of short period"</i> .
Opinion on optimum levels of mobility	Thinks mobility levels should be 3-4 times at early and mid stage and 5+ times in later stage
Views on mobility	To <i>"visit different countries and structures for research, meeting researcher interested in your same topics, maybe from other point of views, is a very enriching experience"</i> .

## Annex 5: Aide Memoire

An aide memoire has been developed to facilitate interviews with research managers to acquire the institutional perspective on the issues in the study.

- 1) What do you consider to be the *main impediments* to cross border researcher mobility within the EU? (long and short term)
- 2) How do you think these could be *addressed*? (At what level etc.)
- 3) What does your organisation do to *promote* inward/outward mobility?
- 4) Do you think there is an *optimum level* of mobility? (For your institute?)
- 5) Do you consider cross-sectoral mobility to be important? Do you think this is facilitated by any policy measures?
- 6) What do you think are the *positive impacts* of mobility (to all concerned)?
- 7) What do you think are the *negative impacts* (to all concerned)?
- 8) Do you think mobility should be encouraged?
- 9) How to encourage?
- 10) Are you aware of any national / international policies to encourage researcher mobility?
- 11) Are you aware of any sources of funding for researcher mobility?
- 12) Does EU funding help or hinder you in facilitating mobility?
- 13) Do you think there should be a more uniformed regulation for mobile researchers?  
How do you think this could be achieved?

### Further questions

- 14) Are there any procedures in place for re-employment of returning researchers at your institute?
- 15) Are you aware of any problems relating to of pensions and other social security issues for mobile researchers?
- 16) Do you think there are any difficulties faced in terms of promotion prospects / pay levels etc. by mobile researchers?

## **Annex 6: List of interviewees**

### **Krzysztof Abramski**

Full Professor, Faculty of Electronics, Wrocław University of Technology, Poland

### **Karl Erik Brofoss**

Programme Director at NIFU STEP, Norway

### **Christian Carter**

HR Policy Department, University of Bristol, UK

### **Professor Stephen Dunnett**

Professor at the School of Biosciences, Cardiff University, UK

### **Professor Jakob Edler**

Research Director of the Manchester Institute of Innovation Research from 1<sup>st</sup> August 2007, formerly of Fraunhofer ISI, Germany

### **Volodymyr Hutsaylyuk**

Associate Professor in Department of Mechanical Engineering, Military University of Technology, Warsaw, Poland

### **Inge Jonckheere**

Science Programme Manager: EUROCORES Programme Coordinator for Environmental Sciences. Responsible coordinator for EuroDEEP and EuroDIVERSITY Programmes. BiodivERSA and EUFAR ESF Management Committee Representative at European Science Foundation, France

### **Nikodem Kuznik**

Associate Professor in Chemistry Department, Silesian University of Technology, Poland

### **Jordi Molas-Gallart**

Research Professor at INGENIO, a joint research centre of the Spanish Higher Council for Scientific Research (CSIC) and the Universitat Politècnica de València (UPV), Spain

### **Catherine Paradeise**

Professeur at l'Université de Marne-la-Vallée, formerly deputy director of the social sciences department at the National Center of Scientific Research (CNRS), France

### **Vello Pettai**

Head of large scale research project at University of Tallin, Estonia

### **Clément Sire**

Research Director at CNRS, France

# Annex 7: Extrapolation methodology: A method for estimating the population proportions

## 1. Introduction

We denote  $x_1$  as the number of researchers in group 1 in the (net) sample (see Table 1),  $x_2$  as the number of researchers in group 2 in the sample,  $x_3$  as the number of researchers in group 3 in the sample, and  $x_4$  as the number of researchers in group 4 in the sample. Here we have that  $x_1 = 804$ ,  $x_2 = 620$ ,  $x_3 = 753$ , and  $x_4 = 1,188$ . Thus,  $x_i$  denotes the number of researchers in group  $i$  in the sample,  $i = 1, 2, 3, 4$ . If  $n$  denotes the total number of researchers in the whole sample ( $n = 3,365$ ), then we have that

$$(1) \quad n = \sum_{i=1}^4 x_i.$$

Further, we denote  $M_1$  as the number of researchers in group 1 in the population,  $M_2$  as the number of researchers in group 2 in the population,  $M_3$  as the number of researchers in group 3 in the population, and  $M_4$  as the number of researchers in group 4 in the population. In our analysis the population consists of all researchers in EU27. Suppose that  $N$  denotes the total number of researchers in the population, and  $M_i$  denotes the number of researchers in group  $i$  in the population,  $i = 1, 2, 3, 4$ . Then, we have the following relationship:

$$(2) \quad N = \sum_{i=1}^4 M_i.$$

We define the fraction of researchers who are included in group  $i$  in the population for  $p_i$ . It follows that

$$(3) \quad p_i = \frac{M_i}{N},$$

where  $i = 1, 2, 3, 4$ . Our methodological problem is that we do not know the number of researchers who are included in each of the 4 groups for the whole population, i.e. we

do not know the size of  $M_i$ . Therefore we can not calculate the fraction  $p_i$ , even if we know the size of  $N$ .

One possible method of estimating  $p_i$ , is to use the following estimator of  $p_i$  :

$$(4) \hat{p}_i = \frac{x_i}{n},$$

where  $i = 1, 2, 3, 4$ . The problem with this method is that we do not account for possible significant differences between the sample and the population with respect to gender, age, main research domain, etc. The researchers in the sample may for example be older than the researchers in the population, which may have an effect on the number of mobile researchers in the population relative to the number of mobile researchers in the sample. In the next subsection we will develop a method where we try to account for such differences.

## **2. Methodology**

This subsection is based on Section 16.10 in Bhattacharyya and Johnson (1977). Suppose that each group in the sample and the population are divided into different strata. More precisely, group  $i$  in the sample and the population is divided into  $h$  strata. Each stratum consists of a homogenous group of researchers: same gender, age, main research domain, etc. As an example one stratum may consists of female researchers in the age group 31-40 with the main research domain within life sciences.

Assume that  $x_{ij}$  is the number of researchers in group  $i$  in stratum  $j$  in the sample, and that  $n_j$  is the total number of researchers in stratum  $j$  in the sample,  $i = 1, 2, 3, 4$ ,  $j = 1, 2, \dots, h$ . We have that

$$(5) x_i = \sum_{j=1}^h x_{ij},$$



$$(6) \quad n_j = \sum_{i=1}^4 x_{ij},$$

and

$$(7) \quad n = \sum_{j=1}^h n_j.$$

If we use (6) and (7), we obtain that

$$(8) \quad n = \sum_{j=1}^h \sum_{i=1}^4 x_{ij} = \sum_{i=1}^4 \sum_{j=1}^h x_{ij}.$$

Further, we assume that  $M_{ij}$  is the number of researchers in group  $i$  in stratum  $j$  in the population, and that  $N_j$  is the total number of researchers in stratum  $j$  in the population,  $i = 1, 2, 3, 4$ ,  $j = 1, 2, \dots, h$ . It follows that

$$(9) \quad M_i = \sum_{j=1}^h M_{ij},$$

$$(10) \quad N_j = \sum_{i=1}^4 M_{ij},$$

and

$$(11) \quad N = \sum_{j=1}^h N_j.$$

From (10) and (11) we get that

$$(12) N = \sum_{j=1}^h \sum_{i=1}^4 M_{ij} = \sum_{i=1}^4 \sum_{j=1}^h M_{ij}.$$

Suppose that  $p_{ij}$  denotes the fraction of researchers in group  $i$  who are included in stratum  $j$  in the population. Thus,

$$(13) p_{ij} = \frac{M_{ij}}{N_j}.$$

We estimate  $p_{ij}$  by using the following estimator of  $p_{ij}$  :

$$(14) \hat{p}_{ij} = \frac{x_{ij}}{n_j}.$$

The overall population fraction of group  $i$  is the following weighted average:

$$(15) p_i^a = \frac{N_1}{N} p_{i1} + \frac{N_2}{N} p_{i2} + \dots + \frac{N_h}{N} p_{ih} = \sum_{j=1}^h \frac{N_j}{N} p_{ij} = \frac{1}{N} \sum_{j=1}^h N_j p_{ij}.$$

An estimator of  $p_i^a$  is:

$$(16) \hat{p}_i^a = \frac{N_1}{N} \hat{p}_{i1} + \frac{N_2}{N} \hat{p}_{i2} + \dots + \frac{N_h}{N} \hat{p}_{ih} = \sum_{j=1}^h \frac{N_j}{N} \hat{p}_{ij} = \frac{1}{N} \sum_{j=1}^h N_j \hat{p}_{ij}.$$

The standard deviation of  $\hat{p}_i^a$  is:

$$(17) St.dev(\hat{p}_i^a) = \frac{1}{N} \sqrt{\sum_{j=1}^h \frac{N_j(N_j - n_j)}{(n_j - 1)} \hat{p}_{ij}(1 - \hat{p}_{ij})}.$$

We further calculate the confidence interval for  $\hat{p}_i^a$ , which is equal  $(L,U)$ , where  $L$  is the lowest value in this interval and  $U$  is the highest value in this interval. For a  $100(1-\alpha)\%$  confidence interval for  $\hat{p}_i^a$  we have that

$$(18) L = \hat{p}_i^a - z_{\alpha/2} \hat{St.dev}(\hat{p}_i^a) = \hat{p}_i^a - z_{\alpha/2} \frac{1}{N} \sqrt{\sum_{j=1}^h \frac{N_j(N_j - n_j)}{(n_j - 1)} \hat{p}_{ij}(1 - \hat{p}_{ij})},$$

$$(19) U = \hat{p}_i^a + z_{\alpha/2} \hat{St.dev}(\hat{p}_i^a) = \hat{p}_i^a + z_{\alpha/2} \frac{1}{N} \sqrt{\sum_{j=1}^h \frac{N_j(N_j - n_j)}{(n_j - 1)} \hat{p}_{ij}(1 - \hat{p}_{ij})},$$

where  $z_{\alpha/2}$  is the upper  $\alpha/2$  point of the standard normal distribution.

The estimator in (16) is an unbiased estimator<sup>18</sup> of  $p_i^a$  (see (13)-(15)):

$$(20) E(\hat{p}_i^a) = \frac{1}{N} \sum_{j=1}^h N_j E(\hat{p}_{ij}) = \frac{1}{N} \sum_{j=1}^h N_j E\left(\frac{x_{ij}}{n_j}\right) = \frac{1}{N} \sum_{j=1}^h N_j p_{ij} = p_i^a.$$

Assume that  $N_j = n_j$  for all  $j$ . It follows from (7) and (11) that

$$N = \sum_{j=1}^h N_j = \sum_{j=1}^h n_j = n,$$

and, thus, from (5) and (14) we obtain that

$$\hat{p}_i^a = \frac{1}{n} \sum_{j=1}^h n_j \hat{p}_{ij} = \frac{1}{n} \sum_{j=1}^h n_j \frac{x_{ij}}{n_j} = \frac{1}{n} \sum_{j=1}^h x_{ij} = \frac{1}{n} x_i = \frac{x_i}{n} = \hat{p}_i.$$

---

<sup>18</sup> The estimator in (4) is not unbiased if there are significant differences between the sample and the population with respect to some explanatory variables (for example gender and age), since in this case we will not have a simple (that is representative) random sampling.

Therefore, in this case the estimator in (16) is equal the estimator in (4), i.e. stratification is unnecessary.

Note that if  $\hat{p}_{ij} = \bar{p}_i$ , where  $\bar{p}_i$  is a constant term, then from (11) and (16) we obtain that

$$\hat{p}_i^a = \frac{1}{N} \sum_{j=1}^h N_j \bar{p}_i = \bar{p}_i \frac{1}{N} \sum_{j=1}^h N_j = \bar{p}_i \frac{1}{N} N = \bar{p}_i.$$

Moreover, note from (14) and (16) that

$$\sum_{i=1}^4 \hat{p}_i^a = \sum_{i=1}^4 \sum_{j=1}^h \frac{N_j}{N} \hat{p}_{ij} = \sum_{j=1}^h \sum_{i=1}^4 \frac{N_j}{N} \hat{p}_{ij} = \sum_{j=1}^h \frac{N_j}{N} \sum_{i=1}^4 \hat{p}_{ij} = \sum_{j=1}^h \frac{N_j}{N} \sum_{i=1}^4 \frac{x_{ij}}{n_j} = \sum_{j=1}^h \frac{N_j}{N} \frac{1}{n_j} \sum_{i=1}^4 x_{ij},$$

and if we use (6) and (11), we obtain that

$$\sum_{i=1}^4 \hat{p}_i^a = \sum_{j=1}^h \frac{N_j}{N} \frac{1}{n_j} n_j = \sum_{j=1}^h \frac{N_j}{N} = \frac{1}{N} \sum_{j=1}^h N_j = \frac{1}{N} N = 1.$$

## Annex 8: The Survey Questions

### Basic Information about you (All respondents)

**Are you ...?**

Male

Female

**How old are you?**

(Drop down box)

**What is your country of nationality?**

(Drop down box)

**What is your highest formal qualification?**

Year of Award (YYYY)

Undergraduate Degree

Masters Degree

Doctorate

**How many years of experience do you have as a researcher?**

Select: 0-4, 5-7, 8-10, 11-15, more than 15

**What is your marital status?**

Married

Single

Divorced

Co-habiting

Prefer not to disclose

**Do you have children?**

Yes

No

**If you do not have children please leave blank. If you have more than five children, please enter the ages of the first five children only.**

(Options for ages of children)

**What is the name of your current employing institution/organisation?**

**In which country is it located?**

(Drop down options)

**What is your job title?**

Free text

**What type of contract do you currently have?**

Fixed term < 1 year

Fixed term 1-2 year

Fixed term 2+ year

Open ended (tenure) contract

Non-employment contract (e.g. funded by fellowship/grant)

Not mentioned above. Please specify

**Is it?**

Full time

Part time <50%

Part time >50%

**What is your current annual NET salary? (in EURO)**

NET salary is your 'take home' salary after tax and other deductions

0-20,000

20,000-30,000

30,000-40,000

40,000 or higher

Prefer not to disclose

**What is your main research domain?**

According to the European Research Council (ERC), there are three main scientific domains: Physical Sciences and Engineering; Social Sciences and Humanities; and Life Sciences. Please select the one that best fits your research activities.

Physical Sciences and Engineering  
Social Sciences and Humanities  
Life Sciences

**What best describes your situation?**

**A response is required \***

I am currently a mobile researcher  
I have been a mobile researcher in the past  
I would like to be a mobile researcher in the future  
I am not interested in being a mobile researcher at the moment

**\* The answer to this question will filter respondents to 1 of 4 options:**

**I AM CURRENTLY A MOBILE RESEARCHER**

**In which country/region did you work before your current post?**

(Select from list)

**How long is the overall duration of your current mobility period?**

(Select from list)

**Who is sponsoring your current period of mobility?**

*Select as many as applicable*

My current employer  
EU Programme (e.g. Marie Curie, ERC, etc.)  
Other EU programme or projects  
National government or funding agency  
Other, please specify

**If you are sponsored by more than one institution, please give details below**

**Where did you hear about this opportunity?**

(Select from list)

**How many times have you been a mobile researcher?**

(Select from list)

**Were any of these factors important in your decision to become a mobile researcher?**

*If yes, please indicate how important the factor was. (Options: Not important, Slightly important, important, Very important)*

Availability of research facilities/equipment  
To enter a new area of research  
Career opportunities  
Better economic opportunities  
Social/Cultural life  
For personal relationship reasons  
To increase my network of contacts  
Personal development  
Obligated to be mobile as part of my contract  
Other. Please give details below.

**If you would like to elaborate / give further details on any of these factors please do so here. (Free text)**

**Have you experienced difficulties in relation to any of the following factors?**

*If yes, please indicate the extent of the difficulty (Options: Not at all, Slight difficulty, Difficulty, Major difficulty)*

Immigration rules (e.g. getting a work visa)  
Funding for mobility  
Language  
Social/Cultural life  
Child care arrangements  
Other caring responsibilities  
Personal relationship  
Accommodation  
Social security benefits (maintaining/transferring)  
Salary (maintaining/transferring)  
Pension rights (maintaining/transferring)  
Health care insurance (maintaining/transferring)  
Lack of competition-based internationally open recruitment  
Lack of recognition of mobility experience in recruitment and career development  
Opportunities for career progression  
Other. Please give details below.

**If you would like to elaborate/ give further details on any of these difficulties please do so here** (Free text)

**Would you consider another period of mobility after this one?**

Yes  
No

**Please explain your reasons.**

(Free text)

**In your opinion, how many times should you be mobile in your research career?** (Options: 0, 1-2, 3-4, 5+)

In early stage career (0-4 yrs experience)  
In middle stage of career (4-8 yrs experience)  
In later stage of career (8+ yrs experience)

**Please explain your reasons (Free text)**

## **I HAVE BEEN A MOBILE RESEARCHER IN THE PAST**

**When were you most recently a mobile researcher?**

(Select from list)

**What was the location of your most recent period of mobility?**

(Select from list)

**Where did you hear about this opportunity?**

(Select from list)

**How long was your most recent period of mobility?**

(Select from list)

**Who sponsored your most recent period of mobility?**

*Select as many as applicable*

My current employer  
EU Programme (e.g. Marie Curie, ERC, etc.)  
Other EU programme or projects  
National government or funding agency  
Other, please specify

**If you were sponsored by more than one institution, please give details below**

**How many times have you been a mobile researcher in your career?**

(Select from list)

**Were any of these factors important in your decision to become a mobile researcher?**

Please indicate how important these factors were (Options: Not important, Slightly important, important, Very important)

Availability of research facilities/equipment

To enter a new area of research

Career opportunities

Better economic opportunities

Social/Cultural life

For personal relationship reasons

To increase my network of contacts

Personal development

Obligated to be mobile as part of my contract

Other. Please give details below.

**If you would like to elaborate / give further details on any of these factors please do so here.** (Free text)

**During your mobility, did you experience any difficulties in relation to any of the following?** (Options: Not at all, Slight difficulty, Difficulty, Major difficulty)

Immigration rules (e.g. getting a work visa)

Funding for mobility

Language

Social/Cultural life

Child care arrangements

Other caring responsibilities

Personal relationship

Accommodation

Social security benefits (maintaining/transferring)

Salary (maintaining/transferring)

Pension rights (maintaining/transferring)

Health care insurance (maintaining/transferring)

Lack of competition-based internationally open recruitment

Lack of recognition of mobility experience in recruitment and career development

Opportunities for career progression

Other. Please give details below.

**If you would like to elaborate/ give further details on any of these difficulties please do so here** (Free text)

**Would you consider another period of mobility in the future?**

Yes

No

**Please explain your reasons.**

(Free text)

**In your opinion, how many times should you be mobile in your research career?** (Options: 0, 1-2, 3-4, 5+)

In early stage career (0-4 yrs experience)

In middle stage of career (4-8 yrs experience)

In later stage of career (8+ yrs experience)

**Please explain your reasons** (Free text)

**I WOULD LIKE TO BE MOBILE**

**What factors motivate you to become a mobile researcher?**

Please indicate how important these factors are to you (Options: Not important, Slightly important, important, Very important)

Availability of research facilities/equipment

To enter a new area of research

Career opportunities

Better economic opportunities



Social/Cultural life  
For personal relationship reasons  
To increase my network of contacts  
Personal development  
Obligated to be mobile as part of my contract  
Other. Please give details below.

**If you would like to elaborate / give further details on these factors please do so here** (Free text)

**Do difficulties in relation to any of these factors inhibit you being mobile at present?**

*If yes, please indicate the extent of the difficulty. (Options: Not at all, Slight difficulty, Difficulty, Major difficulty)*

Immigration rules (e.g. getting a work visa)  
Funding for mobility  
Language  
Social/Cultural life  
Child care arrangements  
Other caring responsibilities  
Personal relationship  
Accommodation  
Social security benefits (maintaining/transferring)  
Salary (maintaining/transferring)  
Pension rights (maintaining/transferring)  
Health care insurance (maintaining/transferring)  
Lack of competition-based internationally open recruitment  
Lack of recognition of mobility experience in recruitment and career development  
Opportunities for career progression  
Other. Please give details below.

**If you would like to elaborate/ give further details on any of these difficulties please do so here** (Free text)

**Are you aware of information about mobility opportunities from any of these sources?**

*If "No", leave it blank.*

Current department/institution  
Colleagues/personal network  
Contacts in previous department / institution  
National information channels about vacancies for researchers  
International information channels about vacancies for researchers  
Newspapers, magazines, etc.  
Website  
Other, please specify

**In your opinion, how many times should you be mobile in your research career?** (Options: 0, 1-2, 3-4, 5+)

In early stage career (0-4 yrs experience)  
In middle stage of career (4-8 yrs experience)  
In later stage of career (8+ yrs experience)

**Please explain your reasons** (Free text)

### **I AM NOT INTERESTED IN BEING MOBILE AT THE MOMENT**

**Have you ever considered becoming a mobile researcher?**

Yes  
No

**Please explain your reasons.** (Free text)

**Have difficulties in relation to any of the following stopped you from becoming a mobile researcher?**

*If yes, please indicate the extent of the difficulty. (Options: Not at all, Slight difficulty, Difficulty, Major difficulty)*

Immigration rules (e.g. getting a work visa)  
Funding for mobility  
Language  
Social/Cultural life  
Child care arrangements  
Other caring responsibilities  
Personal relationship  
Accommodation  
Social security benefits (maintaining/transferring)  
Salary (maintaining/transferring)  
Pension rights (maintaining/transferring)  
Health care insurance (maintaining/transferring)  
Lack of competition-based internationally open recruitment  
Lack of recognition of mobility experience in recruitment and career development  
Opportunities for career progression  
Other. Please give details below.

**If you would like to elaborate/ give further details on any of these difficulties please do so here** (Free text)

**What is the most important factor that would encourage you to become a mobile researcher?**  
**Please explain your reasons** (Free text)

**In your opinion, how many times should you be mobile in your research career?** (Options: 0, 1-2, 3-4, 5+)

In early stage career (0-4 yrs experience)  
In middle stage of career (4-8 yrs experience)  
In later stage of career (8+ yrs experience)

**Please explain your reasons** (Free text)

## **ALL RESPONDENTS**

### **FINAL REMARKS**

**Do you think mobility is of benefit to researchers?**

No  
Yes – of some benefit  
Yes- Of great benefit

**Please explain your reasons** (Free text)

**Do you hold a managerial responsibility with regard to any mobile researchers in your institution?**

Yes  
No

**If YES:**

**Would you be willing to be contacted for interview by telephone?**

No  
Yes. Please provide details below.

## **ALL RESPONDENTS**

### **THANK YOU**

**You have completed this survey. Your participation is highly valuable for this study. If you have any concern about this survey please contact us.**

## Annex 9: List of target institutions for survey (Rindicat Group)

<p><b>UK</b></p> <p>University of Cambridge  University College London  Edinburgh University  University Of Manchester  London School of Economics  University of Bristol  University of Cardiff  University of Teesside  Wellcome Trust  SPRU, University of Sussex</p>	<p><b>France</b></p> <p>Sciences Po  Pierre And Marie Curie Université  University Louis Pasteur Strasbourg  University Grenoble  Ecole Normale Super Paris  CNRS  Ecole Nationale des Ponts et Chaussées (Paris)  Université Claude Bernard Lyon 1  Université Toulouse 3  University of Bordeaux  Université Montpellier II</p>
<p><b>Poland</b></p> <p>Uniwersytet Jagiellonski (Jagiellonian)  Adam Mickiewicz University (Poznan)  University of Warsaw (Warszawa)  University of Łódź  University of Silesia (Katowice)  University of Gdansk  Cracow University of Economics (Kraków)  Agh University of Science &amp; Technology</p>	<p><b>Spain</b></p> <p>University of Barcelona  University Autonomia Madrid  Pompeu Fabra Polytechnic, Barcelona  CSIC  University Salamanca  Pompeu Fabra University, Barcelona  University of Vic  University of Seville</p>
<p><b>Hungary</b></p> <p>Budapest University of Economic Sciences and Public Administration  Central European University  University Of Szeged  University Of Debrecen  Simmelweis University  Eotvos Lorand University  Budapest University Of Technology &amp; Economics  Hungarian Academy of Sciences (selected institutes)</p>	<p><b>Norway</b></p> <p>University Oslo  NTNU  University Bergen  University Tromso  Bergen University College  Oslo University College  NIFU-STEP  SINTEF</p>
<p><b>Germany</b></p> <p>Technical University Munich  Technical University, Berlin  Humboldt University, Berlin  University of Hamburg  Eberhard Karls University Tubingen  University Bonn  University Freiburg  University Goettingen  Max- Planck Society  University of Potsdam  University of Leipzig</p>	<p><b>Netherlands</b></p> <p>Amsterdam University  Delft University of Technology  Leiden University  Erasmus University Rotterdam  Utrecht University  Groningen University  Radboud University Nijmegen  Eindhoven University of Technology  University of Maastricht</p>

**Contributions to this study and the report were made by:**

**IDEA**

Elissavet Lykogianni, Anneleen Peeters, Arnold Verbeek

**NIFU-STEP**

Pål Børing, Aris Kaloudis

**PREST (Manchester Institute of Innovation Research)**

Deborah Cox, Jakob Edler, Lawrence Green, Kieron Flanagan, Barbara Jones, Kathryn Morrison, Yanuar Nugroho

**SPRU**

Nick von Tuzelmann, Dagmara Weckowska

The study was carried out under the direction of

Emmanuel Boudard, DG Research, The European Commission

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## Notes

<sup>i</sup>We must recognise that there are a range of different kinds of researcher mobility and therefore a range of different drivers of (as well as barriers to) researcher mobility. Science is an inherently internationalised enterprise and mobility can be driven by more or less pure scientific goals (for instance access to advanced training, samples or research infrastructure – all of which are likely to vary across disciplines or sub-disciplines) as well as career or personal goals. In some circumstances mobility may actually be a contractual or funding requirement. The decision to be mobile then will be driven by a complex mixture of different considerations and incentives, which are likely to vary over time (i.e. from one career stage to another) and from one field to another. In a comprehensive study on researcher mobility the range of potential drivers and their interactions would need to be considered in addition to possible inhibiting factors. A comprehensive study would also need to carefully consider the range of potential impacts of mobility, positive but also negative. A traditional concern of research policy has been with the threats posed by ‘too much’ outward mobility (often reduced to the rather static idea of a ‘brain drain’). Attention has now shifted to a more dynamic view of ‘brain circulation’ over time; a circulation from which both the source and destination research system may benefit. This view has been strongly influenced by the realisation of the subsequent positive role played by Indian scientists and engineers who had emigrated to work in California’s Silicon Valley in the later creation of new high-tech firms in India. However, it must be recognised that there is the potential for negative impacts from mobility, whether felt at the system level, that of the institution or research group or by the mobile researcher themselves. Similarly we must also recognise that mobility may be driven by negative developments in the source research system or institution. However the purpose of this study is restricted to an examination of the potential role of ‘framework conditions’ such as social security or employment regulations and practices, and career development/human resource management issues, in inhibiting the mobility of researchers who would otherwise be motivated to be mobile.

<sup>ii</sup> According to RESCAR, 34% of the post-docs in engineering and 12% in the social sciences secured a position in the private sector. Again this is common in Germany and Sweden and – other than for former doctoral candidates – also Italy. RESCAR researchers emphasise that the interpretation of this intersectoral mobility is not easy.

“It might be concluded on the one hand that it reflects a valuable transfer of advanced knowledge and research skills from the academic sphere to industrial and social practice. On the other hand former doctoral students in Germany and Norway and Sweden (the latter only in engineering) and post-docs in these countries as well as Italy leave the academic sector at a later stage than in other countries, where fewer people obtained a PhD degree and continued their career outside of science.” (Robinson et al., 2007, p.76)

<sup>iii</sup> In particular, engineers with a PhD find better employment conditions than those in social science, with only 3% in unpaid work compared to 8.8% and 73% with a permanent contract compared to 63%. There are high rates of permanent contracts in both engineering and the social sciences in Germany, Hungary and Sweden, and low rates in Italy and Portugal for both disciplines (Robinson et al., 2007, p.77).

<sup>iv</sup> However, there are high proportions of social scientists entering permanent employment with public employers outside the universities. RESCAR further notes that the relative proportion of temporary and permanent posts in university employment is much the same in both disciplines, probably reflecting employment principles which are substantially independent of discipline in this sector (Robinson et al., 2007, p.77).

<sup>v</sup> About 60% of new PhDs in both engineering and the social sciences leave directly into permanent employment. However, within 3 months after leaving, more PhDs from engineering than from the social sciences found a permanent job with exception of Italy: more than 33.3% of engineering PhDs need more than 12 months and more than 60% of the social science PhDs. In Norway and the UK the situation in the social sciences is again better than in engineering, whereas in France former doctoral students in particular often found a permanent job after a medium time period of 3-12 months. As with freshly-graduated PhDs, most post-doctoral researchers also achieve permanent employment soon after leaving research. Less than 20% are reported to be in temporary employment and only 1% unemployed. Temporary positions seem to

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play a more important role for post-docs leaving Portugal and the UK (Robinson et al., 2007, pp.77-78).

<sup>vi</sup> Empirical work we are conducting in Ireland for a different study suggests that outward mobility from that country has declined with the increased emphasis on building up Irish research capacity and the consequent increases in domestic research funding. The expanding Irish research system seems to be retaining all those researchers who might otherwise have a period of international mobility. Many Irish researchers now believe that a period of international mobility should be formally specified as part of the doctoral training track. Ironically in earlier decades forced mobility stemming from the underdevelopment of the Irish research base meant that many Irish scientists travelled to the UK and further afield in search of advanced doctoral or post-doctoral experience or access to facilities or materials not available at home. Significant efforts have been made to attract back this scientific 'diaspora' over the past ten to fifteen years.

European Commission

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