

Study on mobility patterns and career paths of EU researchers

FINAL REPORT (deliverable 7)

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in consortium with:

- **NIFU STEP**
- **WIFO**
- **LOGOTECH**
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- **Management Center Innsbruck (MCI)**
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WIFO

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The report is accompanied by the MORE set of indicators in an excel file which summarises the main data provided by the MORE project. The data collected for this set of indicators is largely based on the four surveys designed, implemented and analysed by different teams within the MORE consortium. The present report refers to these four surveys where relevant data have been used.

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EXECUTIVE SUMMARY

The overall goal of the MORE project (Mobility and Career Paths of EU Researchers) was to *provide a study on the mobility patterns and career paths of EU researchers*.

At an operational level, the study has had two main sub-objectives, namely:

1. to update the existing IISER indicators, and
2. to develop surveys and studies on the mobility of researchers supplementing the existing information collected through the IISER project.

The IISER update has resulted in the collection of indicators on the stocks of researchers and researcher mobility: the former focusing on the update of indicators on the number of researchers in the EU, with the latter providing information on the circulation of researchers (mainly doctoral candidates and scholars) within the EU countries and between the EU and the US.

In parallel, three EU-wide and one extra-EU survey were launched to collect information on researchers' characteristics, employment situation, mobility and the factors influencing and motivating mobility, as well as the perceived effects of mobility. They have targeted four different sub-groups of researchers both in terms of sector of employment and in terms of geographical location, namely: researchers working in the Higher-education institutes, researchers working in public (non-university institutes), researchers working in the industry sector and researchers who have moved between EU and non-EU countries, in particular EU-US mobility.

The following provides a summary of the main conclusions from the present Final Report. While this includes many of the main findings of the MORE project, more detailed information on the project and the conclusions of the different reports is found in the separate deliverables.

How many researchers are there in the EU?

Based on official Eurostat data, in 2007 there were 2.2 million researchers (in head counts) in EU27 or 1.4 million researchers (full-time equivalents).

- In general, we see a steady increase in the number of researchers; between 2000 and 2007, the number of researchers grew by nearly 31%, or 4% per year.
- The annual growth rate of the number of researchers in FTEs in 2000-2007 is 3.9% p.a. for the EU27 compared to 1.3% p.a. for the USA, 11.8% for China and 1.3% for Japan. Among the EU27 two of the new Member States report the highest annual growth rates, Cyprus and the Czech Republic with 14.9 and 10.5% p.a. respectively.
- In relative terms, there were on average 6 researcher FTEs per 1,000 active population in the EU27 in 2007. This compares to 9 FTEs in the US, 11 in Japan and 2 in China.
- At country level, Finland has the highest penetration of researchers in the workforce with 15 researchers per 1,000 active population.
- Other Scandinavian countries (Denmark and Sweden with around 10 researchers per 1,000 labour force) are in the top-5 countries for this indicator together with Luxembourg and the UK.

- The most recent Member States, Romania and Bulgaria as well as the Mediterranean islands, report the lowest number with 3 or fewer researchers per 1,000 active population.

Who are the respondents to the MORE surveys?

The MORE surveys indicate on average that around two out of three respondents in the surveys are male, with the exception being in the industry survey, where more than four out of five respondents are male.

The respondents in the industry survey graduate, on average, at a younger age (28 years old) than the 'academic' researchers (32 years old for the HEI researchers). This relates strongly to the distribution of PhD recipients among the different surveys; the share is much lower in the sample of industry researchers (50%) than in the other three surveys (ranging from 76% to 85%).

Mobility as a student seems to have been more 'popular' among respondents of the Extra-EU survey (32% in comparison to 20-23% for the other surveys).

Compared with academic researchers, industrial researchers are more likely to be male, older and a graduate in Natural sciences or engineering and technology. They are also more likely to have worked in industry as a student (52% in comparison to 24-28% for the other surveys) but are less likely to have obtained a postgraduate degree (PhD or equivalent).

How many mobile researchers are there and who are they?

For the purposes of the MORE project, mobile researchers are defined as those who have moved from the country of their highest graduation to work as a researcher for at least 3 months in another country.

More than half (56%) of the researchers working in the higher-education-institute (HEI) sector have been (or are currently) internationally mobile. Two out of three (67%) of the mobile researchers are male and 91% have a PhD, 6 percentage points higher than the share of PhD holders in the overall sample (HEI survey).

30% of the mobile researchers in the HEI sector had been mobile as a student compared to just 22% in the overall sample, indicating that student-mobility increases the probability of becoming mobile as a researcher later in one's career.

By comparison, industrial researchers are less likely to be mobile (41%) although, as with "academic" researchers, PhD holders and those who have been mobile as a student are more likely to have been mobile.

How do the characteristics of recent-mobile researchers compare with those who have been mobile at least once during their career?

Recent-mobile researchers are defined as those who have been internationally mobile at least once during the last three years. Among the HEI researchers 29% had been recently mobile:

- Recent-mobile researchers have a younger profile (in terms of age, years since graduation and family attributes).
- Student mobility among the recent-mobile sub-group is higher than in the entire sample and also higher than in those mobile at least once in their career.

- Recent-mobile researchers had a larger share of those that worked in industry as a student than those mobile at least once in their career.

How many researchers have moved between sectors and what are their characteristics?

Within the HEI sample, 17% of the researchers have moved between the public and the private sector.

- A higher share of males, holders of a postgraduate degree and graduates in the Natural science or engineering and technology field are present within the sectorally-mobile compared to the whole sample of the HEI survey.
- 47% of the HEI sectorally-mobile had worked in industry as a student compared to 28% in the entire HEI full sample.
- Industrial researchers have a much higher probability of sectoral mobility than "academic" researchers: 42% of the industrial researcher sample have moved between the public and the private sectors at least once. Furthermore, there seems to be a positive correlation between geographical and sector mobility among this group.

What are the most important influencing factors of geographical mobility? Which of these are considered as barriers to mobility?

Practical influencing factors (administrative and non-career/profession related factors such as the social security system, administrative barriers, language issues, child care, etc.) do not seem to play an "important" role in the mobility decision of "academic" researchers. However:

- female researchers assign higher importance than males to child-care arrangements;
- child-care arrangements are considerably more important for the non-mobile researchers indicating that it is a potential barrier to mobility.

Among those respondents targeted by the extra-EU mobility survey, we see that:

- EU-US mobile researchers attach less importance to the practical influencing factors of mobility than do US-EU mobile researchers;
- The one exception is language to which EU-US mobile researchers attach more importance, presumably as many have a mother tongue other than English

Industry researchers present quite a different picture as they consider nearly all the practical influencing factors as important:

- All factors seem to be more important for young researchers than for other respondents in the entire sample.
- Practical influencing factors seem to be seen rather as barriers to mobility rather than as facilitating factors since the non-mobile industry researchers attach on average considerably higher scores than their mobile colleagues to all these factors.

Profession-related influencing factors (related to the researcher's career or profession such as the 'maintenance of network contacts' and 'obtaining funding') also seem to be of relatively low importance among 'academic' researchers. However, we should note here that more detailed results (e.g. on push- and pull-factors of mobility as well as on factors influencing future mobility decisions are presented in the relevant report analyzing the results of the HEI survey.

- These factors (maintenance of network contacts and obtaining funding) seem to act as barriers to mobility than facilitating factors, as non-mobile researchers attach considerably higher scores on their importance than do mobile researchers.
- The EU-US mobile group of researchers seems to attach more importance as well on 'obtaining funding' as a factor affecting mobility decisions, especially among the non-mobile group.

What are the most important motivations for geographical mobility? Do these differ among researchers working in different sectors?

Researchers, in general, do not seem to attach a very important role to **personal motives** (referring to personal and culture-related motives) concerning their decision to become mobile however, different sub-groups do attach relatively higher importance to these motive. For example:

- non-mobile researchers tend to consider personal or family-related motives as more important in terms of their mobility decisions. Therefore personal/family-related factors do seem to act as barriers to mobility.
- Culture-related motives, though not important for the "academic" researchers, do seem to play a role in the mobility decision of industry researchers, mostly of females and the non-mobile group.
- Among the Extra-EU sample, although personal and cultural motives do not drive EU-US mobility, these motives are considerably more important for US-EU mobility.

Profession-related motives (referring to motivations related to the career or the profession of the researchers (e.g. 'personal research agenda', 'career progression goals', 'career opportunities at new location', salary and other financial incentives', etc.) receive higher importance as motivation for international mobility than personal motivations. These seem to be more important for internationally mobile researchers than for non-mobile ones.

Among industry researchers, profession-related motives seem to be even more important, especially those referring to 'access to internal and external research facilities' and 'prospects to work with leading experts'. Differences between mobile and non-mobile researchers are not as pronounced as was the case for the 'academic' researchers.

Among the researchers targeted by the extra-EU mobility survey, we find that

- 'Career progression goals' and 'personal research agenda' are the two most important drivers for mobility; those who have been internationally mobile researchers consider them notably more important than those who have not been internationally mobile.
- All profession-related motives are notably more important as drivers of mobility from the EU to the US than from the US to the EU.

How do researchers self-assess the overall effects of geographical mobility for their career and personal life?

The overall effect of mobility on the career progression of the mobile researchers is perceived as positive (with scores above 4 out of 5) for the "academic" researchers.

Among "academic" researchers targeted through the extra-EU survey we see that:

- The overall effect on career progression of the EU-US mobile researchers is considerably higher than the relevant effect for the US-EU mobile researchers (4.6 versus 3.8). This seems to 'match' the findings on the motivations of the two extra-EU mobile groups (EU-US and US-EU mobile): EU-US mobility is mainly driven by profession-related motives, while US-EU mobility is mainly driven by personal-related motives.
- Researchers seem to rank network effects higher than output effects (with the effects on publications and access to infrastructure being the highest reported among the output effects and the effects on professional experience and access to international network of researchers the highest reported among the network effects).
- The researchers who have moved from the EU to the US report consistently higher output and network effects than their colleagues having moved from the US to the EU. This difference is most notable for the effects on 'professional experience' and 'access to international network of professionals'.

Mobile industrial researchers also rank network effects higher than output effects as was seen for mobile academic researchers.

- The effects on patents are the highest reported for mobile industry researchers, while mobile academic researchers score higher effects for publication output, this however may be linked to the higher relevance of patents for the work of industrial-researchers than of publications.
- Among the network effects, 'interdisciplinarity of research' and 'diversity of network' score higher among industry researchers.

Part 1 CONTEXT AND OBJECTIVES OF THE PROJECT

1 INTRODUCTION TO THE PROJECT

1.1 Context of the project

A wide strand of the literature in economics and innovation has been dedicated to the analysis of the relationship between growth and technical change and innovation (e.g. Romer, 1991; Grossman and Helpmann, 1991). While economists might disagree on the degree to which technological progress affects growth (i.e. which fraction of economic growth is explained by technical change), they all agree on the importance of technical change and innovation for growth, initially conceptualised by Solow (1957). Science and technology, being directly linked to technical change and innovation, are often seen as key drivers to economic growth and, more generally, to the competitiveness of countries in the changing global economy.

Scientists, engineers and researchers, being the core part of employment in science- and technology-related professions, receive increasing attention as the “factors” of production directly linked to the outputs produced by science-, technology- and innovation-related activities. Additionally, working in an environment where science and technology becomes increasingly decentralised, and is recently taking place often through cross-border collaborations, mobility of researchers is becoming more important than ever before. International mobility of researchers is important not only because, as a phenomenon, it is increasing rapidly (OECD, 2003) but also because it contributes to knowledge diffusion and “catching-up” effects of R&D and other innovation-related activities.

In this context, policy initiatives that promote mobility have received significant attention. According to the European Commission “human resources are, to a large extent, the key of research efforts, excellence and performances. The number of researchers and their mobility are two important aspects of this issue” (EC, 2003). Mobility is increasingly seen as a ‘vehicle’ towards the strengthening of the European Research Area and the promotion of European competitiveness.

Despite the importance of mobility especially of high-skilled personnel in science and technology, there seems to be no systematic way in which countries record or monitor skilled-migration flows at the international level (ILO, 2003; Lowell and Findlay, 2002). In view of this lack of data, the EC launched in 2007 the FP6 Specific Support Action “Integrated Information System on European Researchers” (IISER) with the purpose of creating an EU-wide system of indicators that capture researchers’ stocks, flows, career, and mobility events using existing sources of data.

Acquiring data on the ‘stocks’ and ‘flows’ of researchers, i.e. on the number of mobile researchers as well as on the gross and net flow of researchers moving cross-border, is important in “quantifying” mobility. However, qualitative data on the researchers’ opinions on why they do or do not become mobile as well data on the effects of mobility are very important, especially in terms of designing policy measures or improving existing ones that promote mobility within the research community.

Studies on the drivers and barriers to researcher mobility have indicated that mobility is triggered by a variety of factors. Kannankutty and Burelli (2007) find that

immigrant scientists and engineers move to the US not only for educational reasons or job and economic opportunities, but also for family-related reasons. The impact of family-related and personal factors is emphasised also by Ackers et al. (2007). De Gripp et al. (2008) indicate that drivers of mobility are primarily past mobility, differences in wages and R&D expenditures. Rindicate (2008), analysing results of a survey conducted among EU researchers, indicates that researchers opting to become mobile face barriers to mobility ranging from finding funding for research to concerns of the effects of mobility on their pension rights.

Although the literature provides some indications on the size of mobility as well as on the drivers and factors that influence mobility, to our knowledge, there has been no study that has systematically provided data on the 'stocks' of mobile researchers (aimed at providing results representative of the EU population), as well as on the motivations, influencing factors and effects of mobility. The MORE project with its four EU-(and beyond) wide surveys has aimed to fill this gap by providing information on researchers, their employment, mobility and career paths for particular groups of researchers including those working in the public sector (academic and non-university), in industry and those researchers working outside the EU (with focus on the USA).

More information about the purposes and implementation of these surveys is provided in section 2.2.2 of the present report. The following section provides more information on the objectives and deliverables of the MORE project.

1.2 Objectives and deliverables of the MORE study

The overall purpose of this study, according to the Terms of Reference has been:

"to provide a study on the mobility patterns and career paths of EU researchers."

At an operational level, the study has had two main sub-objectives, namely:

1. to update the existing IISER indicators, and
2. to develop surveys and studies on the mobility of researchers supplementing the existing information collected through the IISER project.

As will be further described in Part 2, the IISER update has resulted in the collection of indicators on the stocks of researchers and researcher mobility: the former focusing on the update of indicators on the Number of Researchers in the EU, while the latter providing information on the circulation of researchers (mainly doctoral candidates and scholars) within the EU countries and between the EU and the US (see MORE IISER final update Report for more information).

In parallel, three EU-wide and one extra-EU survey have been launched. These surveys have had as main purpose the collection of information on researchers' characteristics, employment situation, mobility and the factors influencing and motivating mobility, as well as the perceived effects of mobility. The surveys have targeted four different sub-groups of researchers both in terms of sector of employment and in terms of geographical location, namely: researchers working in the Higher-education institutes, researchers working in public (non-university institutes), researchers working in the industry sector and researchers who have moved between EU and non-EU countries, especially EU-US movements (for more details see section 2.2).

In the context of these objectives, the MORE project has provided the following deliverables:

- MORE Scoping Paper (2009): this provides a literature review and a review of the methodologies to be followed in the MORE surveys.
- MORE IISER first update Report (2009): this provides the first update to the IISER indicators.
- MORE IISER final update Report (2010): this provides the second and final update of the IISER indicators. Any reference to the IISER update in the present report refers to the final IISER update conducted in 2010.
- MORE HEI Report (2010): this report presents the findings from the survey targeting researchers working in higher-education institutes (HEI survey thereafter), which was launched in 2009.
- MORE RI Report (2010): this presents the findings from the survey targeting researchers working in public (non-university) research institutes (RI survey thereafter), which was launched in 2010.
- MORE Industry Report (2010): this provides the findings from the survey targeting researchers working in the industry (Industry survey thereafter), which was launched in 2009.
- MORE Extra-EU Report (2010): this provides the findings from the survey targeting researchers having moved between EU and non-EU countries (with particular focus on EU-US movements) (Extra-EU survey thereafter), which was launched in 2010.
- MORE Final Report (2010): this is the present report and provides a summary of the main findings and conclusions derived from all MORE reports and surveys structured under the MORE set of indicators (see below).
- MORE set of indicators (2010): this indicator tool is submitted together with the MORE Final Report and provides a summary of data and information for the main indicators of the MORE project (see Part 2 for an overview of the indicators).

1.3 Objectives and outline of the present report

1.3.1 Objectives of the MORE Final Report

As mentioned in the previous section, the main objective of the current MORE Final Report is to summarise the main findings and conclusions from the different MORE reports and surveys structured according to the MORE set of indicators. The intention of this report is neither to reproduce every finding of the different MORE surveys and of the IISER update, nor to repeat all conclusions drawn in the previous MORE reports. Each of the MORE reports stands on its own and serves the purpose of proving in detail all relevant findings and conclusions.

To the contrary, the objective of the present report - MORE Final Report - is to provide the main findings and conclusions stemming from the different MORE deliverables. In order to present the content of this report in a comprehensive way, we have structured the main findings and conclusions of the previous MORE deliverables according to the main themes identified in the conceptual framework of the study (see section 3.2). The MORE set of indicators provides for each of these themes information on the indicators collected. It is this information on **the find-**

ings of the MORE set of indicators that the present report intends to summarise and present. The MORE Final Report is therefore structured according to the main indicators presented in the MORE set of indicators.

The **objective of the present MORE Final Report** is to provide the main findings and conclusions stemming from the different MORE deliverables structured according to the main themes identified in the conceptual framework of the study. For each of the main themes, the present report presents the **findings of the MORE set of indicators**.

1.3.2 Outline of the report

The report starts in Chapter 2 with an overview of the methodology used for the four MORE surveys and the MORE IISER update, presenting the definitions applied, the sampling methods followed and any additional information provided (e.g. the analysis of the ELFS survey and of the NSCG survey).

Part 2 presents the MORE set of indicators. It starts with a description of the conceptual framework on which the study has been based and it provides an overview of the MORE set of indicators which are described in detail in the Part 3. It also lists the main research questions for which the MORE set of indicators provide answers.

Part 3 follows the main themes of the MORE conceptual framework and indicates for each theme the main results that have been obtained from the different MORE sources of data (the MORE surveys and the MORE update of the IISER indicators).

Finally, Part 4 concludes by presenting the main conclusions from the findings derived from the MORE set of indicators. In addition, methodological and policy-relevant recommendations for future research on the mobility of researchers are presented.

2 METHODOLOGY AND OUTPUTS OF THE PROJECT

2.1 Introduction

This chapter describes the main lines of the methodologies followed for the main outputs of MORE, namely the four MORE surveys and the MORE update of the IISER indicators. A detailed description of the different methodologies has been provided in the previous relevant MORE reports. The intention here is not to repeat every detail about the design of the surveys and their implementation but rather to describe the main lines of the methodologies used and the implications of these methodologies on the interpretation of the findings and results (mainly on the representativeness of the different surveys).

This chapter starts with a brief overview of the key definitions used throughout the MORE project -- the definition of the 'researcher' and the definition of a 'mobility event'. It continues by providing an outline of the main sampling methods followed in the four MORE surveys. The last section gives information on the content of the IISER indicators which have been updated and the data sources that were used for this update. The chapter concludes with a brief reference to additional information provided by some of the MORE reports focusing on the evidence provided from the analysis of the European Labour Force Survey and the National Survey of College Graduates in the US.

2.2 The four MORE surveys

The MORE project has conducted four surveys targeting the researcher population employed in the EU and beyond. The purpose of these surveys has been to obtain insight on the number of researchers in the EU who are geographically mobile or non-mobile and to obtain their opinions on the motivations of mobility (or non-mobility), the factors that influence mobility as well as the perceived effects of their mobility.

Before providing details summarizing some of the results, we provide a short description of the main definitions and sampling methodologies used in the MORE surveys. As indicated earlier, the relevant MORE reports provide detailed information on the sampling methods followed including the implications for the representativeness of the survey samples and well as implementation procedures.

2.2.1 Definitions

2.2.1.1 Defining the "researcher"

As already mentioned, this study has focused on the stocks and flows of researchers across countries and sectors, and also provides information on the current employment situation of researchers. As such, the starting point for the collection of statistics and qualitative information has therefore been the "researcher". Before describing the structures of the data collection scheme, defining what is meant by the term 'researcher' is crucial.

MORE Technical Report 1 (MORE Scoping Paper, 2009) provided a detailed review of the different definitions provided by the literature on researchers and their mobility. Here we provide a short overview of these definitions and indicate the definition followed in the MORE project.

2.1.1.1.1 The main definitions

The International Standard Classification of Occupations (ISCO) is a tool for organising jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job. Unfortunately, ISCO does not have a code to define researchers. Consequently, based on ISCO we do not have a clear-cut definition that enables us to select and distinguish researchers from other types of skilled labour.

However, based on the international literature, we can identify two widely accepted definitions of researchers. The first definition is found in the Canberra manual (OECD, 1995) and focuses on the concept of "Human Resources in Science and Technology". The second definition, described in the Frascati manual (OECD, 2002), focuses on "R&D personnel". The latter definition forms the basis for collecting R&D statistics of the OECD member countries.

The Canberra manual focuses on **"Human Resources devoted to Science and Technology" (HRST)** and defines this concept as:

- 1) having successfully completed education at the tertiary level in a science and technology field of study;
- 2) not formally qualified as above but being employed in a science and technology occupation where the above qualifications are normally required.

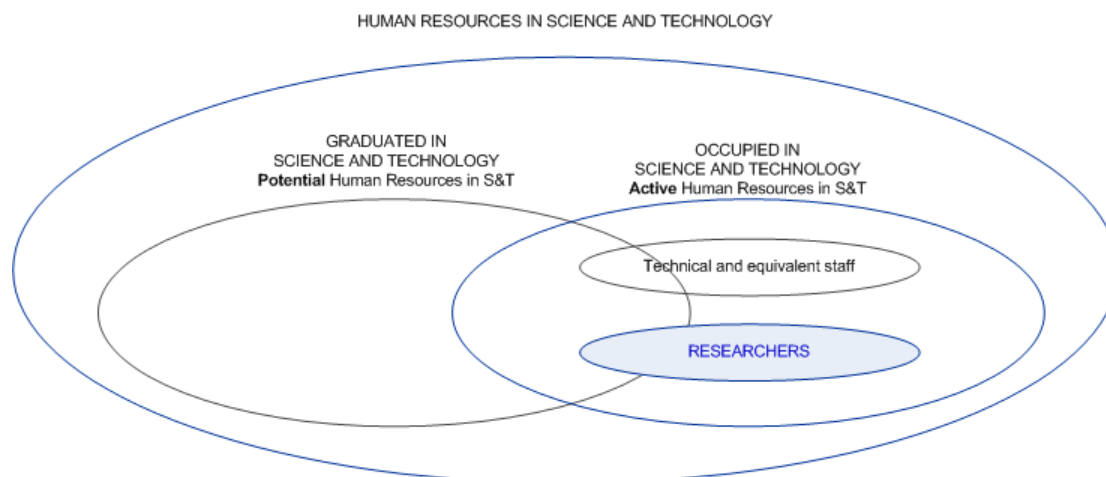
In this perspective "Human Resources in Science and Technology" (HRST) are measured in two ways: by degree and by occupation.

The Frascati manual identifies researchers as: "professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned".

There is no indication of the intensity in which these research activities should be carried out. Hence, it is quite a wide definition encompassing all professionals engaged in research whether on a part-time or full-time basis. From this definition it is also clear that the Frascati manual puts emphasis on the occupation and the activities being performed and disregards the 'degree' as a qualifying criterion for being a researcher.

The following figure visualises the difference between the Canberra and Frascati definitions. The Canberra manual contains the broadest definition since researchers (Human Resources in Science and Technology) are identified either by their degree in S&T (science or technology) or their S&T occupation (or both). In contrast, the Frascati manual identifies researchers exclusively by their S&T occupation.

Figure 2-1: Defining the concept of researcher: an example



Source: MORE Final Report

2.1.1.1.2 MORE definition

Defining researchers only by their S&T-degree is no guarantee that they actually execute research activities. Therefore we call this group the “potential human resources in Science and Technology”. Defining researchers by occupation has the advantage that all active researchers in S&T are measured, irrespective of their initial degree.

Box 1: MORE definition for the “researcher”

Throughout the data collection phases of the MORE project (with emphasis on its surveys) following the Frascati manual, we define researchers as

“professionals engaged in the conception or creation of new knowledge, products, methods and systems and also in the management of the projects concerned” (OECD, 2002).

Thus, the occupation of a science and technology job is the criterion by which researchers are identified.

2.2.1.2 Defining “mobility”

As mentioned in Rindicate (2008), 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”. Mobility is therefore a multidimensional phenomenon with many important aspects to be analysed. In the following, we give a short overview of the main types of mobility relevant to the MORE study and indicate which definitions of mobility have been adopted (for more information see MORE Scoping Paper, 2009).

Throughout the MORE project two main definitions of mobility are used:

- *geographical mobility* (between different countries or between wider geographical regions) and
- *job mobility*.

These are described below.

2.1.1.2.1 Geographical mobility

Geographical mobility refers to the physical movement of an individual to another region, country or continent. Depending on the original place (sender) and new place (receiver), we can distinguish among the following types of geographical mobility:

- Regional mobility: mobility to another region within the same country
- International mobility: mobility to another country (possibly another continent). International mobility flows can be classified as:
 - Intra-EU mobility
 - Inflows into EU from other ("third") countries
 - Outflows from EU to other countries (e.g. US, Japan, China, India, etc.)

In terms of *geographical mobility*, a researcher is defined as mobile *if he/she moved, to a country other than his/her country of highest educational attainment, after receiving said degree, to work as a researcher, for minimum of three months.*

Thus, for definitional purposes, a mobility event is one where the **home (or source) country** is the country where the researcher received his/her highest educational attainment and the **destination (host) country** is any country different from the home country where the researcher has worked for a minimum of three months after receiving their highest degree.

Box 2: MORE definition for the "geographical mobility"

A **geographical-mobility event** is one where

- the researcher has obtained his highest degree in country X, and
- subsequently has worked as a researcher for a minimum of three months in country Y (where X is different from Y).

This researcher is then considered as having been mobile from country X to country Y.

This definition therefore takes as its (geographical) reference point the country in which the researcher obtained his/her highest degree. Due to this, an EU researcher is not necessarily defined as an EU national working as a researcher, but rather as a national of any country who has received his/her highest degree from an educational institution in one of the EU27 countries. Similarly, a non-EU researcher is defined as a researcher who obtained his/her highest degree from an educational institution in a non-EU country, regardless of nationality.

2.1.1.2.2 Job mobility

Job mobility is the concept used to describe the movement to another job. Depending on the location of the new job, the following types of job mobility can be distinguished:

- Occupational/career mobility: when a researcher carries out a different job (occupational category) for the same employer (e.g. moving from junior to senior researcher/manager).
- Intrasectoral mobility: when a researcher carries out the same job for another employer in the same sector (e.g. moving as a post-doc researcher from one university to another).
- Intersectoral mobility: when a researcher carries out the same job for another employer in another sector (e.g. moving from university to industry).

Job-to-job mobility refers to job mobility within or between sectors and implies a movement from one employer to another. Researchers, in particular university researchers, do not always change employer contracts, but are nevertheless moving to another country or sector for some period of time. The latter phenomenon is called a "*research visit*" (i.e. an exchange of staff). So far, little is known about this phenomenon; therefore we have incorporated and measured this type of mobility in the MORE surveys. Specifically, we define a research visit as a mobility event lasting at least 3 months and without a change of employer. Though considering research visits as a mobility event deviates from the traditional Eurostat definition of job-to-job mobility, the MORE surveys' data enables us to include both job-to-job mobility events on the one hand and research visits on the other hand.

The main focus of the MORE study is on measuring *international mobility patterns (including international research visits)* as well as *inter- and intrasectoral mobility patterns of researchers*. Career and regional mobility are not the subject of this project.

There are a number of different questions in the MORE surveys that address the issues of sectoral and job mobility. Two main questions address movements across sectors (with emphasis put on the movement between the 'public' and the 'private' sectors) and between different jobs. Thus, information is provided on whether the survey respondents have moved

- between sectors ('public' to 'private') or not during their career as researcher;
- across different jobs and/or employers during their career as researcher.

2.2.2 Sampling methods and representativeness of the four MORE surveys

2.2.2.1 The Higher-Education institute (HEI) researcher survey

The main goal of this survey was to create a dataset representative at the EU27 level on researcher mobility. To do so, it based its survey methodology on the main R&D definitions provided by the Frascati manual (OECD 2002) and on the Eurostat statistics on R&D personnel (researcher head counts) in the EU27 by performing sector and by scientific field. The provision of representative data at the aggregate EU27 level implies that the answers from the respondents can be weighted in such a way that the aggregate estimates correspond to the EU27 population of researchers. The overall methodology of the survey focused therefore on targeting the sample of respondents in a manner permitting a valid extrapolation of the answers collected to the overall population of researchers in EU27.

For the HEI survey, the overall size of the population of researchers in the higher education sector in EU27 is defined as the sum of the number of researchers (head count) in this sector in all 27 Member States based on the Eurostat statistics (in 2006) in six fields of science and technology, that is, Natural Sciences, Engineering and Technology, Medical Sciences, Agricultural Sciences, Social Sciences and Humanities¹. Thus, we constructed a 27X3 table with statistics and es-

¹ When information was missing in the official Eurostat statistics, we estimated the missing values on the basis of information from previous years or by using FTE (full time equivalent) statistics.

timates of the number of researchers in 27 Member States and in three aggregated scientific fields².

Optimally, a list of all researchers in all Higher Education Institutions (HEI) which are included in the Eurostat statistics would have been the best basis for the HEI survey. Since such a list does not exist, we have followed a two-stage stratified cluster sampling procedure with two stratification variables – *country* and *field of science*³. This resulted in *81 strata*⁴ (the 27X3 table): 27 EU member countries and three fields of science as already mentioned. *Clusters* are the individual departments of universities. The precise definition of a cluster is “Department A of University B in Country C and Field of Science D”⁵.

To implement this survey, a database containing the universities which are members of the European Universities Association (EUA members Directory) in all EU27 countries was created and was enriched with information on HEIs found in a variety of sources such as the national HEIs’ associations, web sites of ministries of education, national statistical offices and other sources. Further, we have identified, through web search all the faculties or departments. Following the cluster-sampling methodology (for more details see MORE HEI report) 1,660 HEIs units were selected as our cluster sample. From these selected units, all researchers were then counted and identified based on the information available on the web-sites⁶.

In the case of France, although all departments were checked, the resulting outcome in terms of e-mails was poor. For this reason, the research team complemented the above list with 5,240 new e-mail addresses derived from the FP6 and FP7 databases. Unfortunately no information was available regarding their departments and field of science. This information was collected ex-post for only the fraction of the researchers who finally agreed to participate in the survey.

The survey had been active during Summer 2009 (end of June to end of September).

² The three scientific fields are:

- *Natural Sciences and Technology*: the number of researchers in this field is the sum of Eurostat figures for Natural Sciences and Engineering and Technology.
- *Medical Sciences and Agriculture*: the number of researchers in this field is the sum of Eurostat figures for Medical Sciences and Agricultural Sciences.
- *Social Sciences and Humanities*: the number of researchers in this field is the sum of Eurostat figures for Social Sciences and Humanities.

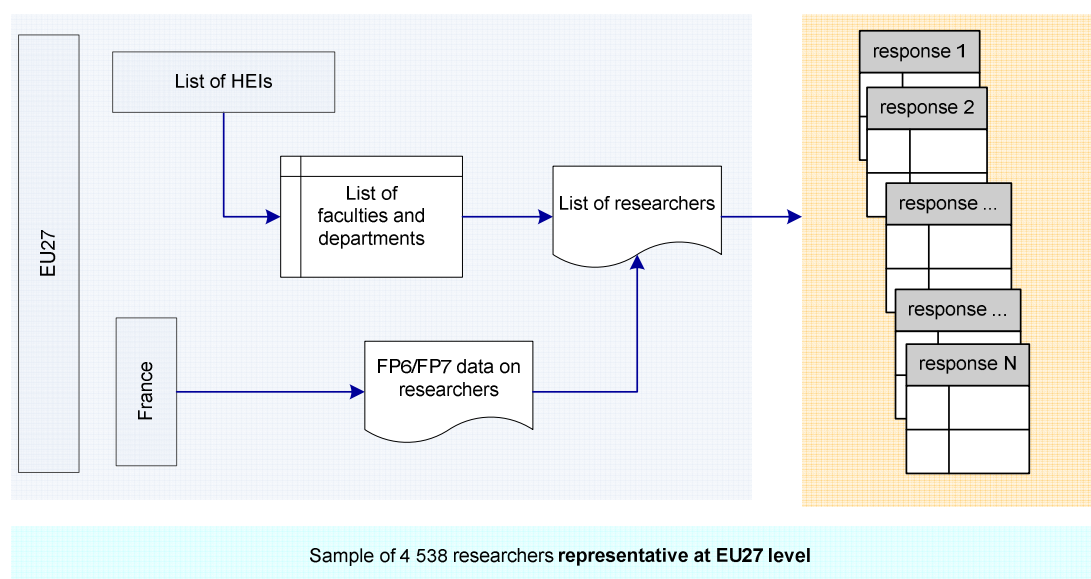
³ See MORE HEI Report, Annex 1 for a discussion on sampling methodologies and for a justification of why a two-stage stratified cluster sampling is the best option for this particular survey.

⁴ It should be noted that the actual number of strata is 77, since the final sample did not contain any researchers from four strata. The impact of this omission is negligible, since these strata contained fewer than 500 researchers in a population of roughly one million researchers.

⁵ Each stratum will, therefore, consist of at least one cluster, and will be a specific department of a university within this stratum. A department within each university is defined as a “degree conferring unit of the university”. Usually, it will correspond to a particular science, for example Mathematics.

⁶ The list of institutions, based on which researchers’ contact details have been created, has included universities and colleges of technology which are members of the European University Association or national HEI associations and has not included “research institutes, experimental stations and clinics or minor other types of institutions of post-secondary education operating under the direct control of, or administered by higher education institutions” which are also included in the Frascati definition of these institutes.

Figure 2-2: The HEI survey: short description of sampling



Source: MORE Final Report

It should be once more noted that due to the sampling strategy followed as well as the data available, the HEI survey is representative of the entire researcher population working in higher-education (university) institutes at the EU27 level. The data however are representative at the country level with the exception of France due to the poor response rate and the additional sampling as described above⁷. In addition, due to the remarkably low response rate of researchers in France, data for France are not available in the MORE set of indicators database. These data are however included in the aggregate EU27 totals; additional robustness analysis (see for more details in the MORE HEI report) has indicated that the low response rate of the researchers in France has not affected significantly the representativeness of the HEI survey data at the EU27 level.

2.2.2.2 The Research institute (RI) survey

The research-institute survey was designed to study researchers working at the non-university public research institute sector. As discussed in the MORE RI report, the non-university 'public or semi-public' research sector, though extensive and highly significant in many EU member states, does not represent a single, homogenous, well-defined 'sector' from a statistical point of view. Rather, for the purposes of sampling it represents a residual – all those 'public' or 'quasi-public' research performing institutes which are left once HEIs are accounted for (for more details see the MORE RI report). As a result, following a rigorous multi-level sampling strategy of the kind used in the HEI survey was impossible for the RI survey.

Consequently, we constructed a list of research institutes not belonging to the higher-education sector. This was difficult as these institutes include a wide range of different types from those with a highly academic culture and incentive system such as an Academy of Sciences, CNR, CSIC or Max Planck institute, through those of a semi-academic culture and incentive system such as a TNO or Fraunhofer institute, to those exhibiting a more market-oriented or public policy ori-

⁷ It should be noted that the error rate is much higher within each country separately, due to the smaller sample size.

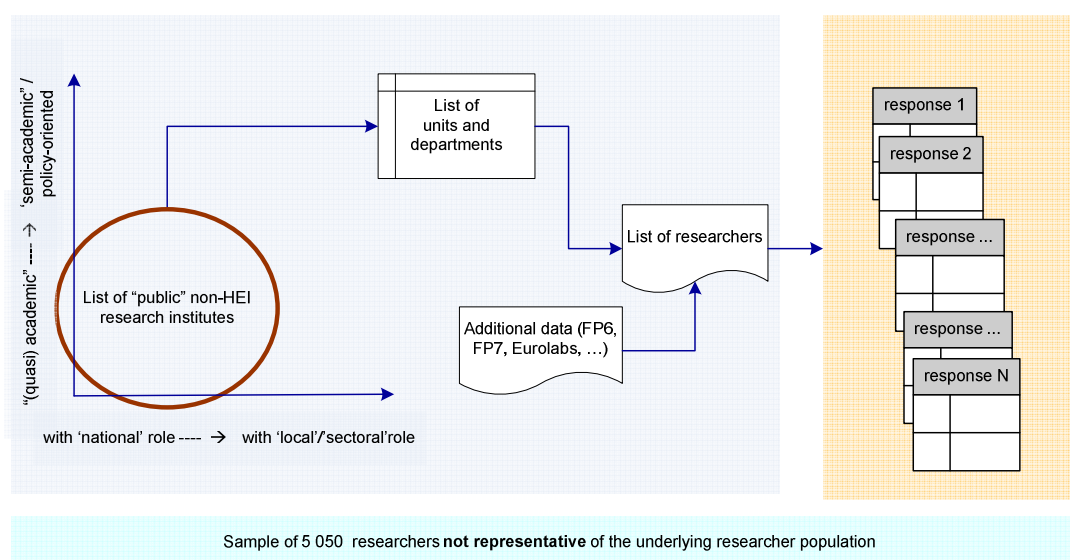
ented culture and incentive system. These institutes hire researchers who are members of the same disciplinary networks and communities as are HEI researchers working in similar fields. Some institutes also play a 'national', 'local' or 'sectoral' role. Institutes focused wholly in the support of a particular sector, perhaps in a particular sub-national region, are likely (but not always) to be smaller in absolute size, further away from the academic or quasi-academic end of the continuum described above, and are likely to be more oriented towards technology or knowledge transfer and other technical or consultancy services rather than research and development.

For the purposes of this survey, we have limited the scope of the survey participants to researchers working for institutes which are closest to the 'academic' or 'quasi-academic' institutes and a 'national' role and ambition. As already noted, public ownership cannot be a determining criterion. However, receipt of public funding for research and development is an obvious criterion.

As the primary source of information for the RI survey, the consortium used the Research-performing-organisation list of IDEA Consult⁸. This list has the virtue of EU27 coverage and was systematically compiled and exhaustively validated to ensure that it covered institutes responsible for 80% of GOVERD in 2006. Additionally, the older, but large EUROLABS study database held by Manchester and the FP6/7 data provided by the EC also provided some information. The list of "public" research institutes created was supplemented with selected institutes for some countries such as the Academy of Sciences for the East European Countries and a list provided by NIFUSTEP. For two countries (i.e. Portugal and Malta) that were not represented in the RI list, we also checked the FP6 database. However all research institutes contained in the FP6 database in Portugal had been previously linked to Higher Education Institutes and thus were excluded from this survey. The survey was then sent to a list of researchers from the relevant units/departments of the identified research institutes.

The survey was active during March 2010.

Figure 2-3: The RI survey: short description of sampling



Source: MORE Final Report

⁸ Study on "Coordination and cooperation - Research Performing Organisations (RPO)" carried out by COWI Denmark and IDEA Consult on behalf of European Commission-DG Research.

The sampling methodology followed clearly implies that the sample obtained from this survey is not representative of the population of researchers working in “public”, non-HEI research institutes, as a result, the conclusions and findings drawn from this survey cannot be generalized to the underlying population. As such it is not recommended that indicators are calculated from this sample on specific sample stratifications (e.g. by country, field of science, etc.), since these would not be representative as well. Nevertheless, the RI survey covers a relatively large sample of 5,050 researchers working in the research institute sector. Consequently, the results and findings, though not representative of the underlying population, provide a very useful ‘picture’ of the characteristics and opinions of the researchers working in the EU in public, non-HEI research institutes.

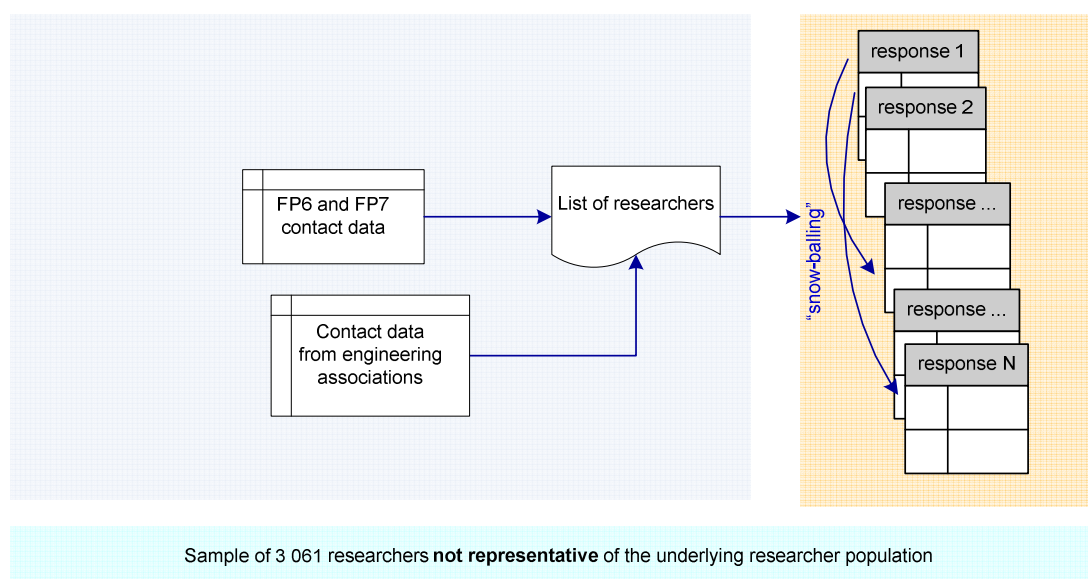
2.2.2.3 The Industry survey

The industry survey targeted researchers working in the private sector, referred to as “industrial” researchers in the report. The sampling method and its implications for representativeness were a central issue for the design of this survey. Establishing a representative sampling for industry researchers requires information not only on the total size of this population, but also on stratification parameters of the population e.g. country, industrial sector, field of science, companies conducting R&D, etc. (for more details see MORE Industry Report). Unfortunately, sufficient information to proceed with a stratified sampling procedure for this survey is lacking. Indeed, since no information is available on the exact number of researchers in private industry, or on the population of R&D performing firms, or on the fields of technology in which these firms are active, or on the distribution of R&D performing firms across countries, neither sector nor country of activity could be potentially used as stratification variables.

Acknowledging that the industry survey will not result in a representative sample of the underlying researchers’ population, this survey was based on convenience sampling. An indirect sampling approach was initially designed whereby the researchers would be approached through their employers, i.e. the companies which are active in R&D (using the list of the thousand most important R&D investors in Europe provided by the Industrial R&D Investment Scoreboard). Due to practical difficulties (for more details see the MORE Industry Report), instead the team had to follow a direct sampling approach to contact researchers working in the private sector. This was done primarily by contacting applicants to the 6th and 7th Framework Programme for Research and Technological Development (FP6 and FP7) of the European Commission who are employed in private industry. Additionally, engineering associations were contacted and asked to provide the names of individuals at these associations who would forward survey invitations to their members. Finally, the questionnaire provided an option enabling respondents to forward a survey invitation to colleagues (“snowballing”).

The industry survey was active during Autumn 2009 (end of September until end of November).

Figure 2-4: The Industry survey: short description of sampling



Source: MORE Final Report

The sample of 3,061 net responses created is, as already mentioned, not representative of the underlying population of industry researchers. Moreover, a number of potential shortcomings may be present. The respondents derived from either the FP6 or the FP7 contact lists might be biased towards excellent researchers and/or researchers employed in excellent research organisations as companies that are able to participate in the Framework Programmes are typically amongst the most advanced in their respective industries. Furthermore, the contacts derived from FP6 might be biased towards non-mobile researchers since FP6 ran in the period 2003-2006 and establishing contact with these researchers today implies that they have probably not been mobile since then. Researchers contacted through engineering associations may also imply a technological bias as engineers are employed more frequently in specific industries where researchers with natural sciences or social sciences background are usually not present. Finally, snowballing usually leads to a correlated sample structure as respondents to the survey are more likely to send the questionnaire to others with similar characteristics and professional backgrounds (for more details see MORE Industry Report).

Since the industry survey provides a sample not representative of the underlying researcher population, the conclusions drawn from this survey cannot be generalized to the underlying researchers' population. Therefore, it is recommended that no indicators are calculated from this sample on specific sample stratifications (e.g. by country, industrial sector, etc.), since these would not be representative as well. Nevertheless, the Industry survey covers a relatively large sample of 3,061 researchers working in the private sector, and therefore the findings provide a very useful 'picture' of the characteristics and opinions of researchers working in the industry.

2.2.2.4 The Extra-EU survey

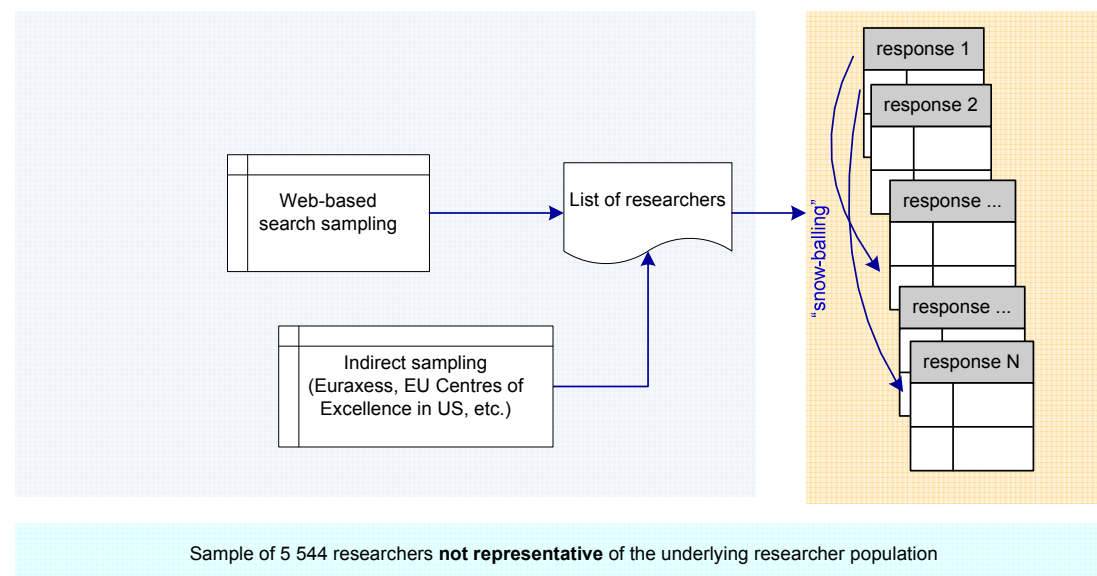
The extra-EU survey differs from the other MORE surveys since it is not a survey on intra-EU mobility (mobility of EU researchers within the EU countries) but, as the name indicates, on extra-EU mobility, i.e. on mobility of EU researchers to non-EU countries and regions with special emphasis on EU-US mobility. This survey was designed as a pilot study to analyse and compare the mobility patterns

of EU researchers to the US with the mobility patterns of US researchers to the EU. It was extended to also include mobility from the EU to countries/regions other than the US, and it also includes non-mobile researchers. Two main methods of sampling were used to identify the groups included in this survey:

- Web-based search where we specified the criteria by which e-mail addresses of researchers were retrieved. This resulted in a large sample of e-mail addresses of people likely to be US academics who previously had resided in the EU or EU academics who previously had resided in the US.
- Indirect sampling methods were used as well in order to broaden the reach of this survey. The European Commission forwarded the survey link to the Euraxess network of researchers, the EU Centres of Excellence in the US and the coordinators of the ATLANTIS Programme on EU-US Cooperation in Higher Education and Vocational Training. The team also forwarded the survey link to the professional network Linked-In. "Snowballing" was also used whereby respondents had the opportunity to forward the link to people who they thought should also be included in the survey.

The Extra-EU survey was active between January and February 2010.

Figure 2-5: The Extra-EU survey: short description of sampling



Source: MORE Final Report

Once again, it is important to note that this survey sample is not a statistically representative one and as such the conclusions drawn from it cannot be generalized to the underlying researchers' population. Consequently, it is recommended that no indicators are calculated from this sample on specific sample stratifications (e.g. by country, field of science, etc.), since these would not be representative as well. Nevertheless, the Extra-EU survey covers a relatively large sample of 5,544 researchers, therefore its findings provide a very useful 'picture' of the characteristics and opinions of the researchers who have been or not been mobile between the EU and US as well as between other regions.

Box 3: The MORE surveys and their representativeness: a summary

- The **Higher-education-institute** survey provided a **representative sample** of the population of researchers working in HE institutes. This implies that the results can be generalised to the EU27 population of these researchers after the relevant weighting of the parameters has been applied. Conclusions at the level of the country (except for France) can also be drawn, but with considerably higher error margins.
- The **Research-institute** survey provides indications on the characteristics and opinions of the researchers working in “public”, non-university research institutes, it is however not representative of this underlying population. Therefore, it is not recommended to calculate indicators from this sample on specific sample stratifications (e.g. by country, field of science, etc.), since these would not be representative as well.
- The **Industry** survey provides indications on the characteristics and opinions of the researchers working in the private sector (with focus on private firms), it is however not representative of this underlying population. Therefore, it is not recommended to calculate indicators from this sample on specific sample stratifications (e.g. by country, field of science, industrial sector, etc.), since these would not be representative as well.
- The **Extra-EU** survey provides indications on the characteristics and opinions of the researchers mobile between the EU and the US as well as between the EU and other non-EU countries and also of non-mobile researchers (with focus EU-US mobility), it is however not representative of this underlying population. Therefore, it is not recommended to calculate indicators from this sample on specific sample stratifications (e.g. by country, field of science, etc.), since these would not be representative as well.

2.3 The IISER-indicator update

One of the objectives of the MORE project, as already indicated in the introduction to this report, was to update the indicators developed under the IISER project.

The FP6 Specific Support Action “Integrated Information System on European Researchers” (IISER) aimed at (i) collecting existing information at national level in order to provide a first dynamic, albeit partial, overview of the European scene in this area, and (ii) conducting an analysis of gaps and methodologies in order to derive a full-fledged information system.

Two updates of the IISER indicators were provided during the MORE project:

- The first update in June 2009 (MORE Report 1: Update of IISER Indicators (Final version, August 2009))
- The second and final update in February 2010 (MORE Report 2: Second (final) update of IISER Indicators (Final version, April 2010))

The IISER project provided indicators mainly on the following subjects:

- A. Indicators on researchers’ stock and career
 - a. Number (and forecasting) of researchers in the European Union
 - b. Number of researchers in the training phase and post-docs
- B. Indicators on researchers’ mobility
 - a. Circulation of researchers within Europe
 - b. Number of researchers leaving Europe
 - c. Number of researchers coming into Europe

It also proposed the collection of qualitative indicators on researchers' motivation and satisfaction, data that had not been available during the IISER project.

The MORE project through the IISER updates has updated these indicators using the following main sources of data:

- Eurostat R&D statistics
- Eurostat Labour Force Survey
- OECD Statistics
- National Bureau of Statistics of China
- NSF data of the 2006 Survey of Earned Doctorates
- Open Doors data

The MORE final update IISER Report provides all the details of the work performed. Some of the IISER indicators have been selected for inclusion in the MORE set of indicators; the main findings are presented in Part 3 of this report.

2.4 Additional information and analysis provided by MORE

In addition to the information provided through the IISER updates and the findings from the four MORE surveys, the MORE reports have provided insights from two additional sources of information, the European Labour Force Survey (ELFS), and the 2003 National Survey of College Graduates (NSCG) in the US.

2.4.1 The European Labour Force Survey

In the context of the MORE Industry survey the team has used data from the European Labour Force Survey (ELFS) to compare the mobility of those employed in research occupations and HRST. Despite important caveats related to these data (for more details see the MORE Industry Report), the ELFS data were used to compare the mobility of those employed in research occupations and HRST. This is important as it allows us to assess (at least from the perspective of rough proportions) the validity of the results of the questionnaire. This comparison also allows future research to more accurately assess the biases that result from analysing the mobility of researchers by proxies taken from the more readily (and regularly) available datasets such as the European Labour Force Survey. Also, comparison of researchers based on survey methods (like the industry survey) with other population groups is not possible; having the ELFS data at our disposal however has enabled us to proceed with such comparisons.

2.4.2 The National Survey of College Graduates in the US

In the context of the Extra-EU survey which focused mainly on mobility between the EU countries and the US, we have provided evidence from the National Survey of College Graduates in the US (NSCG). Despite the drawbacks of these data (for more details see the MORE Extra-EU Report) we have used this survey to gauge the magnitude of EU-migrants in the United States as of 2003, disaggregated by field of study, highest degree, country of birth and country of highest degree. Then, we investigated the reasons that this group of immigrants report as the reasons for their migration to the US. Although the sampling method is com-

pletely different than that that followed in the Extra-EU survey and no direct comparison can be made with the findings from the Extra-EU survey, we provide a rough comparison of the motives that EU researchers going to the US report in the MORE Extra-EU survey with the motivations to go to the US that EU migrants report in the NSCG survey.

Part 2 THE MORE SET OF INDICATORS

3 THE CONCEPTUAL FRAMEWORK AND ADDED-VALUE OF MORE

3.1 Introduction

This chapter starts with a presentation of the conceptual framework of the MORE project. This framework presents the main areas in which collection of data is necessary in order to obtain a 'picture' of the "mobility and career paths of researchers".

This chapter describes the information that the existing IISER indicators provide in relation to the MORE conceptual framework on mobility and indicates the existing gaps in knowledge. Next, we indicate the additional information that the MORE project provides through its four surveys.

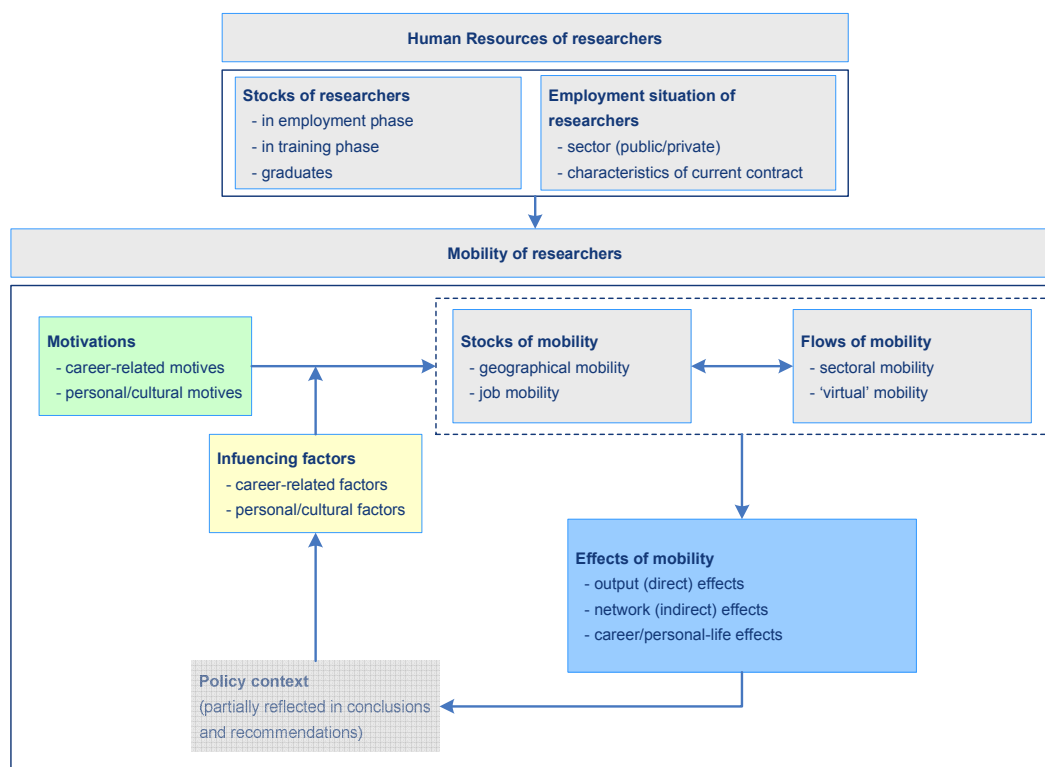
We use the main elements of the more conceptual framework to summarize our findings. In doing so, we develop the MORE set of indicators. Our main findings are summarized under these set of indicators in Chapter 4, which lists the MORE set of indicators. Finally, this section ends with Chapter 0 which outlines the research questions that the MORE indicators answer.

3.2 MORE conceptual framework

The overall purpose of the MORE study was twofold: a. to carry out and analyse four surveys targeting researchers in the EU and b. to update the IISER indicators. Both the MORE surveys and the IISER update have provided a set of indicators reflecting data on the number of researchers in employment or in training phase and their employment situation, the mobility of researchers and the influencing factors, the motivations and perceived effects of mobility. These two different sources of information (the updated IISER indicators and the MORE surveys) neither provide the same data nor do they cover the same populations. Nevertheless, the MORE project and especially this final report has the goal of presenting a combined set of main indicators: **the MORE set of indicators**. The MORE set of indicators provides a summary of the main indicators produced throughout all phases of the MORE project. (The data and indicators developed during the analysis of the four MORE surveys as well as during the update of the IISER indicators are presented in detail in the separate MORE reports)

Before presenting the MORE set of indicators, we describe the main elements we consider to be important in developing a monitoring system on the mobility of researchers and their career paths. These elements are used to build the conceptual framework on which data collection and indicator development have been based. The following figure describes the MORE conceptual framework.

Figure 3-1: MORE collection of indicators: the conceptual framework



Source: MORE Final Report

The focus lies on the researchers and, as such, information on the 'stocks' of researchers is essential as a starting point. In addition, information on the (current) employment situation of the researchers is useful and often essential in understanding the 'professional' profiles of the researchers.

The emphasis in the MORE project, however, has been the mobility of researchers: the stocks and flows of mobile researchers. Stocks of mobility refer to a given number of mobile researchers at a given point of time (a snapshot). There, we distinguish among geographical mobility (mobility across countries and or broader regions) and job mobility (mobility between different jobs). Flows of mobility relate to the career paths of researchers by providing a more dynamic overview of the movements of mobile researchers over time. Here, we focus on flows among different sectors (referring mainly to movements between the public and the private sector) as well as 'virtual' mobility, i.e. collaborations among researchers located in different countries and/or different sectors.

Mobility of researchers is expected to have effects on the micro-, meso- and macro-level, i.e. at the level of the individual (researcher), the level of the organisation (firm, research institute) and at the sector or even the country level. These potential effects need to be examined and well-understood if policy makers aim to design a system for monitoring mobility and its effects. The MORE project has provided information on the effects of mobility through its surveys where researchers have been asked to indicate the effects that they have perceived from mobility. Therefore, the MORE surveys provide information on the self-assessment of the effects of mobility at the level of the individual researcher (or on "perceived" effects).

The perceived effects at the level of the individual as well as the effects actually realised at the level of institutions or countries are expected to affect short- and long-term policy-making decisions which in turn shape the factors influencing

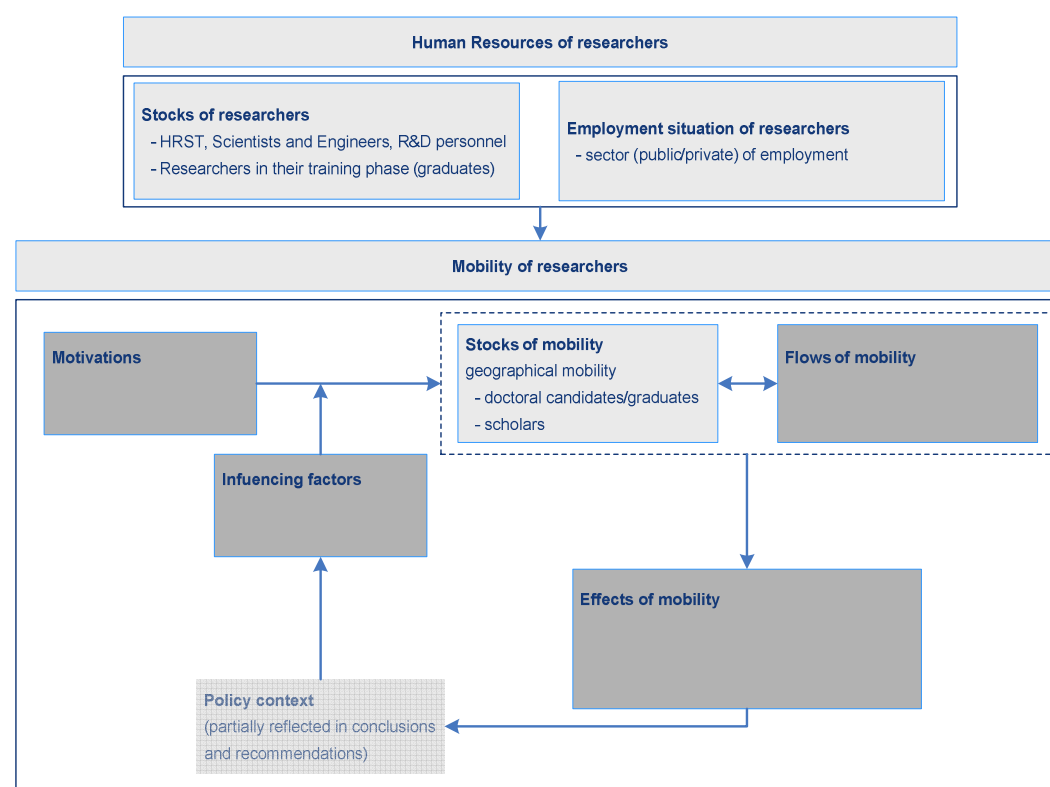
mobility. These in turn are the factors that influence the mobility decisions of researchers. Here the opinions of researchers are important in identifying where there are barriers to mobility that need to be removed, for example. But researchers' mobility is actually determined or initiated by their personal motivations to become mobile, i.e. the reasons why they want to become mobile or prefer not to become mobile. Thus, analysing the motives that drive mobility is important in identifying differences among researchers with different professional backgrounds, career paths or countries of origin or destination.

This conceptual framework provides the main elements that can describe and explain various patterns of mobility. The next sections provide an overview of (i) the extent to which IISER (2007) cover these core elements and (ii) the extent to which the MORE study has contributed by adding to and improving the set of current IISER indicators.

3.3 Building beyond the IISER indicators

The MORE set of indicators is built upon the main elements of the conceptual framework presented in the previous section. Data and information was collected across all main elements of this framework. The starting point of this project was the update to the IISER indicators. The main elements covered by the IISER indicators are summarised in Figure 3-2. Subsequently we will present the additional provided by the MORE project through its four surveys.

Figure 3-2: The IISER indicators



Source: MORE Final Report

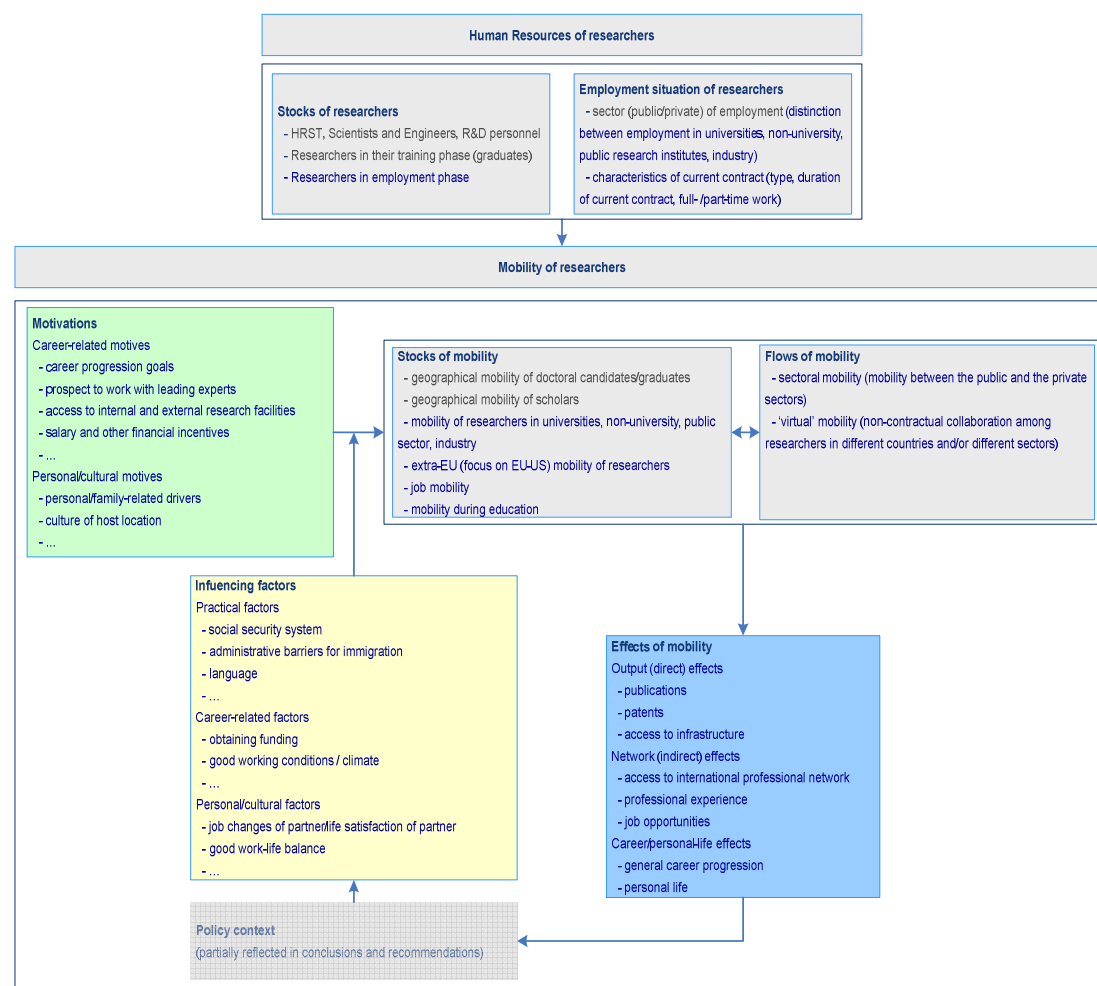
The IISER indicators provide information primarily on the stocks of researchers and on the stocks of the mobility of researchers. The indicators on the stocks of researchers contain data largely on the Human Resources in S&T, the number of Scientists and engineers, the number of graduates in tertiary education with aca-

demographic orientation, doctoral graduates, and some data on post-doctoral researchers. The IISER also contains information on the number of researchers in the public and business sector. The indicators on the stocks of mobility are limited to data on geographical mobility of doctoral candidates/graduates and scholars rather than researchers according to their sector of employment. No indicators are available on the stocks of job mobility of researchers.

On the side of the flows of mobility, i.e. movements across sectors of employment and collaboration among researchers based in different countries and/or different sectors) no information is provided by the IISER indicators. Finally, the IISER indicators provide no data on the influencing factors of mobility, the motivations of researchers for mobility or the effects of mobility.

The MORE project has had as its main goal not only to update the IISER indicators but also to enrich these indicators with additional data on the mobility of researchers, their motivations, the influencing factors and the effects of mobility. Figure 3-3 provides a 'picture' of the added-value of the MORE project to the existing IISER indicators in terms of data coverage.

Figure 3-3: MORE input to the IISER indicators (the main elements)



Source: MORE Final Report; in grey colour: information from the IISER update; in blue colour: additional information (not exhaustive) provided by the MORE surveys.

It should be noted that Figure 3-3 does not cover all information and data collected during the MORE project. Rather it presents the main additional data that the MORE project, through its surveys, provides to the updated IISER indicators.

The data provided through the MORE surveys added to the existing IISER indicators the following:

- information on the stock of researchers in their employment phase distinguishing among researchers working in the public (university or non-university sector), or in the industry.
- information on the characteristics of researchers' current employment situation (type of current contract, duration of current contract, full-/part-time work).
- information on job mobility as well as on mobility during the training phase.
- information on the movement of researchers between the public and the industrial sectors;
- information on contractually-based collaboration among researchers in different countries and/or different sectors.
- information on the motivations of researchers towards mobility. In general, we provide information on the opinions of researchers on career-related drivers of mobility (e.g. prospect to work with leading experts, access to internal and external research facilities, salary and other financial incentives) as well as on personal-related drivers related to personal/family life and cultural factors at the home or host location.
- information on the opinion of researchers on the factors influencing their decisions related to mobility. Information is offered on practical influencing factors such as the social security system, administrative barriers for immigration, language, etc. Information is also provided for career-related factors (e.g. obtaining funding, good working conditions / climate, etc.) as well as on personal and culture-related factors (e.g. job changes of partner/life satisfaction of partner, good work-life balance, etc.).
- information on the self-assessment of researchers on the effects realised from their mobility. Here we provide data on the realisation of output (direct) effects (e.g. publications, patent output of researchers, access to infrastructure), network (indirect) effects (e.g. access to international professional network, professional experience, job opportunities, etc.) as well as on career/personal-life effects (on general career progression and on the researchers' personal life).

The following section provides a detailed list of the indicators provided throughout the MORE project organised by the main elements of the MORE conceptual framework.

4 MORE-INDICATORS: THE COMPLETE SET

As already mentioned in previous sections, the intention of the present MORE Final Report is to present in a comprehensive and condensed way the main findings of the different MORE reports. These findings have been structured around the main elements of the MORE conceptual framework and will be presented in Part 3 of this final report. Here the MORE indicators are presented per main topic and sub-topic following the main elements of this framework.

The following topics and sub-topics are covered:

- Human resources of researchers
 - 'Stocks' of researchers
 - Employment situation of researchers
- Mobility of researchers
 - Stocks of mobility
 - Stocks of geographical mobility
 - Stocks of job mobility
 - Flows of mobility
 - Sectoral mobility
 - Contractually-based collaboration among researchers in different countries and/or different sectors
 - Influencing factors of (geographical and job) mobility
 - Practical influencing factors
 - Profession-related influencing factors
 - Personal influencing factors
 - Motivations for (geographical and job) mobility
 - Profession-related motivations
 - Personal motivations
 - Effects of (geographical and job) mobility
 - Overall career and personal effects
 - Output (direct) effects
 - Network (indirect) effects

The MORE set of indicators listed in Table 4-1 below is structured according to the above-mentioned topics. It is important to mention again that the information collected per indicator is drawn from the main five MORE outputs: the four MORE surveys and the MORE update of the IISER indicators. However, not all these five MORE outputs provide information for all indicators. Accordingly, in this table, the information source for each indicator is noted.

Table 4-1: The MORE set of indicators

Main topic	Sub-topic	Indicator	Code
HR of researchers	Stock of researchers	Number (HCs and FTEs) of researchers and per 1000 active population (15-74 years old)	HR-ST1
		Number of researchers in the MORE surveys	HR-ST2
		Number of tertiary education graduates (ISCED 5A and 6)	HR-ST3
		Number of doctoral graduates (ISCED 6) and per 1000 population aged 25-34	HR-ST4
		Ratio of doctoral graduates (ISCED 6) over tertiary degrees with academic orientation (ISCED 5A)	HR-ST5
		Number and share of researchers who are doctoral candidates (PhD students) in total number of survey respondents	HR-ST6
		Number and share of researchers who are post-doctoral researchers in total number of survey respondents	HR-ST7
	Employment situation of researchers	Number and share of researchers in public sector (higher education sector and government sector) in total number of researchers	HR-EMPL1
		Number and share of researchers in private sector (business enterprise and private non-profit sector) in total number of researchers	HR-EMPL2
		Number and share of researchers within the MORE surveys working in the public sector (higher education or public/government research institute sector)	HR-EMPL3
		Number and share of researchers within the MORE surveys working in the private sector (business or private-not-for-profit sector)	HR-EMPL4
		Number and share of researchers within the MORE surveys with a fixed term contract	HR-EMPL5
		Number and share of researchers within the MORE surveys with a permanent(=open-ended) contract	HR-EMPL6
		Number and share of researchers within the MORE surveys working full-time	HR-EMPL7
Mobility of researchers	Stocks of mobility	<i>Geographical mobility</i>	
		Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree, after (highest-degree) graduation	MOB-ST1
		Number and share of researchers who have worked in the last three years for at least 3 months in a country other than the country where they attained their highest educational degree, after (highest-degree) graduation	MOB-ST2
		Number of different countries worked in since graduation (including periods of self-employment)	MOB-ST3

		Number and share of doctoral candidates (ISCED 6) with the citizenship of another EU27 member state in the reporting country in the EU27 (MOB-ST4)		MOB-ST4
		Number and share of doctoral candidates (ISCED 6) of the reporting citizenship in EU27 in all the other member states in the EU27		MOB-ST5
		Ratio of citizens from the respective country-earning doctorates at US colleges and universities to number of doctoral degrees awarded at home		MOB-ST6
		<i>Job mobility</i>		
		Number and share of internationally mobile researchers having moved to a new employer in a different country		MOB-ST7
		Number of jobs/ employers since graduation		MOB-ST8
		Number and share of researchers having moved job at least once from one public research organisation to another		MOB-ST9
	Flows of mobility	Number and share of researchers who have moved between the public and the private sectors (sectoral mobility)		MOB-FLOW1
		Number and share of researchers engaged in formal collaboration with only academic researchers from other countries by mobility status		MOB-FLOW2
		Number and share of researchers engaged in formal collaboration with only industry researchers from other countries by mobility status		MOB-FLOW3
		Number and share of researchers engaged in formal collaboration with both academic and industry researchers from other countries by mobility status		MOB-FLOW4
	Influencing factors of mobility	<i>Geographical mobility</i>		
		Practical/personal factors	Social security system	MOB-FCT1
			Administrative barriers for immigration	MOB-FCT2
			Language	MOB-FCT3
			Quality and cost of accommodation	MOB-FCT4
			Child care arrangements	MOB-FCT5
			Work permission for partner	MOB-FCT6
			Social integration at host country	MOB-FCT7

		Professional factors	Obtaining funding	MOB-FCT8
			Maintenance of professional and personal network of contacts	MOB-FCT9
		Job mobility		
		Professional factors	Job satisfaction	MOB-FCT10
			Good working conditions / climate	MOB-FCT11
		Personal factors	Good work-life balance	MOB-FCT12
			Job changes of partner/life satisfaction of partner	MOB-FCT13
			Maintaining family and personal relationships	MOB-FCT14
			Life satisfaction of children	MOB-FCT15
	Motivations for mobility	Geographical mobility		
		Personal motives	Personal/family motives	MOB-MOT1
			Culture-related motives	MOB-MOT2
		Professional motives	Career progression goals	MOB-MOT3
			Personal research agenda	MOB-MOT4
			Prospect to work with leading experts	MOB-MOT5
			Access to internal and external research facilities	MOB-MOT6
			Salary and other financial incentives	MOB-MOT7
			Career opportunities at new location	MOB-MOT8

		Job mobility		
		Professional motives	Prospects in scientific career	MOB-MOT9
			Promotion prospects within companies, organisations	MOB-MOT10
			High salary	MOB-MOT11
			High job security	MOB-MOT12
	Effects of Mobility	Geographical mobility		
		Overall effects	Overall effect on career progression	MOB-EFF1
			Overall effect on personal and family life	MOB-EFF2
		Output (direct) effects	Publication output	MOB-EFF3
			Patent output	MOB-EFF4
			Access to infrastructure and know-how	MOB-EFF5
			Ability to work in industrial sector	MOB-EFF6
		Network (indirect) effects	Access to international network of professionals	MOB-EFF7
			Professional experience	MOB-EFF8
			Job opportunities at 'home' country	MOB-EFF9
			General recognition as researcher	MOB-EFF10
		Job mobility		
		Output effects	Publication output	MOB-EFF11
			Patent output	MOB-EFF12
		Network effects	Chances on job market	MOB-EFF13
			Network diversity	MOB-EFF14
			Interdisciplinarity of research	MOB-EFF15

The coding next to each indicator corresponds to the numbering per indicator followed in the MORE set of indicators provided as an excel-tool which accompanies this report. In Annex 2 we present in detail these indicators together with their sources of data and the reference to the MORE reporting. Additionally, Annex 3 provides a detailed description of each indicator. There, we present a fiche per indicator containing information on its data sources, geographical and time coverage, unit of measurement, breakdowns, derived indicators, etc. As an example, we present in Table 4-2 the fiche on one of the main mobility indicators that uses the four MORE surveys as sources of information (indicators MOB-ST1).

Table 4-2: Example of indicator fiche for indicator MOB-ST1

Code: MOB-ST1	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree)
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number of researchers (head counts)
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By age (≤ 40) - By gender - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

HEI survey: Higher-education institute survey

RI survey: Research institute survey

IND survey: Industry survey

Extra-EU survey: Extra EU survey focusing on EU-US mobility

5 THE MAIN RESEARCH QUESTIONS OF MORE

The findings and conclusions drawn from the analysis of the MORE set of indicators provide answers to the following questions:

Human Resources of researchers

- “Stocks” of researchers and their characteristics
 - How many researchers are there in the EU?
 - Which are the main characteristics of researchers and how do these compare among different sub-groups?
 - What is the number of graduates in tertiary education and how does this compare to the number of researchers?
 - What do the MORE surveys indicate about the characteristics of researchers in their training phase?
- Employment situation of researchers
 - How many researchers are employed in the different sectors in the EU?
 - What are the differences in the characteristics of researchers across the different sectors?
 - What is the share of researchers with a permanent contract and how does this differ among the different sectors?

Mobility of researchers

- Stocks of (geographical and job) mobility
 - How many mobile researchers are there and who are they?
 - Do the characteristics of recent-mobile researchers differ from those who were mobile once in their career?
 - Do the job-mobile researchers have different characteristics than the rest of the researchers?
- Flows of mobility
 - How many researchers have moved between sectors and what are their characteristics?
 - How often do researchers collaborate with researchers in other countries and/or other sectors?
- Influencing factors of (geographical and job) mobility
 - Which are the most important influencing factors of geographical mobility?
 - Which of these are considered as barriers to mobility?
 - Do these differ among researchers working in different sectors?
 - Which are the most important influencing factors of job mobility?
 - Do these differ among internationally mobile and non-internationally mobile researchers?
- Motivations for (geographical and job) mobility
 - What are the most important motivations for geographical mobility?
 - Do these differ among researchers working in different sectors?

- Do intra-EU and extra-EU mobile researchers indicate different motivations for mobility?
- What are the most important motivations for job mobility?
 - Do these differ among internationally mobile and non-internationally mobile researchers?
- Effects of (geographical and job) mobility
 - How do researchers self-assess the overall effects of geographical mobility for their career and personal life?
 - Do intra-EU and extra-EU mobile researchers realise different types of effects due to mobility?
 - What are the most important output and network effects of geographical mobility according to the researchers?
 - Are there differences among the different mobility groups?
 - What are the most important output and network effects of job mobility according to the researchers?
 - Do industrial researchers realise different types of effects than 'academic' researchers?

Part 3 of this report that follows presents an overview of the main findings and conclusions with respect to each indicator listed in Chapter 4, while Part 4 presents a summary of the relevant findings of the MORE indicators with respect to the research questions presented above.

Part 3 MOBILITY OF RESEARCHERS (MORE): THE MAIN FINDINGS

6 INTRODUCTION TO THE MAIN FINDINGS

This chapter discusses the indicators derived from the information collected in the four MORE surveys and the (final) IISER update report. In this part, we present the main findings from the IISER update and the four MORE surveys as summarised by the MORE set of indicators. This part follows the same structure as that of the MORE indicators (see Chapter 4).

Here it is important to repeat that although comparisons are made among the different surveys, **these surveys do not share the same properties, especially when it comes to the representativeness of their underlying population.** Most importantly, the HEI survey is the only survey representative of the underlying researcher population (researchers working in the higher-education sector in the EU27). Therefore, when we compare the findings among the different MORE surveys per indicator, we do not intend to provide precise comparisons but rather only **indications of the differences or similarities** among the different survey samples and researcher groups.

The indicators that will be discussed are those presented in Table 4-1. First we discuss the set of indicators related to the human resource situation of researchers in the EU27, followed by the mobility of EU27 researchers. Under “human resources of researchers” there are two subsets of indicators namely those included in the “stocks of researchers” (e.g. number and share of researchers in employment phase, in training phase, graduates) and those included in the “employment situation of researchers” (such as number and share working in public/private sector, characteristics of the researchers’ current employment contract). Under the “mobility of researchers”-set of indicators we provide first some discussion on the “stocks of mobility” (geographical and job mobility), followed by “flows of mobility” including sectoral (public-private) and mobility through co-operation with researchers from other countries. Other than the stocks and flows of mobility we discuss the motivations and influencing factors of mobility as well as its perceived effects.

At this point it is useful to add a short description behind the “philosophy” of the creation of the MORE set of indicators (on which the rest of the discussion in this part is based).

The MORE set of indicators presents, in a non-exhaustive way, the main indicators collected through the four MORE surveys as well as through the final IISER update. Particularly when we look into the indicators created in order to summarise MORE survey data, **each indicator defines a subset of the sample.** For example, the indicator on the number of researchers who are sectorally mobile, defines a subset of the survey samples: the subset of the sectorally mobile researchers.

What is the purpose of the indicators? It is to provide and present, in a comparative way across the different surveys, a collection of main demographic characteristics for each subsample. For example, we present the share of males who are sectorally mobile (i.e. the share of males given that they are sectorally mobile), the share of PhD holders given that they are sectorally mobile, the share of graduates in Natural sciences and technology given that they are sectorally mobile, etc.

For some indicators (MOB-ST1, MOB-ST2, MOB-ST7, MOB-ST9, MOB-FLOW1, MOB-FLOW2) we present also additional information in Annex 4 of this report.

7 HUMAN RESOURCES OF RESEARCHERS

The first broad set of indicators shows the human resources of researchers in the EU27 using data from Eurostat and the MORE surveys. For the researchers in the MORE surveys we also give an overview of their characteristics including gender, age, time since graduation, civil and family status, degree of graduation (in case of PhD holders), etc.

Regarding the 'stocks' of researchers we discuss total numbers and their evolution over time in the EU27 as well as their distribution by country. We include all levels of research, meaning that we present numbers on both researchers and those in their training phase, where the latter gives an idea about the future (potential) 'stock' of researchers.

Next, we discuss the indicators related to the employment situation of the researchers, namely whether they are working in the public or the private sector and under what type of contract (fixed-term or permanent; full-time or part-time) they are employed.

7.1 'Stocks' of researchers

7.1.1 Stocks researchers in employment phase

7.1.1.1 Number (HCs and FTEs) of researchers (also per 1000 labour force) (HR-ST1)

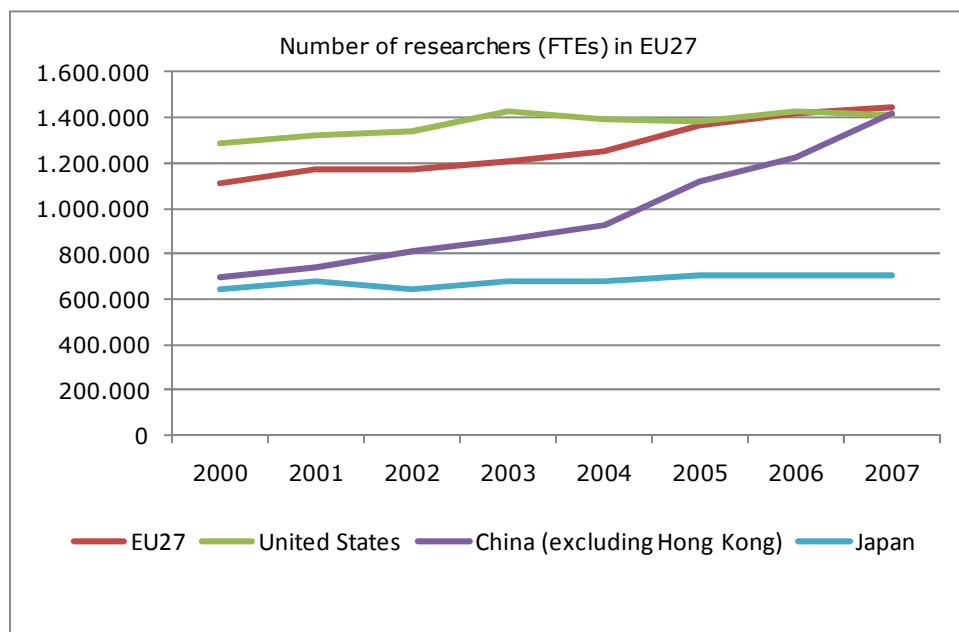
The first indicator gives an overview of the stock of researchers in the EU27. Both headcounts and full-time equivalents are presented. There were 2,157,838 researchers in the EU27 in 2007, corresponding to 1,448,337 in full-time equivalents. We show how the numbers of researchers evolved from 2000 to 2007 for the EU27 as a total and by country.

The evolution over time and the situation per country is also shown for the number of researchers per 1,000 active population (15-74 years old). This gives an idea about the importance of researchers in the total workforce which is expected to evolve positively given the policy focus on the knowledge-based society.

Figure 7-1 shows that there is a slow but steadily increasing trend in the number of researchers, with a jump in 2005 where the number of researchers grew by 9.6 percent compared to the year before. In total the number of researchers grew by nearly 31% between 2000 and 2007.

The number of researchers in the EU27 is growing stronger than researchers in the US but not as strong as researchers in China. The three regions showed a more or less equal number of researchers in 2007 (see figure 2 in the MORE final update of IISER indicators, p22).

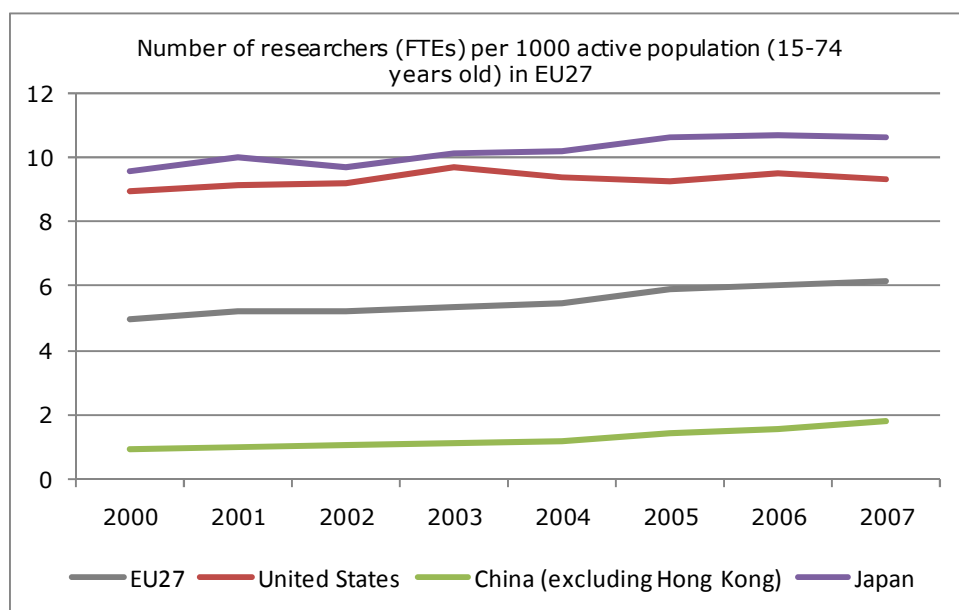
Figure 7-1: Number of researchers (FTEs) in EU27, 2000-2007



Source: MORE IISER (final) update report

Not only the total number of researchers in the EU27 is growing but also the number of researchers in the total number of 1000 persons of active population (Figure 7-2) is growing but at slightly lower speed (23% total growth between 2000 and 2007). Also here the largest growth was noticed in 2005 where the number of researchers per 1,000 of active population was growing by nearly 8%. However, there are also some years with very low or even negative growth (2002). In 2007 there were 6 researcher FTEs in the EU27. This compares to 9 FTEs in US, 11 in Japan and 2 in China.

Figure 7-2: Number of researchers (FTEs) per 1000 active population between 15 and 74 years old in EU27, 2000-2007



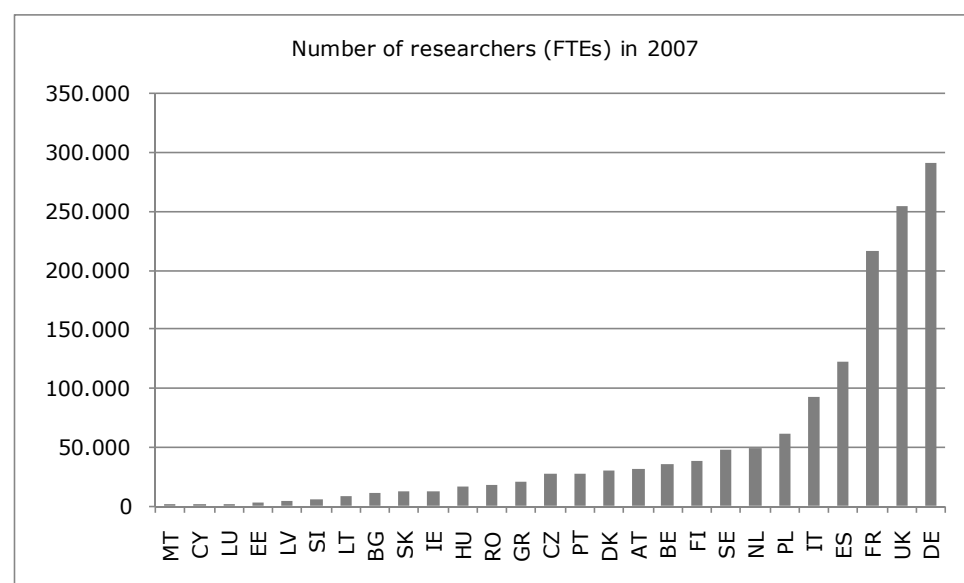
Source: MORE IISER (final) update report

Figure 7-3 shows the numbers of researchers (FTEs) per country in 2007. Obviously, there are large differences with a strong correlation between the total

population of a country and its 'stock' of researchers as we see Germany, UK and France clearly having the highest numbers of researchers, followed by Spain and Italy in the top-5.

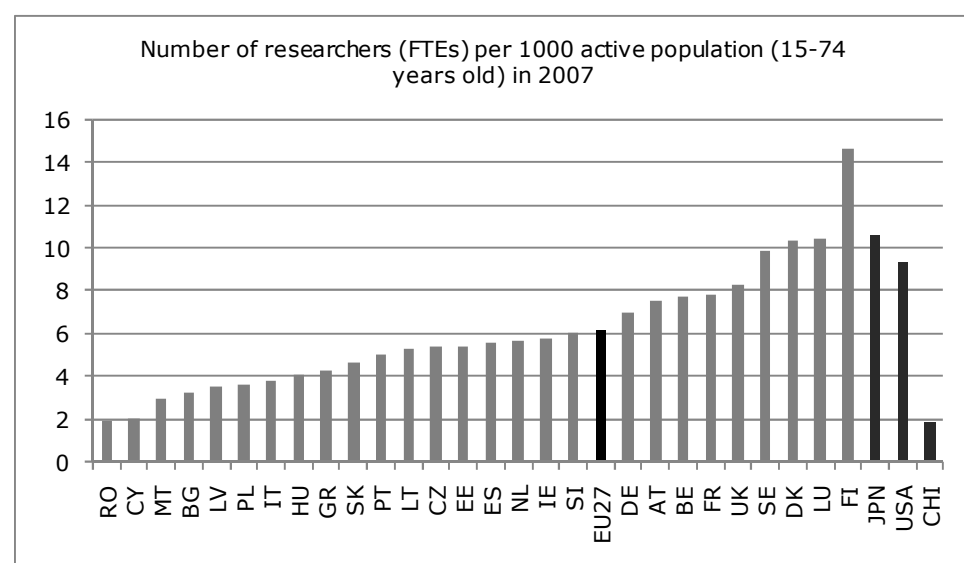
However, when we look at the number of researchers per 1,000 of active population (Figure 7-4), the picture is slightly different. Finland has the highest penetration of researchers in the workforce with 15 researchers per 1,000 active population. Also other Scandinavian countries (Denmark and Sweden with around 10 researchers employed) have a high number of researchers per 1,000 active population. To complete the top-5 we find Luxembourg in second and the UK in the fifth place. Romania, Cyprus, Malta, Bulgaria and Latvia have the lowest numbers with a striking contrast between Romania's 2 and Finland's 15 researchers per 1,000 active population.

Figure 7-3: Number of researchers (FTEs) in 2007, by country



Source: MORE IISER (final) update report

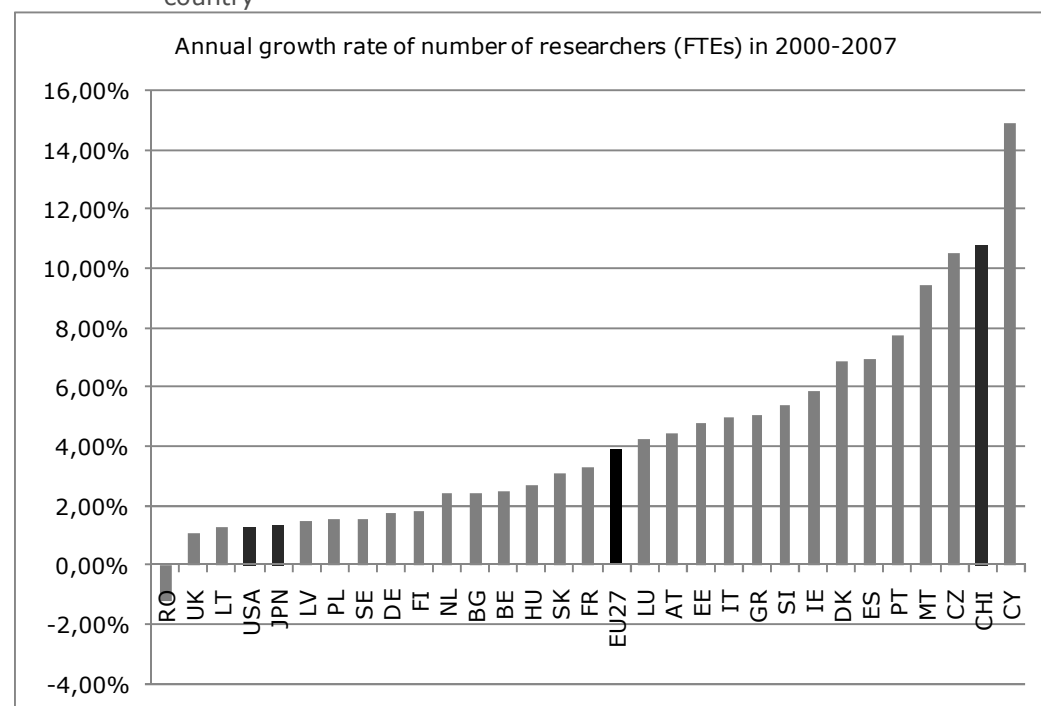
Figure 7-4: Numbers of researchers (FTEs) per 1000 active population (15-74 years old) in 2007, by country



Source: MORE IISER (final) update report

The following table presents the annual growth rate of the number of researchers in FTEs per country comparing with the USA, China and Japan. There we see that the annual growth rate of the number of researchers in FTEs in 2000-2007 is 3.95 p.a. for the EU27 compared to 1.3 % p.a. for the USA, 10.8% for China and 1.3 for Japan. Among the EU27 we see that two new Member States report the highest annual growth rates, Cyprus and the Czech Republic with 14.9 and 10.5% p.a. respectively.

Figure 7-5: Annual growth rate of the number of researchers (FTEs) in 2000-2007, by country



Source: MORE IISER (final) update report

7.1.1.2 Number of researchers in the MORE surveys (HR-ST2)

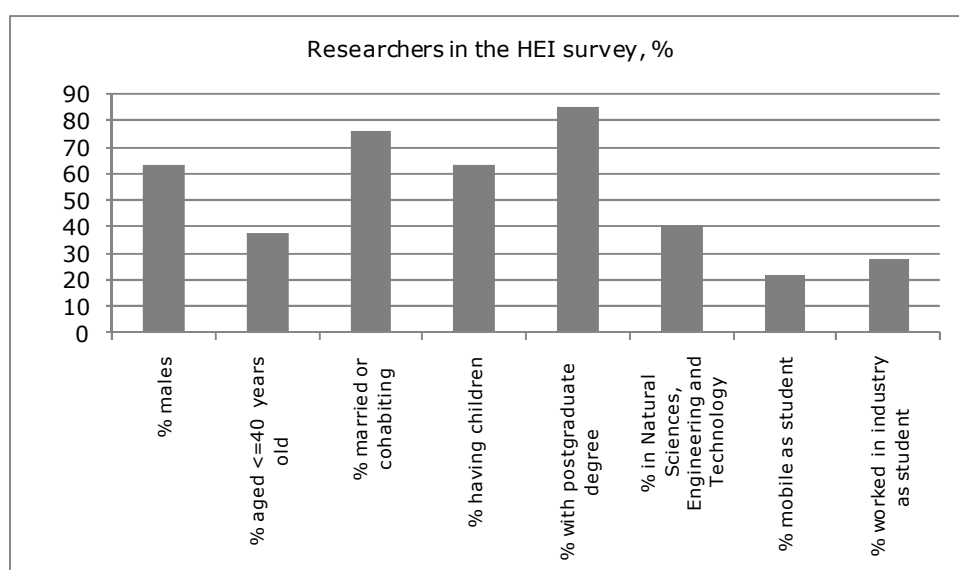
This section presents the first indicator based on MORE survey data. More such indicators are presented in the following sections. Here, however, we would like to repeat that although comparisons are made among the different surveys, these surveys do not share the same properties, especially when it comes to the representativeness of their underlying population. Therefore, when we compare the findings among the different MORE surveys per indicator, we do not intend to provide precise comparisons but rather only indications of the differences or similarities among the different survey samples and researcher groups.

Next, we present the number of researchers in the four different MORE surveys and their characteristics such as gender and age distribution, their family status (married or cohabiting, having children), their education (having a postgraduate degree, the share of researchers who have graduated in Natural sciences, engineering and technology) and their mobility as a student (having been geographically mobile and having worked in industry). We discuss the characteristics of the researchers in each of the surveys separately.

Findings from the HEI survey

In total there were 4,538 respondents in the HEI survey of which a large part were male (63%) (see Figure 7-6). The average age in the survey was 45 with 38% younger or equal than 40 years old. The average number of years since graduation was 13. Most of the researchers had a partner and children (76% married or cohabiting and 63% with children). A very large majority of the higher education institutes' researchers had a postgraduate degree (85%), with 41% having obtained their highest degree in Natural science, engineering and technology (the rest of the respondents have received their highest educational attainment either in the Medical Sciences and Agriculture or in the Social Sciences and Humanities). On average 22% of the HEI respondents had been mobile as students and 28% had worked in industry as a student.

Figure 7-6: Characteristics of researchers in the HEI survey

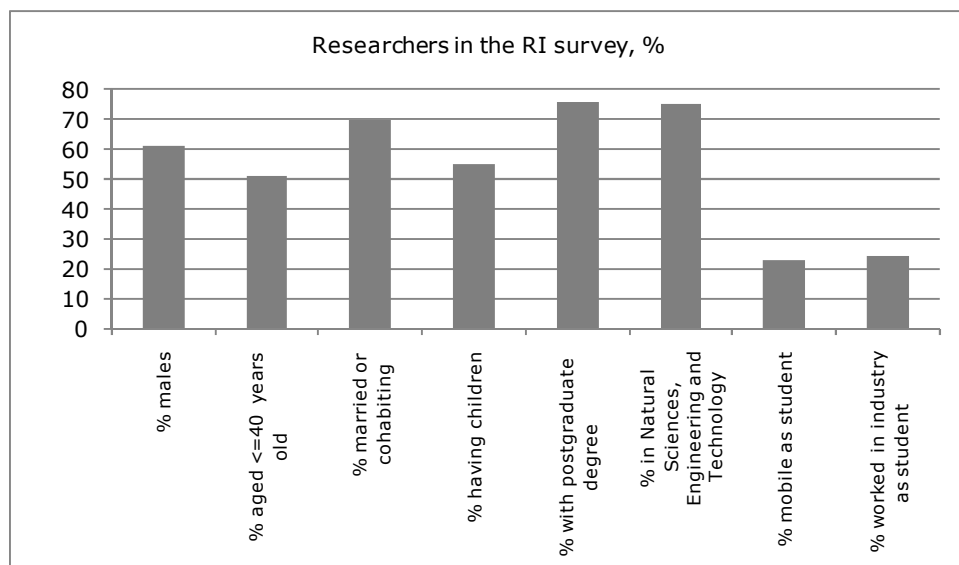


Source: MORE HEI survey

Findings from the RI survey

The total number of respondents in the research institute survey was 5,050, with nearly two thirds of the researchers being male (61%) (Figure 7-7). The respondents seem slightly younger than those in the HEI survey with an average age of 42 and with more than half of the researchers being less than 40 years old (51%). Also related to the apparently younger population is the fact that a lower share were married or cohabiting (70%) and had children (55%). 76% of the RI researchers had a postgraduate degree; three quarters of these researchers obtained their highest degree in the fields of Natural sciences or engineering and technology. Student mobility is similar to that found for HEI researchers, with 23% having been mobile as a student and 24 % having worked in industry as a student.

Figure 7-7: Characteristics of researchers in the RI survey

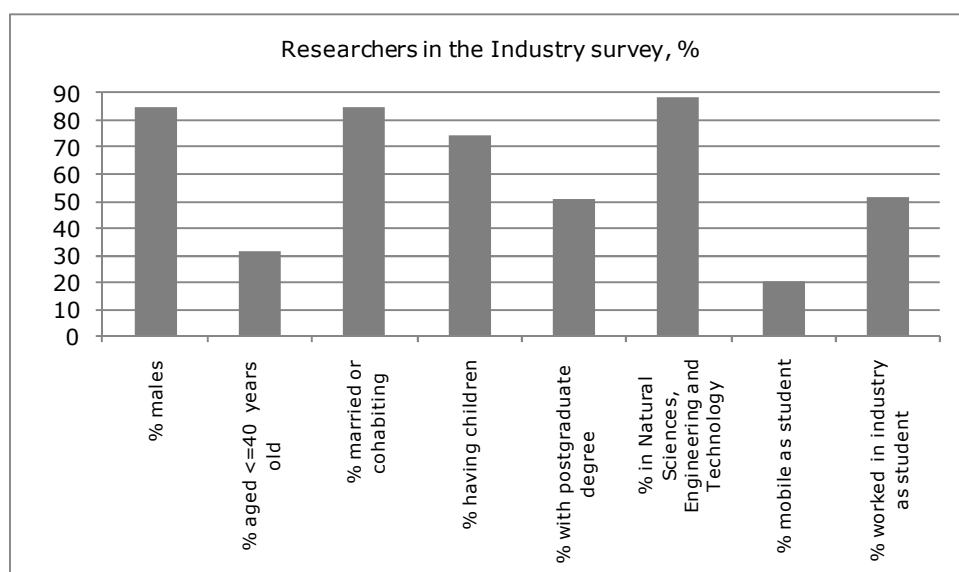


Source: MORE RI survey

Findings from the Industry survey

Of the 3,061 respondents in the industry survey a strikingly high share were male (85%) (Figure 7-8). The industry researchers appear on average to be older than either HEI or RI respondents, with an average age of 46 and with one third of the researchers being less than 40 years old. On average, industry researchers had obtained their highest degree 17 years ago. Most of them were married or cohabiting and had children (85 and 74%, respectively). Around half had a postgraduate degree (51%) and most of them obtained their highest degree in Natural sciences, engineering and technology (89%). While geographic mobility as a student appears to be similar to the other sub-groups of researchers (21% were mobile as a student); not unexpectedly, a high number of industry researchers had already worked in industry as a student (52%).

Figure 7-8: Characteristics of researchers in the industry survey

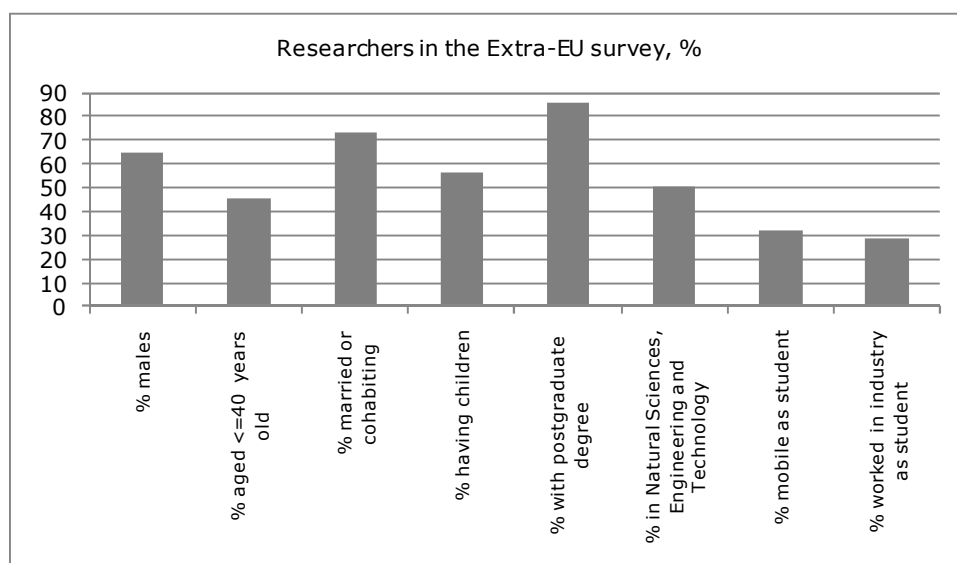


Source: MORE Industry survey

Findings from the Extra-EU survey

The 5,544 respondents of the Extra-EU survey show similar characteristics to the respondents in the other surveys (see Figure 7-9): 65% were male, the average age was 44 years, and, on average, had obtained their highest degree 13 years ago. There is quite a high share of young researchers (45% were younger or equal to 40 years old) and a relatively low share had children (57%). A very high share had a postgraduate degree (86%) and exactly half of these researchers obtained their highest degree in Natural sciences or engineering and technology (50%). Furthermore, the Extra-EU survey presents the highest share of researchers that had been mobile as students (32%).

Figure 7-9: Characteristics of researchers in the Extra-EU survey



Source: MORE Extra-EU survey

7.1.2 Number of graduates

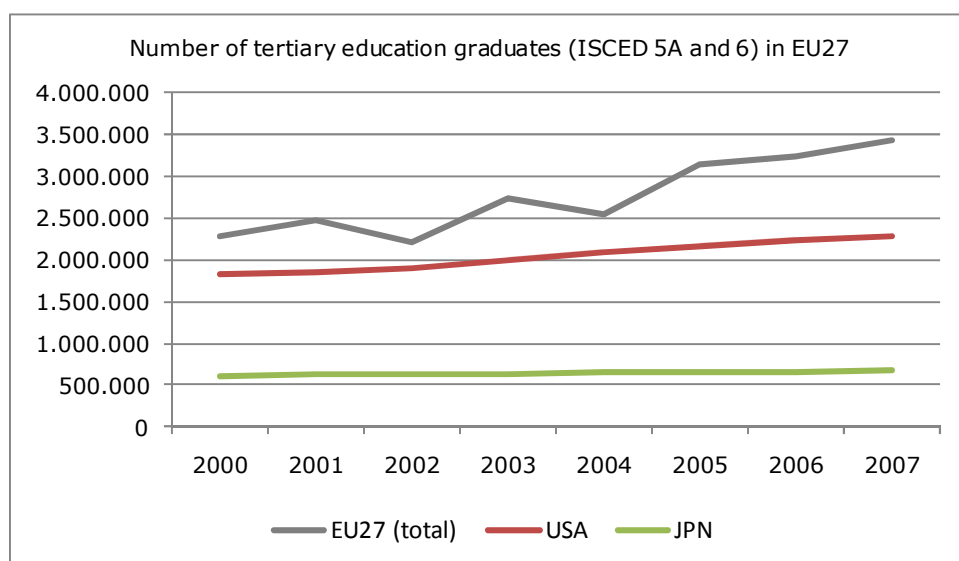
Here we show the evolution over time in the EU27 and by country for the graduates with tertiary education who form the 'pool' of potential researchers. These count those with tertiary degrees with academic orientation (ISCED 5A) and doctoral graduates (ISCED 6).

7.1.2.1 Number of tertiary education graduates (ISCED 5A and 6) (HR-ST3)

Figure 7-10 shows that the pool of potential researchers has been fluctuating since 2000 but has been increasing since 2004. Between 2000 and 2007, the number of tertiary education graduates grew by nearly 50 percent. Thus the pool of *potential* researchers grew faster than the pool of *actual* researchers (31%) in the EU27.

In the total EU27 there were 3,414,618 tertiary education graduates in 2007. The ranking of EU27 countries by absolute numbers of tertiary education graduates in 2007 follows more or less the ranking according to the populations in the different countries (therefore there are no unexpected conclusions and no figure is drawn).

Figure 7-10: Number of tertiary education graduates in EU27, 2000-2007

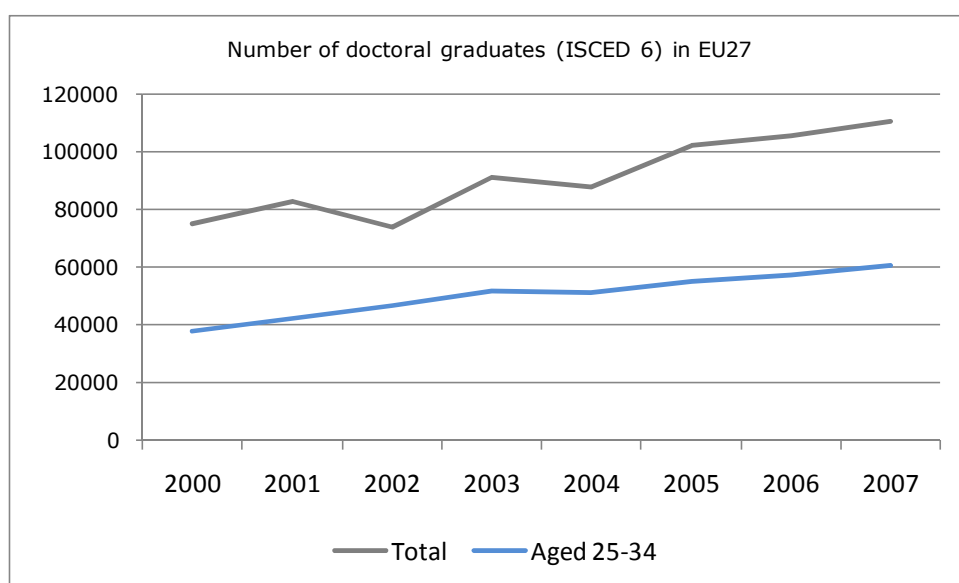


Source: MORE IISER (final) update report

7.1.2.2 Number of doctoral graduates (ISCED 6) (HR-ST4)

With regards to those tertiary degree graduates who have a doctoral degree, we find that in the EU27 in 2007 there were 110,628 doctoral graduates of which 60,465 were between the ages of 25 and 34. Figure 7-11 shows the evolution in the number of doctoral graduates from 2000 to 2007 for the entire EU27. Both the total and the “young” doctoral graduates are shown. While the total number has been increasing with some fluctuations, the number of young doctoral graduates (ages between 25 and 34 years) does not fluctuate and increases steadily. The average annual growth rate of the total number of doctoral graduates between 2000 and 2007 was 5.7% (MORE final IISER update report, p45) and the growth rate for young doctoral graduates has been slightly higher at 7%.

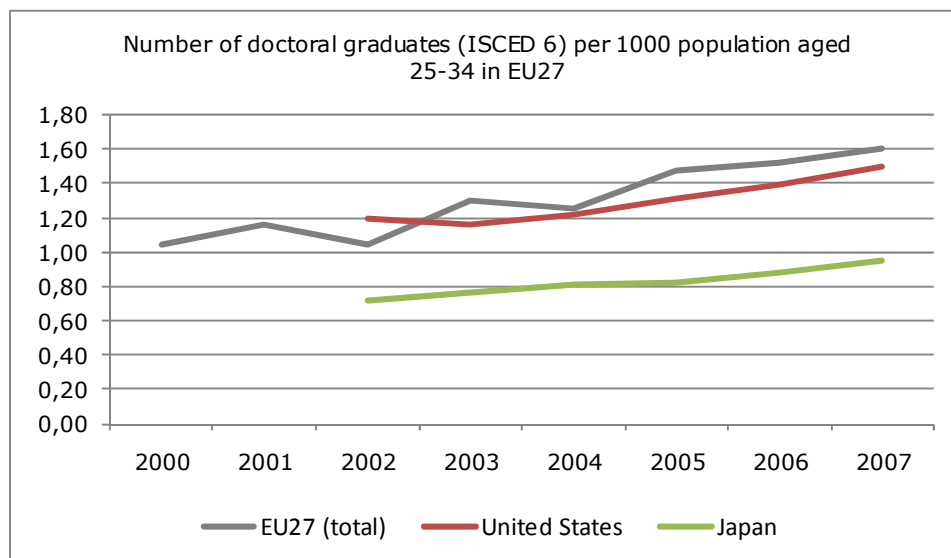
Figure 7-11: Number of doctoral graduates in EU27, 2000-2007



Source: MORE IISER (final) update report

Figure 7-12 also shows that the number of doctoral graduates per 1,000 of the population (in the 25 to 34 years category) has been increasing by around 6.3 percent on average per year.

Figure 7-12: Number of doctoral graduates per 1000 population aged 25-34 in EU27

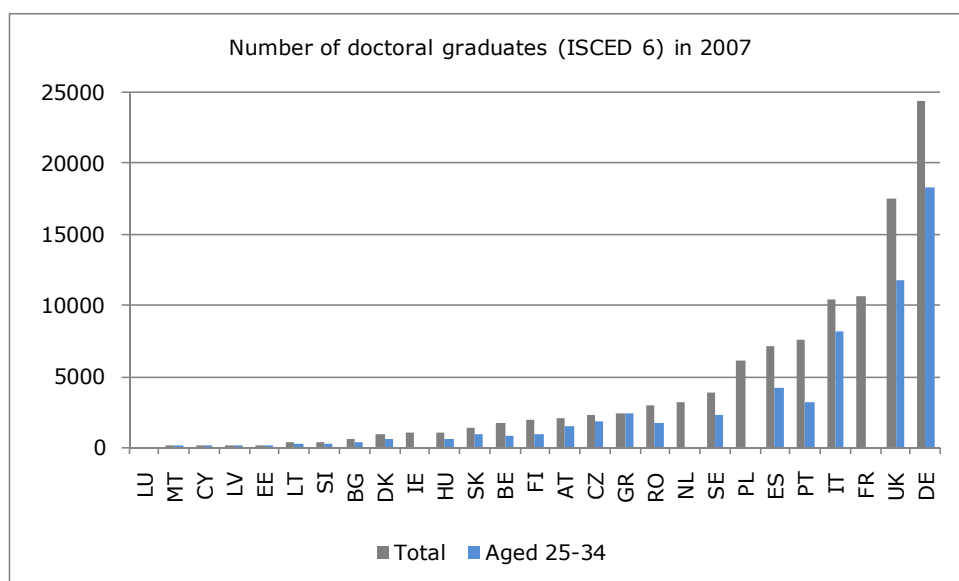


Source: MORE IISER (final) update report

Note: no data available for USA and Japan in 2000 and 2001.

Figure 7-13 shows the number of doctoral graduates by country in 2007. Germany, UK, France, Italy and Portugal are the top-5 countries in terms of numbers of doctoral graduates in 2007. Together with Spain, these countries accounted for 60 percent of the total number of doctoral degrees awarded in 2007 (second update IISER Indicators, p49).

Figure 7-13: Number of doctoral graduates in 2007, by country

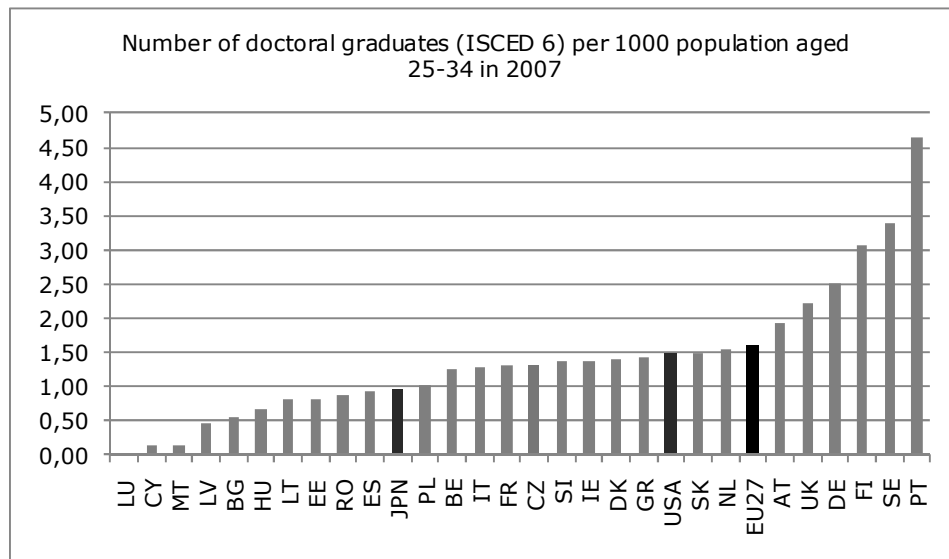


Source: MORE IISER (final) update report

Figure 7-14 shows, in the population age category 25 to 34 years that the countries with the highest numbers of doctoral graduates per 1,000 of their young

population (age 25 to 34) are Portugal, Sweden, Finland, Germany, the UK and Austria with between 1.9 and 4.7 doctoral graduates per 1,000 of population.

Figure 7-14: Number of doctoral graduates per 1,000 aged 25-34 by country, 2007



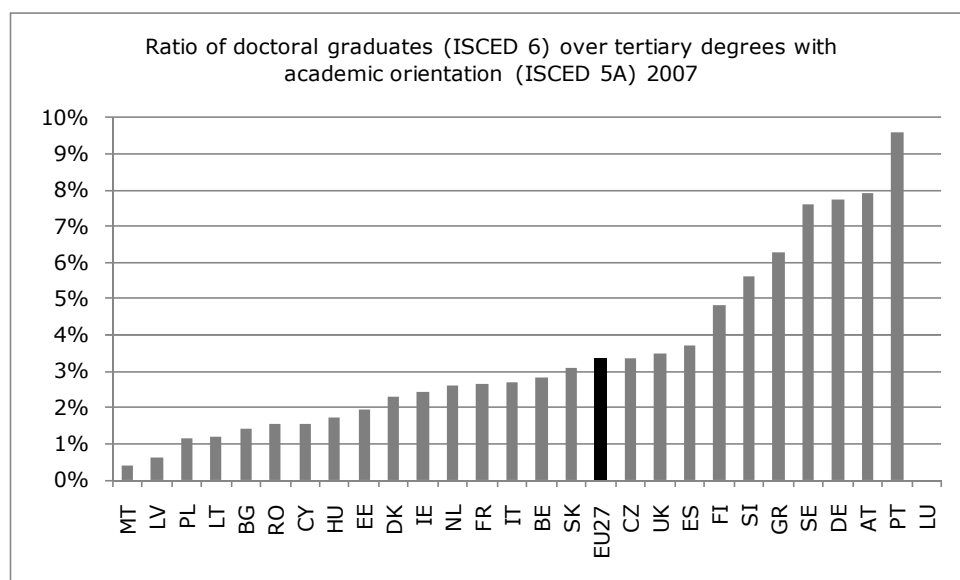
Source: MORE IISER (final) update report

7.1.2.3 Ratio of doctoral graduates (ISCED 6) over tertiary degrees with academic orientation (ISCED 5A) (HR-ST5)

To get a better view on the consistency of the potential pool of researchers, we show the ratio of doctoral graduates over tertiary degrees with academic orientation. As we have seen, the number of doctoral degrees has been growing on average by 5.7% annually while the number of tertiary degrees with academic orientation has grown by about 6%, so they have been growing at nearly equal speed. This is also reflected in the stability of the ratio over time: with the exception of 2004 where the ratio was at 4 percent, it had always been at 3 percent. (To be precise however, due to the slightly lower growth rate of the doctoral graduates compared to the growth of those with tertiary degrees with academic orientation, there has been a very small decrease in the share; namely, 3.42 in 2000 and 3.35 in 2007. This share has remained constant for all fields of education (second update IISER Indicators, p53).

There were large differences, however, in the ratio of doctoral graduates over tertiary degrees with academic orientation by country (Figure 7-15). The countries with higher shares than the average in the EU27 are Portugal (9.6%), Austria (7.9%), Germany (7.8%), Sweden (7.6%), Greece (6.3%), Slovenia (5.6%), Finland (4.8%), Spain (3.7%), UK (3.5%) and the Czech Republic (3.4%).

Figure 7-15: Ratio of doctoral graduates over tertiary degrees with academic orientation by country, 2007



Source: MORE IISER (final) update report

7.1.3 Number of researchers in training phase

In this section we look at the researchers who can still be considered to be in their training phase, namely doctoral candidates as well as post-doctoral researchers. These individuals may be at an early stage of their careers as researchers but many of them may still choose another career path once their training is finished. Here we discuss the characteristics of the doctoral candidates and the post-doctoral researchers found in three of the four surveys (excludes the Industry survey since it is a topic less relevant for this sub-group) conducted, with conclusions drawn at the end of this section.

7.1.3.1 Number and share of researchers who are doctoral candidates (PhD students) in the total number of survey respondents (HR-ST6)

Findings from the HEI survey

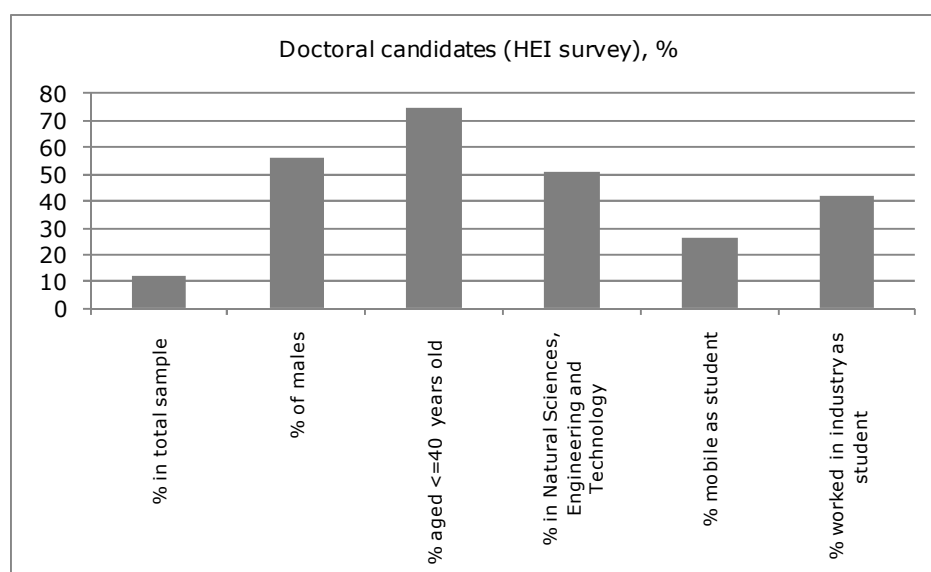
Of the 4,538 respondents in the HEI survey, 568 were doctoral candidates (12%). Looking at the share of men in this early phase of the researchers' careers (Figure 7-16) and comparing it with their share in the total HEI survey (Figure 7-6), we find that it was much lower for the doctoral candidates than on average for the total surveyed group. Of the doctoral candidates 56% were male compared with 63 percent of all respondents in the HEI survey. So it appears that there are more women among the HEI sample at the doctorate phase of their career than there are among post-doctoral students as well as at the researcher phase among the HEI sample. Independent of the reasons why (e.g. less opportunities offered to women, etc.) which we cannot assess from the results of this survey, it seems that among the researchers working in the Higher education institutes in Europe, the share of women decreases as we move from the doctoral-stage to the post-doctoral one and to the later stage of career as researcher.

Obviously, the average age of doctoral candidates was lower than the average age in the entire survey. There is a difference of ten years (doctoral candidates in the HEI survey were on average 35 years old while in the total sample respondents were 45 years old). Likewise, the share of those 40 or younger was much higher for the HEI doctoral candidates (75%).

Amongst the doctoral candidates in the HEI survey a larger share had graduated in Natural sciences or engineering and technology (51%) than there was for all survey respondents (41%) suggesting either that these scientific fields are gaining in attractiveness or that doctoral candidates exit these fields after obtaining their degree.

While the share that has been mobile as a student is slightly higher in the younger group of HEI researchers (26% compared to 22% in general), the share of researchers that had been working in industry as a student is strikingly larger for the group of doctoral candidates than for the overall group of HEI researchers. In fact, 42% of the doctoral candidates in the HEI survey had worked in industry compared to just 28% overall. This suggests either an increasing interest in industry or an increased focus in many countries' training programmes to require students to obtain some practical experience.

Figure 7-16: Characteristics of the researchers who are doctoral candidates (HEI survey)



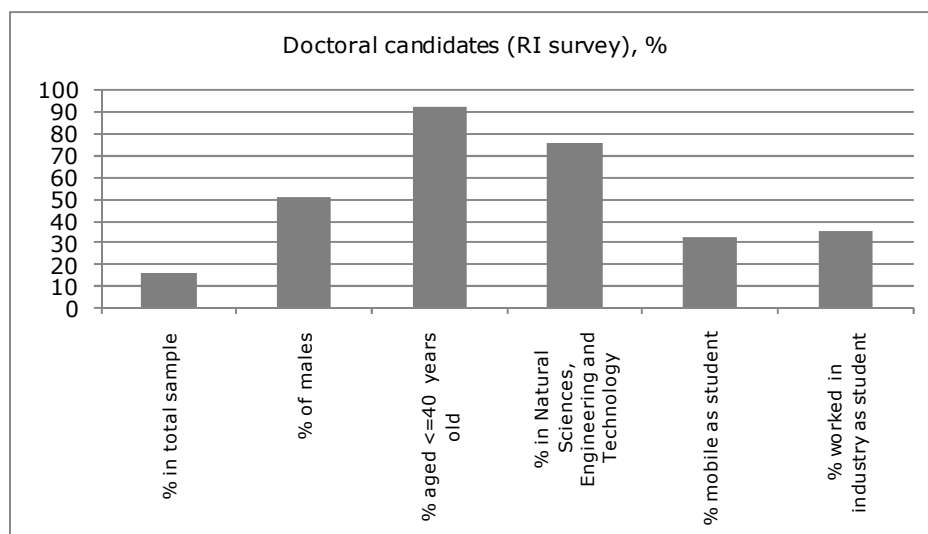
Source: MORE HEI survey

Findings from the RI survey

The results for the doctoral candidates in the RI survey are very similar to those in the HEI survey: 16% of the researchers were doctoral candidates (820 out of 5,050) with a nearly equal male/female ratio at 51 percent (Figure 7-17). The average age was even lower (31 years) than in the HEI survey and as many as 92% of the doctoral candidates in the RI survey were younger than 41 years old. Researchers in the RI survey were in general younger than the researchers in the other surveys. The share that has been trained in the fields of Natural sciences or engineering and technology (76%) was nearly equal to the percentage in general (75%) so there does not appear to be a general exit from science fields. Both the share that has been mobile as a student and the share that has worked in indus-

try were higher than the results for the total survey reflecting an increased focus on mobility and practical training among the doctoral candidates.

Figure 7-17: Characteristics of the researchers who are doctoral candidates (RI survey)



Source: MORE RI survey

Findings from the Extra-EU survey

No remarkable differences on this subset of the sample are found among the Extra-EU and the HEI and RI survey samples. For more details on the characteristics of this sub-sample for the Extra-EU survey we refer to the MORE set of indicators.

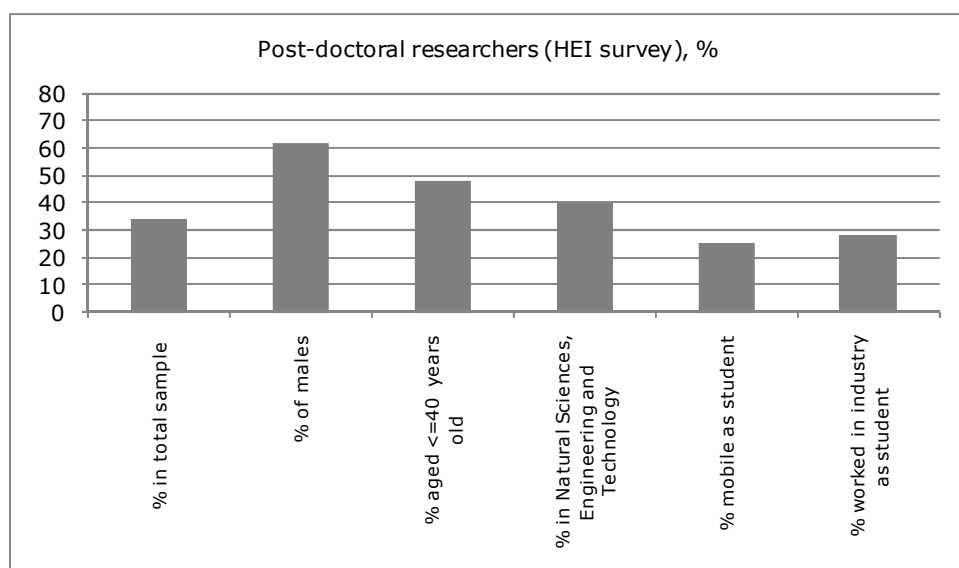
7.1.3.2 Number and share of researchers who are post-doctoral researchers in total number of survey respondents (HR-ST7)

Next, we turn to the post-doctoral researchers in the surveys. They constitute a larger share of the respondents than do the doctoral candidates and their characteristics lie closer to the general characteristics observed overall in the survey.

Findings from the HEI survey

In the HEI survey 1,556 respondents were post-doctoral researchers (34% of the total), 62% of which were male (Figure 7-18). This gender distribution is already very close to the general distribution in the HEI survey where 63% were male. The 'more equal' gender distribution in the doctoral candidate phase (56% were men) has already disappeared by the time researchers reach the post-doctoral phase. The share of researchers younger than 41 years old has dropped from 75% in the doctoral candidate phase to 48% in the post-doctoral phase. Also the share of those graduated in Natural sciences, engineering and technology has dropped to 40%, the level in the total survey. So, it seems that before the post-doctoral career phase, both women and natural scientists or engineers have started reducing in numbers. Student mobility and experience in industry as a student did not deviate from the general characteristics, so the increased focus on practical industry experience appears to be a recent phenomenon.

Figure 7-18: Characteristics of the post-doctoral researchers (HEI survey)

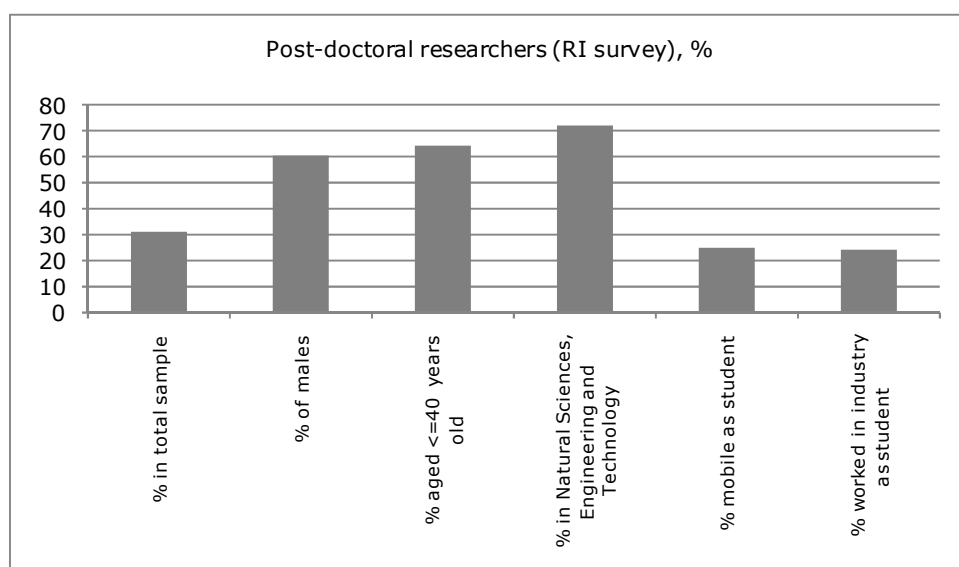


Source: MORE HEI survey

Findings from the RI survey

In the RI survey 31% of the respondents were post-doctoral researchers (1,541 out of 5,050). The distribution of their characteristics follows the overall distribution of the respondents to the RI survey, with the exception of the share that was younger than 41 years old (64% amongst the post-doctoral researchers, but 51% in the total RI survey), and will therefore not be discussed further. See Figure 7-19 for a summary of the characteristics of the RI post-doctoral researchers.

Figure 7-19: Characteristics of the post-doctoral researchers (RI survey)



Source: MORE RI survey

Findings from the Extra-EU survey

Compared to the previous two surveys (HEI and RI), the Extra-EU sample indicates that there is a considerably higher share of respondents who were post-doctoral researchers (42% compared to 34% in the HEI survey).

For more details on the characteristics of this sub-sample for the Extra-EU survey we refer to the MORE set of indicators.

7.2 Employment situation of researchers

7.2.1 Employment of researchers across different sectors

7.2.1.1 Number and share of researchers in public sector (higher education sector and government sector) (HR-EMPL1)

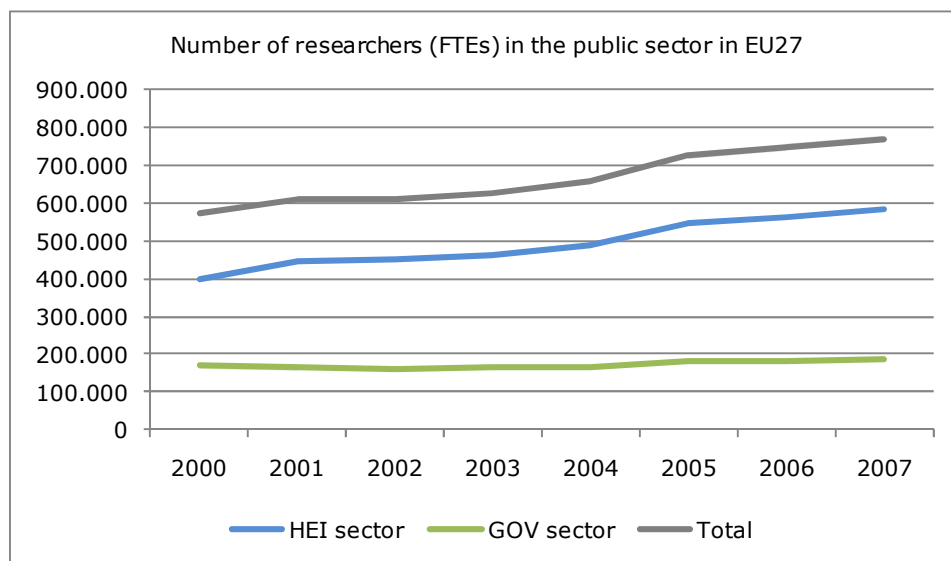
In the EU27 in 2007, 1,143,399 researchers (HC) were working in the HEI sector and 227,183 in the government sector accounting for a total of 1,370,582 researchers working in the public sector. In FTEs, there were about 767,000 researchers working in the public sector (second update IISER Indicator report, p26).

In the following graphs we present a summary of the evolution over time of the number of researchers in the public sector and the share of public researchers among the total number of researchers between 2000 and 2007 in the EU27. The public sector consists of two sub-sectors; namely the researchers in the higher education sector and those in the government sector, with the large majority of researchers found in the former.

In Figure 7-20 we see that the number of researchers (FTEs) in the HEI sector has grown steadily over time while the number in the government sector appears to be rather stable. The average annual growth rate in the HEI sector was 5.5 percent while the growth rate in the government sector was 1.3 percent per year. So not only are their numbers considerably smaller, the share of researchers in the government sector appears to be declining.

Among the total number of researchers (in head counts), public sector researchers constitute the largest share and this share has remained stable over time. This share was 63 percent between 2000 and 2004 and was equal to 64 percent between 2005 and 2007. Within the public sector, however, the share of those working in the government sector has been decreasing. In 2000, while 63 percent of the total number of researchers in the public sector were comprised of 50 percent from the HEI sector and 13 percent from the government sector, by 2007 the share of HEI researchers had risen to 53 percent of the total researchers in the public sector and the share of government researchers had declined to 11 percent.

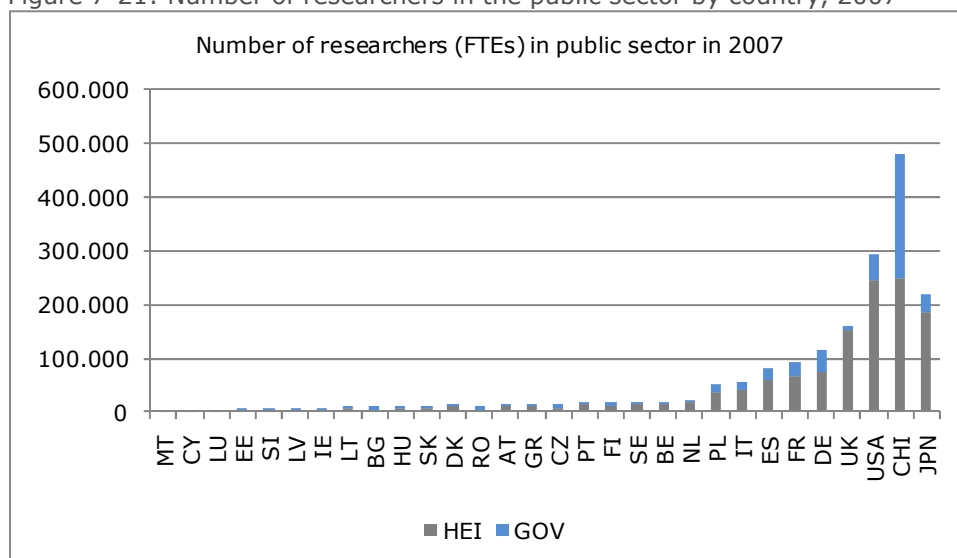
Figure 7-20: Number of researchers in the public sector in EU27, 2000-2007



Source: MORE IISER (final) update report

Figure 7-21 (where countries are ordered according to their total number of researchers (in FTEs) in the public sector, combining those in the HEI and government sectors) shows that in 2007, the six countries with the highest number of public sector researchers were the UK, Germany, Spain, France, Italy and Poland. Not surprisingly, these are the same six countries with the highest total researcher populations.

Figure 7-21: Number of researchers in the public sector by country, 2007

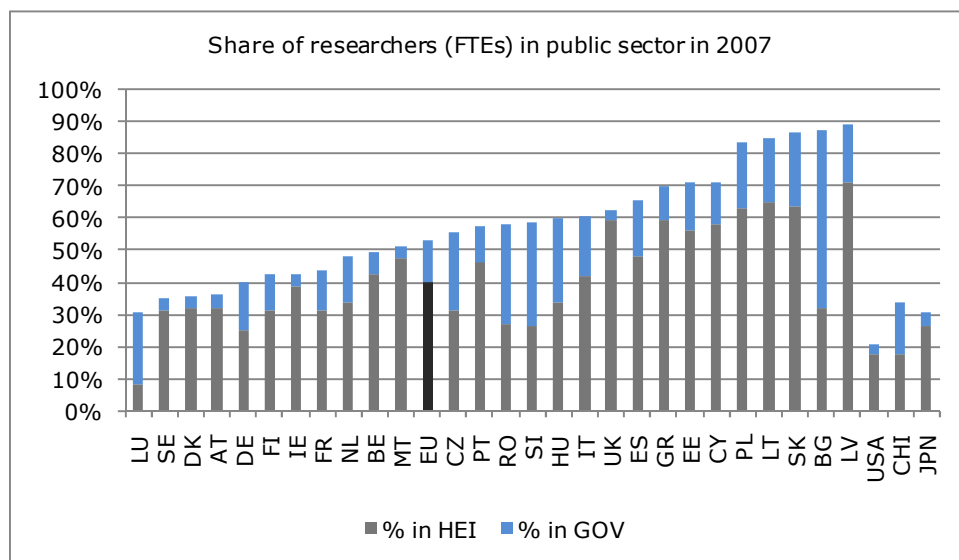


Source: MORE IISER (final) update report

The share of public sector researchers was higher than 80% in Latvia, Bulgaria, Slovakia, Lithuania and Poland. It was quite low (40% or less) in Luxembourg, Sweden, Denmark, Austria and Germany. In general, the Scandinavian and other Western-European countries mostly had shares below the average for the EU27. Government sector researchers constitute a share of total researchers ranging between 3-4% (as in Austria, Sweden, Denmark, the UK and Malta) and around 30% (as in Slovenia and Romania) with the big exception being Bulgaria where the government sector researchers accounted for 55 percent of the total researcher population. The EU27 average for the share of public-sector researchers

in FTEs is 53%. This compares with 21%, 34% and 31% of the relevant share for the USA, China and Japan, respectively.

Figure 7-22: Share of researchers in the public sector by country, 2007

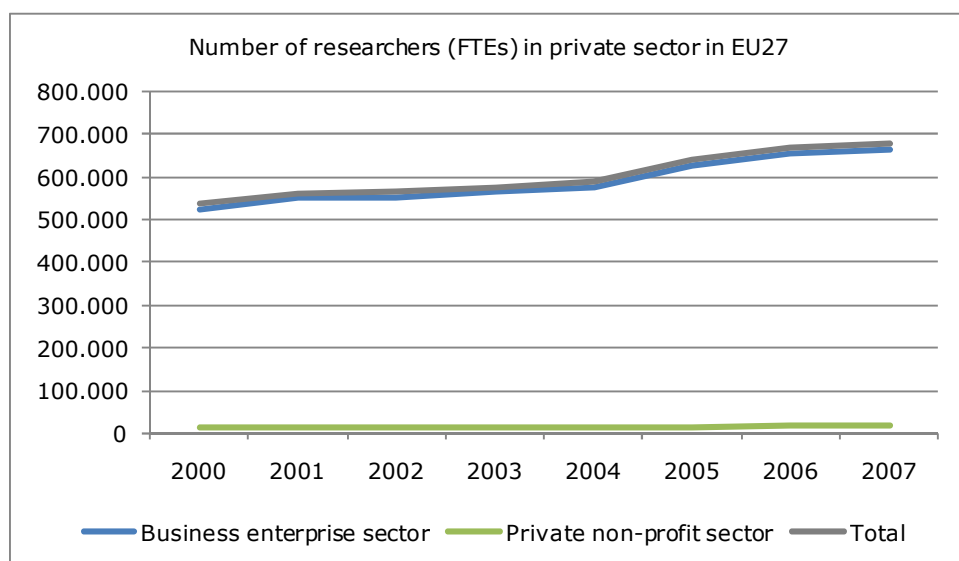


Source: MORE IISER (final) update report

7.2.1.2 Number and share of researchers in business enterprise sector and private non-profit sector in total number of researchers (HR-EMPL2)

The number of researchers in the private sector (business and enterprise sector and private non-profit sector) was quite a bit lower than the public sector researchers (as the share of public sector researchers already suggested). In total, there were 787,257 researchers (HC) working in the private sector in the EU27 in 2007 which is 36 percent of all researchers or 681,074 (FTEs). The big majority of them were working in the business and enterprise sector (764,267 HC or 664,353 FTEs) and only 1% of all researchers were working in the private non-profit sector. Even though they have been increasing over time (Figure 7-23), the share of private sector researchers in the total researcher population has remained about the same over time.

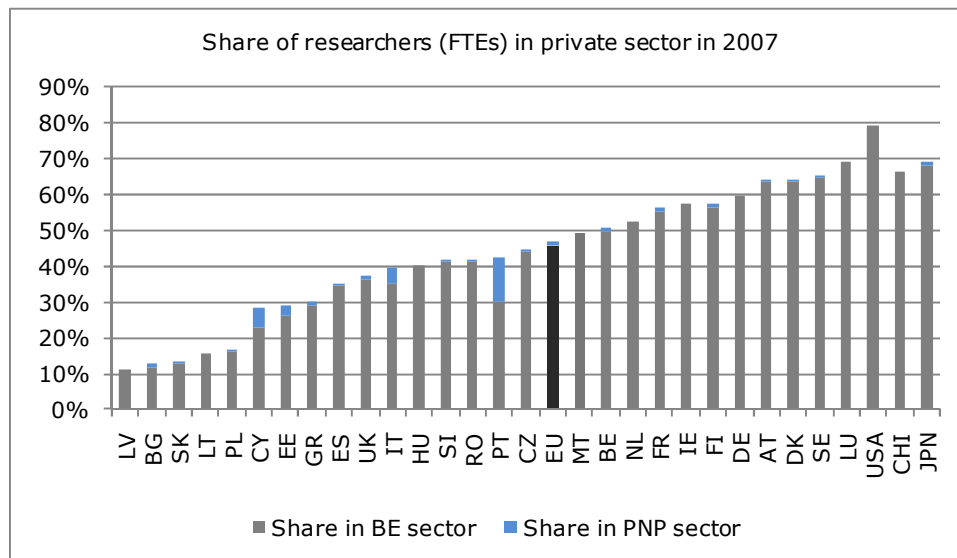
Figure 7-23: Number of researchers in the private sector in EU27, 2000-2007



Source: MORE IISER (final) update report

In Figure 7-24 which shows the share in the private sector, we see the mirror image of Figure 7-22 which showed the share in the public sector. We find here the opposite ordering of countries with very low shares of researchers found in the private sector in, for example, Latvia, Bulgaria, Slovakia, Lithuania and Poland and high shares of private sector researchers found in Luxembourg, Sweden, Denmark, Austria, Germany, Finland. The EU27 average for the share of researchers in FTEs working in the private sector is 47%. This compares to 79%, 66% and 69% for the USA, China and Japan, respectively.

Figure 7-24: Share of researchers in the private sector by country, 2007



Source: MORE IISER (final) update report

The MORE set of indicators presents additional information on the number and share of researchers within the MORE surveys working in the public sector (higher education or public/government research institute sector) and on the number and share of researchers within the MORE surveys working in the private sector (business or private-not-for-profit sector).

7.2.2 Characteristics of employment contract

We consider two different characteristics of the researchers' employment contract. First, we look at the number and the shares of researchers that work under a fixed-term versus a permanent contract and whether there are differences in the characteristics of the researchers working under these different types of contract. Second, we show the numbers and shares of the researchers who work full-time and investigate whether their characteristics are different from the general characteristics of the total samples in the different surveys. The shares of fixed-term and permanent contract researchers do not add up to 100 because there were other type of contract possibilities offered in the questionnaire; namely, "non-employment contract" and "self-employed".

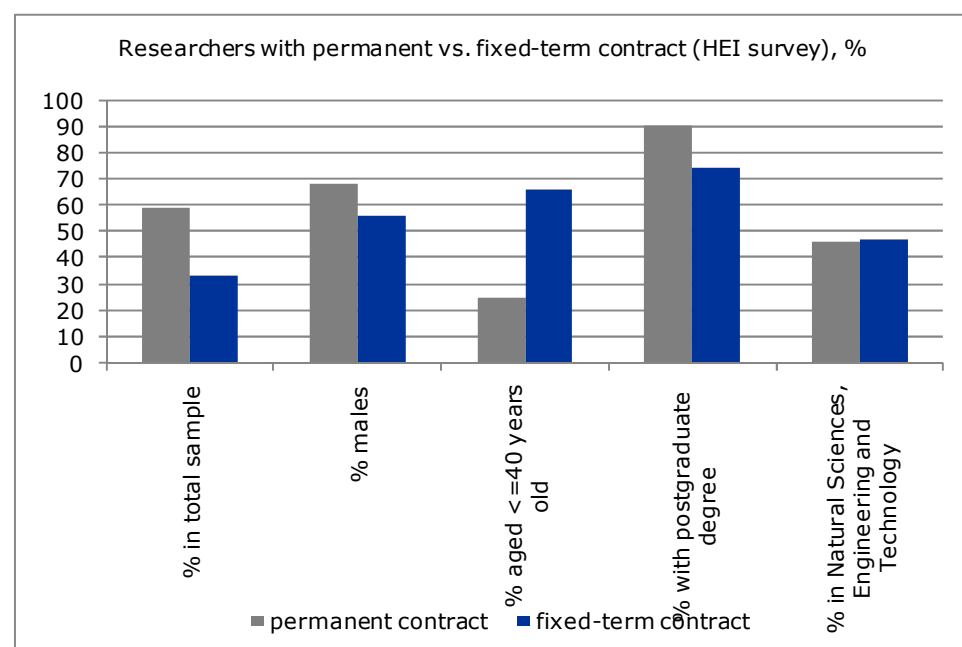
7.2.2.1 Number and share of researchers within the MORE surveys with a fixed term contract (HR-EMPL5) and Number and share of researchers within the MORE surveys with a permanent (=open-ended) contract (HR-EMPL6)

Findings from the HEI survey

In the HEI survey, one third of the researchers were working under a fixed-term contract (1,589 respondents) and 2,586 researchers were working under a permanent contract. Figure 7-25 shows the profile of the typical fixed-term researcher. We see that there is a lower male dominance (56% are male) and the researchers on fixed-term contracts are on average younger than the average respondent to the HEI survey (or more specifically, than researchers with a permanent contract). 66% were younger than 41 years old compared to 25% of the permanent-contract researchers in the HEI survey. Those with a fixed-term contract had graduated on average 8 years earlier while this was 16 years for those with a permanent contract. 74% of the researchers with a fixed-term contract held a post-graduate degree compared to 90% of the researchers who held a permanent contract. The percentage in Natural science or engineering and technology was about the same; namely, 47 and 46% for the fixed-term and permanent contract researchers respectively.

In general for the HEI survey, we can conclude that there are substantial differences between the researchers working under a fixed-term and those working under a permanent contract with the former showing characteristics associated with being in the early phases of a researcher's career: being younger and less male dominated.

Figure 7-25: Characteristics of researchers with permanent vs. fixed-term contract (HEI survey)

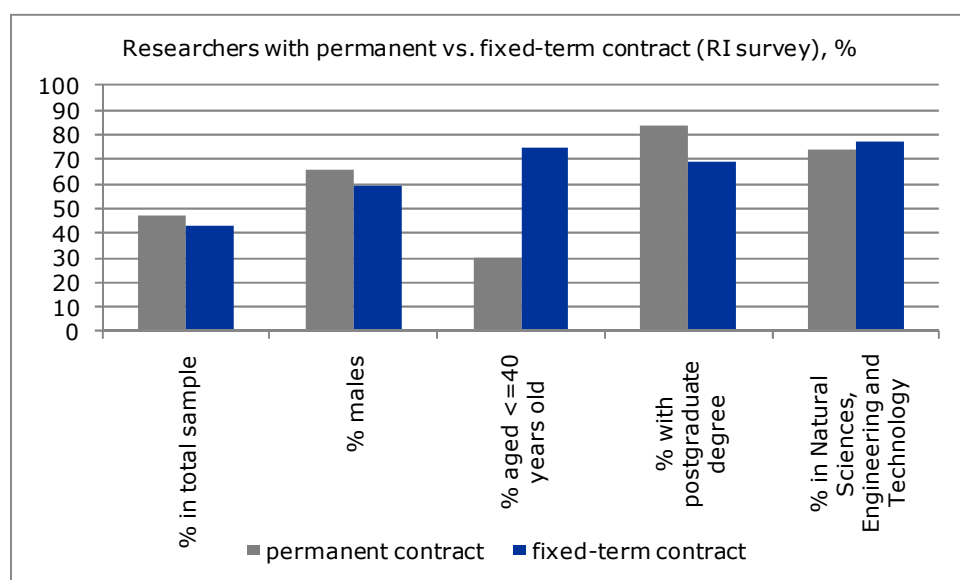


Source: MORE HEI survey

Findings from the RI survey

2,164 or 43% of the respondents in the RI survey were working under a fixed-term contract. This was the highest share among all the surveys. Here we find the youngest researchers with an average age of 37 years and with 75% being younger than 41 years old (see Figure 7-26). As we observed in the HEI survey, those with a permanent contract were generally older and present a higher share of men (66% of those with a permanent contract were men compared to 59% of those with a fixed-term contract). We also see that the years since graduation of the permanent contract holders were double those of the researchers holding fixed-term contracts (15 compared to 7). The percentage of researchers holding a post-graduate degree was lower amongst the fixed-term researchers (69%) than amongst the permanent contract holders in the RI survey (84%). The share of those having graduated in Natural science or engineering and technology was, however, more or less the same between the two groups of researchers (77 and 74% respectively for the fixed-term and permanent contract holders).

Figure 7-26: Characteristics of researchers with permanent vs. fixed-term contract (RI survey)



Source: MORE RI survey

Findings from the Industry survey

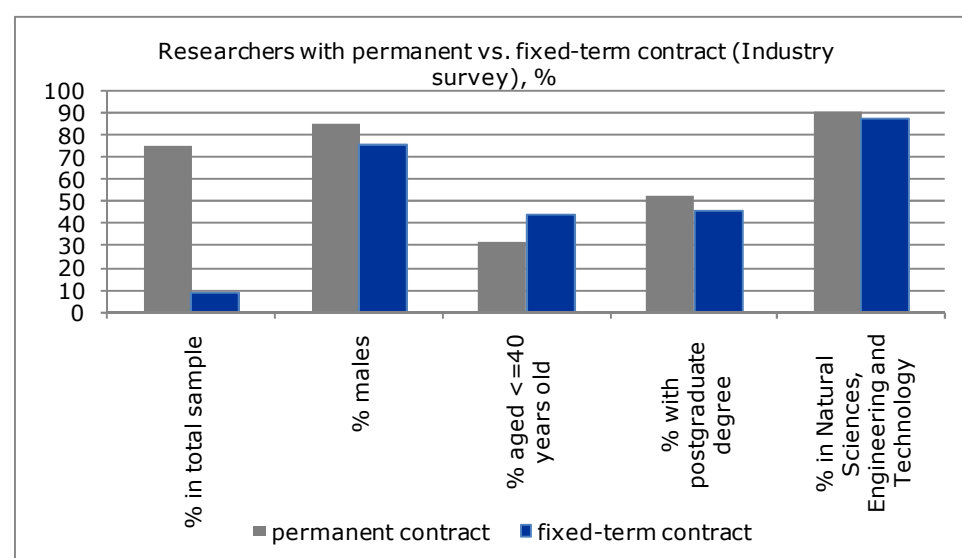
In the industry survey there were 270 researchers working under a fixed-term contract. With 9 percent of the survey, this was by far the lowest share among the four surveys (the share on fixed-term contracts was between 33 and 43% in the other surveys). The industry researchers also differ in this respect from the researchers in the other surveys. Not only do 9% work under a fixed-term contract, but we do not observe the same differences between the fixed-term and the permanent contract holders seen in the other surveys. Only the fact that those with a permanent contract are more likely to be male than those with a fixed-term contract is consistent across surveys. Unlike the HEI or RI survey results, in the industry survey we find that researchers with a fixed-term contract were older than those with a permanent contract, with an average age of 50 compared to 45. Also the years since graduation were not half as many amongst the fixed-term researchers as observed earlier, but were nearly equal with 15

years on average for the fixed-term researchers and 17 years on average for the permanent contract holders.

The share of those having graduated in Natural sciences or engineering and technology was quite similar amongst the two groups with 87 and 90 percent of the fixed-term and permanent contract researchers respectively having obtained their highest degree in these fields. This finding is analogous to what was found in the other surveys,

Generally we can conclude that the profile of researchers in the industry survey is quite different from the researcher profiles in the other surveys. Not only was there a striking difference in the percentage of researchers working under a fixed-term contract, being the lowest at 9 percent in the industry survey, but also the researchers under the two different contract types did not exhibit the same differences in characteristics was found in the other surveys.

Figure 7-27: Characteristics of researchers with permanent vs. fixed-term contract (Industry survey)



Source: MORE Industry survey

Findings from the Extra-EU survey

The Extra-EU survey sample presents similar characteristics relative to the HEI and RI subsamples when we look into the number of researchers with a permanent and those with a fixed-term contract. The MORE set of indicators presents additional information for the relevant subsamples of the Extra-EU survey.

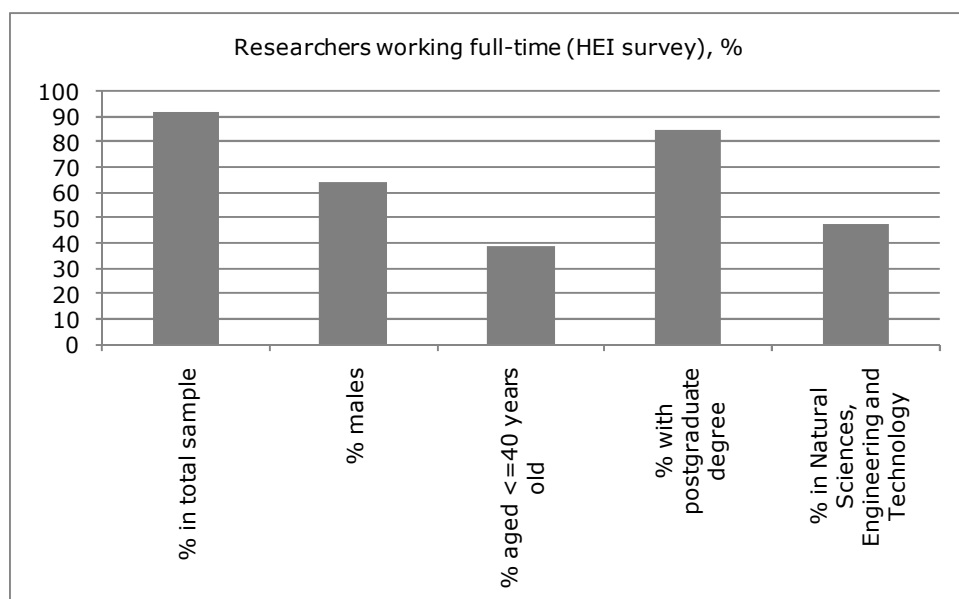
7.2.2.2 Number and share of researchers within the MORE surveys working full-time (HR-EMPL7)

In this last part of the section on the characteristics of the researchers' employment contracts, we investigate the number and shares of those working full-time and whether the characteristics of those working full-time correspond to what is generally found among all survey respondents. This information is only available for the HEI, RI and industry surveys.

Findings from the HEI survey

In the HEI survey, 92 percent of the researchers were working full-time. The only aspect where their characteristics deviate from the general characteristics of the sample described in 7.1.1.2 was the share of them that has been graduated in Natural sciences or engineering and technology. We found that 48 percent of the full-time researchers had been graduated in Natural sciences or engineering and technology (Figure 7-28), compared with 41 percent in the full sample.

Figure 7-28: Characteristics of researchers working full-time (HEI survey)



Source: MORE HEI survey

Similar findings are found when focusing on the relevant subsamples of the RI and the Industry surveys. More information is presented in the MORE set of indicators.

7.3 Main findings

According to Eurostat data, in 2007 there were in the EU27 2,157,838 researchers in HC or 1,448,337 in terms of FTEs. The number of researchers in the EU27 has been steadily growing (by 31% in total between 2000 and 2007). In the same six year period, there were about 6 researcher FTEs per 1000 employed in the EU27; this compares to 9 FTEs in US, 11 in Japan and 2 in China. This share has also been growing but at a slower rate (by 23% between 2000 and 2007).

At the level of the Member States, Scandinavian and other EU15 countries had a high number of researchers per 1,000 active population (higher than the average for the EU27 as a group of 6), while the Central and Eastern European countries generally had a lower number of researchers per 1,000 active population. The most recent member states Romania and Bulgaria and the Mediterranean islands had the lowest number with 3 or fewer researchers per 1,000 active population.

Within the four MORE surveys, the samples were dominated by male respondents: their share ranged from 61 to 65% for the 'academic' researchers (HEI, RI, Extra-EU samples) and reached 85% in the industry survey sample. Their age averaged between 42 and 46 years old (the number of years since graduation: between 12 - 17 years on average). Most of the researchers were married (70 - 85%) and had children (55 - 74%). PhD holders were the majority among the 'academic' samples (76 - 86% within the HEI, RI and Extra-EU samples); they represented 51% of the industrial researchers.

Mobility as a student was higher among the researchers in the Extra-EU survey where 32% had been mobile as a student (compared to less than 23% in the other surveys). Working in industry as a student was especially popular among industry researchers with 52% of them having worked in industry as a student (compared to less than 28% in the other surveys).

In general, we see an "atypical" profile of the researchers working in industry compare to all the other MORE surveys. They were more likely to be male and older, were less likely to hold a PhD, were more likely to have graduated in Natural sciences or engineering and technology, and were more likely to have had experience in industry as a student.

When we looked at the number of graduates in tertiary education (a 'pool' of potential researchers), based on Eurostat data, we found that there were 3,414,618 tertiary education degrees in the EU27 in 2007 and 110,628 doctoral graduates. The number of tertiary education graduates has been growing faster since 2000 than the number of researchers, suggesting an increasing tendency to lose talent from the EU27 research base.

There was a strong growth rate of doctoral graduates (on average 5.7% annually between 2000 and 2007), especially among the younger (aged between 25 and 34 years) doctoral graduates (7%). The number of doctoral graduates per 1,000 in the population (aged 25 to 34 years) has also been increasing on average by 6.3% per year.

The share of doctoral graduates relative to the number of tertiary degrees with academic orientation has remained constant between 2000 and 2007 at 3%. This is the case in all fields of education. However, there are large differences among countries in 2007, for example, with the share for Portugal being nearly 10% while the shares for Malta, Latvia, Poland, Lithuania and Bulgaria being 1% or less.

Going back to the MORE surveys and looking at the sub-group of researchers in their training phase, we found that there were 12% doctoral candidates among the HEI survey respondents and 16% among the RI survey. In addition, around one third of the respondents were post-doctoral researchers in the HEI and the RI surveys. A considerably higher share was found in the Extra-EU survey where 42% of the respondents were post-doctoral researchers (34% in the HEI survey).

There was a much higher share of female respondents at the doctoral training than at the post-doctoral phase, suggesting that women tend to gradually reduce in number as they move from the doctoral-stage to the later stage of their career as a researcher and especially before the post-doctoral phase.

In general, while the characteristics of the doctoral candidates are quite different from the general characteristics of all respondents in the surveys, the post-doctorates in all surveys had similar characteristics to what was found generally for the entire sample in each survey.

There seems to be a much higher share of doctoral candidates who have worked in industry. Across all surveys between 35% and 42% of the doctoral candidates have worked in industry as a student (compared to the overall samples where the

percentages of those having worked in industry as students ranging between 24% and 29%, excluding the industry survey). There was also higher student mobility amongst the doctoral candidates in the RI sample: 33% having been mobile as a student compared to 23% in entire sample of respondents to the RI survey. These effects -- increased focus on student mobility and experience in industry -- appear amongst the doctoral candidates in the survey but not amongst the post-doctoral researchers suggesting that it is a fairly recent phenomenon.

8 STOCKS AND FLOWS OF MOBILITY

8.1 Stocks of mobility

8.1.1 Geographical mobility

In the first part of this chapter, we examine the occurrence of geographical mobility, both at the employment and training phase. For information on mobility during the employment phase, we rely on the MORE survey, for mobility in the training phase, we use education statistics provided by Eurostat.

For mobility in the employment phase, we look separately at the characteristics of those who had been mobile at least once over their lifetime and at the characteristics of those who had been mobile in the last three years. Lastly, in the section on mobility during researchers' employment phase, we present averages on the number of different countries a researcher has worked in since graduation. While the first two indicators are available for the four MORE surveys, the last is only available for the Extra-EU survey.

8.1.1.1 Mobility of researchers at employment phase

8.1.1.1.1 Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree) graduation (MOBST1)

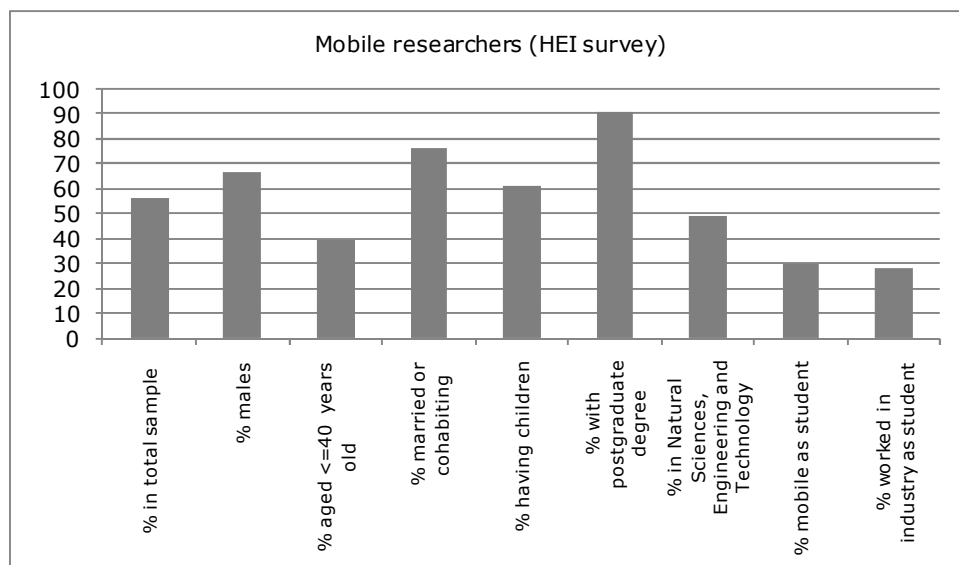
Findings from the HEI survey

In the HEI survey there were 2,586 mobile researchers and they accounted for more than half of the sample (56%). In Figure 8-1 we present an overview of their characteristics. 67% of the mobile researchers were male, which is 4 percentage points higher than the percentage of men in the full sample. This suggests that male researchers are somewhat more mobile than female researchers. The age and family situation of those who had been mobile does not appear to be different from the age and family situation found in the entire sample.

The share of mobile researchers with a post-graduate degree was 92%, which is 7 percentage points higher than what was observed in the full HEI sample (85%) suggesting that those with a post-graduate degree were more mobile than those lacking a post-graduate degree. There is also a strong difference in field of highest degree earned, where 41% in the full sample were in Natural science or engineering and technology compared to 49% of the mobile researchers.

While the share of those that have worked in industry was not different for the mobile versus the full sample, there is a clear difference in the percentage that had been mobile as students: 22% in the full sample compared to 30% for the mobile group, so mobility, at least in the early phases of one's career, appears to increase the probability of being mobile later in life.

Figure 8-1: Characteristics of the mobile researchers (HEI survey)

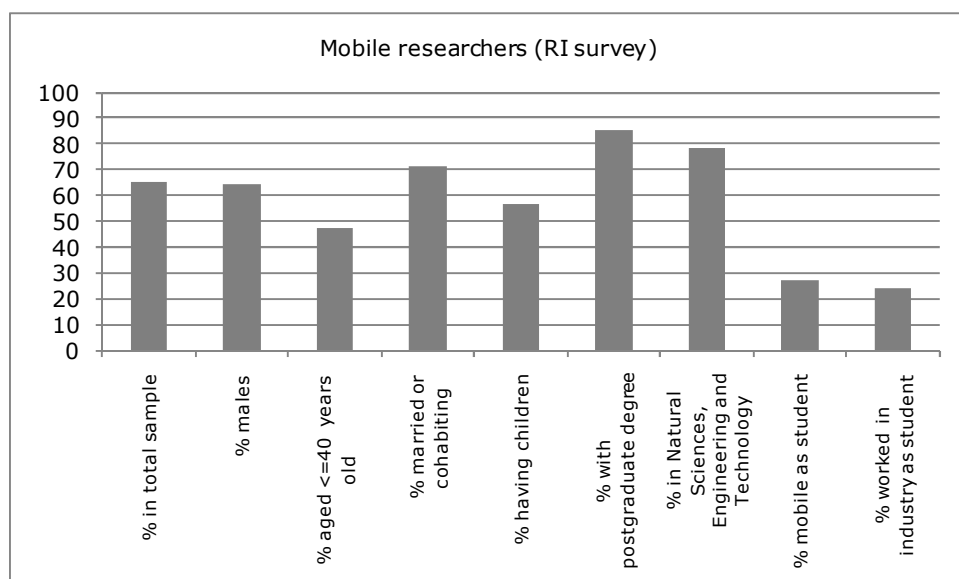


Source: MORE HEI survey

Findings from the RI survey

In the RI survey 3,284 respondents had been/were mobile (65% of the sample). We observe more or less the same picture as discussed for the HEI survey above. The mobile researchers appear to have a slightly higher proportion of men. Their age and family situations were not very different from that observed in the full sample, although the mobile group appears to be slightly older: one year on average older in age and in years since graduation and 4 percentage points fewer are aged 40 years or younger. There were 9 percentage points more mobile researchers with a post-graduate degree and 3 percentage points more have graduated in Natural science or engineering and technology compared to the full sample. Also, there was a 4 percentage-points higher proportion of those who had been mobile as students although there was no difference in the proportions working in industry as students.

Figure 8-2: Characteristics of the mobile researchers (RI survey)



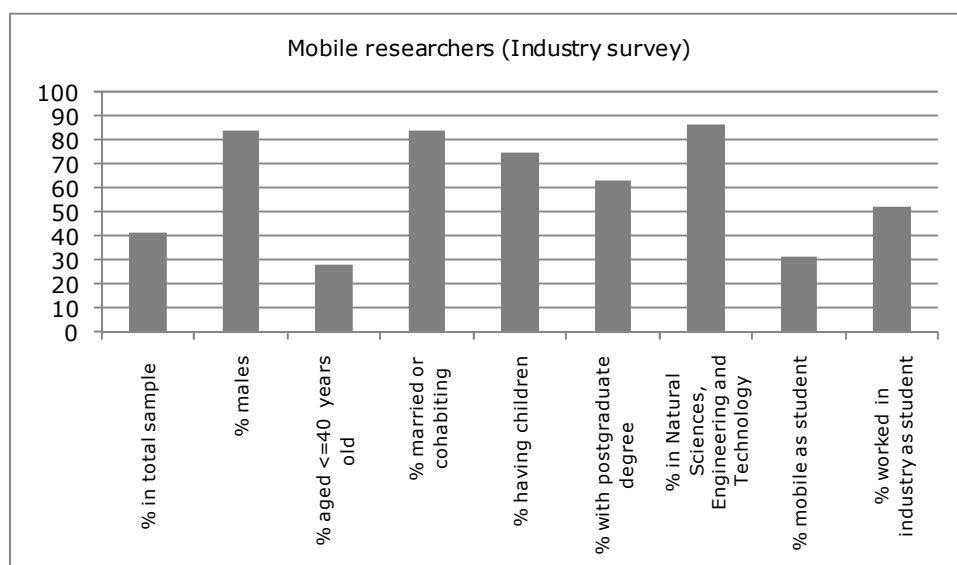
Source: MORE RI survey

Findings of the Industry survey

Turning to the industry survey, we found that 1,264 had been mobile. With 41% of this survey's respondents having been mobile, this was the lowest mobility found in the four MORE surveys.

The mobile researchers in the industry survey were more similar to the full sample than found in the other surveys; we do not notice a different male/female mix or other deviations from the full sample. But the two differences that can be found are more pronounced than what was seen in the other surveys. We find that 64% of the mobile industry researchers had a post-graduate degree, compared to just 51% in the full industry sample. And second, we find a 10 percentage point higher incidence of student mobility in the mobile researcher group than in the entire sample.

Figure 8-3: Characteristics of the mobile researchers (Industry survey)

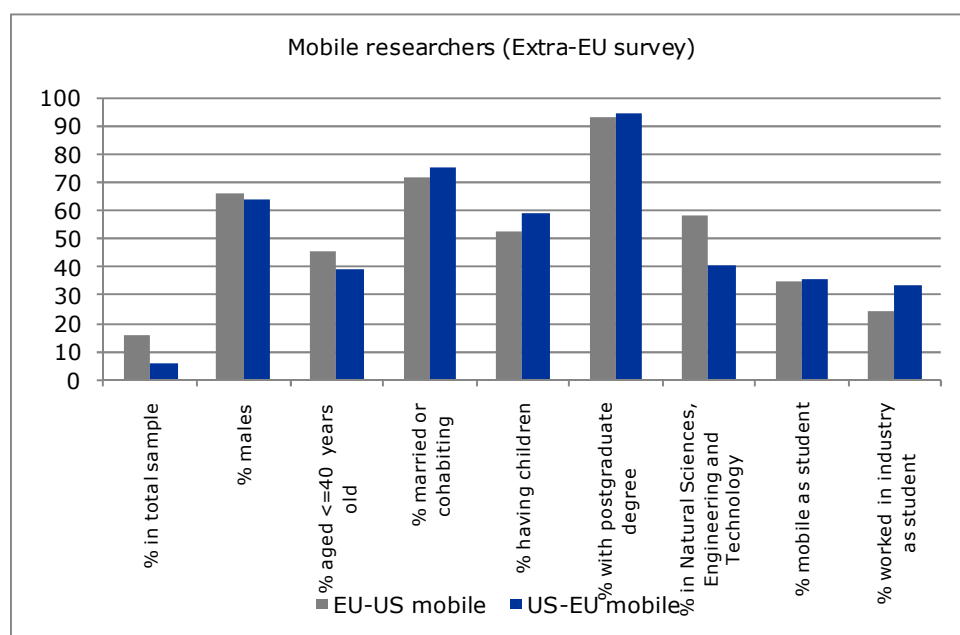


Source: MORE Industry survey

Findings from the Extra-EU survey

In the Extra-EU survey we found a mobility incidence of 65% (3,617 mobile researchers). However, mobility in the Extra-EU sample refers to extra-EU mobility. Here, therefore, we present some general demographic characteristics for the two main groups of this survey, the EU-US and the US-EU mobility groups. Among the two mobility groups we see that no significant differences appear apart from the relatively lower share of graduates in Natural sciences, engineering and technology among the EU-US mobile researchers compared to the US-EU mobile group. One other noteworthy difference is the higher share of researchers who have worked in industry as students among the US-EU mobile group compared to the EU-US mobile group. This can be reflected by the increased 'proximity' of the industrial research environment to the academic one in the US relative to the EU as a whole.

Figure 8-4: Characteristics of the mobile researchers (Extra-EU survey)



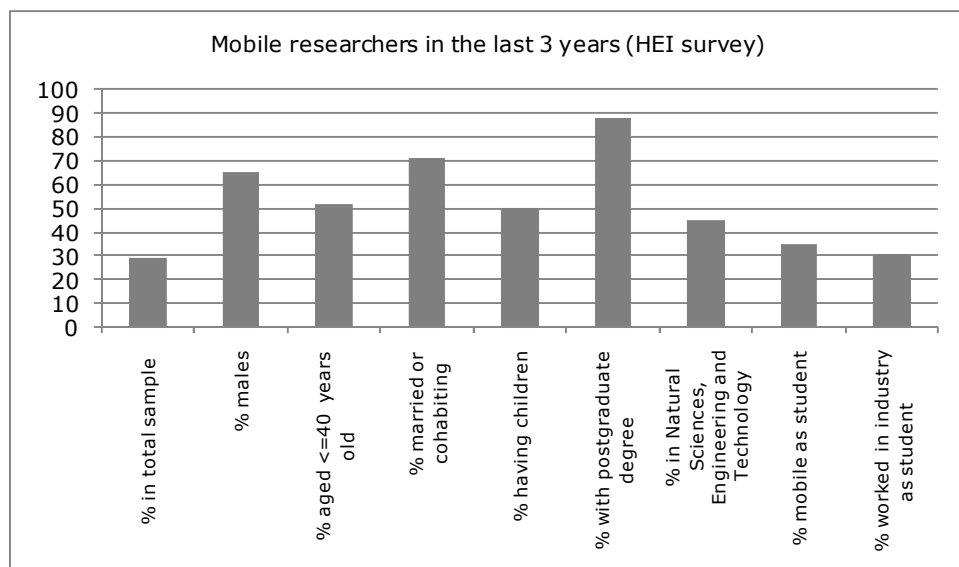
8.1.1.1.2 Number and share of researchers who have worked in the last three years for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree) graduation (MOB-ST2)

We call this indicator “recent mobility” in the remainder of the report. The incidence of mobility over the last three years was also reflected in the generally younger profile of this group of researchers.

Findings of the HEI survey

In the HEI survey 29% of the sample had been mobile in the last three years (1,339 out of 4,538 respondents). The profile of this recently mobile group was that of a younger researcher who were slightly more likely to be male than in the entire sample. The average age of those that were recently mobile was three years lower than in both the full sample and the lifetime mobility sample with a significantly higher share of young researchers (52% compared to 38 and 39, respectively in the entire and the lifetime-mobile samples). Also the shares of those married or cohabiting and those having children were lower, especially the latter percentage. Even though there is still a higher share of the recently mobile sample that held a post-graduate degree and whose highest degree was in Natural science or engineering and technology, the differences from the entire sample are less strong. In contrast, the differences with respect to activities as a student (having been mobile and having had experience in industry) are more striking with 35% of the recently mobile group having been mobile as a student and 31% of them having worked in industry as students.

Figure 8-5: Characteristics of the recently mobile researchers (HEI survey)



Source: MORE HEI survey

Findings from the RI survey

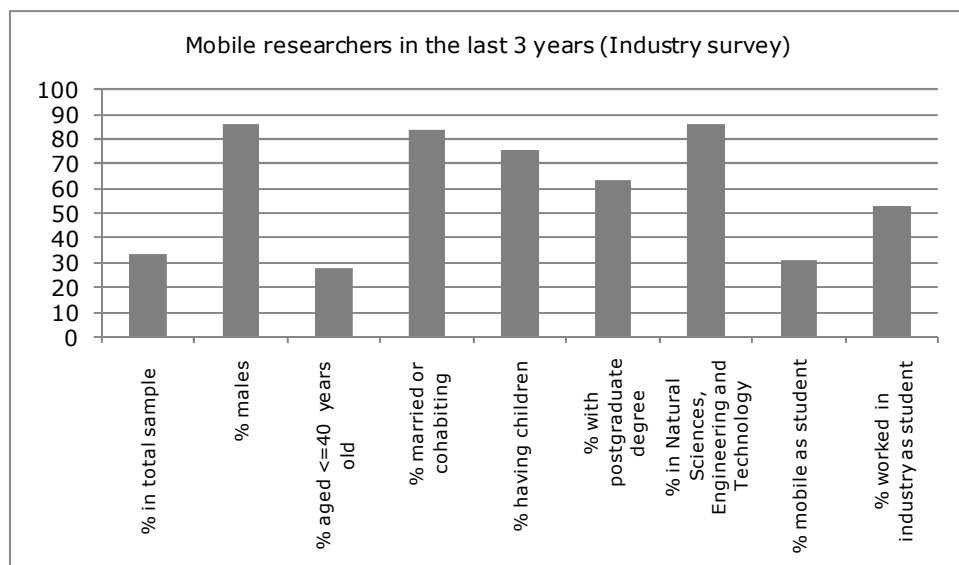
For the 1,781 recently mobile researchers in the RI survey (35% of the sample) we can draw the same conclusions as above. Similar findings as in the HEI sample are also found here.

Findings from the Industry survey

In the industry survey, the difference between the share of mobile (at least once) during the career and the share of recently mobile researchers was not as dramatic: 34% had been recently mobile (1,036 respondents) and 41% had at least once been mobile over the course of their careers since graduation.

Since the at-least-once mobile and the recently mobile subset of the Industry sample are overlapping to a large degree, their characteristics are quite similar to one another and we can draw the same conclusions for both. The characteristics of the recently mobile group differed only from the characteristics of the entire sample of respondents to the Industry survey in two aspects; namely, a higher share of researchers in the recently mobile group held a post-graduate degree and a higher share had been mobile as students.

Figure 8-6: Characteristics of the recently mobile researchers (Industry survey)



Source: MORE Industry survey

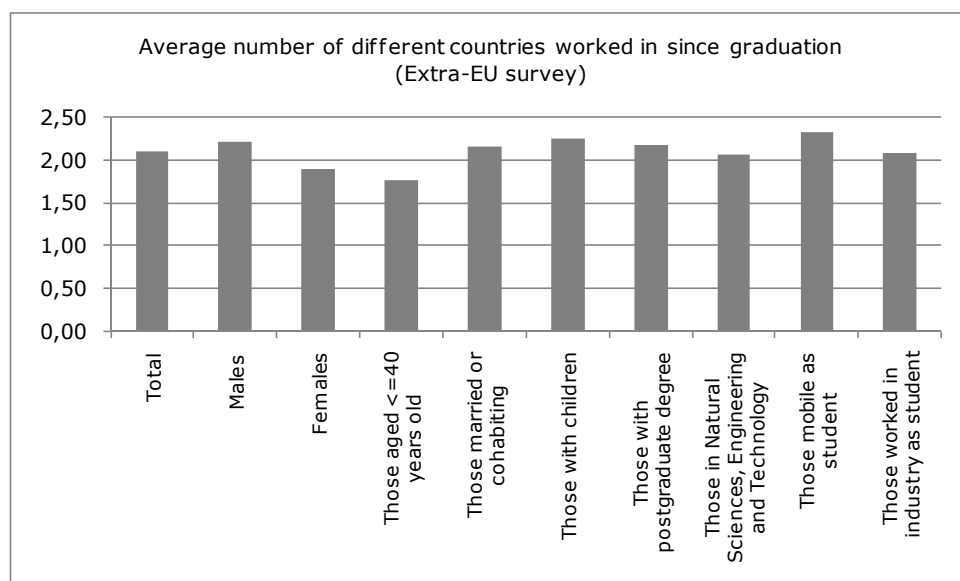
Findings from the Extra-EU survey

Similar findings are also found when analysing the Extra-EU survey subsample.

8.1.1.1.3 Number of different countries worked in since graduation (including periods of self-employment) (MOB-ST3)

This information is only available for the Extra-EU survey. The researchers report that, on average, they had worked in two different countries since their graduation (Figure 8-7). The differences among the sub-groups indicated in the figure are not remarkable. We do see, however, that women and younger researchers had worked in slightly fewer countries. For younger researchers this outcome is not surprising, by definition, older researchers have had more opportunities to work abroad than have younger researchers given their age differences.

Figure 8-7: Countries worked in since graduation (Extra-EU survey)



Source: MORE Extra-EU survey

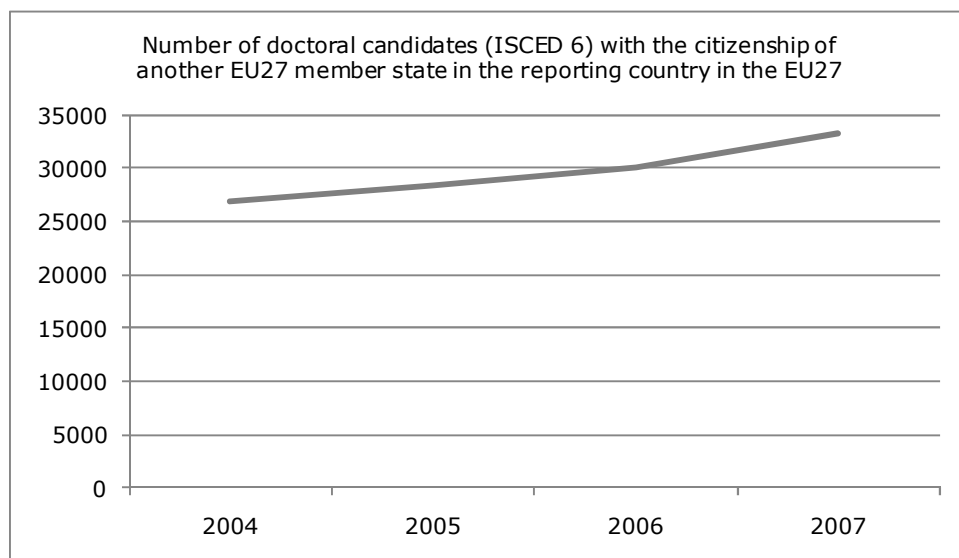
8.1.1.2 Mobility of researchers at training phase

To discuss mobility of researchers in their training phase, we rely on statistics provided by Eurostat.

8.1.1.2.1 Number and share of doctoral candidates (ISCED 6) with the citizenship of another EU27 member state in the reporting country in the EU27 (MOB-ST4)

Figure 8-8 shows that the number of doctoral candidates in the total EU27 with the citizenship of another EU country (intra-EU inflows of doctoral researchers, second update IISER Indicators, p59) had clearly increased between 2004 and 2007, from 26,883 to 33,186 (an increase of 23% or 7.3% annually). The increase was especially large between 2006 and 2007 where the number grew by 10%. Even though the numbers are rising, the share over these four years has remained quite constant (between 8% in 2004 and 7% in 2007). The numbers and the shares of doctoral candidates with the citizenship of a third country (not-EU) were actually higher with 17 percent (or 84,000) of the doctoral candidates in EU27 holding the citizenship of a third country (second update IISER Indicators, p58).

Figure 8-8: Number of doctoral candidates (ISCED 6) with the citizenship of another EU27 member state in the reporting country in the EU27, 2004-2007

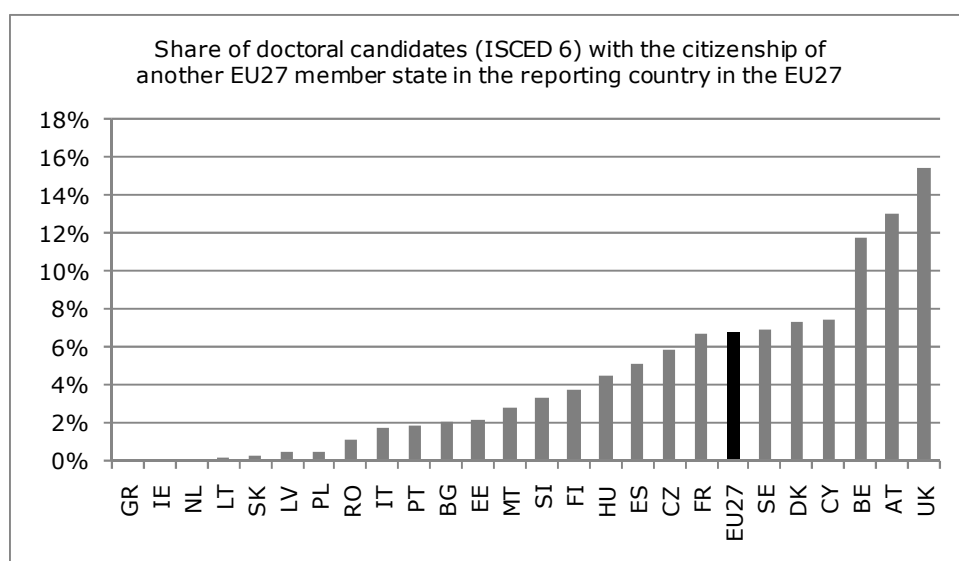


Source: MORE final IISER update Report

The country with the largest number of foreign EU27 doctoral candidates was the UK (where there were 15,306). It is followed, but by a large difference, by France (4,819), Spain (3,724) and Austria (2,368). (Data were not available for Germany, Greece, Ireland, Luxembourg and the Netherlands).

Figure 8-9 shows the shares of doctoral candidates with the citizenship of another EU country by country. The UK had not only the highest number but also the highest share of doctoral candidates with the citizenship of another EU country (15%). Other countries with a high share were Austria (13%), Belgium (12%), while Cyprus, Denmark, Sweden and France had around 6% of doctoral candidates with the citizenship of another EU country.

Figure 8-9: Share of doctoral candidates (ISCED 6) with the citizenship of another EU27 member state in the reporting country in the EU27, 2007



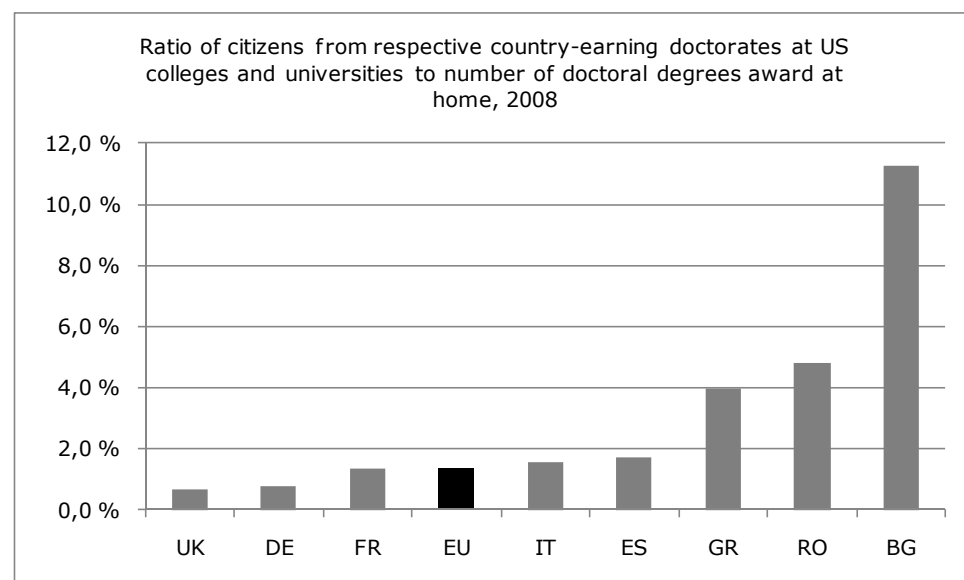
Source: MORE final IISER update

Additional information on the number and share of doctoral candidates (ISCED 6) of the reporting citizenship in EU27 in all the other member states in the EU27 is provided in the MORE set of indicators (MOB-ST5).

8.1.1.2.2 Ratio of citizens from the respective country-earning doctorates at US colleges and universities to number of doctoral degrees awarded at home (MOB-ST6)

Data on this indicator are very limited; it is only available for 8 EU countries which are among the top-40 countries of origin of non-US citizens earning doctorates at US colleges and universities. Therefore, data for the EU-total are based only on the information from these 8 countries. On average, 1.4 doctorates were awarded to citizens of these 8 countries from US institutions for every 100 doctorates awarded at home. Bulgaria appears to be an outlier having a ratio of 11.3% while the EU average was only around 1.4% (see IISER Indicators update, p38).

Figure 8-10: Ratio of citizens from respective country-earning doctorates at US colleges and universities to doctoral degrees awarded at home in 2008, by country



Source: MORE final IISER update

8.1.2 Job Mobility

In this section, we discuss job mobility of the researchers in the four MORE surveys. Job mobility refers to job changes either within the country or between different countries. Not surprisingly, job mobility often showed a positive correlation with geographic mobility. We investigate the characteristics of researchers who have moved to a new employer in a different country (HEI and RI surveys), then we examine the average number of jobs/employers by several socio-demographic characteristics of the researchers (Industry and Extra-EU surveys) and lastly, we examine the characteristics of those researchers who have moved at least once between one public research organisation to another (HEI survey).

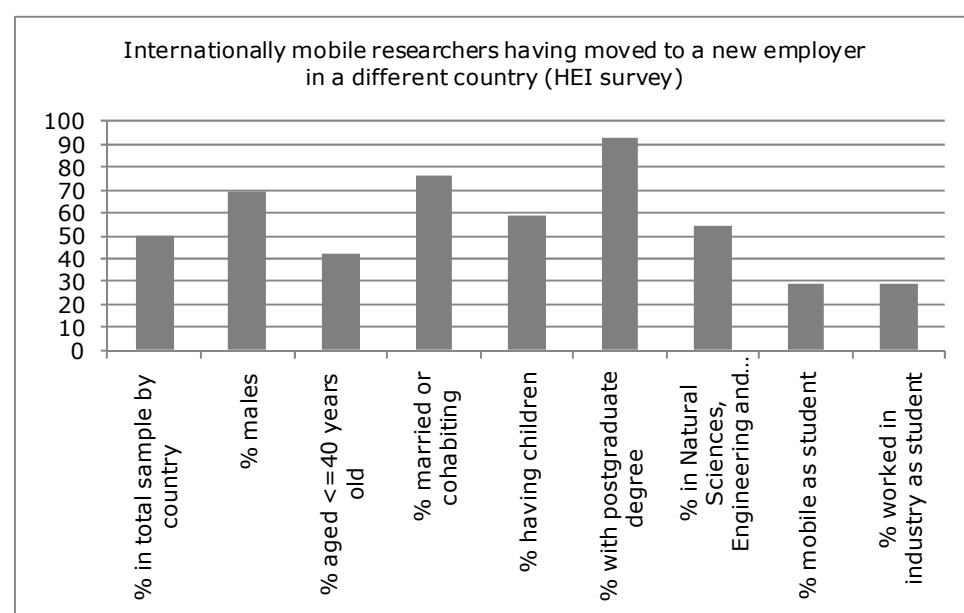
8.1.2.1 Number and share of internationally mobile researchers having moved to a new employer in a different country (MOB-ST7)

Findings from the HEI survey

In the HEI survey there were 1,284 researchers who had moved to a new employer in a different country, accounting for approximately half of the sample.

Figure 8-11 shows the typical profile of the researchers who had moved to a new employer in a different country. We observe characteristics similar to those observed in the mobile sample but they are even more pronounced here. We find a higher concentration of males in the group who had moved to a new employer in a different country; namely, 69 percent of this sub-sample were men (compared to 63% in the full sample and 67% in the mobile sample). Similarly, we see a higher share of researchers who held a post-graduate degree (93% compared to 85% in the full sample and 91% in the mobile sample). Also the share who obtained their highest degree in science (54%) was quite a lot higher than in the full sample (41%) and even in the mobile sample (49%). The student mobility was also higher but to a similar extent as was observed in the mobile sample (29% compared to 22% in the full and 30% in the mobile sample).

Figure 8-11: Characteristics of mobile researchers having moved to a new employer in a different country (HEI survey)



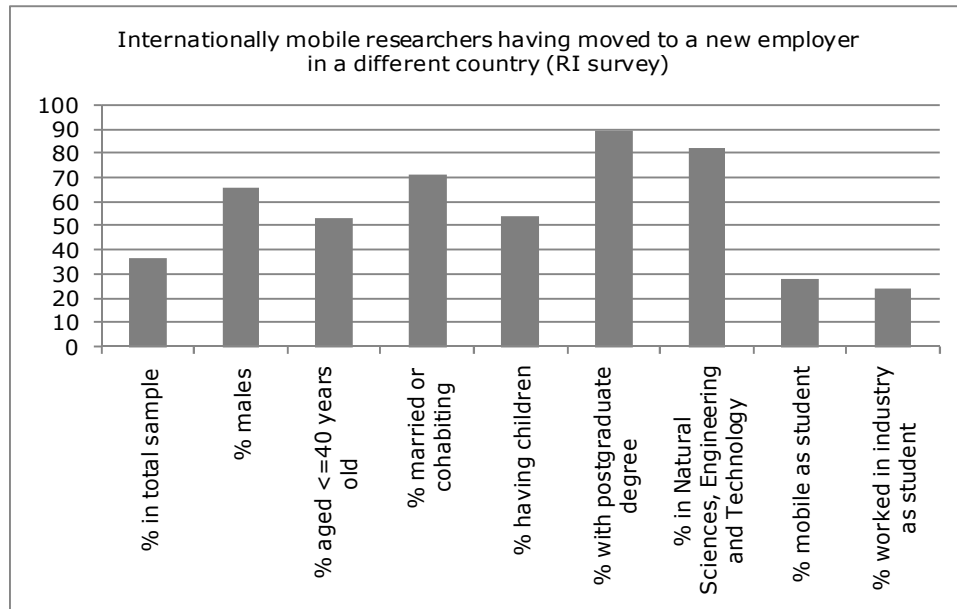
Source: MORE HEI survey

Findings from the RI survey

Of the 5,050 researchers in the RI survey, 1,890 had moved to a new employer in a different country (37%), which is significantly lower than the 50% observed in the HEI survey even though mobility was actually much higher in the RI survey than in the HEI survey (65 and 56% respectively). The characteristics of those who had moved to a new employer in a different country in the RI survey was the same as what had been observed for the HEI researchers who have moved to a new employer in a different country. Just like in the mobile RI sample we now find a stronger male concentration (66% compared to 61% in the entire sample and 64% in mobile sample), more post-graduate degree holders (89% compared to 76% in the full and 85% in the mobile sample) and more scientists (82% com-

pared to 75% in the full and 78% in the mobile sample), but these differences are even stronger. The increase in student mobility (compared to student mobility in the full sample) was, however, about the same (28%).

Figure 8-12: Characteristics of mobile employer having moved to a new employer in a different country (RI survey)



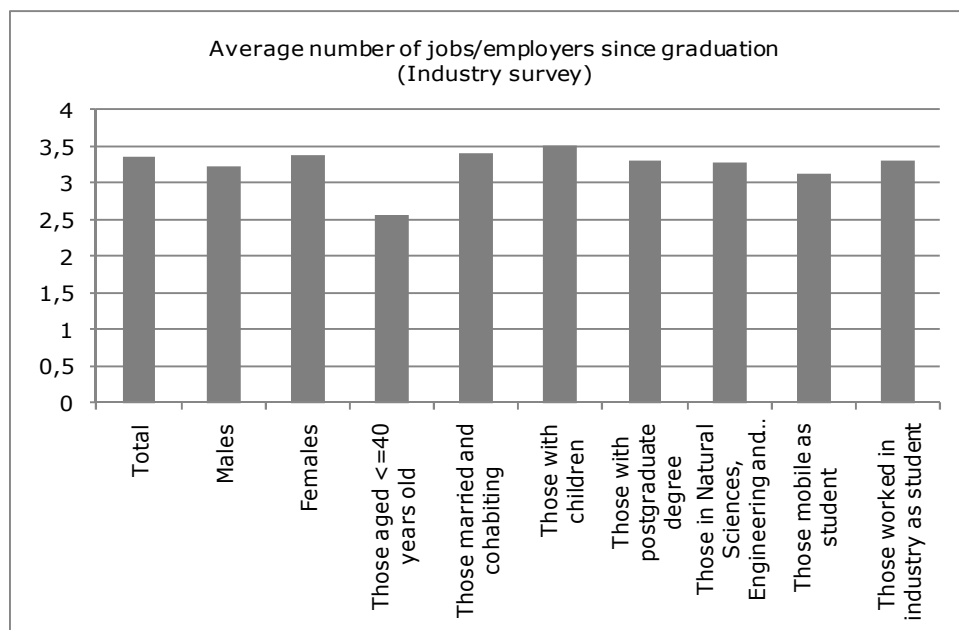
Source: MORE RI survey

8.1.2.2 Number of jobs/ employers since graduation (MOB-ST8)

Findings from the Industry survey

On average, a researcher in the industry survey has had 3.4 jobs. Not unexpectedly, we found the lowest average number of jobs the group of young researchers (age of 40 or below) with on average 2.6 jobs. The second lowest found was for those who had been mobile as a student. However, since we have seen before that it is mostly the young who have been mobile as students, this low average is rather a reflection of the age of the researcher rather than the propensity to be mobile as a student. Those who were married or cohabiting and those who have had children had higher averages of 3.4 and 3.5 jobs respectively, but again, this is probably a reflection of their age. There is also a gender difference with women having had on average a higher number of jobs compared to men (3.4 and 3.2 respectively). And, the average number of jobs held is slightly lower among those who had obtained their highest degree in Natural sciences or engineering and technology (3.3).

Figure 8-13: Average number of jobs since graduation (Industry survey)



Source: MORE Industry survey

Findings from the Extra-EU survey

Similar findings are suggested when looking at the Extra-EU survey for this indicator.

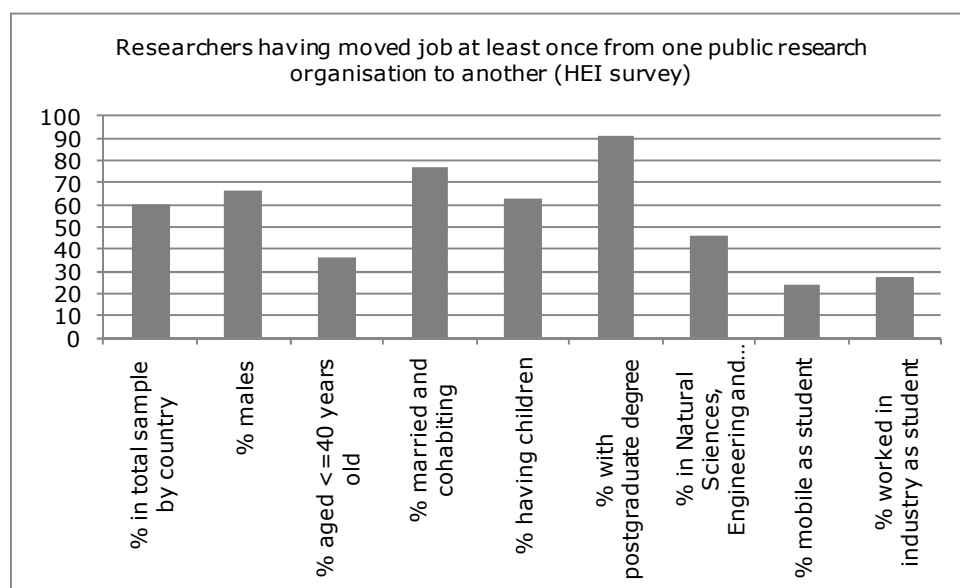
8.1.2.3 Number and share of researchers having moved job at least once from one public research organisation to another (MOB-ST9)

For the last indicator on job mobility we can only use information from the HEI survey since very few observations were collected in the RI survey.

Findings from the HEI survey

60% of the HEI researchers had moved at least once from one public research organisation to another (2,694 researchers). There was a slightly higher percentage of men among these researchers (66%) and also a higher percentage of researchers who held a post-graduate degree (91%) and had obtained their highest degree in Natural sciences or engineering and technology (46%). We also find a slightly higher percentage of those that had been mobile as a student (24% compared to 22% in the full sample), but student mobility was much lower than for the mobile group (where it was 30%). Except for this last characteristic, the characteristics of the job mobile and the geographically mobile researcher were similar.

Figure 8-14: Characteristics of researchers having moved from one public research organisation to another (HEI survey)



Source: MORE HEI survey

8.2 Flows of mobility

In this section we study flows of mobility both between the public and the private sector (sectoral mobility) as well as the formal co-operation between researchers of different countries.

8.2.1 Sectoral mobility

8.2.1.1 Number and share of researchers who have moved between the public and the private sectors (sectoral mobility) (MOB-FLOW1)

As explained in the previous chapter, the MORE set of indicators have been constructed with as main objective the presentation of the main demographic characteristics of each subsample that each indicators defines. This information is summarised also here in a comparative way so that comparative conclusions are reported among the different surveys. However, additional information referring to different subsamples is also provided in Annex 4 to this report.

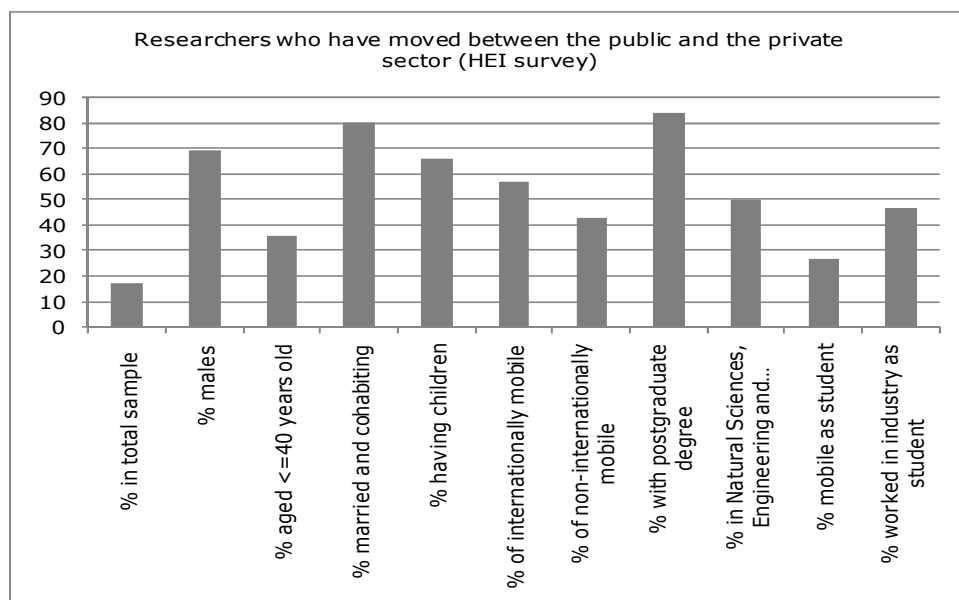
Findings from the HEI survey

In the HEI survey 725 researchers had moved between the public and the private sector accounting for 17% of the sample. In this group we see a higher than average share of men (69% compared to 63% overall), a higher share of researchers who obtained their highest degree in Natural science or engineering and technology (50% compared to 41%) and higher student mobility (27% compared to 22%). The share that is remarkably higher for the sectoral-mobile group than in the entire sample is for those who had worked in industry as a student: 47% of the sectoral-mobile sample had worked in industry as a student whereas 28% in the full sample had done so. Thus, there seems to be a correlation between hav-

ing had some experience in industry and the later shifting between the public and the private sector.

The distribution of the geographically mobile and non-mobile researchers within the sectoral-mobile group was the same as the distribution within the full sample (57% geographically mobile and 43% non-mobile).

Figure 8-15: Characteristics of sector mobile researchers (HEI survey)

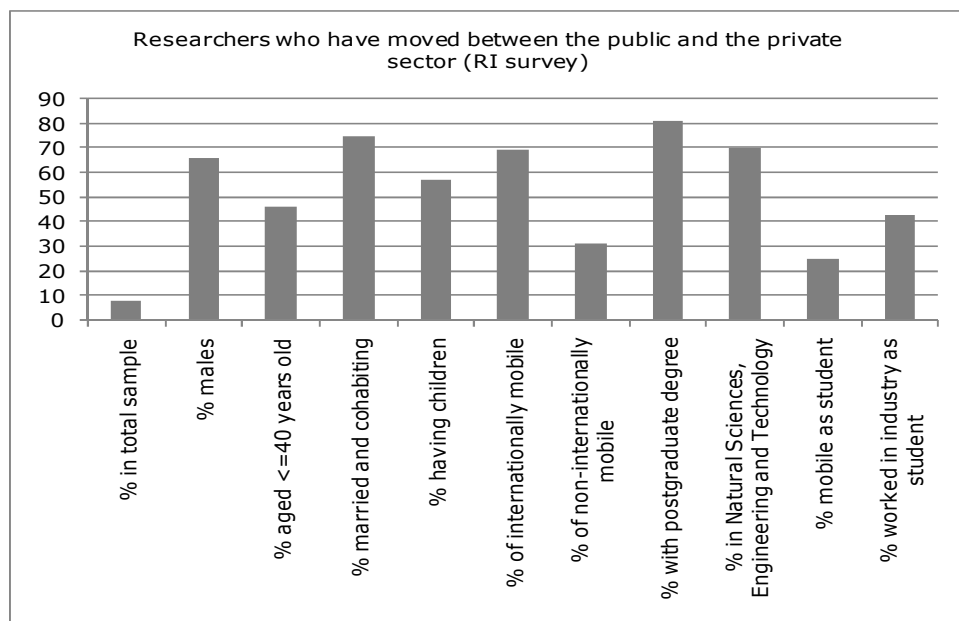


Source: MORE HEI survey

Findings from the RI survey

The RI survey contains the lowest percentage of researchers who had been mobile between the private and the public sector, namely 8% (or 416 researchers). Otherwise, we also find a higher percentage of men, a slightly older sample (in age and family attributes), and a higher share with a post-graduate degree. On the other hand, we find a lower share of scientists (opposite to what was found in HEI survey). Again we find a noticeably higher share of those that had worked in industry as a student (43%). The geographically mobile/non-mobile distribution does not differ much from the distribution seen in the full sample (with 69% mobile in the sectoral-mobile group and 65% mobile in the full sample).

Figure 8-16: Characteristics of sector mobile researchers (RI survey)

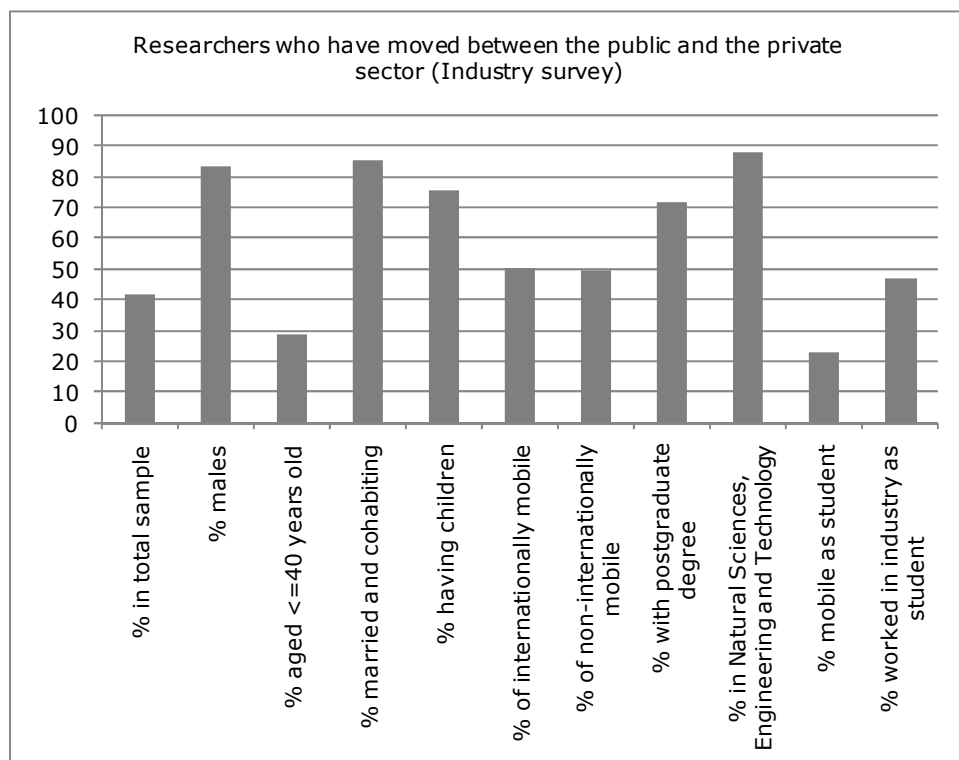


Source: MORE RI survey

Findings from the Industry survey

The industry survey contains the highest share of researchers who had been mobile between the public and the private sector; namely, 42% (1,272 researchers). The only difference in this case from the entire sample of respondents was the considerable higher share that held post-graduate degree, 72% compared to 51% in the entire sample. Here, we see that the distribution of geographically mobile vs. non-mobile researchers among the sectorally mobile is not the same as it is among the entire sample: 51% of the sectorally mobile respondents are geographically mobile while 41% of the entire sample are geographically mobile researchers; therefore, so for the industry researchers there appears to be a positive correlation between geographical and sector mobility.

Figure 8-17: Characteristics of sector mobile researchers (Industry survey)



Source: MORE Industry survey

8.2.2 Formal collaboration among researchers

In this section, we discuss two types of formal collaboration, namely formal collaboration with only academic researchers from other countries or with both academic and industry researchers from other countries (collaboration with industry researchers is not analysed as the subsamples are particularly small).

In the following two sections we present some demographic characteristics of two subgroups of the sample: the researchers who currently collaborate with only academic researchers from other countries and the researchers who currently collaborate with both academic and industrial researchers from other countries. The two sub-groups are presented separately as they correspond to different response-options of the relevant HEI-survey questionnaire. We need to note however the following:

- The share of HEI researchers who collaborate with academic researchers equals to the sum of the two percentages (share of researchers collaborating with only academic researchers and share of researchers collaborating with both academic and industrial researchers). That is, the share of researchers who currently collaborate with academic researchers is 61% (41% plus 20%, see below).
- When analysing the demographic characteristics of the two subgroups we see that they do not present notable differences, except for the higher concentration of researchers having worked as student in the sub-group of those collaborating with both academic and industrial researchers. We therefore, present these two sub-groups separately following the MORE indicator tool.

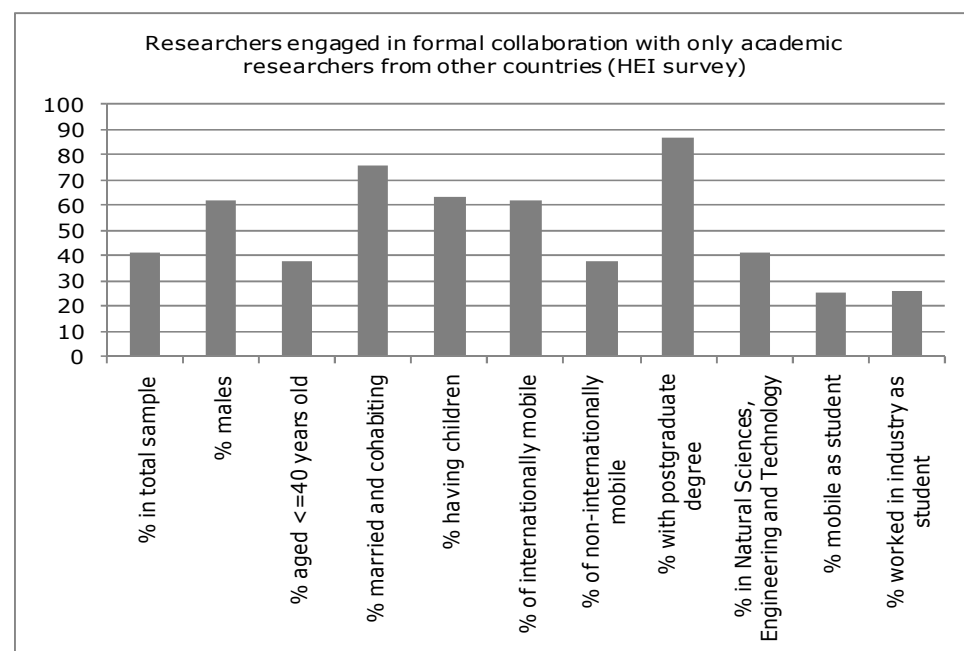
8.2.2.1 Number and share of researchers engaged in formal collaboration with only academic researchers from other countries by mobility status (MOB-FLOW2)

For this indicator we have information only for the HEI (Figure 8-18) where we find that 41% were engaged in formal collaboration with only academic researchers from other countries. Thus, the incidence of international/academic collaboration was higher than the incidence of recent (in last three years) geographical mobility but lower than the incidence of life-time geographical mobility.

Findings from the HEI

In the HEI 1,826 researchers were engaged in formal collaboration with only academic researchers from other countries. The characteristics of the collaborators were not different from what was generally observed in the sample, except for the distribution of geographically mobile and non-mobile researchers: there is a higher share of geographically mobile researchers in both (academic) groups of researchers collaborating internationally or intersectorally than we see in the overall sample.

Figure 8-18: Characteristics of researchers engaged in formal collaboration - academic only (HEI survey)



Source: MORE HEI survey

Similar conclusions are drawn when we look into the Extra-EU survey sample.

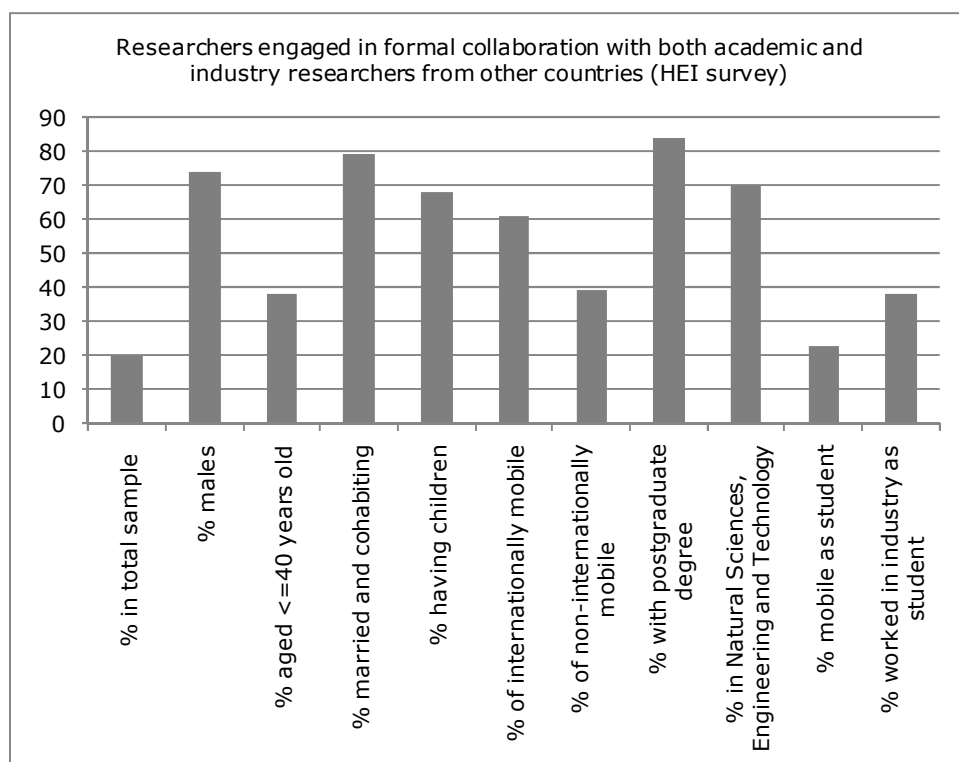
8.2.2.2 Number and share of researchers engaged in formal collaboration with both academic and industry researchers from other countries by mobility status (MOB-FLOW4)

Findings from the HEI

We find 877 researchers in the HEI survey (20%) who had been engaged in formal collaboration with both academic and industry researchers from other countries. The characteristics of this type of virtually mobile researcher are the same

in both surveys and differ strongly from the general picture. For this group, we find the highest concentration of male researchers (with 74 and 75% in the HEI and Extra-EU survey, respectively) with a very strong focus on the sciences (70 and 64% had obtained their highest degree in the Natural sciences or engineering and technology) and a high share who had worked in industry as a student (38% in both surveys). It appears that having worked in industry as a student is a fairly good predictor of the likelihood of working together with researchers from industry later on.

Figure 8-19: Characteristics of researchers engaged in formal collaboration - academic and industry (HEI survey)



Source: MORE HEI survey

Similar conclusions are drawn when we look into the Extra-EU survey sample.

8.3 Main findings

8.3.1 Stocks of mobility

The four MORE surveys indicate that mobile researchers are more likely to be men than women, contain a higher share of PhD holders and have a higher probability of having completed their highest degree in Natural science or engineering and technology the Medical Sciences and Agriculture or in the Social Sciences and Humanities compared to all respondents in the full samples.

Student mobility seems to predict mobility in later stages of a researchers' career: a higher share of mobile researchers had been mobile as students compared to the full samples.

Based on the HEI survey data 56% of the researchers working in HEI institutes have been internationally mobile at least once during their career; 29% of the researchers have been mobile during the last three years. Industrial researchers also seem to be the least mobile; there were 41% mobile researchers among the industry sample respondents, compared to 56% mobile researchers among the HEI respondents and 65% mobile researchers among the RI and Extra-EU respondents.

The respondents to the industry survey show some notable differences to the respondents to the other three MORE samples as 64% of mobile industrial researchers held a postgraduate degree (compared to 51% in the full sample) and 31% of mobile industrial researchers had been mobile as student (compared to 21% in the full sample).

The 'academic' researcher samples (HEI, RI, Extra-EU) show differences among the recent-mobile and the at-least-once-mobile-in-their-whole-career groups. Recent-mobile researchers show a younger profile (in terms of age, years since graduation and family attributes). The prevalence of males and of PhD holders among the mobile researchers is less pronounced for the recently mobile than for the at-least-once-mobile-in-their-whole-career groups of researchers.

As in the at-least-once-mobile-in-their-whole-career group, the recently mobile have a higher share of males and a higher share of post-graduate degree holders than in the total sample. This difference is, however, less dramatic when we compare the at-least-once-mobile-in-their-whole-career researchers to all respondents in the HEI and RI surveys. Student mobility among the recently mobile is higher than in the full sample and also higher than in the at-least-once-mobile-in-their-whole-career subgroup. Recently mobile researchers also have a higher share than have worked in industry as a student than the at-least-once-mobile-in-their-whole-career.

Going back to the MORE surveys, job mobile researchers who go to a different country appear to have similar characteristics to those of geographically mobile researchers. Among job-mobile researchers there is a higher concentration of men, a higher concentration of researchers who held post-graduate degrees and a higher concentration of those in Natural sciences or engineering and technology. Job mobile researchers who are also internationally mobile have a higher share of student-mobile researchers compared to the job mobile who have not been internationally mobile.

8.3.2 Sectoral flows of mobility and international collaboration

Sector mobility occurs most often among industrial researchers (42% of the sample's respondents, compared to 17%, 8% and 15% in the HEI, RI and Extra-EU samples). Sector-mobile researchers show a higher share of men (HEI, RI and Extra-EU surveys), and of graduates in the Natural sciences, engineering and technology sciences (HEI and Extra-EU surveys), and within the RI survey, also a higher share of PhD holders. The surveys also show that a positive correlation seems to exist between having had work experience in industry as student and subsequent sector-mobility.

The distribution of the geographically mobile and non-mobile among the sector-mobile group is largely the same as in the full sample, although in the industry survey a positive correlation appears to exist between sectoral mobility and geographical mobility (51% of sector-mobile researchers are geographically mobile compared to 41% who were geographically mobile in the full sample).

41% (HEI survey) of the respondents were engaged in formal collaboration with only academic researchers from other countries. This share is higher than the share of those who had recently been geographically mobile in both surveys, but lower than the share of those who had at-least-once been mobile during their career. Their characteristics do not differ from the general picture but there is a higher concentration of geographically mobile researchers. Additionally, the share of internationally mobile researchers among those who have had collaborations with partners from other countries, is higher than the share of non-mobile researchers, indicating that international research collaboration does not seem to serve as a substitute to international mobility.

We should note here that the share of researchers who currently collaborate with academic researchers abroad equals 61% (sum of the share of researchers collaborating only with academic researchers and the share of those collaborating with both academic and industry researchers abroad).

9 INFLUENCING FACTORS AND MOTIVATIONS FOR MOBILITY

In this chapter we present the indicators that represent the influencing factors of mobility and the motivations that drive researchers to become mobile. We discuss two types of mobility dependent on which survey that is used to provide the information. In three of the four MORE surveys (HEI, RI and Extra-EU), the focus is on geographical mobility only, the industry survey, however, also contains information on the influencing factors of job mobility.

We present for each indicator the average score for a selection of typical groups, namely, the average scores in the full sample of respondents, the young sample of respondents (researchers age 40 and below), the male and the female subsets, and the internationally mobile and non-mobile subsets. For the Extra-EU survey we also provide data for the EU-US mobile group and the US-EU mobile group of researchers.

We need to bear in mind that the surveys are not strictly comparable, especially with respect to their scoring systems. The range of possible scores within the HEI and RI survey went from 1 to 4 (1= Unimportant; 2= Not very important; 3= Important; 4= Highly important), while the Industry and Extra-EU surveys offered a range from 1-5 (1= Not important at all and 5= Extremely important).

Summary graphs per survey for influencing factors and motivations are provided also in Annex 6 of the report.

9.1 Influencing factors of mobility

The influencing factors are divided in two large sets, the *practical influencing factors* and the *profession-related* influencing factors. The practical factors include the role of the social security system, the administrative barriers to immigration, language, quality and cost of accommodations, child care arrangements, work permission for partner and social integration at host country. The profession-related factors include the researchers' opinions on the importance of obtaining funding for their research and the maintenance of professional and personal networks. Additionally, for the industry survey researchers there is information on the influencing factors related to job mobility. Here the profession-related factors include information on job satisfaction and good working conditions/climate. The personal factors for job mobility include good work-life balance, job changes of partner/life satisfaction of partner, maintaining family and personal relationships and life satisfaction of children.

9.1.1 Geographical mobility

9.1.1.1 Practical influencing factors (MOB-FCT1 - MOB-FCT7)

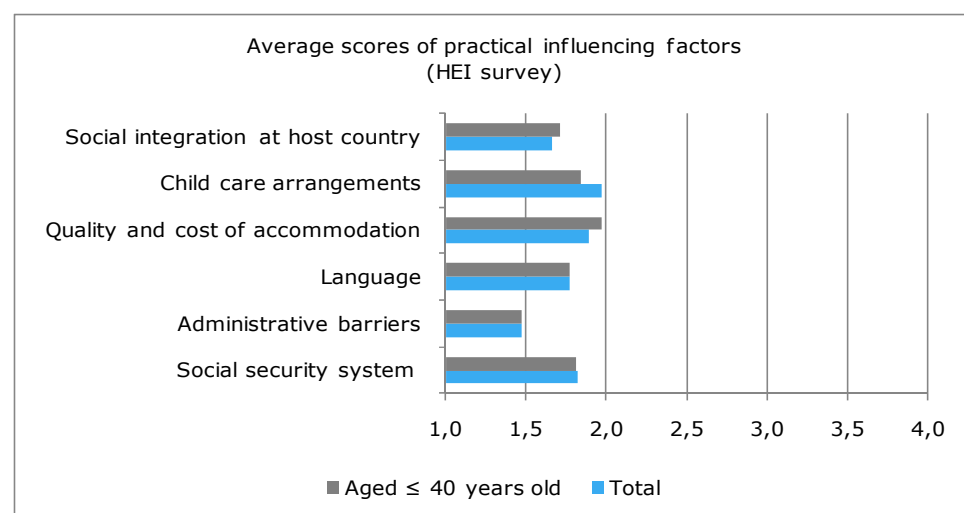
Due to their incomparability, we discuss the results from all four surveys separately, although we will see that their results are similar.

Findings from the HEI survey

Figure 9-1, Figure 9-2 and Figure 9-3 show the average scores of the practical influencing factors for the total and young, male and female and mobile and non-mobile researchers respectively. With scores that fall below 2 (2="not very important", the cut-off for becoming important) for the total and all sub-groups (except for child care arrangement for female and non-mobile researchers (with scores between 2 and 2.5), we can conclude that the practical influencing factors do not play a role in the decision to become mobile.

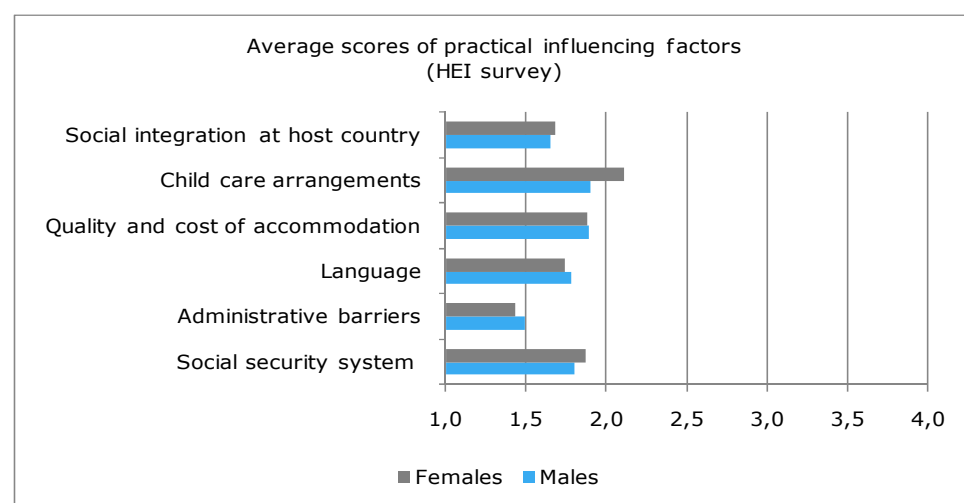
However, there are some differences noticeable between the sub-groups and between the (non-)importance of the factors that we would like to point out, even if the factor is generally not important. For example, administrative barriers are the least important worries of all researchers (total and all sub-groups). The young researchers appear to worry slightly more than the average about quality and cost of accommodation, while the total group on average and especially women and the non-mobile worry slightly more about child care arrangements. The internationally non-mobile also worry more about language than the other groups.

Figure 9-1: Practical influencing factors, total and young researchers (HEI survey)



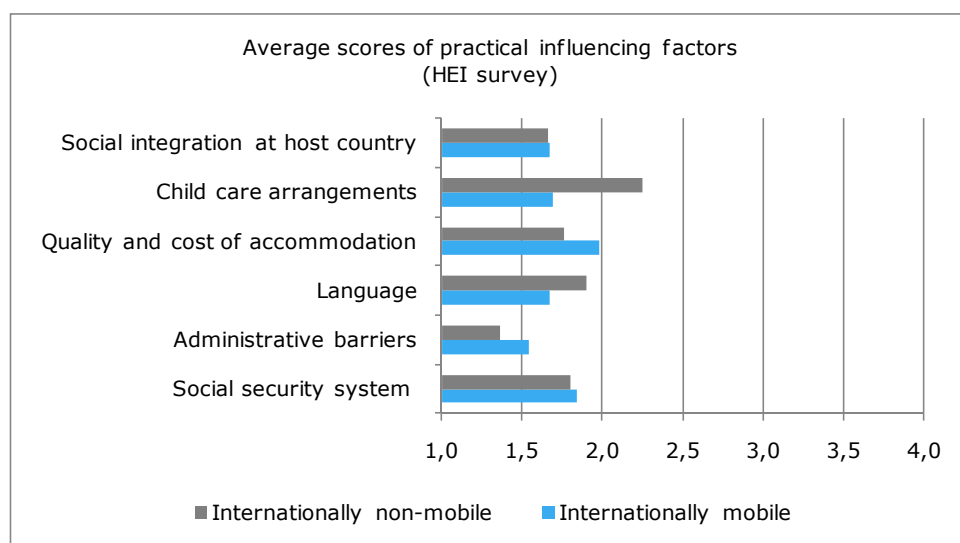
Source: MORE HEI survey

Figure 9-2: Practical influencing factors, male and female researchers (HEI survey)



Source: MORE HEI survey

Figure 9-3: Practical influencing factors, mobile and non-mobile researchers (HEI survey)



Source: MORE HEI survey

Findings from the RI survey

additional information on Chapters 9 and 10

Additional *figures on practical influencing factors for the RI and the Extra-EU surveys*

Figure 12-1, **Figure 12-2** and **Figure 12-3** give the average scores per sub-group for the researchers in the RI survey. We can draw the same general conclusion as seen for the HEI researchers: practical influencing factors are not important for their decision to become mobile or not (with average scores all well below “2”, except for child care arrangements for women and the non-mobile). While administrative barriers are of the least concern for the typical researcher, quality and cost of accommodations and child care arrangements are of slightly more concern, the former especially for men and the internationally mobile and the latter especially for women and the internationally non-mobile.

Additional figures are presented in Annex 5 to this report.

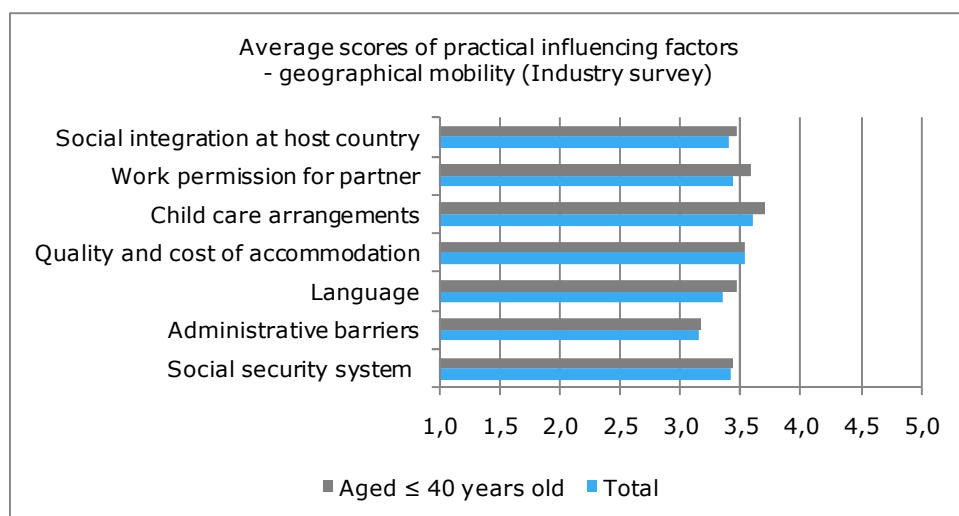
Findings from the Industry survey

The industry survey contains questions on the influencing factors of both geographical and job mobility. Here we discuss the influencing factors for geographical mobility (see **Figure 9-4**, **Figure 9-5** and **Figure 9-6**). We have to keep in mind that the scoring system was different than that used in the HEI and RI surveys with a range from 1 to 5, so 3 is now the neutral score.

Unlike the previous two surveys we have discussed thus far, all of the practical influencing factors appear to be somehow important to industry researchers (between neutral and important). The order does seem to follow that of the other surveys with the administrative barriers being the least important and child care arrangements and quality and cost of accommodation the most important. Nearly all factors are more important for young researchers than for all respondents in the full sample. All factors also play a more important role for the decision of

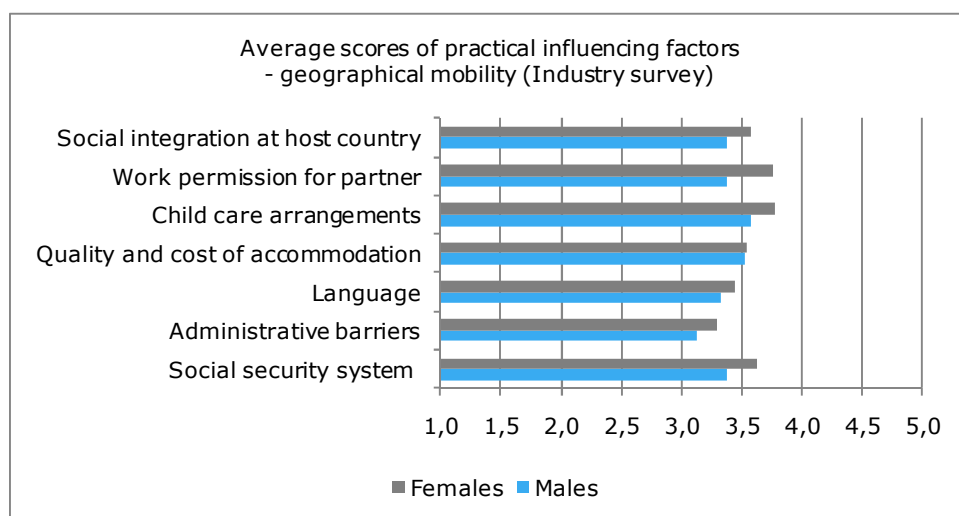
women and especially of the non-mobile for whom there are large differences on the importance of these factors compared to the mobile ones.

Figure 9-4: Practical influencing factors of geographical mobility, total and young researchers (Industry survey)



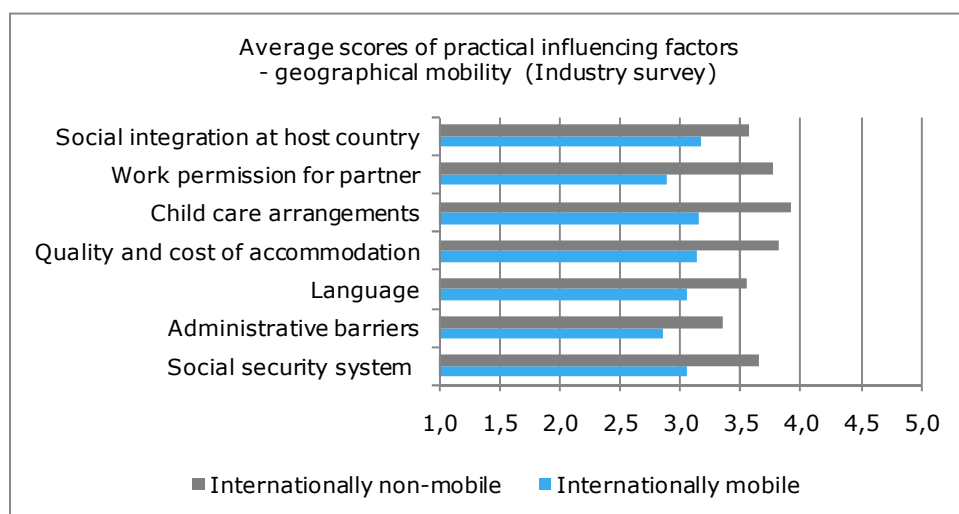
Source: MORE Industry survey

Figure 9-5: Practical influencing factors of geographical mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 9-6: Practical influencing factors of geographical mobility, mobile and non-mobile researchers (Industry survey)



Source: MORE Industry survey

Findings from the Extra-EU survey

In the Extra-EU survey there are additional two groups to compare, namely the EU-US and the US-EU mobile researchers (Figure 9-7).

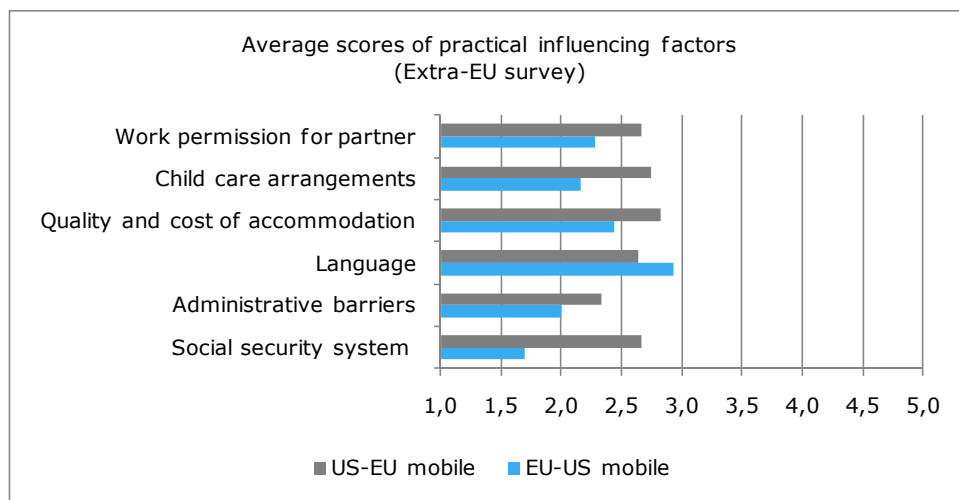
The general picture observed in the Extra-EU survey is similar to that in the HEI and RI surveys, with none of the influencing factors playing an important role (all averages below "3") (see Annex 5).

Unlike the other surveys where researchers were the least concerned about administrative barriers, the researchers in the Extra-EU survey assign less importance to the social security system as a factor affecting mobility decisions. The importance of child care arrangements is also much lower compared to the importance attached to it by the researchers in the other surveys; this is also hold true for women. In the Extra-EU survey it is language that is of highest (near-) concern. The ranking of the practical influencing factors is the same for all sub-groups. Women and the non-mobile appear to attach more importance to the factors presented in the questionnaire (although for child care arrangements, women and men have the same opinion on their (non-)importance).

Even though, none of the factors are important for both the EU-US and the US-EU mobile groups, there are large differences between the two groups. On average, the EU-US mobile group attach a much lower importance to the factors presented than the US-EU mobile group, with the one exception being 'language' where the EU-US mobile group attaches on average higher importance than the US-EU mobile one. The difference (US-EU attaching more importance) is largest for the social security system and for child care arrangements.

The figure below presents the average scores for the practical influencing factors for the two main groups of mobility among the Extra-EU survey: the EU-US mobile and the US-EU mobile researchers. More detailed figures on the Extra-EU survey are presented in Annex 5 to this report.

Figure 9-7: Practical influencing factors, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

9.1.1.2 Profession-related factors (MOB-FCT8, MOB-FCT9)

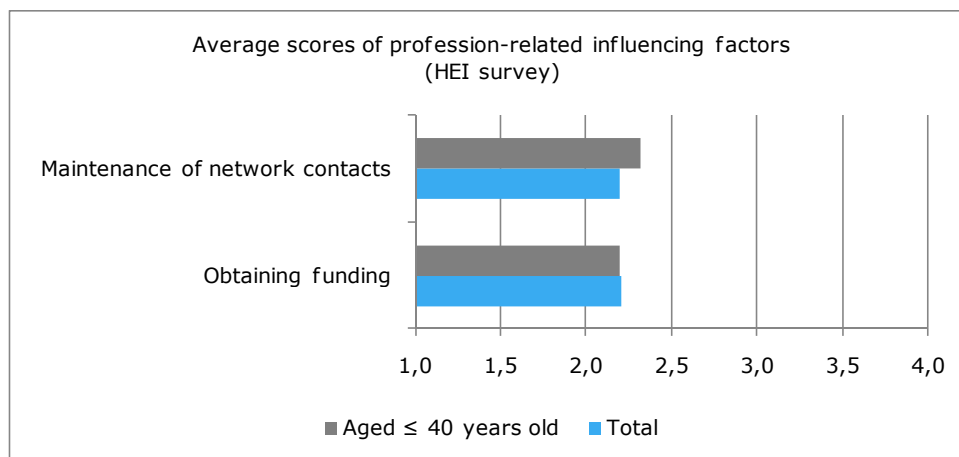
Next we move to the profession-related influencing factors: obtaining funding for one's own research and the maintenance of network contacts. This information only exists for the HEI, RI and Extra-EU survey.

Findings from the HEI survey

Similar to the practical influencing factors, researchers in the HEI survey do not attach great importance to the profession-related influencing factors, with average scores for the total and all sub-groups below the score of "3" (3="important") (see Figure 9-8, Figure 9-9 and Figure 9-10). Especially among those who eventually became mobile, the professional-related factors are unimportant, having an average score of around 2 ("not very important"). In fact, there is hardly any difference in the (non-) importance of either factor queried in the survey.

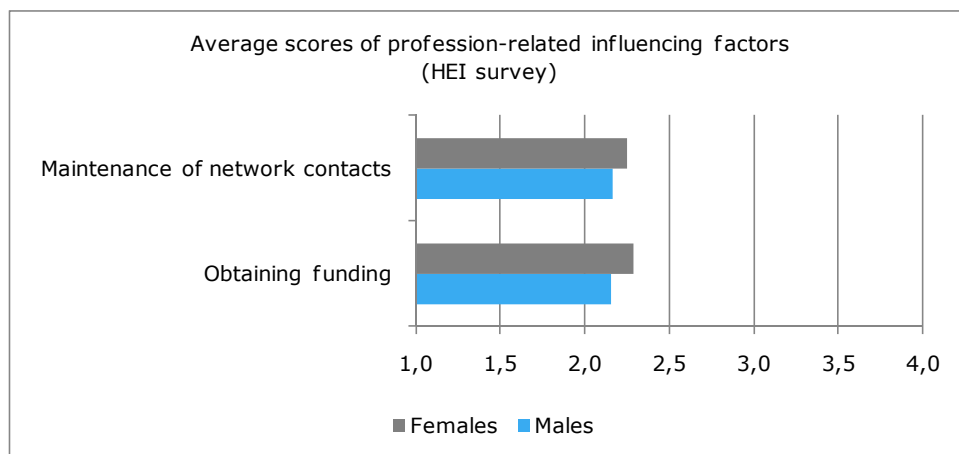
We do find that the female researchers assign slightly more importance on the maintenance of their network contacts and obtaining funding for research while the young researchers too worry slightly more about the former factor.

Figure 9-8: Profession-related factors, total and young researchers (HEI survey)



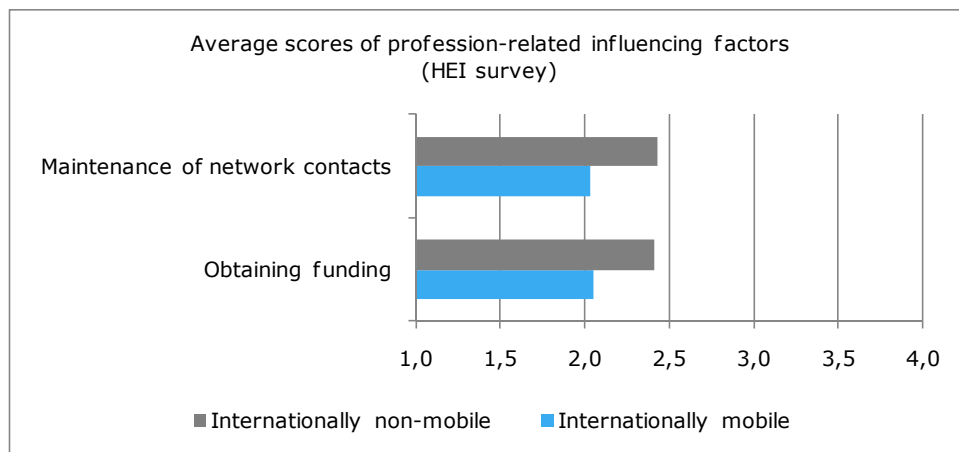
Source: MORE HEI survey

Figure 9-9: Profession-related factors, male and female researchers (HEI survey)



Source: MORE HEI survey

Figure 9-10: Profession-related factors, mobile and non-mobile researchers (HEI survey)



Source: MORE HEI survey

Findings from the RI survey

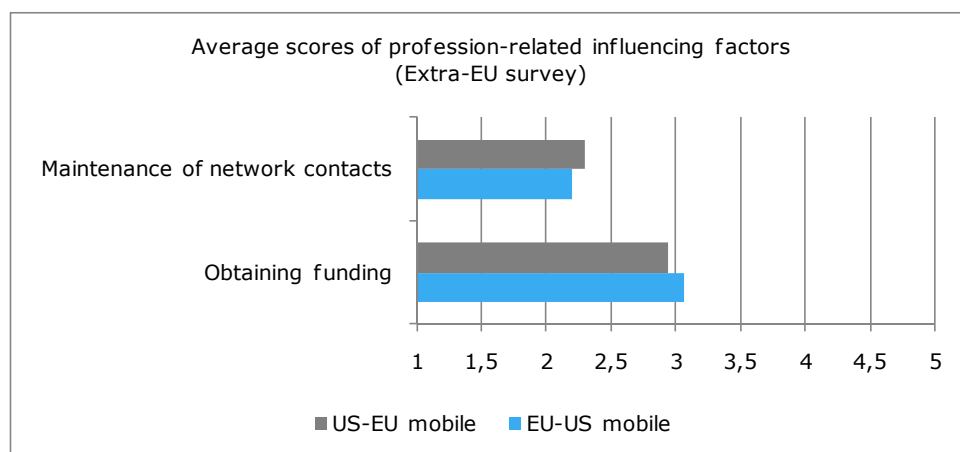
The conclusions for the RI survey are completely similar to those drawn from the HEI survey (see Figure 12-7, Figure 12-8 and Figure 12-9). The only deviation from the earlier results of the HEI survey above is that there are no differences by age. Detailed figures on the RI survey are presented in Annex 5 to this report.

Findings from the Extra-EU survey

For the researchers in the Extra-EU survey, maintenance of network contacts is not an important profession-related influencing factor but obtaining funding is, and more so – with increasing difference – for the younger researchers, female researchers and especially for the non-mobile researchers. It is considered important for the EU-US mobile group but not for the US-EU mobile group.

The figure below presents the average scores for the profession-related influencing factors for the two main groups of mobility among the Extra-EU survey: the EU-US mobile and the US-EU mobile researchers. More detailed figures on the Extra-EU survey are presented in Annex 5 to this report.

Figure 9-11: Profession-related factors, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

9.1.2 Job mobility

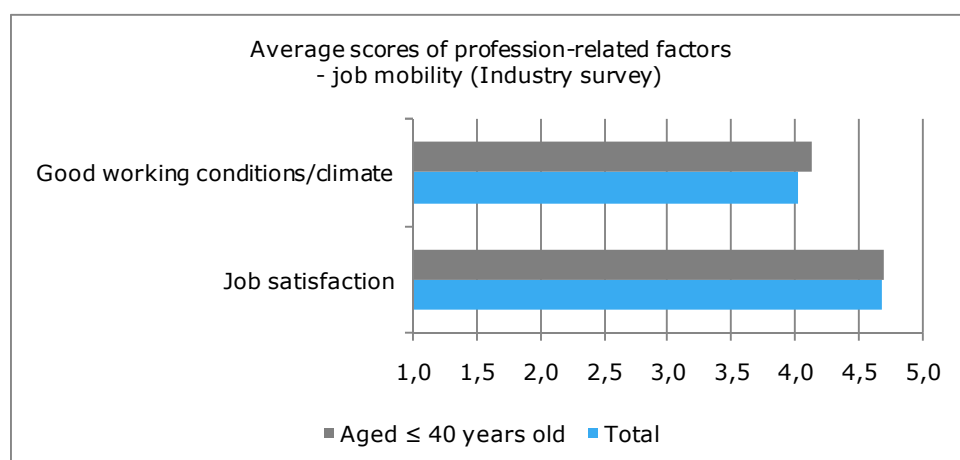
The topic of job mobility was only included in the industry survey. Hence the results are based only on the answers given by these respondents.

9.1.2.1 Profession-related factors (MOB-FCT10, MOB-FCT11)

The opinion of the industry-survey researchers on the importance of profession-related influencing factors for job mobility was asked about two issues; namely on "job satisfaction" and "good working conditions/climate" as criteria for their job/career path decisions.

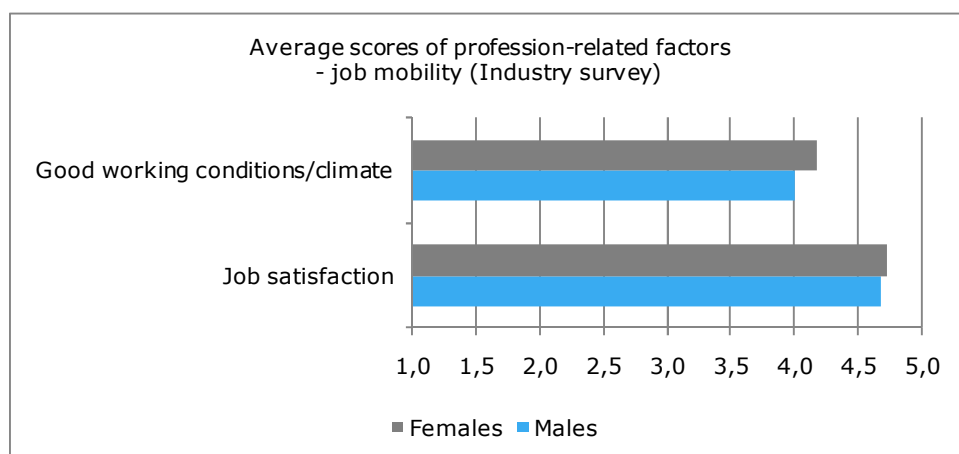
The following three figures (Figure 9-12, Figure 9-13 and Figure 9-14) show that both factors have been either "important" or "extremely important" for all researchers in all sub-groups. The highest importance is attached to the job satisfaction criterion in all sub-groups (with only minor differences between groups).

Figure 9-12: Profession-related influencing factors of job mobility, total and young researchers (Industry survey)



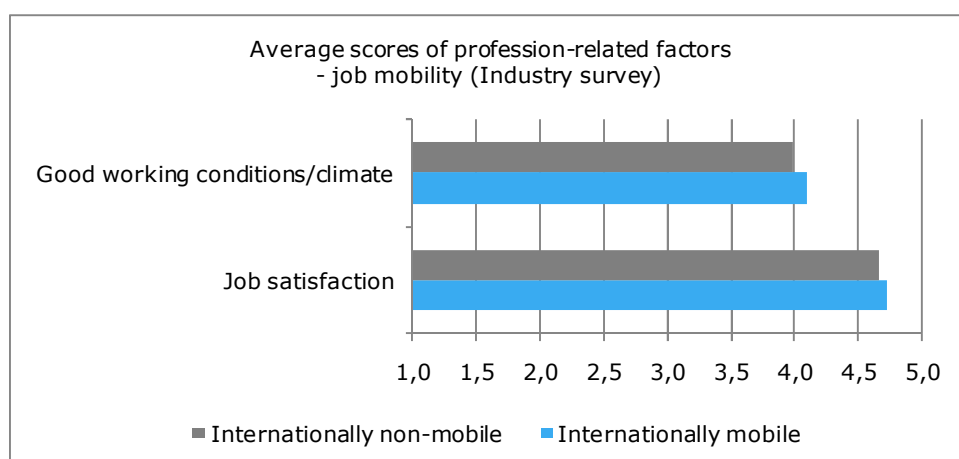
Source: MORE Industry survey

Figure 9-13: Profession-related influencing factors of job mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 9-14: Profession-related influencing factors of job mobility, mobile and non-mobile researchers (Industry survey)



Source: MORE Industry survey

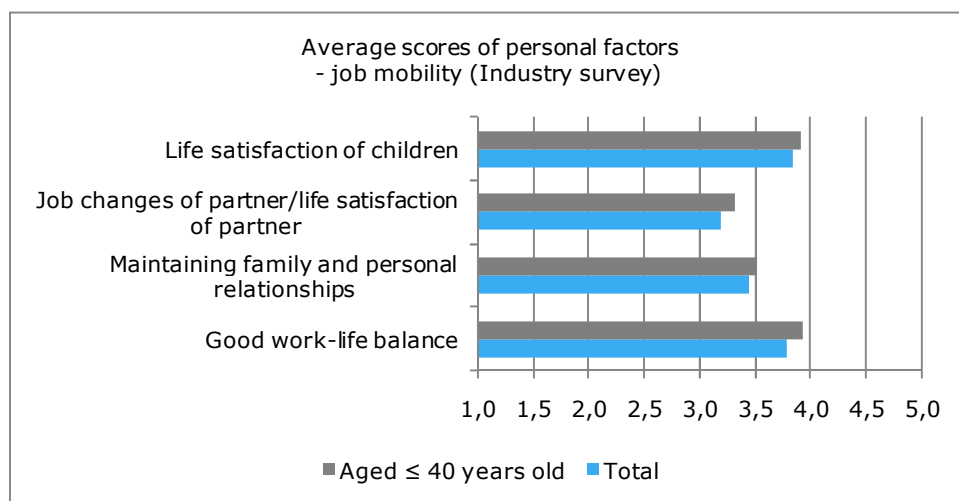
9.1.2.2 Personal factors (MOB-FCT12 - MOB-FCT15)

Under “personal influencing factors of job mobility” included in the questionnaire are the following factors: having a good work-life balance, maintaining family and personal relationships, job changes/life satisfaction of partner and life satisfaction of children.

We see a clear difference between the importance of the profession-related influencing factors and personal factors, with the latter being less important. However, even if their role is smaller, they do play a role with average scores between “neutral” and “important” for all groups. What is considered most important is the life satisfaction of the children and a good work-life balance, while the life satisfaction of the partner is least important. The younger researchers attach a higher importance to all personal factors than the average researcher. Also women attach a higher importance than men to personal factors (except for maintaining family and personal relationships where there is no noticeable difference between men and women). While there were strong differences between the

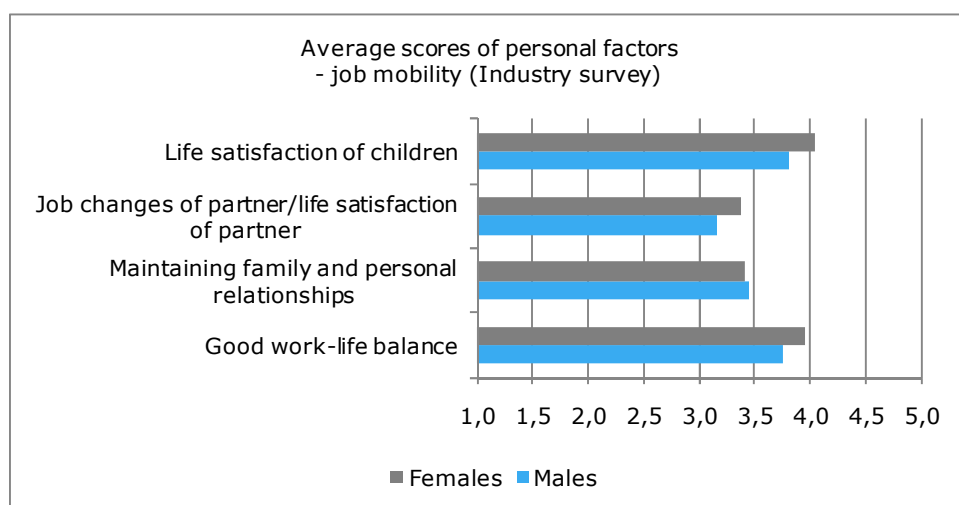
internationally mobile and the non-mobile groups of researchers with respect to the factors that influence geographical mobility, this is not the case for job mobility.

Figure 9-15: Personal influencing factors of job mobility, total and young researchers (Industry survey)



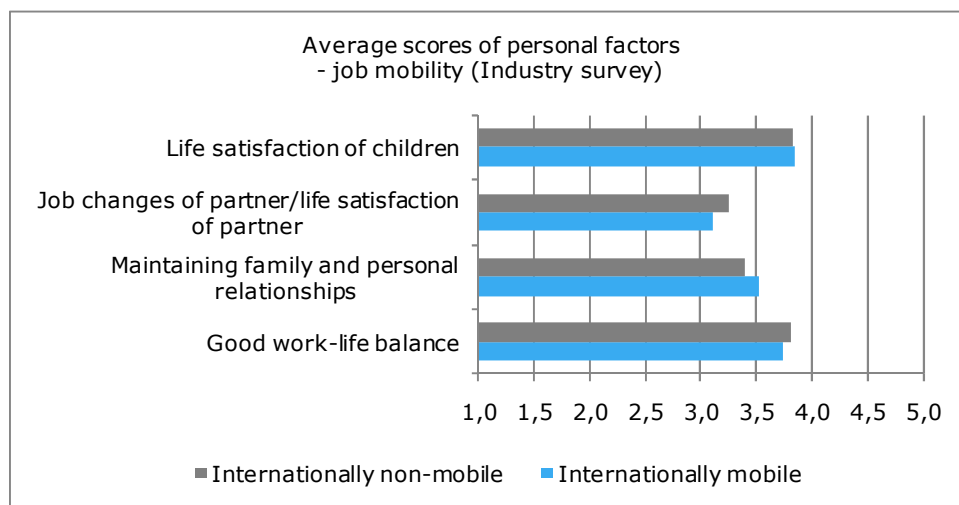
Source: MORE Industry survey

Figure 9-16: Personal influencing factors of job mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 9-17: Personal influencing factors of job mobility, mobile and non-mobile researchers (Industry survey)



Source: MORE Industry survey

9.2 Motivations for mobility

In the present chapter we discuss what drives the researchers to become mobile, or to remain non mobile. We look separately at the motivations of geographical and job mobility (the latter is only available for the industry survey respondents). Similar to the influencing factors, the motivations of geographical mobility can be divided into two sets of drivers, the personal motives and the profession-related motives while we only have information on profession-related motives of job mobility.

9.2.1 Geographical mobility

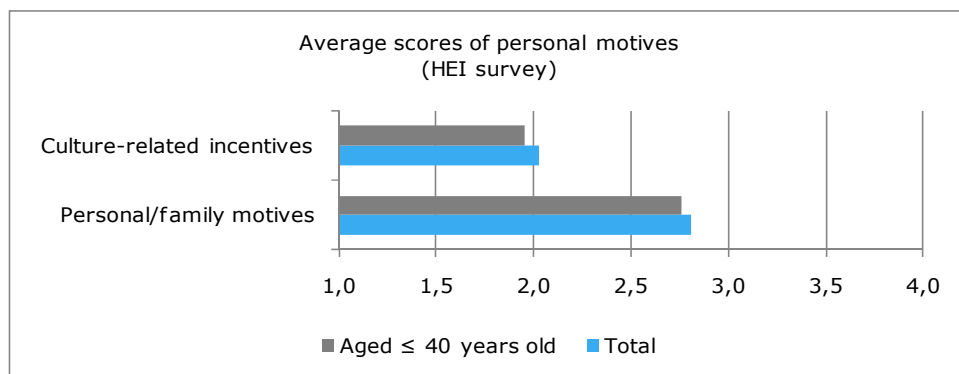
9.2.1.1 Personal motives (MOB-MOT1 - MOB-MOT2)

The personal motivations that were presented to survey respondents include personal/family motives and culture-related incentives.

Findings from the HEI survey

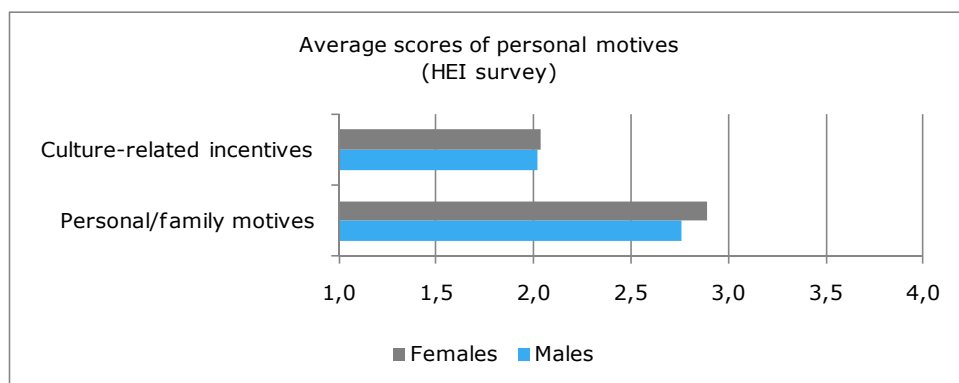
The results of the HEI survey are summarised in Figure 9-18, Figure 9-19 and Figure 9-20. In the HEI survey culture-related incentives do not seem to be an important driver of mobility while personal/family motives are only slightly important (average score between the score of 2=“not very important” and 3= “important”). This result holds for all sub-groups. Women and especially those who have not been internationally mobile appear to attach a slightly greater importance to personal/family motives.

Figure 9-18: Personal motives of mobility, total and young researchers (HEI survey)



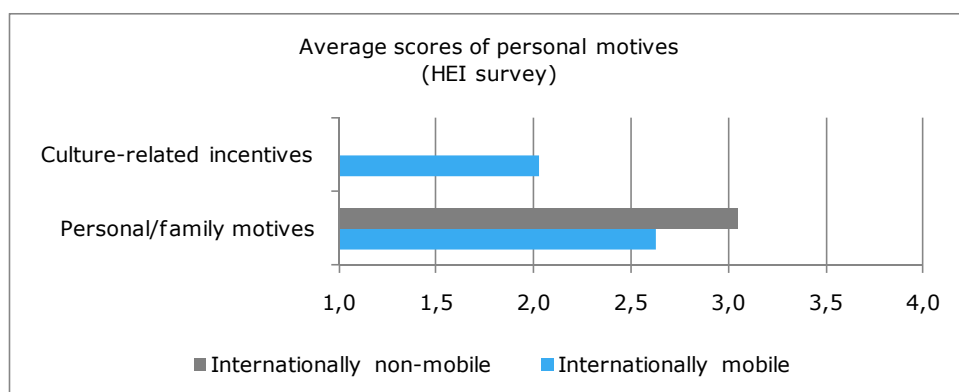
Source: MORE HEI survey

Figure 9-19: Personal motives of mobility, male and female researchers (HEI survey)



Source: MORE HEI survey

Figure 9-20: Personal motives of mobility, mobile and non-mobile researchers (HEI survey)



Note: this question has not been addressed to the non-mobile researchers in this survey.
Source: MORE HEI survey

Findings from the RI survey

The conclusions we can draw from the RI survey are again very similar to those drawn from the HEI survey. Figures referring to the personal motives for the RI survey are presented in Annex 5.

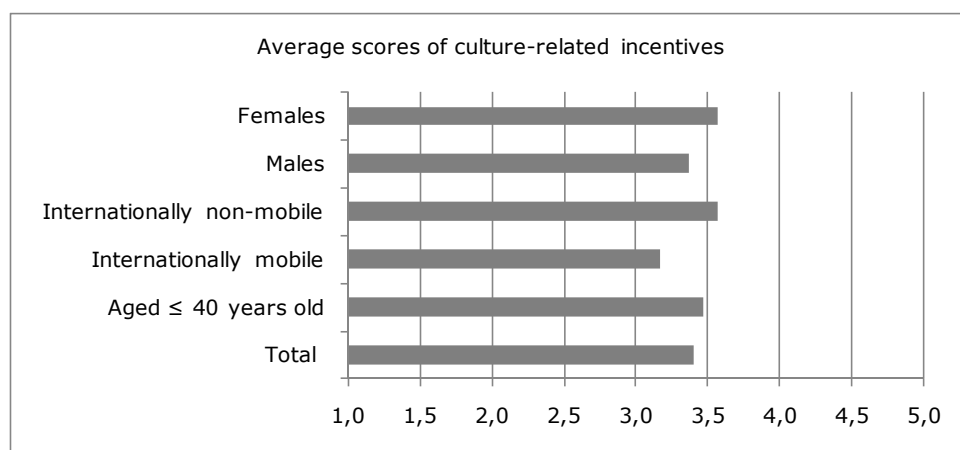
Findings from the Industry survey

In the industry survey the respondents were questioned only about how important they considered culture-related incentives for their geographical mobility.

Since only the results for this one motive need to be presented, the averages for the total and all sub-groups are shown together in one figure (Figure 9-21).

Unlike what was found in the HEI and RI surveys, we find that culture-related incentives are fairly important for industry researchers, especially for the female and the non-mobile industry researchers and they are least important for the internationally mobile group of researchers.

Figure 9-21: Culture-related motives of mobility (Industry survey)



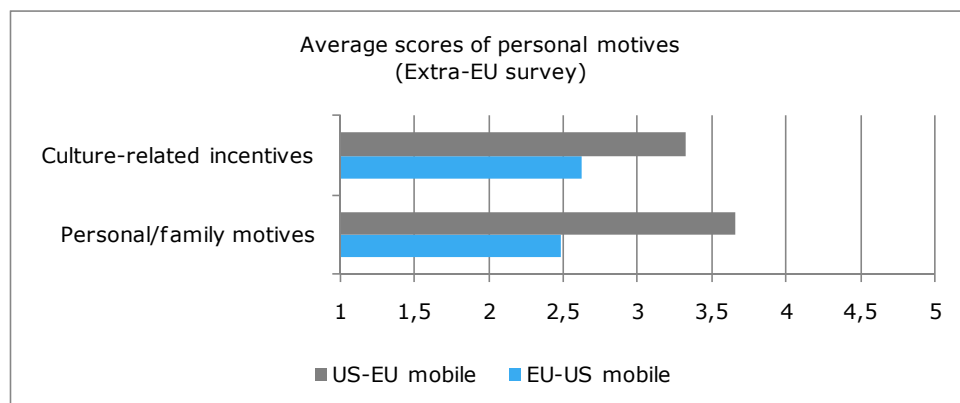
Source: MORE Industry survey

Findings from the Extra-EU survey

The results of the Extra-EU survey are again similar to the results found for the HEI and RI surveys where the culture-related incentives were not important, except for the US-EU mobile group where they seem to be somewhat important (score between "neutral" and "important"). In the Extra-EU survey, however, the personal/family motives also are not important overall and only slightly important for females (average score closer to "neutral" than to "important") and somewhat more important for the non-mobile and the US-EU mobile groups of researchers (average scores closer to "important" than to "neutral").

The figure below presents the average scores for the culture-related motives for the two main groups of mobility among the Extra-EU survey: the EU-US mobile and the US-EU mobile researchers. More detailed figures on the Extra-EU survey are presented in Annex 5 to this report.

Figure 9-22: Personal motives of mobility, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

9.2.1.2 Profession-related motives (MOB-MOT3 - MOB-MOT8)

In this section we discuss the importance of the profession-related motives as drivers of mobility (or non-mobility). The list of motives the respondents were asked to consider included career progression goals, personal research agenda, prospects to work with leading experts, access to internal and external research facilities, salary and other financial incentives, and career opportunities at new location.

The first two were not included in the Industry survey and the last one was not included in the Extra-EU survey. Furthermore, to keep the information as comparable as possible between the surveys, we restricted the analysis of profession-related motives for the total, age and gender groups in the HEI and RI surveys to "career progression goals" and "personal research agenda". Even though there is information on each of the other motives in these surveys, these questions were presented to different groups differently -- referring to past mobility for the mobile group of researchers and to potential future mobility for the non-mobile researchers, making them unsuitable to be used as a total and by different characteristics such as age and gender. We therefore only present the average scores for the internationally mobile group of researchers.

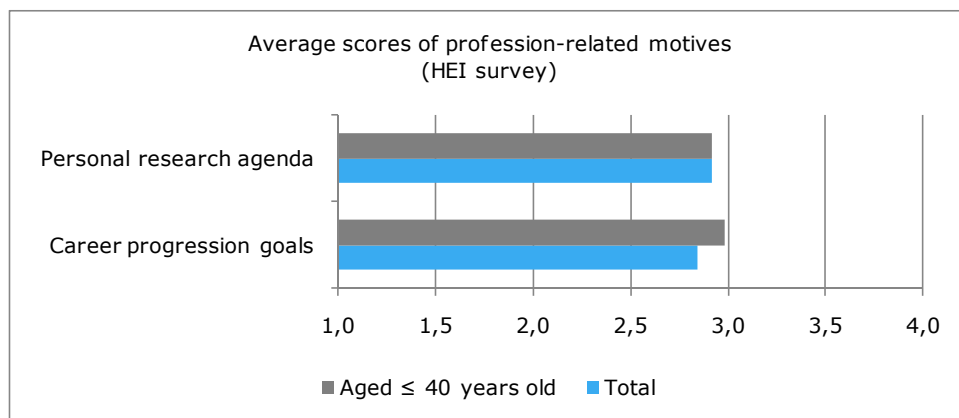
Findings from the HEI survey

Figure 9-23, Figure 9-24 and Figure 9-25 present the averages on the importance of both professional-related motives. Profession-related motives were considered nearly "important" in the HEI survey, especially career progression goals for the young researchers and personal research agenda for male researchers.

There is a strong difference in the role that these motives play as drivers of mobility compared to drivers of non-mobility. For the non-mobile the motives were clearly "not very important" while for the mobile they were clearly "important".

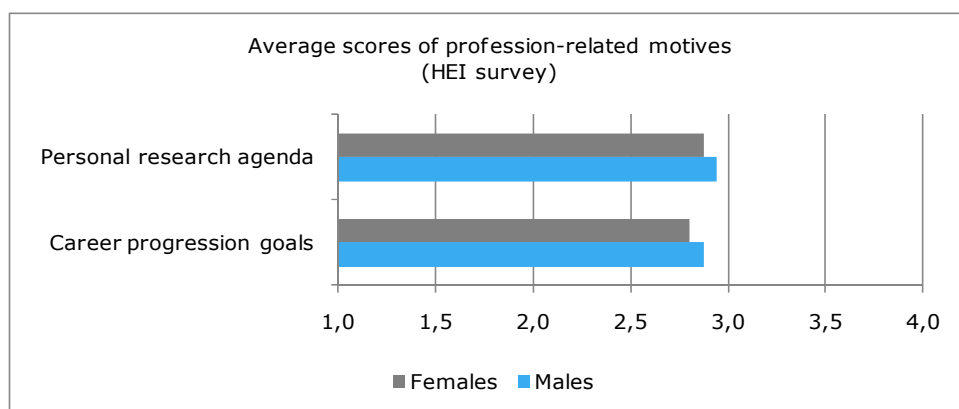
For the internationally mobile group of researchers, there is also information on the other motives, but we see that they were less important than the two discussed above. Salary and other financial incentives were the least important but still considered slightly important (average score is above 2="not very important").

Figure 9-23: Profession-related motives of mobility, total and young researchers (HEI survey)



Source: MORE HEI survey

Figure 9-24: Profession-related motives of mobility, male and female researchers (HEI survey)



Source: MORE HEI survey

Figure 9-25: Profession-related motives of mobility, mobile and non-mobile researchers (HEI survey)



Source: MORE HEI survey

Findings from the RI survey

In the RI survey both motives were generally considered as equally “important”. There were no noteworthy differences by age and gender but the difference between mobility groups was clearly present: the non-mobile did not consider them as important drivers of non-mobility, while the mobile definitely saw them as important motives for mobility (Figure 9-26). It seems therefore that the professional motives are drivers of mobility but not of non-mobility. The other motives that were scored by the internationally mobile group appeared to be less important than the two discussed above with the lowest importance attached to the financial motives. Below we present a chart distinguishing between the mobile and the non-mobile group. The remaining data on profession-related motives for the RI survey is presented in Annex 5.

Figure 9-26: Profession-related motives of mobility, mobile and non-mobile researchers (RI survey)



Source: MORE RI survey

Note: The relevant question on “career opportunities”, “salary and other financial incentives”, “access internal and external research facilities” and “prospects to work with leading experts” has not been addressed to the non-mobile group of respondents.

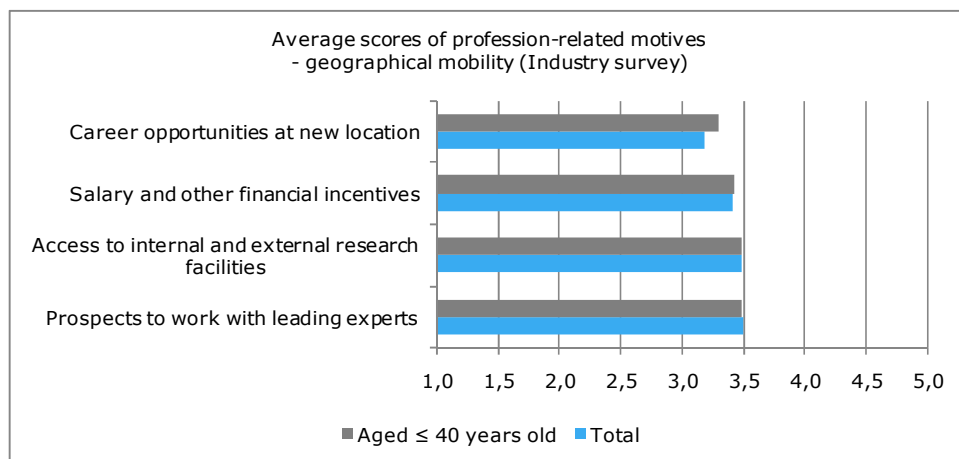
Findings from the Industry survey

In the Industry questionnaire queries about “career progression goals” and “personal research agenda” were not included so the set of motives examined here is different from the set of motives discussed above in the HEI and RI surveys. Overall, the importance attached to the motives in the Industry survey, however, are not very high, ranging from slightly above the neutral score of 3 for “career opportunities at new location” to the nearly important score of 3.5 for “access to internal and external research facilities” and “prospects to work with leading experts”. The score for “salary and other financial incentives” fell somewhere in-between (Figure 9-27) these.

There is no strong age difference but young researchers attached slightly more importance to “career opportunities at new location”. For female researchers, the “prospects to work with leading experts” and “career opportunities at new location” appeared also to be slightly more important than for men (Figure 9-28). The difference between the mobile and the non-mobile group of researchers is not as

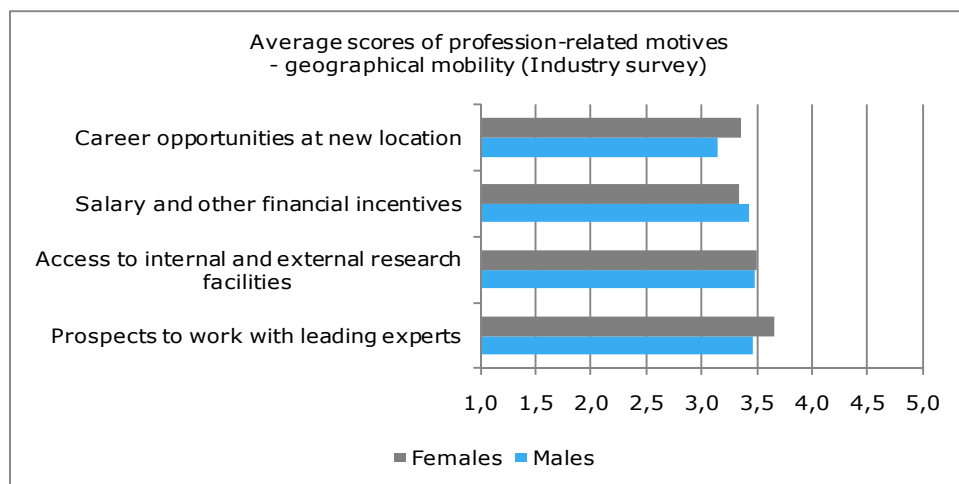
large as what was observed before, the motives were not consistently more important for the mobile than non-mobile researchers. We also see a difference again between the industry (mobile) researchers and the other types of researchers. For the non-mobile, "access to facilities" was the most important driver (and actually slightly more important than for the mobile) while for the mobile "prospects to work with leading experts" was the most important driver (and it was more important than for the non-mobile).

Figure 9-27: Profession-related motives of mobility, total and young researchers (Industry survey)



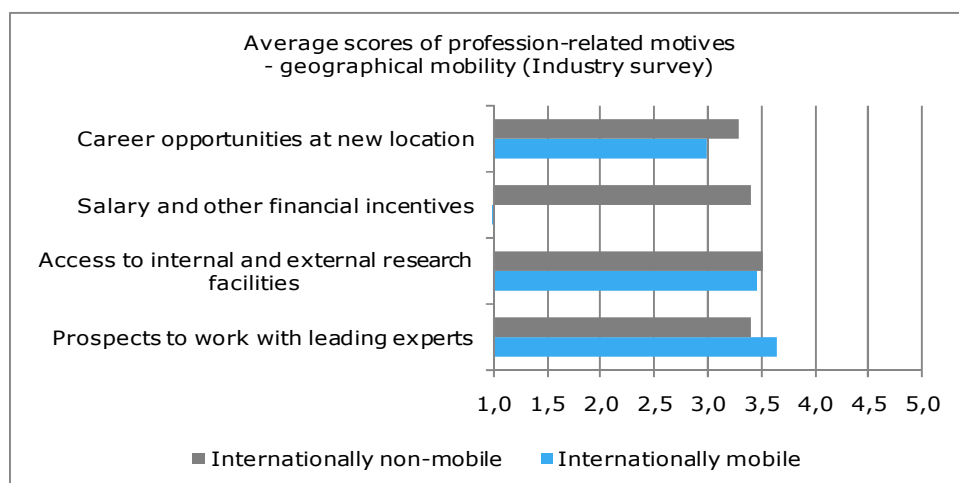
Source: MORE Industry survey

Figure 9-28: Profession-related motives of mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 9-29: Profession-related motives of mobility, mobile and non-mobile researchers (Industry survey)



Source: MORE Industry survey

Note: The relevant question on "salary and other financial incentives" has received no responses from the non-mobile researchers.

Findings from the Extra-EU survey

In the Extra-EU survey it is clear that "personal research agenda" and "career progression goals" were the two most important motivations for mobility, followed by "prospects to work with leading experts" and "access to research facilities" while "salary and other financial incentives" was not considered to be important (falling below the neutral score of 3) (Figure 12-21).

Below we present information on the importance of profession-related motivations for EU-US mobile and US-EU mobile researchers as well as for mobile and non-mobile groups. More detailed figures on the Extra-EU survey are presented in Annex 5 to this report.

Strong differences exist between the mobile and the non-mobile researchers (Figure 9-30) and the EU-US and US-EU mobile researchers (Figure 9-31). For the non-mobile researchers, none of the profession-related motivations played an important role while they were quite important for the mobile group, with the exception of the financial motive. Personal research agenda and career progression goals were clearly the most important motivating factors for mobility.

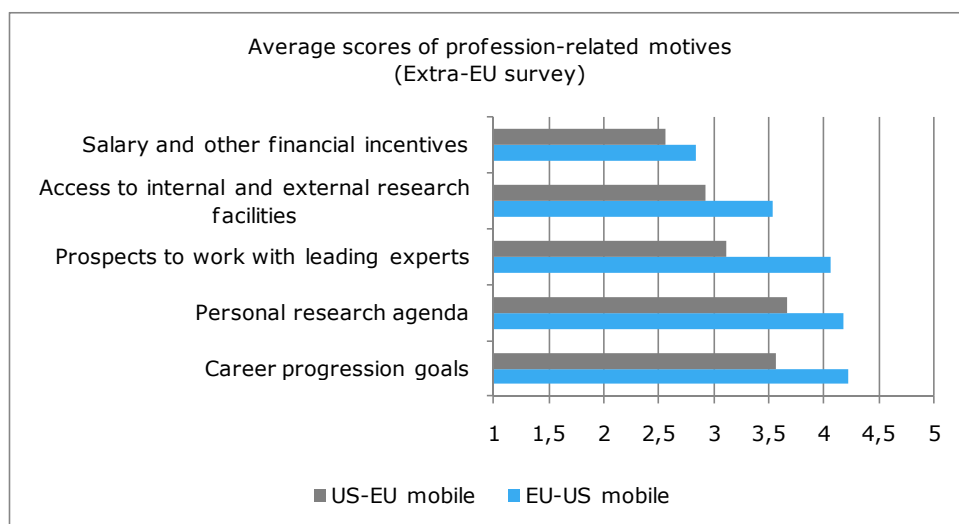
All profession-related motivating factors were more important for the EU-US mobile group than for the US-EU group (although it was the other way around for the personal motives). The ranking of the motives was similar for both groups.

Figure 9-30: Profession-related motives of mobility, mobile and non-mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

Figure 9-31: Profession-related motives of mobility, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

9.2.2 Job mobility

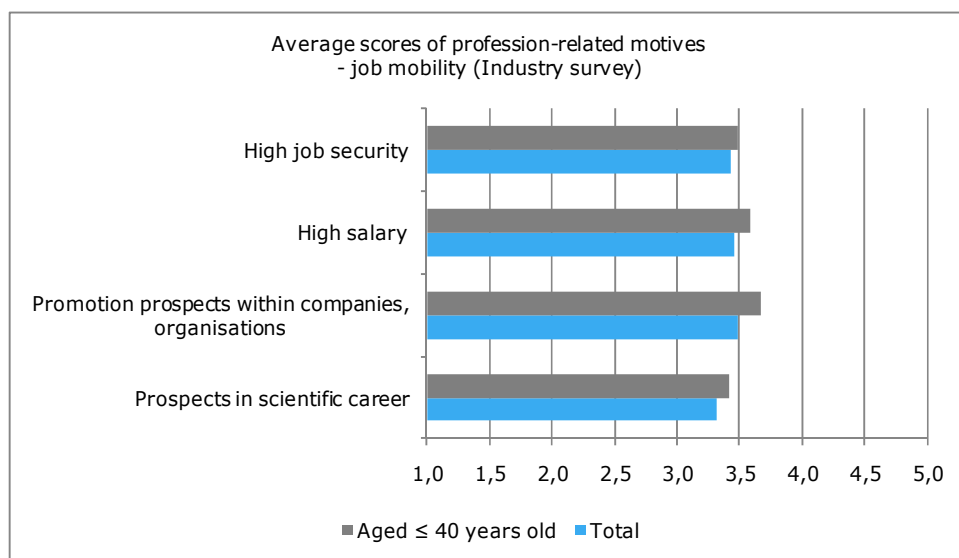
In this section, we examine the importance of profession-related motives in job mobility. There were four profession-related motives of job mobility queried in the survey; namely, "prospects in scientific career", "promotion prospects with companies, organisations", "high salary" and "high job security".

9.2.2.1 Profession-related motives (MOB-MOT9 - MOB-MOT12)

We notice immediately that, unlike the case of geographical mobility, salary did appear to play a role for job mobility (Figure 9-32), especially for men and younger researchers (Figure 9-32 and Figure 9-33). Together with "promotion

prospects” this was actually the most important driver of job mobility (except for women where salary was the least important driver of job mobility). Generally, however, there was not a strong difference in the importance of all the motivations queried. “Prospects in scientific career” was most often the least important motivation, especially for men and the non-mobile (Figure 9-34).

Figure 9-32: Profession-related motives of job mobility, total and young researchers (Industry survey)



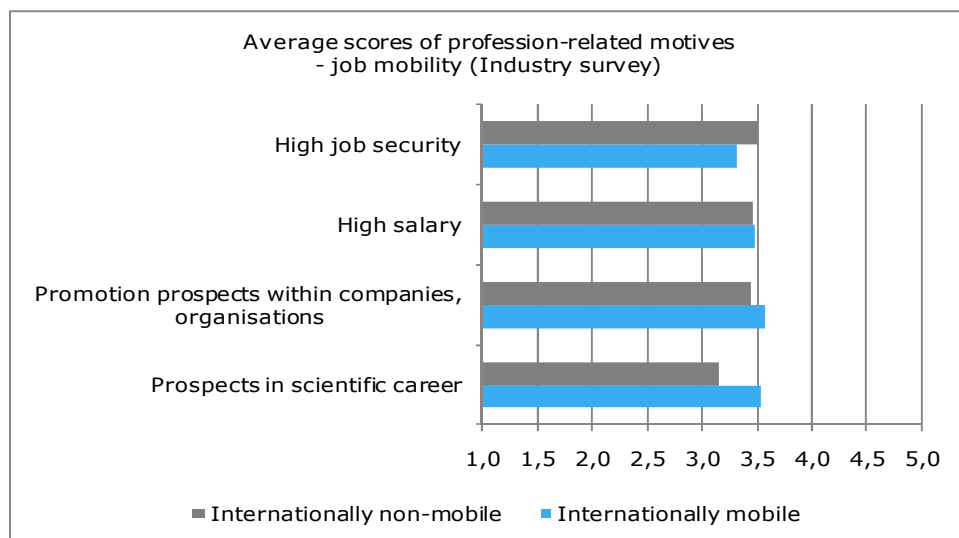
Source: MORE Industry survey

Figure 9-33: Profession-related motives of job mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 9-34: Profession-related motives of job mobility, mobile and non-mobile researchers (Industry survey)



Source: MORE Industry survey

9.3 Main findings

9.3.1 Influencing factors of mobility

There are clear differences between the 'academic' researchers (HEI, RI and Extra-EU surveys) and the Industrial researchers on the importance of the practical influencing factors of mobility. In general, academic researchers did not seem to consider the practical influencing factors (immigration regulations, pension systems, language, etc.) to be important; however:

- Younger researchers found the quality and cost of accommodation important.
- Female researchers and non-mobile respondents assign more importance to child-care arrangements than others.
- Language was an important factor for the Extra-EU group and especially for EU-US mobile researchers.

The practical influencing factors were considerably more important for the US-EU mobile researchers than for the EU-US mobile ones.

Contrary to what was observed for academic researchers, practical influencing factors were more important determinants of mobility for industrial researchers. For them, practical influencing factors were seen more as barriers to mobility, since non-mobile researchers assign more importance to these than did the mobile researchers.

The profession-related influencing factors were not important for 'academic' researchers; these factors were seen more as barriers to mobility as they are important for non-mobile researchers.

For the Extra-EU sample, 'obtaining funding' for research seemed to be a barrier for the non-mobile among the Extra-EU sub-group of researchers.

For job-mobile researchers, professional and personal influencing factors were important for their decision to change jobs or not. Among these "life satisfaction of children" and "good work-life balance" were of particular importance for younger and female researchers.

9.3.2 Motivations for mobility

Personal and family-related motives did not seem to be drivers of mobility but rather acted as barriers to mobility as non-mobile researchers assigned higher importance to these motives than did mobile researchers. These motives were also significantly more important as drivers of US-EU mobility.

'Career progression goals' and 'personal research agenda' were the top-ranked motivations for mobility among the 'academic' researchers, especially important for the EU-US mobility group. 'Salary and other financial incentives' did not, however, seem to be important as drivers of mobility (or non-mobility) for the 'academic' researchers.

In general, profession-related motives were more important as drivers of mobility than as motivations for mobility, and as drivers of EU-US mobility rather than of US-EU mobility. While personal motivations are driving non-mobility, profession-related motivations appear to drive mobility.

Concerning job mobility, financial incentives and promotion prospects were important drivers of job mobility for industrial researchers. 'Job security' was most important for females and 'high salary' was most important for male industry researchers. 'Prospects in scientific career' seemed to be a relatively more important motivation for job mobility among the internationally job mobile group of researchers.

10 EFFECTS OF MOBILITY

The chapter on the perceived effects of mobility contains two large parts. The first part discusses the effects of geographical mobility, the second part discusses the effects of job mobility. Since job mobility was only queried in the Industry survey, part two is based solely on this survey. Similarly, since the effects of geographical mobility were not queried in the Industry survey, the first part of this chapter is based only data from the HEI, RI and Extra-EU surveys. Furthermore, since the HEI and RI surveys contained only limited information on the overall effects of geographical mobility on career progression, the discussion of the effects of geographical mobility is largely based on the Extra-EU survey.

Unlike the former chapter on influencing factors and motivations of mobility, here we do not make a distinction between the internationally mobile and the non-mobile groups of researchers. Obviously, there are no perceived effects of mobility for those who had not been mobile.

10.1 Effects of geographical mobility

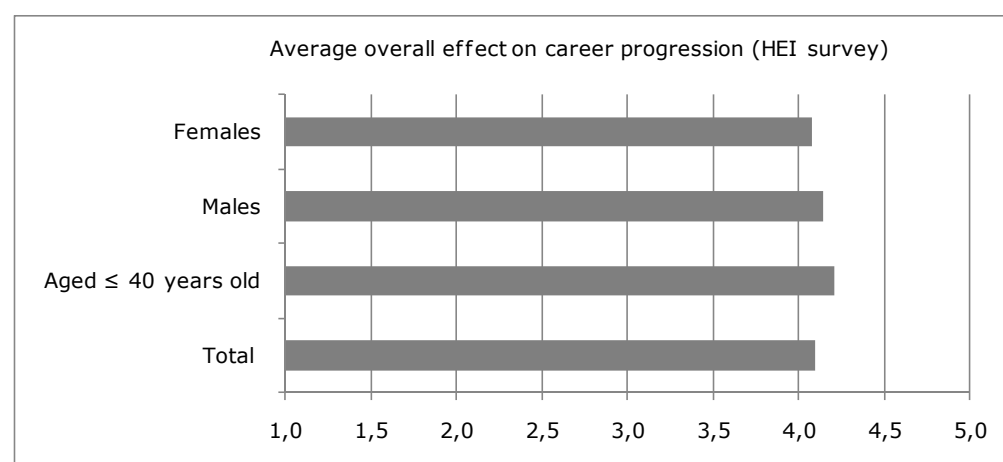
10.1.1 Overall effects (MOB-EFF1 - MOB-EFF2)

The overall effects of mobility include the overall career effect (HEI, RI and Extra-EU survey) and the overall personal effect (Extra-EU survey).

Findings from the HEI survey

For the HEI survey (Figure 10-1) we find that the overall effect of mobility on the career progression of mobile researchers has been perceived as positive and even slightly more so for the young and the male researchers, although the age and gender differences were marginal.

Figure 10-1: Overall effects on career progression (HEI survey)

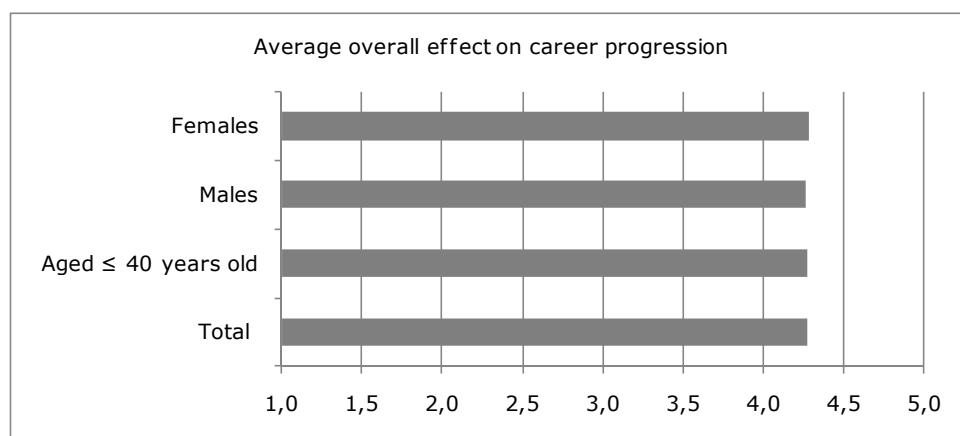


Source: MORE HEI survey

Findings from the RI survey

For the *RI survey* researchers (Figure 10-2) the overall effect on career progression also appears to be positive, and equally so for all groups (total, by age and gender).

Figure 10-2: Overall effects on career progression (RI survey)



Source: MORE RI survey

Findings from the Extra-EU survey

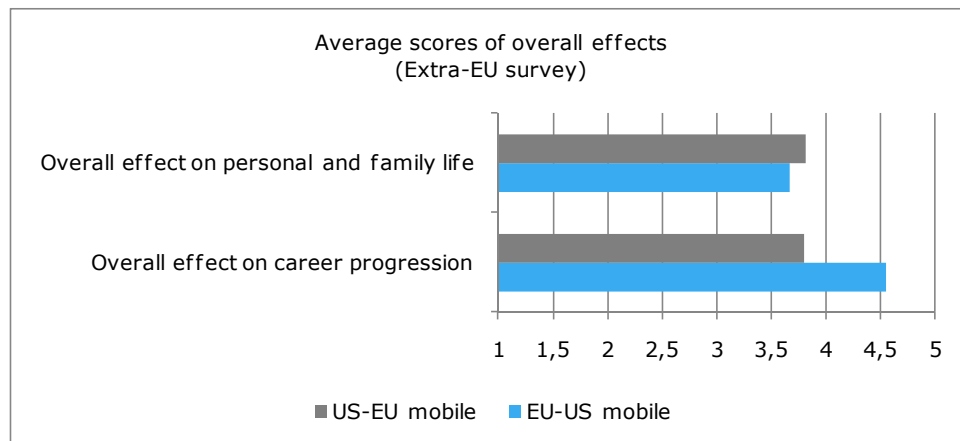
The results from the Extra-EU survey lead to the same conclusions with respect to the overall career effect: the overall effect of mobility on the career of a researcher has been positive and there were no noteworthy age or gender differences.

However, there are some noteworthy differences between the EU-US and US-EU mobile researchers (Figure 10-3). For the EU-US mobile the overall career effect has been much more positive than for the US-EU group. Generally, the EU-US mobile subgroup rated the effect that mobility has had on their career highest of all groups (with a score of 4.55). This also holds true compared to the HEI and RI survey results.

In addition to the overall career effect, information was collected on the overall effect on personal and family life of geographic mobility in the Extra-EU survey. The overall personal effect was positive, but less positive than the overall career effect, for the total and all sub-groups, except for the US-EU mobile where both effects were equally positive (and where the overall career effect was relatively less positive compared to the total and the other subgroups as well as to the HEI and RI surveys).

Below we present the figure distinguishing among the EU-US and US-EU mobile groups. More figures on the Extra-EU survey are presented in Annex 5 to this report.

Figure 10-3: Overall effects of mobility, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

10.1.2 Output effects (MOB-EFF3 - MOB-EFF6)

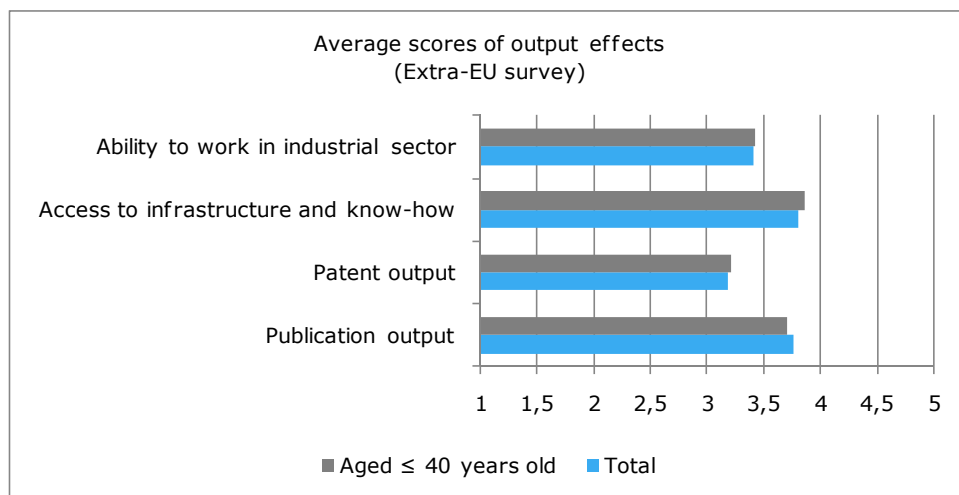
In this section we present an overview of the perceived output effects including the effects on publication output, patent output, access to infrastructure and know-how and the ability to work in the industrial sector. The results are based on the Extra-EU survey only.

First, each of these output effects appeared to be smaller than the overall career effect that was discussed previously (see Figure 10-4). Where the overall career effect received an average score of 4.32 which is in-between “positive” and “significantly positive”, none of the output effects listed received an average score of “important” (with the exception of “access to infrastructure and know-how for the EU-US mobile). However, all output effects are perceived as being better than having “no impact”, with “access to infrastructure and know-how” (average score of 3.81) and “publication output” (average score of 3.77) being the highest perceived output effects.

There is neither an age difference nor any remarkable gender difference found in the magnitude or the rankings of the output effects (Figure 10-4 and Figure 10-5). But again, differences do exist between the EU-US mobile and the US-EU mobile (Figure 10-6). While the ranking of the effects was more or less the same - where the perceived effects of mobility in both directions are observed on “access to infrastructure and know-how” and “publication output” - the magnitude was quite strikingly different, with the effects for the US-EU mobile being consistently lower than the effects for the EU-US mobile. The difference was largest in the “access to infrastructure and know-how”-effect.

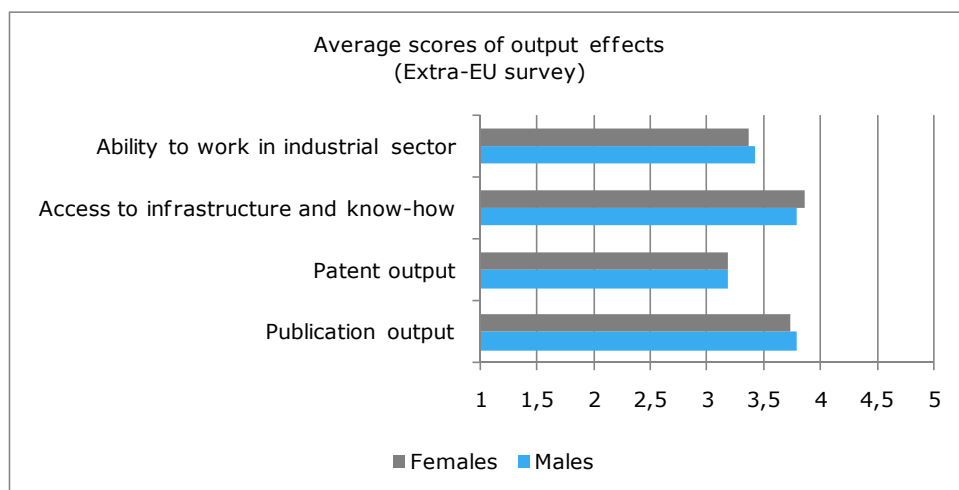
The effect on patent output is actually closer to being perceived as negative than as being perceived as positive (score of 2.96) for the US-EU mobile, and the effect on the ability to work in the industrial sector-effect was not very positive either (score of 3.06).

Figure 10-4: Output effects of mobility, total and young researchers (Extra-EU survey)



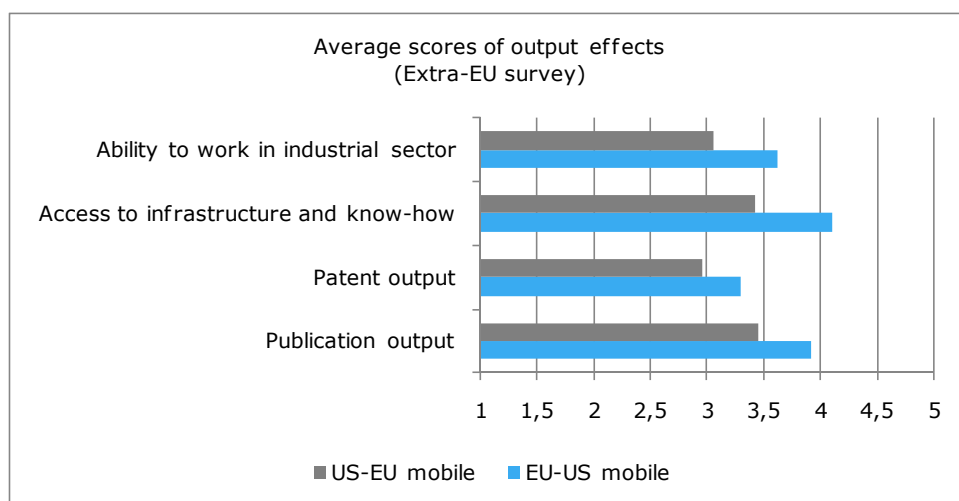
Source: MORE Extra-EU survey

Figure 10-5: Output effects of mobility, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

Figure 10-6: Output effects of mobility, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

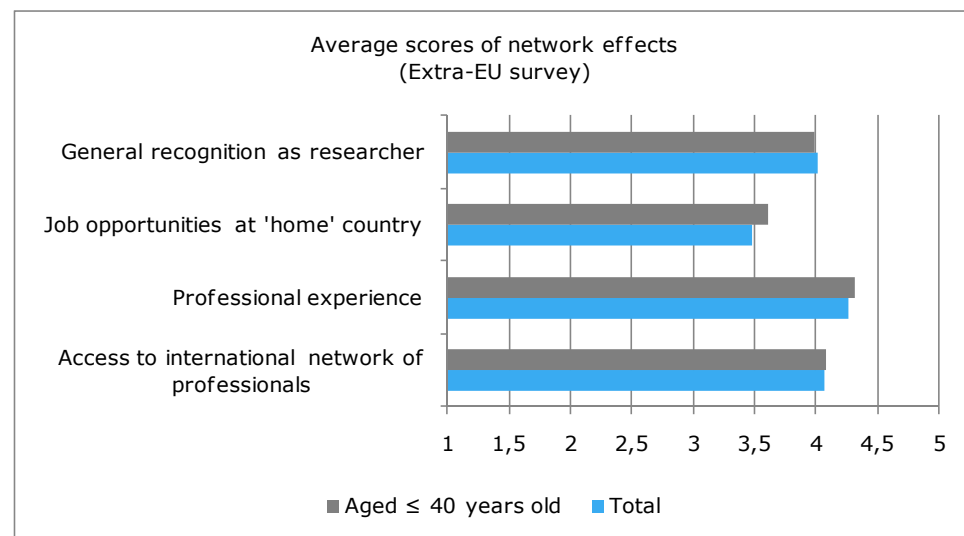
10.1.3 Network effects (MOB-EFF7 - MOB-EFF10)

In the section on network effects we discuss how researchers perceive the effect of their mobility on issues such as: access to an international network of professionals, professional experience, job opportunities at the 'home' country and general recognition as a researcher. These results are based on the information collected in the Extra-EU survey.

Figure 10-7 shows that the perceived network effects are somewhat close to the positive evaluation observed for the effects of mobility on the overall career of the researcher. This is especially true for "professional experience", "access to an international network of professionals" and "general recognition as a researcher" which all received the same positive scores, and not as evident for job opportunities at 'home' country. This suggests that it is primarily these first three issues that are important for the researcher's career (since the overall career effect was quite positive and only these three effects score in the neighbourhood of the overall positive effect).

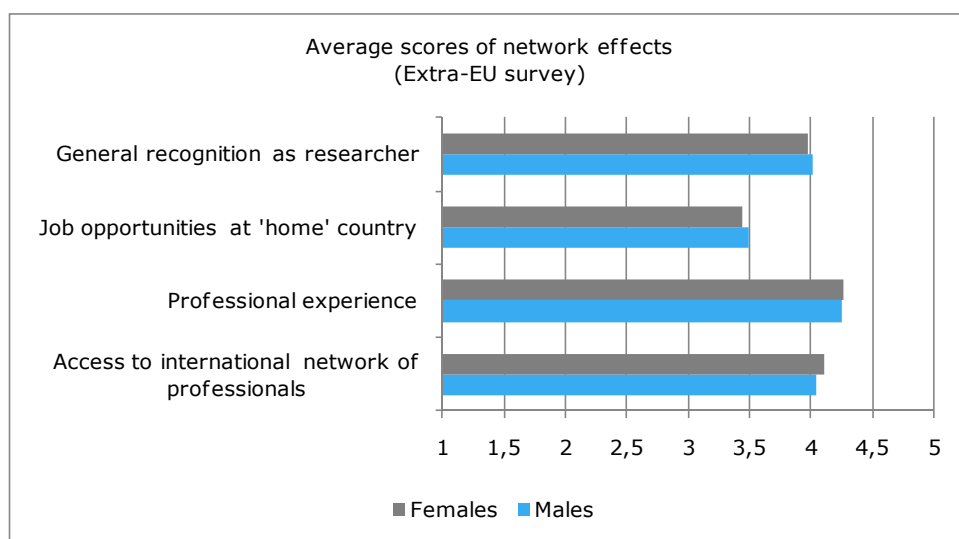
Age and gender differences are marginally small (see Figure 10-7 and Figure 10-8). EU-US mobile and US-EU mobile differences to the contrary, are strikingly large again. For the US-EU mobile the effect on job opportunities in the 'home' country was actually neutral. The difference in the perceived effects was largest for the two most important effects: professional experience (with a difference of 0.7) and access to an international network of professionals (difference of 0.6).

Figure 10-7: Network effects of mobility, total and young researchers (Extra-EU survey)



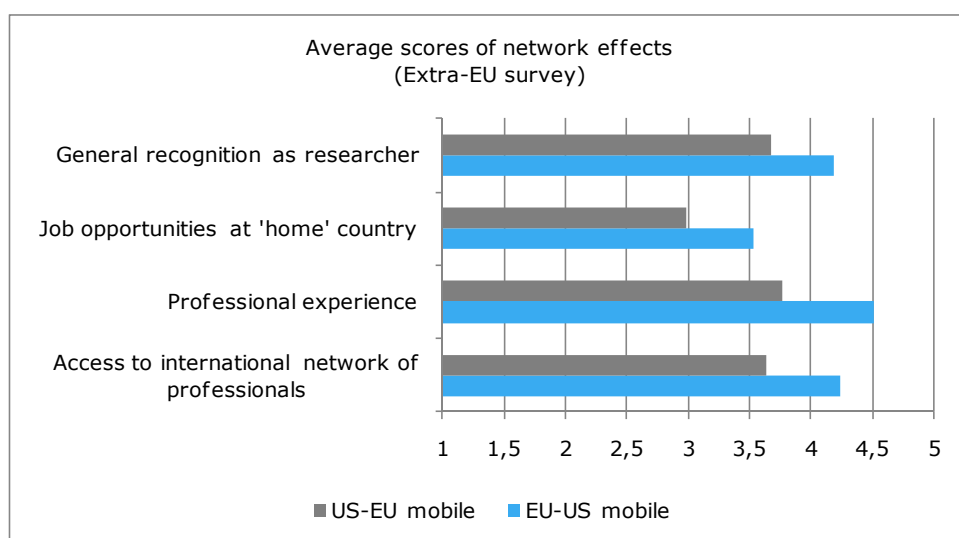
Source: MORE Extra-EU survey

Figure 10-8: Network effects of mobility, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

Figure 10-9: Network effects of mobility, EU-US and US-EU mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

10.2 Effects of job mobility

The effects of job mobility like the effects of geographical mobility in the previous section can also be divided into two types; namely, output effects and network effects. Output effects include publication and patent output while network effects include chances on the job market, network diversity and interdisciplinarity of research. The discussion concerning this section is based solely on the results of the Industry survey.

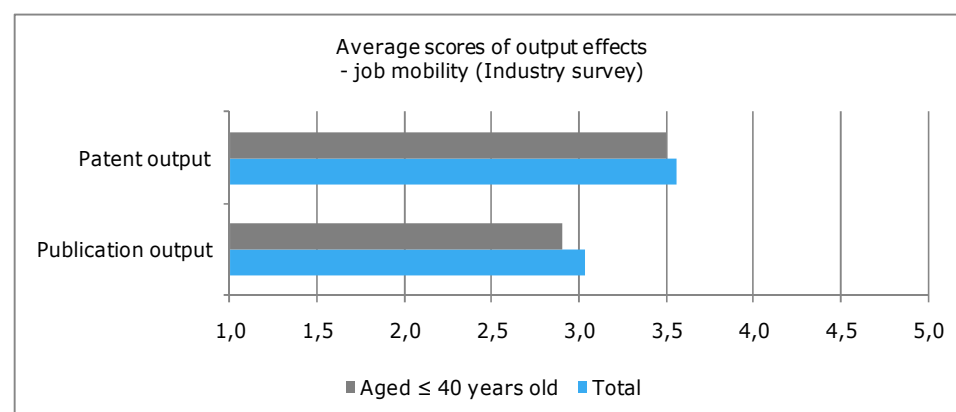
10.2.1 Output effects (MOB-EFF11, MOB-EFF12)

When we compare Figure 10-10 with Figure 10-4, it is immediately clear that both similarities and differences exist. The order of importance of the output effects of job mobility in the Industry survey is quite different from the order of importance of the effects of geographic mobility in the Extra-EU survey. Where in the latter we found that the effect of (geographic) mobility on patent output was the smallest (only slightly higher than the neutral “no impact” score) and the effect on publication output was larger, in the Industry survey the effects of (job) mobility are reverse: there was no impact on publication output but a weak positive effect on patent output (but not reaching the score of “positive impact” on average).

For the young and for female researchers in the Industry survey (Figure 10-10 and Figure 10-11), the output effects were particularly small with the effect on publication output falling below the “no impact” score for both groups.

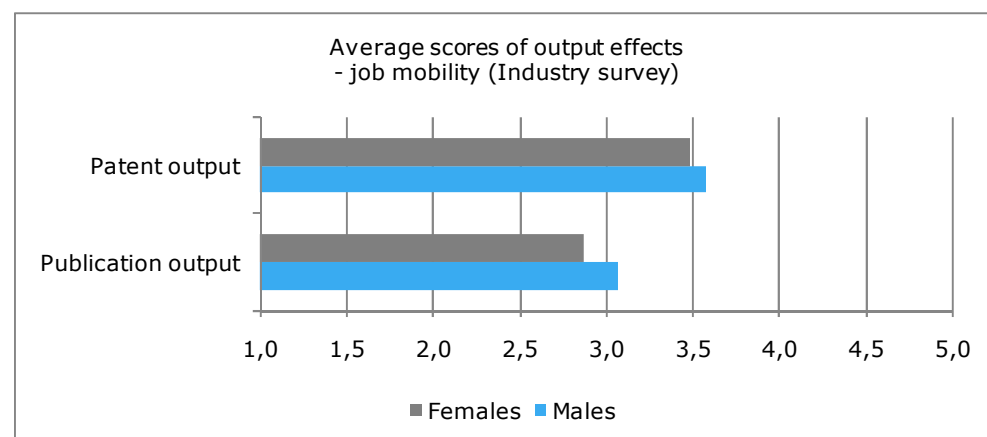
There seem to be no large differences among the job-mobile who are also internationally mobile and those who are not in terms of perceived output effects. Patent output seems to have increased slightly more for the job mobile who had also been internationally mobile.

Figure 10-10: Output effects of job mobility, total and young researchers (Industry survey)



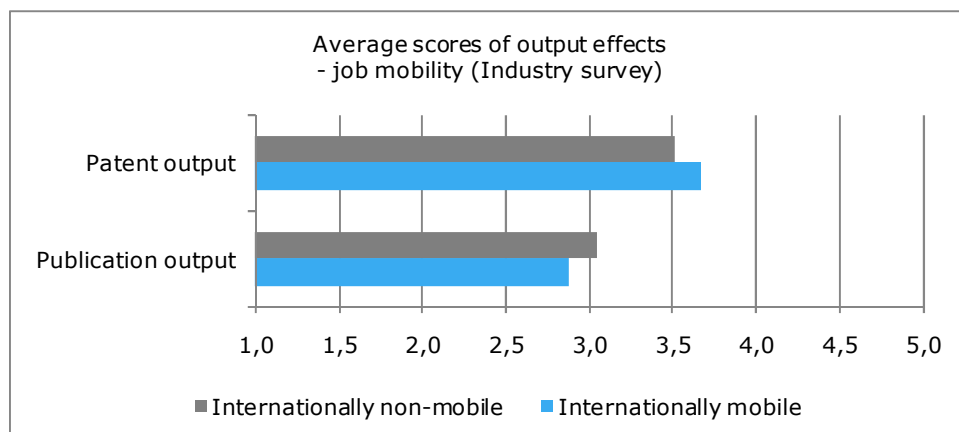
Source: MORE Industry survey

Figure 10-11: Output effects of mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 10-12: Output effects of mobility, internationally mobile and internationally non-mobile (Industry survey)



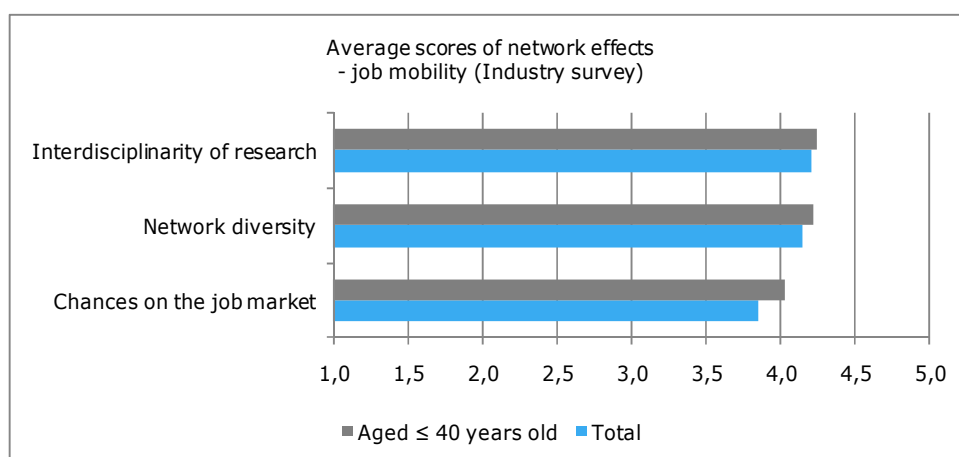
Source: MORE Industry survey

10.2.2 Network effects (MOB-EFF13 - MOB-EFF15)

Here too, the network effects seem to be larger than the direct output effects. On average the effect of job mobility on the researcher's network was seen as "positive". Job mobility had the largest effect on 'interdisciplinarity of research', followed by 'network diversity' and lastly 'chances on the job market'. While the latter effect was on average slightly below the perceived "positive impact", this effect was still larger than the output effects.

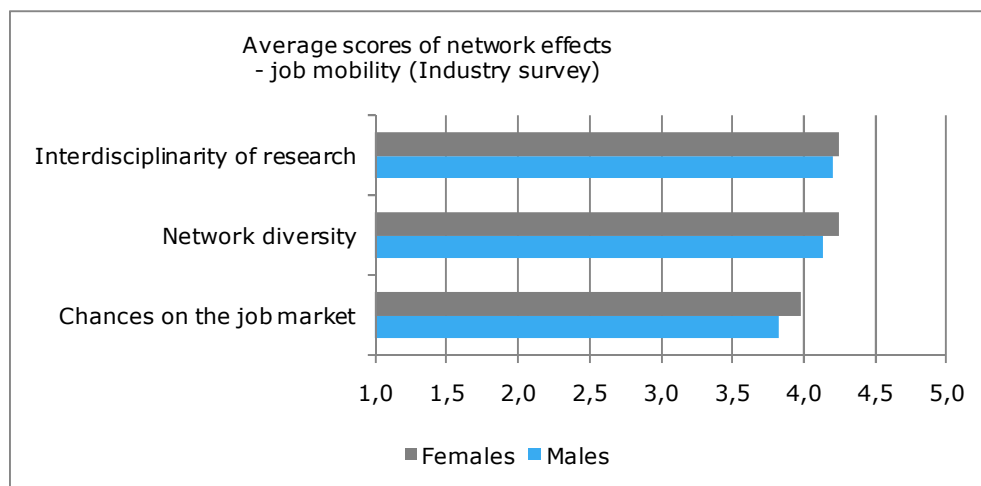
In the case of network effects, we see that the effect for young researchers was slightly more positive than for the total group. Women also seem to perceive slightly more positive network effects of job mobility than men. No notable differences are seen in the perceived networks effects reported among the internationally mobile or non-internationally-mobile groups of researchers.

Figure 10-13: Network effects of job mobility, total and young researchers (Industry survey)



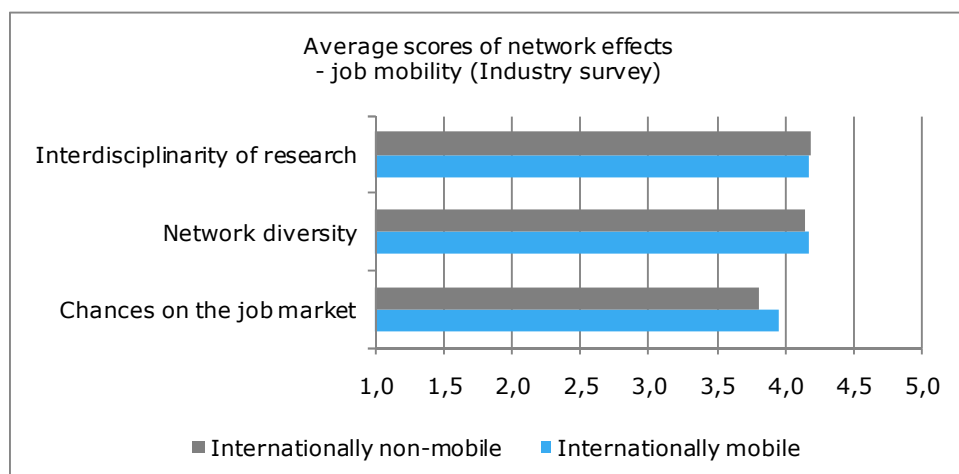
Source: MORE Industry survey

Figure 10-14: Network effects of job mobility, male and female researchers (Industry survey)



Source: MORE Industry survey

Figure 10-15: Network effects of job mobility, internationally mobile and internationally non-mobile (Industry survey)



Source: MORE Industry survey

10.3 Main findings

Researchers among the respondents in the MORE surveys, seem to consider that mobility has positive effects on their career and personal lives. The overall effects of mobility on the researchers' careers appear to be positive. Some differences among the different groups are noteworthy:

- Researchers who have moved from the EU to the US seemed to have realised higher career-related effects from mobility than did US-EU mobile researchers.
- Researchers who had moved from the US to the EU considered having realised more significant effects related to their personal lives.

When comparing this result to the importance of the different motivations for mobility among these two groups we find that EU-US mobility is mainly driven by

profession-related motives and it is profession/career effects that this group seems to realise to a larger extent than the US-EU mobile respondents. On the other hand, US-EU mobility, which is driven to a larger extent by personal motives, seems to result in higher effects on their personal lives according to the researchers' assessment.

Researchers from the Extra-EU sample rank network effects higher than output effects. Among those, the effects on publications and access to infrastructure are the highest scored. The effects on professional experience and access to international network of researchers were the two highest reported among the network effects.

The researchers who had moved from the EU to the US reported consistently higher output and network effects than their colleagues who had moved from the US to the EU. This difference is most notable for the effects on 'professional experience' and 'access to international network of professionals'.

Industrial researchers are further asked to report their opinion on the effects from the change in jobs (job mobility). They rank network effects higher than output effects as did academic researchers. The effects on patents seemed to be most important, contrary to academic researchers who rated the effects on publication output higher. This may however be partially attributed to the fact that patents are more relevant for industrial-researchers than are publications. Among the network effects, interdisciplinarity of research and diversity of network score higher among industry researchers.

Part 4 MOBILITY OF RESEARCHERS: OVERALL CON- CLUSIONS AND RECOMMENDATIONS

11 OVERALL CONCLUSIONS ON THE MORE INDICATORS

This section summarises the main findings which have been presented in Part 3 of this report. These findings are grouped according to the main research questions of the MORE project and reflect the main findings found for each of the MORE set of indicators. (As noted several times previously, more detailed analysis of the update of the existing IISER indicators and the four MORE surveys is provided in the relevant MORE reports).

Furthermore, we note again that **the MORE surveys do not share the same properties especially concerning the representativeness of their underlying populations.** Therefore, when we compare the findings among the different MORE surveys for each indicator we do not intend to provide precise comparisons but rather only **indications of differences or similarities** among the different survey samples and researcher groups.

11.1 Human resources of researchers

11.1.1 “Stocks” of researchers and their characteristics

11.1.1.1 How many researchers are there in the EU?

Based on official Eurostat data we find that there were about 2,157,000 researchers in head counts in EU27 in 2007 which corresponds to about 1,448,000 in full-time equivalents. In general, we see a steady increase in the number of researchers; between 2000 and 2007, the number of researchers grew by nearly 31%, or 4% per year.

The annual growth rate of the number of researchers in FTEs in 2000-2007 is 3.9 p.a. for the EU27 compared to 1.3 % p.a. for the USA, 10.8% for China and 1.3 for Japan. Among the EU27 we see that two new Member States report the highest annual growth rates, Cyprus and the Czech Republic with 14.9 and 10.8% p.a. respectively.

Looking at the number of researchers per 1,000 active population, in 2007 there were 6 researcher FTEs in the EU27; this compares to 9 FTEs in US, 11 in Japan and 2 in China. Furthermore, Finland has the highest penetration of researchers in the workforce with 15 researchers per 1,000 active population. Other Scandinavian countries (Denmark and Sweden with about around 10 researchers employed) are in the top-5 countries for this indicator together with Luxembourg and the UK.

How many researchers are there in the EU?

- There were about 2,157,000 researchers in HC in EU27 in 2007 corresponding to about 1,448,000 FTEs.
- In 2007, there were 6 researcher FTEs per 1000 employed in the EU27; this compares to 9 FTEs in US, 11 in Japan and 2 in China.
- Scandinavian and other EU-15 countries have a high number of researchers per 1000 employed while the Central and Eastern European countries generally show a lower number of researchers per 1000 employed.
- The most recent Member States, Romania and Bulgaria as well as the Mediterranean islands, report the lowest number with 3 or fewer researchers per 1,000 active population.

11.1.1.2 Which are the main characteristics of researchers and how do these compare among different sub-groups?

On average around one out of three respondents in the surveys is male, with the exception being in the industry survey, where more than four out of five respondents are male. The average age of the respondents in the MORE surveys ranges between 42 and 46 years old and the average number of years since graduation lies between 12 and 17 years.

On average the respondents in the MORE surveys which are dominated by researchers not working in the industry, graduate at the age of 32 (HEI), 30 (RI) and 31 (Extra-EU). The respondents in the industry survey graduate, on average, at a younger age, 28 years old. This relates strongly to the distribution of PhD recipients among the different surveys; the share is much lower in the sample of industry researchers (50%) than in the other three surveys (ranging from 76% to 85%). Concerning family life, around 70 to 85% of the respondents in the different surveys are married or cohabiting with a share of 55 to 74% of them having children. The lowest respective shares appear in the RI survey. This finding relates to the fact that the average age of the respondents is lowest for those of the RI survey.

Mobility as a student seems to have been more 'popular' among respondents of the Extra-EU survey (32% in comparison to 20-23% for the other surveys), while working in industry as a student seems to have happened more often for industry researchers (52% in comparison to 24-28% for the rest of the surveys).

Which are the main characteristics of researchers and how do these compare among different sub-groups?

- Males reflect the majority of respondents for all surveys
 - o Between 61 and 65% of the researchers are male in the HEI, RI and Extra-EU surveys.
 - o This finding is more pronounced in the industry survey where 85% of the respondents are male.
- Average age lies above 42 years old and respondents graduated more than 12 years ago:
 - o Average researcher age: 42 - 46 years old.
 - o Average number of years since graduation: between 12 - 17 years.
- Mostly married and with children:
 - o Married or cohabiting: 70 - 76% of sample for HEI, RI and Extra-EU surveys; 85% in the industry survey.
 - o With children: 55 - 74% of samples.
 - o "Younger" researchers (both in terms of age and family life) in RI and Extra-EU surveys.
- Large majority with postgraduate degree:
 - o PhD holders: 76 - 86% of sample for HEI, RI and Extra-EU surveys;
 - o PhD holders: 51% in the industry survey.
- Highest concentration of researchers with Natural science or engineering and technology background in industry (89%) and research institutes (75%).
- Mobility as a student higher among the researchers in the Extra-EU survey
 - o 32% has been mobile as a student
 - o Less than 23% in the other surveys (22% for the HEI survey sample).
- Working in industry as a student is especially popular among industry researchers:
 - o 52% of industry researchers had worked in industry as a student.
 - o Less than 28% in the other surveys.
- "A-typical" researchers in industry:
 - o More men, older, fewer postgraduate degrees, more degrees in Natural sciences or engineering and technology, more experience in industry as a student.

11.1.1.3 How many tertiary education graduates are there and how does this compare to the number of researchers?

In EU27 there were about 3.4 million tertiary education graduates in 2007. This number has increased from 2000 to 2007 by nearly 50%. Compared to the number of researchers in the EU, we see that there was a higher growth in the pool of *potential* researchers than in the pool of *actual* researchers (31%) in the EU27. This difference in growth rates may indicate that policy measures to increase the attractiveness of the profession of a researcher in the EU27 are necessary (especially when we take into account the results on the attractiveness of the EU as an environment to do research presented in the MORE Extra-EU report).

When zooming into the doctoral-degree graduates, we find that in 2007 there were 110,628 doctoral candidates of which 60,465 were between 25 and 34 years old in the EU27. The number of doctoral graduates per 1000 of the population (in 25 to 34 years category) is increasing by around 6.3 percent on average per year. When taking into account the size of the country (in terms of total employment) and age, we see that the countries with the highest numbers of doctoral graduates per 1,000 of their young population (age 25 to 34) are Portugal, Sweden, Finland, Germany, the UK and Austria with between 1.9 and 4.7 doctoral graduates per 1,000 of population.

What is the number of graduates in tertiary education and how does this compare to the number of researchers?

- In 2007 there were 3,414,618 tertiary education degrees in the EU27; there were 110,628 doctoral graduates.
- The number of tertiary education graduates is growing faster than the number of researchers, suggesting an increase in the "loss" of talent for the EU27 research base.
- Strong growth rate of doctoral graduates (on average 5.7% annually between 2000 and 2007), especially of the young (aged between 25 and 34 years) doctoral graduates (7%). Number of doctoral graduates per 1000 population (aged 25 to 34 years) is also increasing by on average of 6.3 % per year.
- There are large differences in the ratio of doctoral graduates over tertiary degrees with academic orientation between countries in 2007, however, with the share for Portugal being nearly 10% and the share for Malta, Latvia, Poland, Lithuania and Bulgaria 1% or less.

11.1.1.4 What do the MORE surveys indicate about the characteristics of researchers in their training phase?

Among the respondents in the HEI survey, which is a sample representative of the population working in the HEI sector in the EU27, 12% were doctoral candidates at the time that the respective survey was live (568 doctoral candidates out of 4,538 respondents). The share of men is much lower for doctoral candidates (56%) than on average in the overall HEI survey (63%) indicating that a lower share of women continue working as researchers after their doctoral studies (whether or not they completed the PhD) than men.

Around one third of the respondents are post-doctoral researchers in the HEI and the RI surveys. This share is considerably higher in the Extra-EU survey where 42% of the respondents are post-doctoral researchers.

While the characteristics of the doctoral candidates are quite different from the general characteristics in the entire surveys, the post-doctorates in all surveys show similar characteristics to those found generally in all surveys.

The survey results indicate that there is a much higher share of doctoral candidates who have worked in industry as students (compared to the entire sample of the surveys) with between 35% and 42% of the doctoral candidates having worked in industry as a student (compared to a share between 24% and 29% in the overall samples, except for the industry survey). Concerning student mobility, this is much higher among doctoral candidates in the RI survey (33% having been mobile as a student) than overall (23%) in this survey). Both these results - an increasing focus on student mobility and experience in industry, together with the observation that the same trend appears not to hold for the post-doctoral researchers suggest that student mobility and experience as a student in industry are fairly recent phenomena.

What do the MORE surveys indicate about the characteristics of researchers in their training phase?

- Between 12 and 16% of the survey respondents are doctoral candidates.
- Relatively high share of post-graduate researchers in the Extra-EU survey:
 - o Around one third of respondents in HEI and RI surveys.
 - o 42% of respondents in Extra-EU survey.
- Women tend to gradually drop out of the research profession and most of them before the post-doctoral phase:
 - o There is a much higher share of female respondents in doctoral training phase, while this effect disappears for post-doctoral researchers.
- In general, researchers tend to 'integrate' into the research environment during the post-doctoral phase:
 - o While the characteristics of the doctoral candidates are quite different from the general characteristics of respondents in all surveys, post-doctorates show similar characteristics with the entire sample in all surveys.
- Higher interest in industry among the doctoral candidates (compared to all respondents in the surveys):
 - o 35% - 42% of doctoral candidates have worked in industry as student.
 - o 24% - 29% of all respondents have worked in the industry as student.
- Higher student mobility among the doctoral candidates in the RI with 33% having been mobile as a student compared to 23% overall in the RI survey.
- Increased focus on student mobility and experience as a student in industry, appear among the doctoral candidates in the survey but not among the post-doctoral researchers suggesting that these are fairly recent phenomena.

11.1.2 Employment situation of researchers

11.1.2.1 How many researchers are employed in the different sectors in the EU?

Using data provided by Eurostat, we find about 1,370,000 researchers (HC) working in the public sector (HEI and government sector) in 2007, representing 64% of the total researcher population. In terms of full-time equivalents, there were about 767,000 researcher FTEs working in the public sector in the EU in 2007. The EU27 average for the share of researchers (in FTEs) working in the public sector is 53%. This compares to 21%, 34% and 31% for the USA, China and Japan, respectively. Although the share of public sector researchers remains constant over time, the composition among researchers working in the HEI and the

government sectors changes to the benefit of the HEI sector. Among the researchers working in the private sector (business enterprise and private, non-profit sectors), the private non-profit researchers always constitutes a rather marginal share of researchers (in FTEs), namely 1 percent.

At the level of the country, the highest share of government sector researchers is in Bulgaria, with 55% of total researchers (the second highest share is 32% in Slovenia). Scandinavian and most other EU-15 countries have “low” shares (i.e., below the average of 53% in the EU27) of public sector researchers.

How many researchers are employed in the different sectors in the EU?

- In 2007 there were about 1.44 million researchers (HC) or 767,000 researcher FTEs working in the public sector; 53% of researcher FTEs in the EU were working in the public sector.
- While the share of public sector researchers has remained constant over time, the composition (between HEI and government researchers) is changing slightly to the benefit of the HEI sector researchers. There were about 580,000 HEI sector FTE-researchers in 2007 accounting for 40% of the total number of FTE-researchers.
- Since the share of public sector researchers is in general constant over time, also the share of private sector researchers remains constant, with an increasing share of business and enterprise researchers while the private non-profit researchers always constitute a rather marginal share of researchers, namely 1 percent.
- The highest share of government sector researchers is in Bulgaria, with 55% of total FTE-researchers (second highest share is 32% in Slovenia).
- Scandinavian and most other Western-European countries present relatively low shares of public sector researchers (i.e. below the average of 53% in the EU27).

11.1.2.2 What is the share of researchers with a permanent contract and how does this differ among the different sectors?

In all surveys, the researchers working under a permanent contract make out the largest share but there are strong differences among the four MORE surveys, with this share ranging from 47% (RI survey) to as much as 75% (Industry survey). Compared to the other three surveys, a notably low share of researchers are working under a fixed-term contract in the industry survey (9%) compared to 33 to 43% of the researchers in the other surveys.

In the HEI, RI and Extra-EU surveys there are pronounced differences between the researchers working under a fixed-term and those working under a permanent contract: those with a fixed-term contract generally have a younger profile (younger in age, with more than twice the share of researchers under 40, half the years since their graduation and a lower share with a post-graduate degree). There is also a higher share of men among those with a permanent contract (related to the fact that women are more likely to be younger and in the early research career stage).

In the industry survey, fixed-term and permanent contract researchers have a similar profile but, if any, the differences in age profile show the opposite conclusion of what was found for the other surveys: in the industry survey, those working under a permanent contract are on average younger than those employed on a fixed-term contract.

What is the share of researchers with a permanent contract and how does this differ among the different sectors?

- In all surveys, the researchers working under a permanent contract account for a large share but there are strong differences between the four MORE surveys:
 - o This share ranges between 47% (RI survey) to as much as 75% (Industry survey).
- A noticeably low percentage of researchers is working under a fixed-term contract in the industry survey:
 - o 9% respondents in the industry survey,
 - o 33 - 43% researchers in the other surveys.
- Within the HEI, RI and Extra-EU samples, researchers with a fixed-term contract generally:
 - o Have a younger profile (more than twice the share under 40, half the number of years since graduation, and a lower share with a post-graduate degree).
 - o Are less likely to be male (may also be related to the fact that women are more likely to be younger and in the early research career stage).
- In the industry survey fixed-term and permanent contract researchers have a similar profile but, opposite to the other surveys, those working under a permanent contract are, on average, younger.

11.2 Mobility of researchers (job and geographical)

11.2.1 Stocks of mobility

11.2.1.1 How many mobile researchers are there and what are their characteristics?

More than half of the researchers working in the HEI sector have been (or are currently) internationally mobile⁹; 56% working in this sector have been mobile. Two out of three (67%) of the mobile researchers are male. In the entire sample 63% of the researchers are male, suggesting that male researchers are somewhat more mobile than female researchers. 92% of the mobile researchers have a PhD which, in comparison to 85% in the entire sample, suggests that those with a post-graduate degree are more likely to be mobile than those without a post-graduate degree. 30% of the mobile researchers had been mobile as a student compared to just 22% in the overall sample, indicating that student-mobility increases the probability of becoming mobile as a researcher later in one's career.

Industrial researchers show a different picture, with 41% of them having been mobile. This is considerably lower than what was observed in the other MORE sub-groups of researchers. Here again, PhD holders and those who have been mobile as a student have a higher probability of having been mobile, higher than in the other sub-groups of researchers (HEI, RI, Extra-EU).

⁹ We refer to 'mobile' researchers as those who have been or are currently mobile.

How many are the mobile researchers and what are their characteristics?

- The group of mobile researchers has a:
 - o slightly higher share of males
 - o higher share with a post-graduate degree,
 - o higher share who hold degrees in Natural science or engineering and technology, than overall in the samples.
- Student mobility seems to predict mobility in later stages of the research career:
 - o A higher share of mobile researchers had been mobile as student compared to the all respondents.
- Some differences are notable in the industry survey:
 - o 64% of mobile researchers held a postgraduate degree compared to 51% in the entire sample.
 - o 31% of mobile researchers had been mobile as a student compared to 21% in the entire sample.
- The lowest incidence of mobility among the surveys was observed among the respondents to the industry survey:
 - o 41% mobile researchers among the industry sample.
 - o 56% mobile researchers among the HEI sample.
 - o 65% mobile researchers among the RI and Extra-EU samples.

11.2.1.2 Do the characteristics of recent-mobile researchers differ from those who were mobile earlier?

Among the HEI researchers 29% had been recently (the last three years) mobile. The recently mobile researchers are younger: 39% of the full sample and 52% of the recently mobile are younger than 41. The characteristics of the recently mobile and those having been at-least-once mobile-in-their-whole-career in comparison to the full sample are similar with two exceptions: activities as a student (being mobile and having had experience in industry) are more pronounced with 35% of the recently mobile having been mobile as a student and 31% having worked in industry as a student (compared to 30% and 28% for the at-least-once mobile-in-their-whole-career and 22% and 28% in the entire sample). This indicates that student (geographical and sectoral) mobility are phenomena that have recently increased.

Among the industry researchers the difference between the share of at-least-once-mobile-in-their-whole-career and recent-mobile researchers is not very pronounced: 34% had been recently mobile (1,036 respondents) and 41% had at-least-once been mobile over the course of their careers after graduation. The characteristics of these two groups are not significantly different; as in the at-least-once-mobile group during their career. The recently mobile group has a higher share with a post-graduate (PhD) degree and a higher share who had been mobile as a student.

Do the characteristics of recent-mobile researchers differ from those who were mobile earlier?

- Recent mobility is in general lower than the incidence of mobility over the career:
 - o 29 - 35% recent-mobile researchers among the MORE surveys.
- Since the sample of at-least-once-mobile-in-their-whole-career and recently mobile more or less overlap in the industry survey, the characteristics and conclusions drawn on those recently mobile are the same for the at-least-once-mobile-in-their-whole-career sample.
- The 'academic' researcher samples (HEI, RI, Extra-EU) show differences among the recent-mobile and the at-least-once-mobile-in-their-whole-career groups:
 - o Recent-mobile researchers have a younger profile (in terms of age, years since graduation and family attributes).
 - o As in the at-least-once-mobile-in-their-whole-career group, the recently mobile have a higher share of males and a higher share of post-graduate degree holders than in the entire sample: this is however less prominent when comparing the at-least-once-mobile-in-their-whole-career researchers with all respondents in the HEI and RI surveys.
 - o Student mobility among the recent-mobile sub-group is higher than in the entire sample and also higher than in the at-least-once-mobile-in-their-whole-career subgroup.
 - o Recent-mobile researchers had a larger share of those that worked in industry as a student than the at-least-once-mobile-in-their-whole-career ones.

11.2.1.3 Do the job-mobile researchers have different characteristics than the rest of the researchers?

In the HEI survey there are 1,284 researchers (out of the 4,538 respondents) who have moved to a new employer in a different country. Of the 5,050 researchers in the RI survey, 1,890 have moved to a new employer in a different country (37%). Men and graduates in Natural sciences, engineering and technology and those who have been mobile as a student are slightly more prevalent in the job-mobile than in the geographically-mobile group in both HEI and RI surveys (69% of job-mobile, 67 geographically-mobile and 63% in the full sample are men; 54% of job-mobile, 49 geographically-mobile and 41% in the full sample are graduates in Natural sciences, engineering and technology in the HEI survey).

Among job-mobile researchers there is a higher concentration of males, researchers who held post-graduate degrees and researchers in Natural sciences or engineering and technology. Job mobile researchers who go to a different country appear to have similar characteristics to those of geographically mobile researchers. Job mobile researchers who are also internationally mobile are more likely to have been mobile as a student than those have not been internationally mobile.

Do the job-mobile researchers have different characteristics than the rest of the researchers?

- Job-mobile researchers who move to a different country appear to have similar characteristics to those who have been geographically mobile, but their characteristics are more pronounced:
 - o There seems to be a higher concentration of men and of graduates in Natural Sciences, engineering and technology among the job-mobile researchers.

11.2.2 Sectoral mobility and international collaboration of researchers

11.2.2.1 How many researchers have moved between sectors and what are their characteristics?

Within the HEI sample, 725 researchers or 17% of the researchers have moved between the public and the private sector. In the RI sample this subgroup accounts for 416 researchers or 8% of the sample. A higher share of men, holders of a postgraduate degree and graduates in the Natural science or engineering and technology field are present in this sub-group compared to the whole sample of both HEI and RI surveys. A remarkable difference observed, however, is that 47% of the HEI sectorally-mobile had worked in industry as a student compared to 28% in the entire HEI full sample (the respective shares in the RI survey are 43% and 24%).

Industry researchers have a much higher probability of sectoral mobility than in either the HEI or the RI survey. 1,272 researchers or 42% of the Industry sample have moved between the public and the private sectors at least once. Among the sectorally mobile, there is a considerably higher share of PhD holders (72%) compared to the full sample (51%).

When we look at the distribution of the geographically mobile and the non-mobile within the group that has been sectorally mobile, we see a similar picture as in the full sample for the HEI, RI and Extra-EU surveys. However, within the industry survey sample, while 41% in the full sample have been geographically mobile, within the sector-mobile sub-group, this is 51%: there seems to be a positive correlation between geographical and sector mobility among this group.

How many researchers have moved between sectors and what are their characteristics?

- Sector mobility occurs the least frequently in the RI sample (8%), followed by the Extra-EU and the HEI surveys (15% and 17%) and most frequently in the industry survey (42%).
- Among the 'academic' researchers' samples (HEI, RI, Extra-EU samples) sector-mobile researchers have, on average:
 - o Higher share of males (HEI, RI and Extra-EU surveys).
 - o Higher share of graduates in the Natural sciences, engineering and technology (HEI and Extra-EU surveys).
 - o More PhD holders in the RI survey.
- There seems to be a positive correlation between having worked in industry as a student and sector (public-private) mobility as researcher.
 - o Among the industry researchers a positive correlation appears to exist between sector mobility and geographical mobility, although this is not the case in the other surveys.

11.2.2.2 How often do researchers collaborate with researchers in other countries and/or other sectors?

Among the different survey samples, between 41% (Extra-EU survey) and 45% (HEI survey) of the respondents were engaged in formal collaboration with only academic researchers from other countries. Their characteristics do not differ from the general picture of the entire sample, however, there is a higher concentration of geographically mobile researchers among the academic researchers who have had international collaboration compared to the entire sample (62% of researchers with international/academic collaboration mobile are also geographically mobile while this is 56% in the entire sample).

Between 16% (Extra-EU) and 20% (HEI survey) were involved in both academic and industry formal collaborations with researchers from other countries. Their characteristics differ from the general picture (entire samples) in the sense that these researchers are more likely to be male and more likely to have graduated in the field of Natural sciences, engineering and technology. Based on the Extra-EU sample, we find that having worked in industry as a student is associated with a higher probability of working together with researchers from industry later (either purely with industry or with both industry and academic researchers).

We should note here that the share of researchers who currently collaborate with academic researchers abroad equals 61% (sum of the share of researchers collaborating only with academic researchers and the share of those collaborating with both academic and industry researchers abroad).

How often do researchers collaborate with researchers in other countries and/or other sectors?

- Pure academic collaboration with researchers from other countries appears to be the most popular, pure industry collaborations are few.
 - o 41% (Extra-EU survey) and 45% (HEI survey) of the respondents were engaged in formal collaboration with only academic researchers from other countries.
 - o In total, 61% of HEI researchers currently collaborate with academic researchers abroad.
- There seems to be a higher concentration of geographically mobile researchers among the 'academic' researchers who have collaborated with researchers in other countries.

11.2.3 Influencing factors of mobility

11.2.3.1 Which are the most important influencing factors of geographical mobility? Which of these are considered as barriers to mobility? Do these differ among researchers working in different sectors?

Among the influencing factors of mobility we differentiated among 'practical' influencing factors and 'profession-related' ones. The 'practical' influencing factors of mobility include administrative and non-career/profession related factors such as the social security system, administrative barriers, language issues, child care, etc.). The 'profession-related' influencing factors of mobility are related to the researcher's career or profession such as the 'maintenance of network contacts' and 'obtaining funding'.

Practical influencing factors seem not to be important for the mobility decision of researchers within the HEI, RI and Extra-EU groups. Within the HEI and the RI samples, however, younger researchers do seem to assign higher importance to quality and cost of accommodation while female researchers assign higher importance to child-care arrangements. Comparing the mobile and non-mobile groups, it seems that child-care arrangements are considerably more important only for the non-mobile researchers.

Within the Extra-EU sample, although practical influencing factors seem not to be important, language seems to play a relatively more important role especially for mobile researchers — especially for the EU-US mobile group who have mostly a different language than English as their mother tongue. In general, however (with the exception of language), EU-US mobile researchers attach less importance to the practical influencing factors of mobility than do the US-EU mobile group.

Industry researchers present quite a different picture; for them, nearly all the practical influencing factors are, on average, important. All factors seem to be more important for young researchers than for other respondents in the entire sample. Practical influencing factors seem to be seen rather as barriers to mobility rather than as facilitating factors since the non-mobile industry researchers attach on average considerably higher scores than their mobile colleagues to all these factors.

The profession-related influencing factors also seem to be of low importance among 'academic' researchers. These factors (maintenance of network contacts and obtaining funding) seem to act as barriers to mobility than facilitating factors, as non-mobile researchers attach considerably higher scores on their importance than do mobile researchers.

In addition looking at the Extra-EU survey, among the profession-related factors, 'obtaining funding' becomes, on average, important for the researchers in this sample especially for the non-mobile group and, among the mobile group, the EU-US group seems to attach more importance as well.

Which are the most important influencing factors of geographical mobility? Which of these are considered as barriers to mobility? Do these differ among researchers working in different sectors?

- There are clear differences between the 'academic' researchers (HEI, RI and Extra-EU surveys) versus the Industrial researchers on the importance of the practical influencing factors of mobility.
- For academic researchers practical influencing factors seem not to be important at all; however:
 - o Younger researchers seem to assign higher importance to quality and cost of accommodation.
 - o Female researchers assign higher importance to child-care arrangements.
 - o Language seems an important factor for the Extra-EU group, especially the EU-US mobile group of researchers.
- Practical influencing factors are considerably more important for the US-EU mobile researchers than for the EU-US mobile ones.
- Unlike what was observed for academic researchers, practical influencing factors are more important determinants of mobility for industrial researchers.
 - o Influencing factors of mobility in industry are viewed as barriers to mobility, since non-mobile researchers seem to worry considerably more about these than do mobile researchers.
- Profession-related influencing factors, on average, seem not to be important for 'academic' researchers, however:
 - o These factors are viewed as barriers to mobility as they are important for non-mobile researchers but not mobile researchers.
 - o "Obtaining funding" for research seems to be a barrier for the non-mobile group as well among the Extra-EU sub-group of researchers.

11.2.3.2 Which are the most important influencing factors of job mobility? Do these differ among internationally mobile and non-internationally mobile researchers?

When focusing on industrial researchers we examined the importance of both profession-related influencing factors ('good working conditions/climate, 'job satis-

faction') and of personal influencing factors ('good work-life balance', 'maintaining family and personal relationships', 'job changes/life satisfaction of partner' and 'life satisfaction of children') of job mobility.

For industrial researchers, profession-related factors are more important than personal factors when it comes to job mobility decisions. Job satisfaction receives a remarkably high score. In general, there seems to be no difference among those job-mobile who have been at the same time internationally mobile and those who have not.

Among the personal influencing factors for job mobility 'work-life balance' and 'life satisfaction of children' seem to be the most important with no notable differences among the internationally mobile and internationally non-mobile researchers.

Which are the most important influencing factors of job mobility? Do these differ among internationally mobile and non-internationally mobile researchers?

- Profession-related factors are more important than personal factors when it comes to job mobility decisions.
- Job satisfaction receives a remarkably high score.
- Among the personal factors, 'work-life balance' and 'life satisfaction of children' seem to be the most important ones, especially for younger and female researchers.
- No notable differences can be found among job mobile researchers who have been also internationally mobile and those who have not.

11.2.4 Motivations for mobility

11.2.4.1 Which are the most important motivations for geographical mobility? Do these differ among researchers working in different sectors? Do intra-EU and extra-EU mobile researchers indicate different motivations for mobility?

Among the motivations for mobility we differentiated among 'personal and culture-related' motives and 'profession-related' ones. The former refers to motives related to the personal and/or family life of the researchers and not the motives related to their career as researcher (we examine 'personal/family incentives' and 'culture-related' incentives). The latter, 'profession-related' motives refer to motivations related to the career or the profession of the researchers (e.g. 'personal research agenda', 'career progression goals', 'career opportunities at new location', salary and other financial incentives', etc.).

Researchers do not attach an important role to personal motives concerning their decision to become mobile. However, non-mobile researchers tend to consider personal or family-related motives as more important in terms of their mobility decisions. Concerns about the family seem to act against mobility. Culture-related motives, though not important for the 'academic' researchers, do seem to play a role in the mobility decision of industry researchers, mostly of females and the non-mobile group. Among the Extra-EU sample, although personal and cultural motives do not drive EU-US mobility, these motives are considerably more important for US-EU mobility.

Profession-related motives receive higher importance as motivation for mobility than personal motivations. These seem to be more important for internationally mobile researchers. This is the case for both the HEI and the RI group of researchers.

Among industry researchers, profession-related motives seem to be even more important, especially those referring to 'access to internal and external research facilities' and 'prospects to work with leading experts'. Differences are not as pronounced among mobile and non-mobile researcher as was the case for the 'academic' researchers.

When we look at the Extra-EU sample, we find that 'career progression goals' and 'personal research agenda' are the two most important drivers for mobility; those who have been internationally mobile researchers consider them notably more important than those who have not been internationally mobile. Additionally, among the mobile researchers, all profession-related motives are notably more important as drivers of mobility from the EU to the US than from the US to the EU.

Which are the most important motivations for geographical mobility? Do these differ among researchers working in different sectors? Do intra-EU and extra-EU mobile researchers indicate different motivations for mobility?

- Personal and family-related motives do not seem to drive mobility; however,
 - o these motives are viewed as deterrents to mobility as non-mobile researchers assign higher importance to them than do mobile researchers.
 - o they are also important as drivers of US-EU mobility.
- Culture-related incentives also do not seem important as drivers of mobility; however,
 - o they are important as drivers of US-EU mobility.
- Career progression goals and personal research agenda are the top motivations for mobility among 'academic' researchers, especially important for EU-US mobility.
- Salary and other financial incentives do not seem to be important as drivers of mobility (or non-mobility) for 'academic' researchers.
- Profession-related motives:
 - o are more important as drivers of mobility than as deterrents for mobility.
 - o are more important as drivers of EU-US mobility than of US-EU mobility.
- While personal motivations are driving non-mobility, profession-related motivations appear to drive mobility.

11.2.4.2 Which are the most important motivations for job mobility? Do these differ among internationally mobile and non-internationally mobile researchers?

With the focus here on industrial researchers, we find that salary incentives do play a role for job mobility, especially for men and younger researchers. Indeed, 'salary incentives' and 'promotion prospects' are the most prominent drivers for job mobility. For females, 'job security' is the most important motivation; for males, it is 'high salary'.

When distinguishing between those who have also been internationally mobile and those who have not, we find that "prospects in scientific career", though be-

ing the least important motivation overall, is the most important motive for internationally mobile researchers.

Which are the most important motivations for job mobility? Do these differ among internationally mobile and non-internationally mobile researchers?

- Financial incentives and promotion prospects are important drivers of job mobility for industrial researchers.
 - o 'Job security' is most important for females;
 - o 'High salary' is most important for males.
- "Prospects in scientific career" seems to be relatively more important as a motivation for mobility for internationally job mobile researchers.

11.2.5 Effects of mobility

11.2.5.1 How do researchers self-assess the overall effects of geographical mobility for their career and personal life? Do intra-EU and extra-EU mobile researchers realise different types of effects due to mobility?

The overall effect of mobility on the career progression of the mobile researchers is perceived as positive (with scores above 4 out of 5) for the HEI, the RI and the Extra-EU samples. Additionally, among the extra-EU sample, the overall effect on personal and family life has been considered as positive as well, but with a lower score (3.7 out of 5). However, this effect is considered higher for the US-EU mobile researchers than for the EU-US mobile ones.

Interestingly, the overall effect on career progression of the EU-US mobile researchers is considerably higher than the relevant effect for the US-EU mobile researchers (4.6 versus 3.8).

How do researchers self-assess the overall effects of geographical mobility for their career and personal life? Do intra-EU and extra-EU mobile researchers realise different types of effects due to mobility?

- The overall effects of mobility on the researchers' careers appear to be positive.
- Some notable difference within the Extra-EU sample exist:
 - o Researchers who have moved from the EU to the US consider having realised higher career-related effects due to their mobility than did US-EU mobile researchers.
 - o Researchers who have moved from the US to the EU consider having realised more significant effects related to their personal life.
 - o The previous two points seem to 'match' the findings of the two groups, EU-US and US-EU mobile; EU-US mobility is mainly driven by profession-related motives, while US-EU mobility is mainly driven by personal-related motives.

11.2.5.2 Which are the most important output and network effects of geographical mobility according to the researchers? Are there differences among the different mobility groups?

Focusing on the Extra-EU survey to examine the self-assessment of researchers on their output effects, we find that 'publication output' and 'access to infrastructure and know-how' are the direct outputs most significantly reported as positive

effects of mobility. When zooming into the different mobility subgroups, we find that the researchers who have moved from the EU to the US indicated significantly higher output effects than their colleagues who have moved from the US to the EU. This difference is most prominent in terms of their 'access to infrastructure and know-how' as well as their 'ability to work in the industry sector'.

Concerning the more "indirect" or network effects (e.g. professional experience, access to international network of professionals, job opportunities at home, etc.) we find that researchers indicate that they have realised higher network- than output-effects. This of course may be partially attributed to the fact that network effects cannot be precisely measured while output effects can. The effects on 'professional experience' and 'access to international network of researchers' are ranked first. For these, we do not see any difference among younger researchers or any gender difference.

However, notable differences are again noticed between EU-US and US-EU mobility groups where the former report higher network effects than the latter. Among these, the difference is greatest for the effects on 'professional experience' and 'access to international network of professionals'.

Which are the most important output and network effects of geographical mobility according to the researchers? Are there differences among the different mobility groups?

- Researchers from the Extra-EU sample rank network effects higher than output effects.
 - o The effects on publications and access to infrastructure are the highest reported among the output effects.
 - o The effects on professional experience and access to international network of researchers the highest reported among the network effects.
- The researchers who have moved from the EU to the US report consistently higher output and network effects than their colleagues having moved from the US to the EU.
 - o This difference is most notable for the effects on 'professional experience' and 'access to international network of professionals'.

11.2.5.3 Which are the most important output and network effects of job mobility according to the researchers? Do industrial researchers realise different types of effects than 'academic' researchers?

Industrial researchers find the effect of job mobility on patent output to be higher than the effect on publication output (in which case no effect is reported). This contrasts with the finding for the more 'academic' researchers of the Extra-EU sample, and it may be related to the fact that patent activities are more relevant for industry researchers than publications while the opposite holds for academic researchers.

As was the case for the 'academic' researchers in the Extra-EU sample, here too industrial researchers report that the network effects are larger than the output effects. Job mobility, according to the researchers' self-assessment, has had large effects on the interdisciplinarity of their research and the diversity of their networks.

Which are the most important output and network effects of job mobility according to the researchers? Do industrial researchers realise different types of effects than 'academic' researchers?

- Industrial researchers also rank network effects higher than output effects as was seen for academic researchers.
 - o The effects on patents are the highest reported for industry researchers, while academic researchers score higher effects for publication output, this however may be linked to the higher relevance of patents for the work of industrial-researchers than of publications.
- Among the network effects, 'interdisciplinarity of research' and 'diversity of network' score higher among industry researchers.

12 RECOMMENDATIONS FOR FUTURE RESEARCH

This part of the report summarises the main recommendations of the MORE consortium after this research project has been concluded. Based on the experiences gained throughout all phases of this project, we also provide in this section methodological recommendations as well as policy-oriented recommendations for future research on the mobility of researchers.

The methodological recommendations reflect the issues arising from the methodologies followed during the different phases of the MORE project. These recommendations may refer to weaknesses of the current methodologies pointing out ways of improvement in subsequent work. They may also indicate methodological points that need to be taken into account when interpreting the results presented here or when deciding about the design of future research. The policy-relevant recommendations point to a range of noteworthy findings that should be relevant for policy makers whether for designing or improving policy measures that promote the mobility of researchers and the attractiveness of a career as a researcher within the EU.

12.1 Methodological recommendations

12.1.1 Building upon existing indicators

As already indicated in Part 2 of this report, the IISER project was intended to integrate the information available on researchers and their mobility. This information, however, was based on existing data largely built around the only harmonised European data-collection instrument on R&D-personnel, the Research and Development survey carried out under the responsibility of Eurostat in joint collaboration with OECD, which collects, among other things, data on Research and Development personnel. Another important source was the UNESCO-OECD-Eurostat (UOE) data collection on education systems.

However, the R&D survey does not include data on the mobility of researchers or on their opinions on the influencing factors, motivations and effects of mobility. Rather, the UOE data collection includes data on mobility based on information on citizenship, largely limited to the mobility of doctoral researchers and doctoral graduates. Consequently, information on mobility is based on the educational attainment and not the employment circumstances of the researcher.

The MORE project having the dual purpose of updating existing information (IISER indicators) as well as collecting additional information on researchers' mobility (MORE surveys), has initiated the process of survey-based data collection on the mobility of researchers at their employment stage.

The MORE data collection process has indicated the need to continue building a survey-based collection system on the employment and mobility of researchers in a systematic way targeting researchers in their employment phase as well as the phase of their doctoral studies.

12.1.2 Definitions for survey-based data collection

With the MORE surveys as a starting point, we provide further information on the main points that have to be taken carefully into account when designing future surveys on researcher mobility.

12.1.2.1 Definitions for researchers

Defining the main “unit of measurement” for this project, i.e. “the researcher” has received central attention in the initial phases of this project. As indicated in Part 1 of the present report, the MORE surveys have addressed researchers defining their role according to the definition used by the Frascati manual, i.e. identifying an individual as a researcher as: “a professional engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned”. Therefore, the occupation of a science and technology job has been the criterion by which we identified a researcher rather than possession of a degree in S&T.

Following this definition the MORE surveys have been targeted to individuals who were currently working as researchers. This, however, excludes from the MORE surveys researchers who at the time the surveys were implemented, were temporarily unemployed or temporarily employed in a non-research employment position and who had been working in the past as researchers. Especially at the early-stages of a researcher’s career, the phenomenon of short, fixed-term contracts with some intervals of no employment are fairly common and therefore this should be taken into account when designing future surveys.

Future surveys should ideally target researchers who are employed in occupations related to the “the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned”

- not only those who are currently employed, but
- also those who had been employed as researchers within a given time period in the past (e.g. for at least 3 years previously); therefore not excluding researchers (often in their early career stage) who are temporarily unemployed.

The inclusion of doctoral researchers in the target group of surveys on researcher mobility is also crucial. The heterogeneity which characterises the employment status of doctoral researchers within Europe should be also taken into consideration. Very often, doctoral researchers receive scholarships either from the institution (university) where they work or from other public-funding institutions. For those researchers identifying themselves as currently ‘being employed’ may not be clear to them, although they are involved in research-related activities.

The target population should clearly include doctoral students as the official employment status of this population varies among different countries and depends largely on the self-interpretation of “being employed” by the researcher herself.

12.1.2.2 Definitions for mobility

Geographical mobility is one of the “cornerstone-concepts” of this project, although job mobility is also considered. When interpreting the results on geographical mobility, it is therefore crucial to be fully aware of the way in which mobility is defined and the implications of this definition.

According to the MORE surveys, a geographical movement has as its starting point the country where the highest educational degree had been obtained and as its ending point any other country; thus, the reference point for geographical mo-

bility is the country in which the researcher obtained his/her highest degree. Therefore, within the group of mobile researchers there are also those who have obtained their highest degree in a country other than their country of nationality or birth and have subsequently returned to their country of nationality or birth (return-mobility). Also, within the group of non-mobile researchers there are also those who have obtained their highest degree in a country other than their country of nationality or birth and have remained there ("quasi"-non-mobile). Both cases are of course in line with the definition; however, distinguishing among those groups of researchers within the mobile and non-mobile groups is recommended in future research. This way, the analysis will be enriched and will allow policy-makers to distinguish among the different motives and influencing factors 'within' these subgroups.

Making a distinction among different mobility and non-mobility sub-groups of the survey-samples at the design-phase of the questionnaires is recommended. More precisely:

- Distinction between **mobility and return-mobility** is important, i.e. distinction among mobile researchers
 - who move to a "foreign" (no-birth/no-nationality) country and
 - who return to their country of birth or nationality after having been educated abroad.
- Distinction between **non-mobility and "quasi"-non-mobility** is important, i.e. distinction among non-mobile researchers
 - who have always stayed in their country of birth/nationality and
 - who have stayed in their country of graduation which is different from the country of birth/nationality.

12.1.3 Sample design

The sample design and the implementation of the four MORE surveys have followed different paths according to the needs of the different surveys and the availability of statistical information for the sampling in each case. The following paragraphs highlight some of the limitations emphasizing how sampling and the survey implementation process can be improved in the future.

12.1.3.1 Sampling and implementation of the HEI survey

For the Higher-education institute survey, the list of institutions, from which the researchers' contacts were created, included universities and colleges of technology which were members of the European University Association or national HEI associations. Excluded were *"research institutes, experimental stations and clinics or minor other types of institutions of post-secondary education operating under the direct control of, or administered by higher education institutions"* which had also been included in the Frascati definition of these institutes. If future surveys aim at following in detail the Frascati definition then these institutes should also be included.

For the implementation of a more efficient sampling procedure, a complete and valid sampling frame is needed. One possibility would be to count all the researchers within HEI departments in EU27 and create a reporting mechanism, which could constantly update such information. A further step could be to create a permanent database of HEI researchers in EU27, containing information about the individual researcher, such as contact information and field of science. This could be achieved initially by a complete enumeration of the HEIs and their departments and a subsequent contact with each one of them, in order to obtain the

relevant information on the research personnel. For following years, an appropriate method of updating such information should be proposed, probably via a standardized form to be submitted annually to the Statistical office of each EU country. This database would permit the application of stratified random sampling and provide a direct contact with the researchers. If this task seems impossible, a minimum requirement would be to collect aggregates for research personnel in each department. This will allow implementing clustering techniques which produce unbiased estimators, while the one applied in the present survey (by necessity) led to slightly biased ones.

In addition, we would recommend the inclusion of non-response analysis for all the surveys carried out in order to identify potential issues either with the survey design or the specificities of the different sub-groups of researchers themselves.

As clearly indicated in the MORE HEI Report, the response rates from researchers located in France were extremely low. For this reason data from the 6th and the 7th EC Framework Programmes had to be used to contact additional researchers. This deviation in the sampling process and the resulting low response rate of researchers has resulted in a sample representative at the EU country level but not for France. This however has had no impact on the representativeness of the HEI survey at the aggregate EU27 level and at the level of the EU countries except for France. Nevertheless, future surveys should aim at deriving a sample representative at the level of all the different EU countries.

Future surveys targeting the population working in higher-education institutes should aim at providing a representative sample of the underlying population not only at the EU27 aggregate level but also at country level for all countries within the EU27.

12.1.3.2 Sampling and implementation of the Research-Institute survey

The sampling method followed for the research-institute survey has been challenging mainly because the research (non-university) institutes sector does not represent a single, homogenous or well-defined 'sector' but rather one consisting i.e. of all those 'public' or 'quasi-public' research performing institutes which are left once HEIs are accounted for. Furthermore, the scope of the RI survey has been limited by including only those researchers working for institutes which are closest to being 'academic' or 'quasi-academic' with a 'national' role and ambition, where receipt of public funding for research and development has been a criterion rather than public ownership. The resulting sample is clearly not a representative one. However, we believe that future studies can aim at being representative if data collected by Eurostat can be obtained on this. This implies requesting from Eurostat and the National Statistics Offices the list of non-university, research institutes that belong to the GOVERD sector and as such are reported to Eurostat. A sample drawn from this population could have more aspirations towards a representative sample. In this case, however, this sector as defined by the National Statistical offices may exclude major public or semi-public research institutes.

As in the case of HEI researchers, for the implementation of a more efficient sampling procedure, a complete and valid sampling frame is needed. A method similar to the one proposed for the HEIs above could be applied here as well.

Further effort should be made to improve the sampling method of the non-university research institutes: a potential suggestion is to link future surveys to the population of research institutions in the GOVERD sector as defined by National Statistical offices that report to Eurostat.

12.1.3.3 Sampling and implementation of the Industry survey

Regarding the MORE industry survey, a representative sample of the industrial researchers' population in the EU could not be achieved. As explained earlier, this was due to lack of information not only on the total size of this population but also on the population of R&D performing firms including their fields or countries of activity. Convenience sampling has therefore been used. This resulted in a non-representative but relatively sizeable number of industry researchers based mainly on data from the databases of the 6th and the 7th EC Framework Programmes as well as from engineering associations. This sampling process is likely to have resulted in same biases in the sample as already discussed in Part 2, e.g. towards researchers working in excellent research organizations, non-mobile researchers, and other.

For future surveys of the industrial researchers' population, improvements on the sampling methods are clearly necessary. A starting point can be to target the top-1,000 R&D investors with registered offices in the EU provided by the EU Industrial R&D Investment Scoreboard (which had been initially the intention of the MORE consortium). The challenge here is to be able to establish a contact within the company with the most appropriate person to 1. provide information about the company itself and 2. provide contact details of researchers working in the company and to forward to them the mobility-survey. In view of these challenges and the specificities of the industry sector (less time available by the researchers, tendency not to reveal employment-related information), one possible recommendation for the future is to link the industry mobility survey (or to provide the contacts to this survey) to other EU-administered surveys such as the EU Industrial R&D Investment Scoreboard itself or the EU Survey on R&D Investment Business Trends. This would enable, on the one hand, linking the mobility survey to company-level data provided by the EU-administered survey and, on the other hand, would require the responsible person within each company to forward the mobility part of the survey to a number of researchers working at the company.

The industry survey on research mobility could be improved (potentially) in two ways:

- at the level of the sampling method: efforts could be made to obtain access to a more representative sample of researchers working in R&D intensive companies in the EU;
- at the level of its scope: a researcher-mobility survey could in the future be linked to company-level data both referring to financial data but also touching upon mobility issues that the companies face.

To bring future surveys of industrial-researcher mobility closer to these objectives, we recommend linking the industry-mobility survey (or providing the contacts to this survey) to an EU administered survey such as the R&D Investment Business Trends.

12.1.3.4 Sampling and implementation of the Extra-EU survey

Unlike the other MORE surveys, the extra-EU pilot survey does not focus on the mobility of researchers intra-EU (from one EU country to the other), rather it focuses on the mobility of EU researchers to non-EU countries, especially to the US, and also includes information on researchers who have been mobile between any other two geographical areas other than the EU and US as well as researchers who have never been mobile. Once again convenience sampling is used. It was not possible to construct a representative sample since access to data on the total relevant population from which a representative sample could be drawn was not available, nor do we have knowledge that such data actually exist.

In the future, however actions should be taken so that follow-up surveys will target a sample representative of the population. This would ideally include (1) ac-

cess to data on study/training visas or temporary work visas from EU27 countries to and from the US on a yearly basis that include contact details for the persons getting these visas (almost impossible to get), or (2) access to data on scholarships, employment contracts or other contracts received from EU or US research-funding institutions.

Future surveys on extra-EU mobility should continue focusing on EU-US mobility as this constitutes a large share of the EU researchers' population being mobile outside the EU. Where possible, a more "targeted-to-the-population" sampling method should be followed. Ideally, this would include the facilitation for the provision of contact information for the underlying population from research-funding institutions. In addition to EU-US mobility, one may also consider extending the geographical coverage to other countries.

The current surveys of the MORE project have provided information on the effects of mobility on researchers' career. However, these effects refer to the experience of researchers during mobility and are therefore self-assessment of effects according to the perceptions of researchers themselves. A next step can be to study the actual effects of mobility to researchers' careers by combining information of individual researchers and their mobility to e.g. their publications and/or patent record. This way the effects of mobility can actually be precisely measured.

In addition to information on their perception about the effects of mobility on their career, it would be very useful to study the actual effects of mobility on specific outputs like publications or patents of the individual researchers.

12.1.4 Questionnaire: design and content

The different MORE surveys have been designed based on different questionnaires; however, a master questionnaire has been designed and been used by all four surveys to ensure that the basic information about the researchers (personal situation, education, employment) is as homogenous as possible among the different surveys. After having completed this first series of surveys, we increasingly see the need to continue linking all surveys to a master questionnaire as well as ensuring that the information asked is as homogenous as possible (while allowing for some necessary deviations due to the different underlying populations of each survey).

We also see the need to increase the comparability of the different surveys in two ways. First, future series of surveys on mobility should ensure that the design of the questionnaire in technical terms is followed as closely as possible by all surveys. This includes for example harmonization among the different surveys with respect to the structure of the questionnaire, the answering patterns and the routing among the different subgroups of the respondents. Second, harmonization should be increased with respect to the content of the questionnaire. For example, throughout all surveys the same types of motivations, influencing factors, effects and other information about mobility should be queried, providing as necessary some 'room' for deviations to the extent necessary due to differences among the target groups of the surveys.

The design of future surveys should ensure harmonisation among the different surveys both in terms of technical design of the surveys (structure of questionnaires, routing among sub-groups, answering patterns, etc.) and in terms of the content of the questions themselves (types of topics covered, types of factors included per topic, etc.).

While implementing the different surveys, the team has increasingly seen the need for a clearer distinction among motivations (or drivers) of mobility and influ-

encing factors of mobility. The motivations for mobility are those factors that affect the decision of a researcher to become mobile or not. These motivations include, for example, “career progression goals”, “getting access to specific research facilities”, “working with ‘star’ academics”, “salary incentives”, “personal/family-life circumstances”, etc. and reflect the reasons why researchers become or not become mobile. These motivational factors are determined by the behaviour of the individual and are therefore endogenous in nature. On the other hand, the influencing factors of mobility should be separately examined as these include exogenously-determined factors that might influence mobility decisions such as “immigration regulations”, “pension and social-care provisions”, “availability and quality of housing”, etc. These are not the reasons why researchers decide to become mobile or not but reflect external factors that might facilitate or deter mobility once the researcher has “shaped” an attitude towards mobility.

On the content of the questionnaire, a clearer distinction should be made between the motivations that are endogenously-determined by the researcher and the influencing factors of mobility, including barriers to mobility, that are exogenously determined by the researcher environment.

The current surveys are in general taking the country of highest educational attainment as the starting point of any mobility event. If the highest educational attainment is a PhD degree, then mobility or non-mobility starts after the completion of doctoral studies. On the one hand, this definition relates to the last country that has ‘invested’ in the doctoral studies of the researcher (when not subsidised by the country of origin if this is different from the country of graduation). On the other hand, this definition excludes the doctoral studies from the mobility path.

Future surveys could consider extending the mobility path to include also researchers’ doctoral studies.

12.2 Policy-relevant observations and recommendations

Chapter 11 has presented the main findings drawn from the MORE set of indicators. Although more details on the IISER update and the individual MORE surveys are provided in the relevant MORE reports, in this section we discuss some of our main findings and highlight the policy recommendations that can be drawn from these findings related to the promotion of mobility of researchers.

12.2.1 “Stocks” of researchers

The number of researchers per Member State relative to total employment indicates that EU15 countries (with Scandinavian countries at the top of the ranking) employ a high share of researchers while New Member States have relatively low shares of researchers. In relative terms, there were 6 researcher FTEs per 1,000 active population in 2007 in the EU27. This compares to 9 FTEs in the US, 11 in Japan and 2 in China.

Overall, EU27 seems to lag behind the US and Japan in terms of the relative measures of the number of researchers (FTEs) in terms of active population. Relatively low shares of researchers are reported especially among New Member States

Among the MORE survey targeting ‘academic’ researchers (HEI, RI and Extra-EU surveys), we see that there is a relatively high share of female researchers at the doctoral researcher phase, but this share seems to significantly diminish already

at the post-doctoral phase of the career. As the overall samples indicate male-dominance in the number of researchers (with more pronounced difference in the industry survey), it seems that women tend to gradually decrease in number before the post-doctoral phase. This has implications for policies targeting an increase in female participation in the research profession.

12.2.2 Mobility of researchers

The MORE surveys provide information on the stocks of researchers as well as their mobility and their views on the motivations, influencing factors and effects of mobility. Data on the growth of the stocks of researchers over time is provided by Eurostat. The MORE surveys provide additional information on the mobility of researchers, which however gives only a 'snapshot' of the situation as the surveys have been launched only once (the HEI and Industry surveys in 2009 and the RI and Extra-EU surveys in 2010). In order to obtain a better picture of the number of mobile researchers and its evolution over time as well as on the variation over time of the opinions concerning, for example, barriers of researchers' mobility should be monitored on a regular basis, allowing examining mobility of researchers over time. Additionally, analysing the variations on the perceptions of researchers about barriers, facilitating factors and effects of mobility per sector and per country over time can provide useful insights on the effectiveness of different policy measures adopted over time that promote mobility.

Monitoring researchers' mobility through the conduct of mobility surveys on a regular basis is important in order to provide a full picture on mobility and its evolution over time as well as on the effectiveness of policy instruments that promote mobility adopted over time.

The MORE surveys indicate that doctoral candidates is a sub-group that has been more mobile as students and has also gained more experience in industry as students compared to post-doctoral researchers as well as all 'academic' researchers, overall. As the career stage of the researcher is linked also to age, this suggests that student mobility (cross-border and towards industry) is a fairly recent phenomenon and may partially be attributed to the effectiveness of policy measures that have been recently taken which target student mobility across countries and sectors.

Monitoring researcher mobility over time and distinguishing among different sub-groups of researchers (in terms of sector and country of employment, as well as career stage) provides useful information on the effectiveness of policy measures targeting particular sub-groups of the researcher population.

Mobility as a student seems to predict mobility at the later stages of the researchers' career. All MORE surveys indicate that the share of mobile researchers who have been mobile as a student is notably higher than the respective share of researchers in the entire samples; moreover, this is the case for 'academic' as well as industrial researchers. Similarly, a positive correlation seems to exist between work experience in industry as a student and sector mobility (among the public and the private sectors) at the later stage of the researchers' career among industrial researchers.

Student-geographical as well as student-sector mobility seem to predict geographical and sector mobility later on. The effect of policy measures promoting student mobility (across countries and sectors) not only in terms of knowledge accumulation at the student stage but also on the probability of mobility at later career stages should be taken into consideration when such policy measures are designed.

Among all four MORE surveys, researchers working in industry seem to be those less geographically mobile, having lower with a notable difference in the share of mobility compared to the surveys targeting 'academic' researchers. At the same time, the different MORE survey samples indicate that industrial researchers present an "a-typical" profile relative to that of researchers working in the public sector. These differences point out the need for more targeted measures promoting the mobility of researchers among those working in the industrial sector.

Mobility seems to be notably less popular among industrial researchers than their colleagues working in the public sector. Adding to this, the notably 'a-typical' profile of industrial researchers relative to 'academic' researchers indicates that there is need for policy measures promoting mobility that are tailor-made to the specific needs and different characteristics of researchers working in the industry.

International collaboration with researchers from other countries is becoming a common phenomenon as research and innovation-related activities are increasingly internationalised. However it is important to know whether this type of international collaboration reduces the need of researchers to move abroad for work. Two MORE surveys (HEI and Extra-EU) both targeting researchers working in the academic sector indicate that there seems to be a higher concentration of geographically mobile researchers among those who have international research collaborations, indicating a positive relationship among the two phenomena. Of a course, no causal relationship can be assumed here: this may indicate that researchers are internationally collaborating can more easily find opportunities to move across countries through their network of professional partners or that those who have been internationally mobile can more easily establish a virtual network of international partners.

The positive relationship found between international research collaboration and geographical mobility among 'academic' researchers indicates that these two phenomena are complements rather than substitutes to each other.

The Extra-EU survey has examined different personal and career-related effects of mobility as well as the motives for mobility of researchers focusing on the EU-to-US and the US-to-EU mobile groups. The analysis has indicated that the researchers moving from the EU to the US are both motivated by career-related factors (career progression goals, access to infrastructure, work with 'star' scientists, and other) and do perceive higher effects on their career from mobility than the researchers moving in the opposite direction. Similarly, researchers coming to the EU from the US report that they are driven mainly by personal/cultural factors and that the effects on their personal life are higher than the effect on their career. Additionally, the same survey indicates that the US scores higher as an attractive location for research compared to EU countries not only by mobile researchers who have worked in both countries, but also by researchers who have worked either in the US or in the EU as well as by researchers who have not worked in either region. This indicates that the US is considered on average as having a more attractive research environment than other countries based not only on past experiences but also on researchers' perceptions.

Survey findings indicate that there is need to promote the attractiveness of EU countries as an environment to do research after having first understood the reasons why EU is not perceived as the most attractive environment for research and having taken into account the significant differences among the different EU Member States' needs.

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ANNEX 1 LITERATURE

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ANNEX 2 THE MORE SET OF INDICATORS

Main topic	Sub-topic	Indicator	Source	MORE reporting reference	Code
HR of researchers	Stock of researchers	Number (HCs and FTEs) of researchers and per 1000 active population (15-74 years old)	Eurostat R&D statistics	MORE IISER final update report	HR-ST1
		Number of researchers in the MORE surveys	MORE HEI/RI/IND/ Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-ST2
		Number of tertiary education graduates (ISCED 5A and 6)	Eurostat Education statistics	MORE IISER final update report	HR-ST3
		Number of doctoral graduates (ISCED 6) and per 1000 population aged 25-34	Eurostat Education statistics	MORE IISER final update report	HR-ST4
		Ratio of doctoral graduates (ISCED 6) over tertiary degrees with academic orientation (ISCED 5A)	Eurostat (Education statistics)	MORE IISER final update report	HR-ST5
		Number and share of researchers who are doctoral candidates (PhD students) in total number of survey respondents	MORE HEI/RI/Extra-EU survey	MORE HEI/RI/Extra-EU reports	HR-ST6
		Number and share of researchers who are post-doctoral researchers in total number of survey respondents	MORE HEI/RI/Extra-EU survey	MORE HEI/RI/Extra-EU reports	HR-ST7
	Employment situation of researchers	Number and share of researchers in public sector (higher education sector and government sector) in total number of researchers	Eurostat R&D statistics	MORE IISER final update report	HR-EMPL1
		Number and share of researchers in private sector (business enterprise and private non-profit sector) in total number of researchers	Eurostat R&D statistics	MORE IISER final update report	HR-EMPL2
		Number and share of researchers within the MORE surveys working in the public sector (higher education or public/government research institute sector)	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-EMPL3
		Number and share of researchers within the MORE surveys working in the private sector (business or private-not-for-profit sector)	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-EMPL4

		Number and share of researchers within the MORE surveys with a fixed term contract	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-EMPL5
		Number and share of researchers within the MORE surveys with a permanent(=open-ended) contract	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-EMPL6
		Number and share of researchers within the MORE surveys working full-time	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	HR-EMPL7
Mobility of researchers	Stocks of mobility	<i>Geographical mobility</i>			
		Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree, after (highest-degree) graduation	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-ST1
		Number and share of researchers who have worked in the last three years for at least 3 months in a country other than the country where they attained their highest educational degree, after (highest-degree) graduation	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-ST2
		Number of different countries worked in since graduation (including periods of self-employment)	MORE Extra-EU survey	MORE Extra-EU report	MOB-ST3
		Number and share of doctoral candidates (ISCED 6) with the citizenship of another EU27 member state in the reporting country in the EU27 (MOB-ST4)	Eurostat Education statistics	MORE IISER final update report	MOB-ST4
		Number and share of doctoral candidates (ISCED 6) of the reporting citizenship in EU27 in all the other member states in the EU27	Eurostat Education statistics	MORE IISER final update report	MOB-ST5
		Ratio of citizens from the respective country-earning doctorates at US colleges and universities to number of doctoral degrees awarded at home	NSF data	MORE IISER final update report	MOB-ST6
		<i>Job mobility</i>			
		Number and share of internationally mobile researchers having moved to a new employer in a different country	MORE HEI/RI surveys	MORE HEI/RI reports	MOB-ST7
		Number of jobs/ employers since graduation	MORE IND/Extra-EU surveys	MORE IND/Extra-EU reports	MOB-ST8

	Flows of mobility	Number and share of researchers having moved job at least once from one public research organisation to another		MORE HEI/ RI surveys	MORE HEI/RI reports	MOB-ST9
		Number and share of researchers who have moved between the public and the private sectors (sectoral mobility)		MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FLOW1
		Number and share of researchers engaged in formal collaboration with only academic researchers from other countries by mobility status		MORE HEI/ Extra-EU surveys	MORE HEI/ Extra-EU reports	MOB-FLOW2
		Number and share of researchers engaged in formal collaboration with only industry researchers from other countries by mobility status		MORE HEI/ Extra-EU surveys	MORE HEI/ Extra-EU reports	MOB-FLOW3
		Number and share of researchers engaged in formal collaboration with both academic and industry researchers from other countries by mobility status		MORE HEI/ Extra-EU surveys	MORE HEI/ Extra-EU reports	MOB-FLOW4
	Influencing factors of mobility	<i>Geographical mobility</i>				
		Practical/personal factors	Social security system	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FCT1
			Administrative barriers for immigration	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FCT2
			Language	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FCT3
			Quality and cost of accommodation	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FCT4
			Child care arrangements	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-FCT5
			Work permission for partner	MORE IND/Extra-EU surveys	MORE IND/Extra-EU reports	MOB-FCT6

			Social integration at host country	MORE HEI/RI/IND/ surveys	MORE HEI/RI/IND reports	MOB-FCT7
		Professional factors	Obtaining funding	MORE HEI/RI/ Extra-EU surveys	MORE HEI/RI/Extra-EU reports	MOB-FCT8
			Maintenance of professional and personal network of contacts	MORE HEI/RI/ Extra-EU surveys	MORE HEI/RI/ Extra-EU reports	MOB-FCT9
		Job mobility				
		Professional factors	Job satisfaction	MORE IND survey	MORE IND report	MOB-FCT10
			Good working conditions / climate	MORE IND survey	MORE IND report	MOB-FCT11
		Personal factors	Good work-life balance	MORE IND survey	MORE IND report	MOB-FCT12
			Job changes of partner/life satisfaction of partner	MORE IND survey	MORE IND report	MOB-FCT13
			Maintaining family and personal relationships	MORE IND survey	MORE IND report	MOB-FCT14
			Life satisfaction of children	MORE IND survey	MORE IND report	MOB-FCT15
	Motivations for mobility	Geographical mobility				
		Personal motives	Personal/family motives	MORE HEI/RI/ Extra-EU surveys	MORE HEI/RI/ Extra-EU reports	MOB-MOT1
			Culture-related motives	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-MOT2
		Professional motives	Career progression goals	MORE HEI/RI/ Extra-EU surveys	MORE HEI/RI/ Extra-EU reports	MOB-MOT3
			Personal research agenda	MORE HEI/RI/ Extra-EU surveys	MORE HEI/RI/ Extra-EU reports	MOB-MOT4

			Prospect to work with leading experts	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-MOT5
			Access to internal and external research facilities	MORE HEI/RI/IND/Extra-EU surveys	MORE HEI/RI/IND/Extra-EU reports	MOB-MOT6
			Salary and other financial incentives	MORE HEI/RI/IND/ Extra-EU surveys	MORE HEI/RI/IND/ Extra-EU reports	MOB-MOT7
			Career opportunities at new location	MORE HEI/RI/IND sur-veys	MORE HEI/RI reports	MOB-MOT8
		Job mobility				
		Professional motives	Prospects in scientific career	MORE IND survey	MORE IND report	MOB-MOT9
			Promotion prospects within companies, organisations	MORE IND survey	MORE IND report	MOB-MOT10
			High salary	MORE IND survey	MORE IND report	MOB-MOT11
			High job security	MORE IND survey	MORE IND report	MOB-MOT12
	Effects of Mobility	<i>Geographical mobility</i>				
		Overall ef-fects	Overall effect on career progression	MORE HEI/RI/Extra-EU surveys	MORE HEI/RI/Extra-EU reports	MOB-EFF1
			Overall effect on personal and family life	MORE Extra-EU survey	MORE Extra-EU re-port	MOB-EFF2
		Output (direct) effects	Publication output	MORE Extra-EU survey	MORE Extra-EU re-port	MOB-EFF3
			Patent output	MORE Extra-EU survey	MORE Extra-EU re-port	MOB-EFF4
			Access to infrastructure and know-how	MORE Extra-EU survey	MORE Extra-EU re-port	MOB-EFF5

		Network (indirect) effects	Ability to work in industrial sector	MORE Extra-EU survey	MORE Extra-EU report	MOB-EFF6
			Access to international network of professionals	MORE Extra-EU survey	MORE Extra-EU report	MOB-EFF7
			Professional experience	MORE Extra-EU survey	MORE Extra-EU report	MOB-EFF8
			Job opportunities at 'home' country	MORE Extra-EU survey	MORE Extra-EU report	MOB-EFF9
			General recognition as researcher	MORE Extra-EU survey	MORE Extra-EU report	MOB-EFF10
		<i>Job mobility</i>				
		Output effects	Publication output	MORE IND survey	MORE IND report	MOB-EFF11
			Patent output	MORE IND survey	MORE IND report	MOB-EFF12
		Network effects	Chances on job market	MORE IND survey	MORE IND report	MOB-EFF13
			Network diversity	MORE IND survey	MORE IND report	MOB-EFF14
			Interdisciplinarity of research	MORE IND survey	MORE IND report	MOB-EFF15

HEI survey: Higher-education institute survey

RI survey: Research institute survey

IND survey: Industry survey

Extra-EU survey: Extra EU survey focusing on EU-US mobility

ANNEX 3 MORE-INDICATOR FICHES

Code: HR-ST1	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number (HCs and FTEs) of researchers and per 1000 employed
Methodological background	/
Unit of measurement	Head counts and FTEs
Breakdowns by	/
Geographical coverage	EU27
Time coverage	2000 - 2007
Sources of data	NIFU STEP based on Eurostat (R&D statistics)
Derived indicators	Head counts and FTEs per 1000 employed
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: HR-ST2	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number of researchers in the MORE surveys
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number of researchers (head counts)
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (less than 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports, MORE Final Report

Code: HR-ST3	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number of tertiary education graduates (ISCED 5A and 6)
Methodological background	/
Unit of measurement	Number of graduates
Breakdowns by	/
Geographical coverage	EU 27
Time coverage	2000 - 2007
Sources of data	Eurostat education statistics
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report
Related indicators	/

Code: HR-ST4	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number (FTE) of doctoral graduates (ISCED 6) and per 1000 population aged 25-34
Methodological background	/
Unit of measurement	Number (FTE) of doctoral graduates
Breakdowns by	/
Geographical coverage	EU 27
Time coverage	2000 – 2007
Sources of data	Eurostat (Education and Population Statistics)
Derived indicators	Number (FTE) of doctoral graduates (ISCED 6 per 1000 population aged 25-34
Additional information	/
Reference to MORE reporting	MORE IISER final Update Report

Code: HR-ST5	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Ratio of doctoral graduates (ISCED 6) over tertiary degrees with academic orientation (ISCED 5A)
Methodological background	/
Unit of measurement	percentage
Breakdowns by	/
Geographical coverage	EU 27
Time coverage	2000 – 2007
Sources of data	UOE education statistics
Derived indicators	/
Additional information	- Doctoral graduates (ISCED 6) - Tertiary degrees with academic orientation (ISCED 5A)
Reference to MORE reporting	MORE IISER Update (final update)

Code: HR-ST6	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number and share of researchers who are doctoral candidates (PhD students) in total number of survey respondents
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/Extra-EU
Geographical coverage	- By country: EU 27 for the HEI survey - EU27 aggregate for the RI and Extra-EU surveys
Time coverage	- 2009: HEI and RI surveys - 2010: Extra-EU survey
Sources of data	MORE HEI/RI/Extra-EU surveys
Derived indicators	- By gender - By age (<= 40)
Additional information	- Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	- MORE HEI/RI/Extra-EU Reports

Code: HR-ST7	
Main field	Human Resources of Researchers
Sub-field	Stock of Researchers
Key indicator	Number and share of researchers who are post-doctoral researchers in total number of survey respondents
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/Extra-EU
Geographical coverage	- By country: EU 27 for the HEI survey - EU27 aggregate for the RI and Extra-EU surveys
Time coverage	- 2009: HEI and RI surveys - 2010: Extra-EU survey
Sources of data	MORE HEI/RI/Extra-EU surveys
Derived indicators	- By gender - By age (<= 40)
Additional information	- Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	- MORE HEI/RI/Extra-EU Reports

Code: HR-EMPL1	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers in public (higher education and government) sector
Methodological background	/
Unit of measurement	Number (HC) and percentage
Breakdowns by	By sector: Higher-education-institute (HEI), Government (GOV)
Geographical coverage	By country: EU 27
Time coverage	2000 – 2007
Sources of data	NIFU STEP based on Eurostat data (R&D statistics)
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: HR-EMPL2	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers in business enterprise sector and private non-profit sector
Methodological background	/
Unit of measurement	Number and share of researchers (head counts)
Breakdowns by	By sector: Business-enterprise (BE), Private-not-for-profit (PNP)
Geographical coverage	By country: EU 27
Time coverage	2000 – 2007
Sources of data	NIFU STEP based on Eurostat data (R&D statistics)
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: HR-EMPL3	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers (within the MORE surveys) working in the public sector (higher education or public/government research institute sector)
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (less than 40)
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: HR-EMPL4	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers (within the MORE surveys) working in the private sector (business or private-not-for-profit sector)
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (less than 40)
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: HR-EMPL5	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers (within the MORE surveys) with a fixed term contract
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (<= 40)
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: HR-EMPL6	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers (within the MORE surveys) with a permanent(=open-ended) contract
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (<= 40)
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: HR-EMPL7	
Main field	Human Resources of Researchers
Sub-field	Employment situation of researchers
Key indicator	Number and share of researchers (within the MORE surveys) working full-time
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI survey
Sources of data	MORE HEI/RI/IND surveys
Derived indicators	- By gender - By age (<= 40)
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology
Reference to MORE reporting	MORE HEI/RI/IND Reports

Code: MOB-ST1	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree)
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number of researchers (head counts)
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By age (<= 40) - By gender - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-ST2	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of researchers who have worked in the last three years for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree) graduation
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number of researchers (head counts)
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By age (≤ 40) - By gender - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-ST3	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number of different countries worked in since graduation (including periods of self-employment)
Methodological background	/
Unit of measurement	Number
Breakdowns by	Sector (Extra-EU)
Geographical coverage	EU27
Time coverage	2010: Extra-EU survey
Sources of data	MORE Extra-EU survey
Derived indicators	- By gender - By age (≤ 40) - By family situation -
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	Extra-EU Report

Code: MOB-ST4	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of doctoral candidates (ISCED 6) with the citizenship of another country, in the reporting country
Methodological background	/
Unit of measurement	Number and percentage
Breakdowns by	/
Geographical coverage	EU 27
Time coverage	2000 - 2007
Sources of data	Eurostat (Education Statistics)
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: MOB-ST5	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of doctoral candidates (ISCED 6) of the reporting nationality in EU27 in all the other member states in the EU27
Methodological background	/
Unit of measurement	Number and percentage
Breakdowns by	/
Geographical coverage	EU 27
Time coverage	2000 – 2007
Sources of data	Eurostat (Education Statistics)
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: MOB-ST6	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Ratio of citizens from the respective country-earning doctorates at non-EU colleges and universities to number of doctoral degrees awarded at home
Methodological background	/
Unit of measurement	Percentage
Breakdowns by	/
Geographical coverage	EU 27: Bulgaria, Germany, Estonia, France, Greece, Italy, Romania, the United Kingdom
Time coverage	2008
Sources of data	NSF data
Derived indicators	/
Additional information	/
Reference to MORE reporting	MORE IISER final update Report

Code: MOB-ST7	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of internationally mobile researchers having moved to a new employer in a different country
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI survey
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI surveys
Derived indicators	- By gender - By age (≤ 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI Reports

Code: MOB-ST8	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number of jobs/ employers since graduation
Methodological background	/
Unit of measurement	Number of jobs/ employers
Breakdowns by	- Sub-group: /IND/Extra-EU
Geographical coverage	- EU27 aggregates
Time coverage	- 2009: Industry survey - 2010: Extra-EU survey
Sources of data	MORE IND/Extra-EU surveys
Derived indicators	- By gender - By age (≤ 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE Industry/Extra-EU Reports

Code: MOB-ST9	
Main field	Mobility of researchers
Sub-field	Stocks of mobility
Key indicator	Number and share of researchers having moved job at least once from one public research organization to another
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI
Geographical coverage	- By country (EU27 for the HEI survey)
Time coverage	- 2009: HEI survey
Sources of data	MORE HEI and RI surveys
Derived indicators	- By gender - By age (≤ 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI Report

Code: MOB-FLOW1	
Main field	Mobility of researchers
Sub-field	Flows of mobility
Key indicator	Number and share of researchers who have moved between the public and the private sectors (sectoral mobility)*
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By gender - By age (less than 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports, MORE Final Report

Code: MOB-FLOW2	
Main field	Mobility of researchers
Sub-field	Flows of mobility
Key indicator	Number and share of researchers engaged in formal collaboration with only academic researchers from other countries *
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the Extra-EU survey
Time coverage	- 2009: HEI survey - 2010: Extra-EU survey
Sources of data	MORE HEI/ Extra-EU surveys
Derived indicators	- By gender - By age (less than 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/ Extra-EU Reports, MORE Final Report

Code: MOB-FLOW3	
Main field	Mobility of researchers
Sub-field	Flows of mobility
Key indicator	Number and share of researchers engaged in formal collaboration with only industry researchers from other countries
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the Extra-EU survey
Time coverage	- 2009: HEI survey - 2010: Extra-EU survey
Sources of data	MORE HEI/ Extra-EU surveys
Derived indicators	- By gender - By age (less than 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/ Extra-EU Reports, MORE Final Report

Code: MOB-FLOW4	
Main field	Mobility of researchers
Sub-field	Flows of mobility
Key indicator	Number and share of researchers engaged in formal collaboration with both academic and industry researchers from other countries*
Methodological background	Weighted data provided for the HEI survey sample
Unit of measurement	Number and percentage
Breakdowns by	- Sub-group: HEI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the Extra-EU survey
Time coverage	- 2009: HEI survey - 2010: Extra-EU survey
Sources of data	MORE HEI/ Extra-EU surveys
Derived indicators	- By gender - By age (less than 40) - By family situation
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Work experience in industry as student
Reference to MORE reporting	MORE HEI/ Extra-EU Reports, MORE Final Report

Code: MOB-FCT1	
Main field	Mobility of researchers
Sub-field	Influencing factors of mobility – geographical mobility
Key indicator	Social security system (Pension rights or contributions / Quality of social security system)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-FCT2	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Administrative barriers for immigration
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-FCT3	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Language
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-FCT4	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Quality and cost of accommodation
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-FCT5	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Child care arrangements (Making child care arrangements/ Availability of adequate schools for children)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-FCT6	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Work permission for partner
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND/Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2009: IND survey - 2010: Extra-EU survey
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND/Extra-EU Reports

Code: MOB-FCT7	
Main field	Mobility of researchers
Sub-field	Practical/personal factors – geographical mobility
Key indicator	Social integration (Social integration at host country / General attitude towards foreigners in the host country/ Culture)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/INDsurveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI survey
Sources of data	MORE HEI/RI/IND surveys
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND Reports

Code: MOB-FCT8	
Main field	Mobility of researchers
Sub-field	Professional factors – geographical mobility
Key indicator	Obtaining funding
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI /Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/ Extra-EU surveys
Time coverage	- 2009: HEI survey - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/ Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/ Extra-EU Reports

Code: MOB-FCT9	
Main field	Mobility of researchers
Sub-field	Professional factors – geographical mobility
Key indicator	Maintenance of professional and personal network of contacts (Potential “loss” of contact with professional network at location where previously)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI /Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/ Extra-EU surveys
Time coverage	- 2009: HEI survey - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/ Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/ Extra-EU Reports

Code: MOB-FCT10	
Main field	Mobility of researchers
Sub-field	Professional factors – job mobility
Key indicator	Job satisfaction
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (<= 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB-FCT 11	
Main field	Mobility of researchers
Sub-field	Professional factors – job mobility
Key indicator	Good working conditions/climate
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (<= 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB-FCT12	
Main field	Mobility of researchers
Sub-field	Personal factors – job mobility
Key indicator	Good work-life balance
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB-FCT13	
Main field	Mobility of researchers
Sub-field	Personal factors – job mobility
Key indicator	Job changes of partner/life satisfaction of partner
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB-FCT14	
Main field	Mobility of researchers
Sub-field	Personal factors – job mobility
Key indicator	Maintaining family and personal relationships (Keeping in touch with friends or family)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB-FCT15	
Main field	Mobility of researchers
Sub-field	Personal factors – job mobility
Key indicator	Life satisfaction of children
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Reports

Code: MOB–MOT1	
Main field	Mobility of researchers
Sub-field	Motivations for mobility – geographical mobility
Key indicator	Personal/family motives
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/Extra-EU surveys
Time coverage	- 2009: HEI survey - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/ Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/Extra-EU Reports

Code: MOB–MOT2	
Main field	Mobility of researchers
Sub-field	Motivations for mobility – geographical mobility
Key indicator	Culture-related incentives (Culture/Desire to return to a country where previously worked)
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB-MOT3	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Career progression goals
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/ Extra-EU surveys
Time coverage	- 2009: HEI survey - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/ Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/Extra-EU Reports

Code: MOB-MOT4	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Personal research agenda
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/ Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/ Extra-EU surveys
Time coverage	- 2009: HEI survey - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/ Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/Extra-EU Reports

Code: MOB–MOT5	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Prospect to work with leading experts / suitable research collaborators
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB–MOT6	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Access to internal and external research facilities
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB–MOT7	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Salary and other financial incentives
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/ Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/IND/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND/Extra-EU Reports

Code: MOB–MOT8	
Main field	Mobility of researchers
Sub-field	Professional motives – geographical mobility
Key indicator	Career opportunities at new location
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/IND/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/IND/surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI survey
Sources of data	MORE HEI/RI/IND surveys
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (<= 40)
Additional information	Average score per answering option
Reference to MORE reporting	MORE HEI/RI/IND Reports

Code: MOB–MOT9	
Main field	Mobility of researchers
Sub-field	Professional motives – job mobility
Key indicator	Prospects in scientific career
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB–MOT10	
Main field	Mobility of researchers
Sub-field	Professional motives
Key indicator	Promotion prospects within companies, organizations
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB–MOT11	
Main field	Mobility of researchers
Sub-field	Professional motives – job mobility
Key indicator	High salary
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB–MOT12	
Main field	Mobility of researchers
Sub-field	Professional motives – job mobility
Key indicator	High job security
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status - By number of jobs
Additional information	Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB-EFF1	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Overall effect on career progression
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: HEI/RI/Extra-EU
Geographical coverage	- By country (EU27 for the HEI survey) - EU27 aggregate for the RI/Extra-EU surveys
Time coverage	- 2009: HEI and IND surveys - 2010: RI and Extra-EU surveys
Sources of data	MORE HEI/RI/Extra-EU surveys
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE HEI/RI/Extra-EU Reports

Code: MOB-EFF2	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Overall effect on family and personal life
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF3	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Publication output
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF4	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Patent output
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF5	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Access to infrastructure and know-how
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF6	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Ability to work in industrial sector
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB – EFF7	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Access to international network of professionals
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB–EFF8	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Professional experience
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (<= 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF9	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	Job opportunities at home
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF10	
Main field	Mobility of researchers
Sub-field	Effects of mobility – geographical mobility
Key indicator	General recognition as researcher
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: Extra-EU
Geographical coverage	- EU27 aggregate
Time coverage	- 2010
Sources of data	MORE Extra-EU survey
Derived indicators	- By mobility status (mobile/non-mobile; EU-US/US-EU mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE Extra-EU Report

Code: MOB-EFF11	
Main field	Mobility of researchers
Sub-field	Effects of mobility – job mobility
Key indicator	Publication output
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2009
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB-EFF12	
Main field	Mobility of researchers
Sub-field	Effects of mobility – job mobility
Key indicator	Patent output
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2009
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB-EFF13	
Main field	Mobility of researchers
Sub-field	Effects of mobility – job mobility
Key indicator	Chances on job market
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2009
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB-EFF14	
Main field	Mobility of researchers
Sub-field	Effects of mobility – job mobility
Key indicator	Network diversity
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2009
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE IND Report

Code: MOB-EFF15	
Main field	Mobility of researchers
Sub-field	Effects of mobility – job mobility
Key indicator	Interdisciplinarity of research
Methodological background	/
Unit of measurement	Average score
Breakdowns by	- Sub-group: IND
Geographical coverage	- EU27 aggregate
Time coverage	- 2009
Sources of data	MORE IND survey
Derived indicators	- By mobility status (mobile/non-mobile) - By gender - By age (≤ 40) - By sectoral mobility status
Additional information	- PhD holders - Field of science in Natural Sciences, Engineering, Technology - Mobile as student - Average score per answering option
Reference to MORE reporting	MORE IND Report

ANNEX 4 ADDITIONAL INFORMATION ON HEI SURVEY

- Additional information on indicators: MOB-ST1, MOB-ST2, MOB-ST7, MOB-ST9, MOB-FLOW1, MOB-FLOW2, MOB-FLOW4:

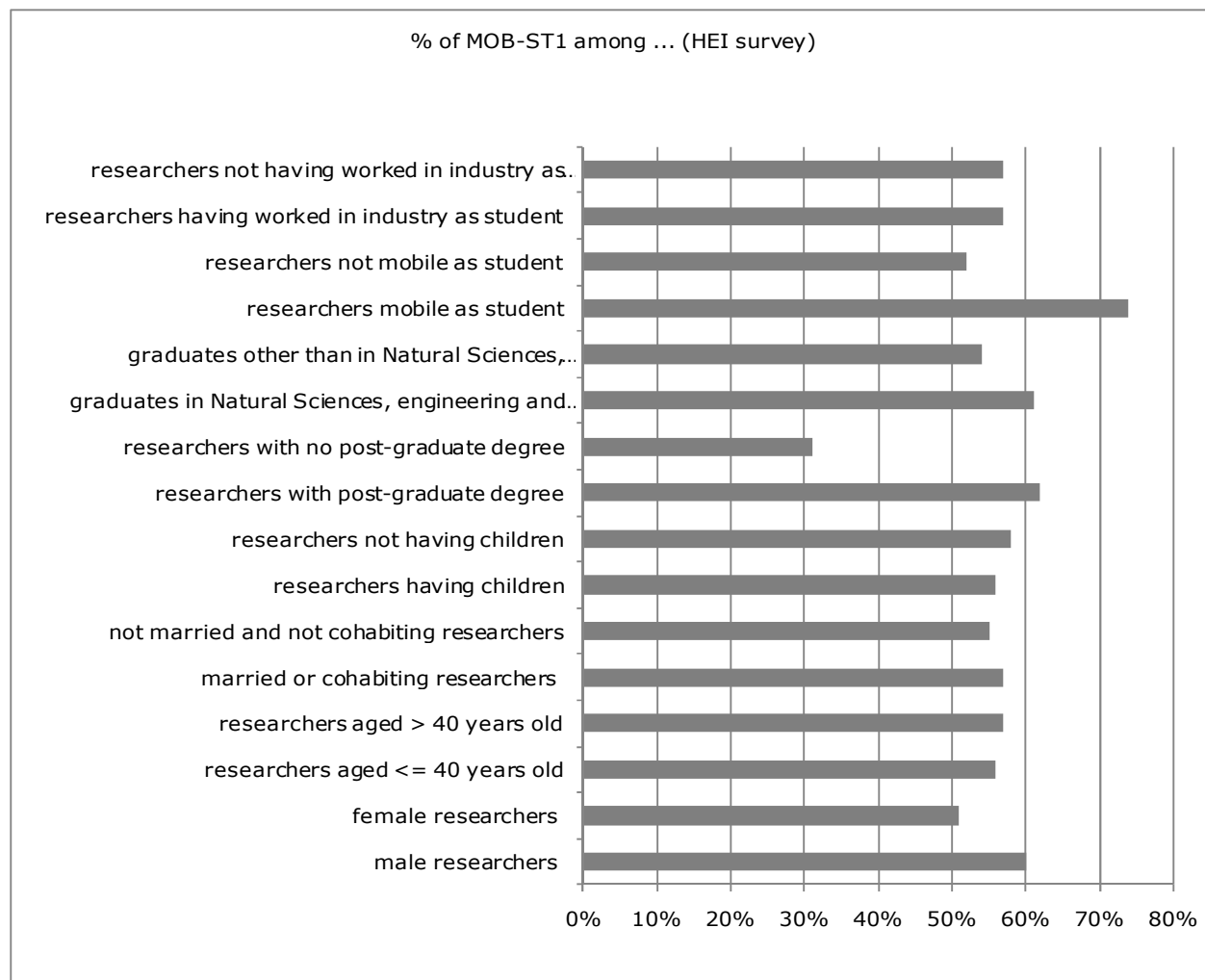
Indicator code	Additional percentages per indicator requested for the HEI survey															
MOB-ST1	Number and share of researchers who have worked for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree) graduation															
	% of MOB-ST1 among male researchers	% of MOB-ST1 among female researchers	% of MOB-ST1 among researchers aged ≤ 40 years old	% of MOB-ST1 among researchers aged > 40 years old	% of MOB-ST1 among married or cohabiting researchers	% of MOB-ST1 among not married and not cohabiting researchers	% of MOB-ST1 among researchers having children	% of MOB-ST1 among researchers not having children	% of MOB-ST1 among researchers with post-graduate degree	% of MOB-ST1 among researchers with no post-graduate degree	% of MOB-ST1 among graduates in Natural Sciences, engineering and technology	% of MOB-ST1 among graduates other than in Natural Sciences, engineering and technology	% of MOB-ST1 among researchers mobile as student	% of MOB-ST1 among researchers not mobile as student	% of MOB-ST1 among researchers having worked in industry as student	% of MOB-ST1 among researchers not having worked in industry as student
	60 %	51 %	56 %	57 %	57 %	55 %	56 %	58 %	62 %	31 %	61 %	54 %	74 %	52 %	57 %	57 %
MOB-ST2	Number and share of researchers who have worked in the last three years for at least 3 months in a country other than the country where they attained their highest educational degree after (highest-degree) graduation															
	% of MOB-ST2 among male researchers	% of MOB-ST2 among female researchers	% of MOB-ST2 among researchers aged ≤ 40 years old	% of MOB-ST2 among researchers aged > 40 years old	% of MOB-ST2 among married or cohabiting researchers	% of MOB-ST2 among not married and not cohabiting researchers	% of MOB-ST2 among researchers having children	% of MOB-ST2 among researchers not having children	% of MOB-ST2 among researchers with post-graduate degree	% of MOB-ST2 among researchers with no post-graduate degree	% of MOB-ST2 among graduates in Natural Sciences, engineering	% of MOB-ST2 among graduates other than in Natural Sciences,	% of MOB-ST2 among researchers mobile as student	% of MOB-ST2 among researchers not mobile as student	% of MOB-ST2 among researchers having worked in industry	% of MOB-ST7 among researchers not having worked in industry as student

						ers					and technol- ogy	engi- neering and technol- ogy			as stu- dent	
	31 %	28 %	38 %	24 %	28 %	35 %	24 %	38 %	31 %	21 %	29 %	30 %	45 %	25 %	33 %	28 %
MOB-ST7	Number and share of internationally mobile researchers having moved to a new employer in a different country															
	% of MOB-ST7 among male re- searchers	% of MOB-ST7 among female research ers	% of MOB-ST7 among research ers aged <= 40 years old	% of MOB-ST7 among research ers aged > 40 years old	% of MOB-ST7 among married or co- habiting research ers	% of MOB-ST7 among not married and not cohabit- ing research ers	% of MOB-ST7 among research ers having children	% of MOB-ST7 among research ers not having children	% of MOB-ST7 among research ers with post- gradu- ate degree	% of MOB-ST7 among research ers with no post- gradu- ate degree	% of MOB-ST7 among gradu- ates in Natural Sci- ences, engi- neering and technol- ogy	% of MOB-ST7 among gradu- ates other than in Natural Sci- ences, engi- neering and technol- ogy	% of MOB-ST7 among research ers mobile as stu- dent	% of MOB-ST7 among research ers not mobile as stu- dent	% of MOB-ST7 among research ers having worked in in- dustry as stu- dent	% of MOB-ST7 among researchers not having worked in industry as student
	31 %	24 %	30 %	27 %	28 %	28 %	27 %	30 %	32 %	12 %	35 %	23 %	36 %	26 %	29 %	28 %
MOB-ST9	Number and share of researchers having moved job at least once from one public research organisation to another															
	% of MOB-ST9 among male re- searchers	% of MOB-ST9 among female research ers	% of MOB-ST9 among research ers aged <= 40 years old	% of MOB-ST9 among research ers aged > 40 years old	% of MOB-ST9 among married or co- habiting research ers	% of MOB-ST9 among not married and not cohabit- ing research ers	% of MOB-ST9 among research ers having children	% of MOB-ST9 among research ers not having children	% of MOB-ST9 among research ers with post- gradu- ate degree	% of MOB-ST9 among research ers with no post- gradu- ate degree	% of MOB-ST9 among gradu- ates in Natural Sci- ences, engi- neering and technol- ogy	% of MOB-ST9 among gradu- ates other than in Natural Sci- ences, engi- neering and technol- ogy	% of MOB-ST9 among research ers mobile as stu- dent	% of MOB-ST9 among research ers not mobile as stu- dent	% of MOB-ST9 among research ers having worked in in- dustry as stu- dent	% of MOB-ST9 among researchers not having worked in industry as student

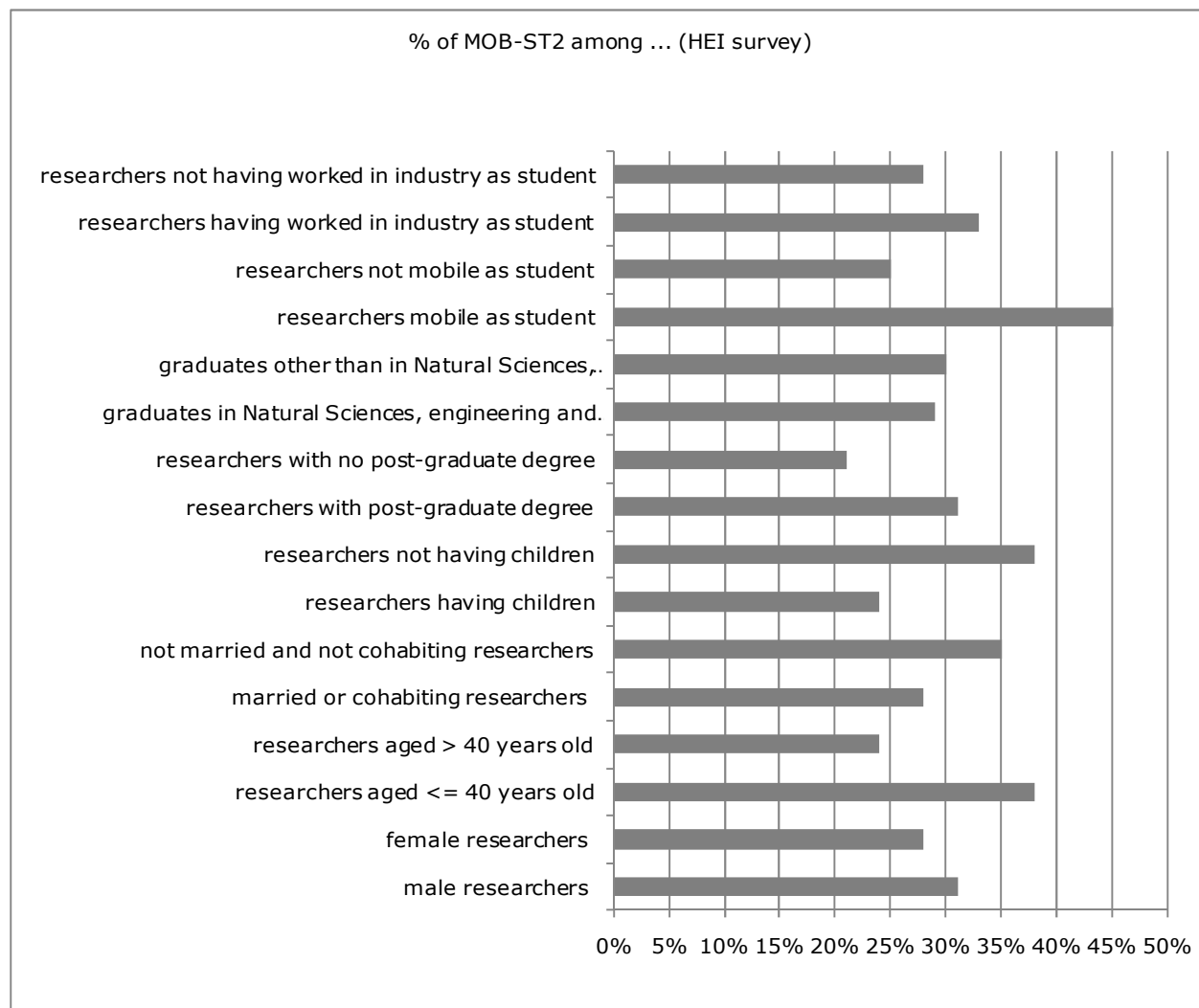
	63 %	54 %	54 %	63 %	61 %	54 %	61 %	57 %	65 %	33 %	59 %	60 %	62 %	59 %	60 %	59 %
MOB-FLOW1	Number of researchers who "have been employed as a researcher in both the public and the private sector"															
	% of MOB-FLOW1 among male researchers	% of MOB-FLOW1 among female researchers	% of MOB-FLOW1 among researchers aged <= 40 years old	% of MOB-FLOW1 among researchers aged > 40 years old	% of MOB-FLOW1 among married or cohabiting researchers	% of MOB-FLOW1 among not married and not cohabiting researchers	% of MOB-FLOW1 among researchers having children	% of MOB-FLOW1 among researchers not having children	% of MOB-FLOW1 among researchers with post-graduate degree	% of MOB-FLOW1 among researchers with no post-graduate degree	% of MOB-FLOW1 among graduates in Natural Sciences, engineering and technology	% of MOB-FLOW1 among graduates other than in Natural Sciences, engineering and technology	% of MOB-FLOW1 among researchers mobile as student	% of MOB-FLOW1 among researchers not mobile as student	% of MOB-FLOW1 among researchers having worked in industry as student	% of MOB-FLOW1 among researchers not having worked in industry as student
	17 %	13 %	14 %	17 %	17 %	13 %	17 %	14 %	16 %	16 %	17 %	15 %	19 %	15 %	27 %	12 %
MOB-FLOW2	Number of researchers whose "current work involves some form of formal collaboration with only academic researchers from another country"															
	% of MOB-FLOW2 among male researchers	% of MOB-FLOW2 among female researchers	% of MOB-FLOW2 among researchers aged <= 40 years old	% of MOB-FLOW2 among researchers aged > 40 years old	% of MOB-FLOW2 among married or cohabiting researchers	% of MOB-FLOW2 among not married and not cohabiting researchers	% of MOB-FLOW2 among researchers having children	% of MOB-FLOW2 among researchers not having children	% of MOB-FLOW2 among researchers with post-graduate degree	% of MOB-FLOW2 among researchers with no post-graduate degree	% of MOB-FLOW2 among graduates in Natural Sciences, engineering and technology	% of MOB-FLOW2 among graduates other than in Natural Sciences, engineering and technology	% of MOB-FLOW2 among researchers mobile as student	% of MOB-FLOW2 among researchers not mobile as student	% of MOB-FLOW2 among researchers having worked in industry as student	% of MOB-FLOW2 among researchers not having worked in industry as student
	40 %	42 %	39 %	42 %	42 %	39 %	42 %	40 %	43 %	32 %	35 %	46 %	44 %	40 %	38 %	42 %
MOB-FLOW4	Number of researchers whose "current work involves some form of formal collaboration with both academic and industry researchers from another country"															
	% of MOB-	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of	% of MOB-

	FLOW4 among male researchers	MOB-FLOW4 among female research searchers	MOB-FLOW4 among research searchers aged <= 40 years old	MOB-FLOW4 among research searchers aged > 40 years old	MOB-FLOW4 among married or cohabiting research searchers	MOB-FLOW4 among not married and not cohabiting research searchers	MOB-FLOW4 among research searchers having children	MOB-FLOW4 among research searchers not having children	MOB-FLOW4 among research searchers with post-graduate degree	MOB-FLOW4 among research searchers with no post-graduate degree	MOB-FLOW4 among graduates in Natural Sciences, engineering and technology	MOB-FLOW4 among graduates other than in Natural Sciences, engineering and technology	MOB-FLOW4 among research searchers mobile as student	MOB-FLOW4 among research searchers not mobile as student	MOB-FLOW4 among research searchers having worked in industry as student	FLOW4 among researchers not having worked in industry as student
	23 %	14 %	19 %	20 %	21 %	16 %	22 %	16 %	20 %	19 %	30 %	12 %	20 %	20 %	27 %	17 %

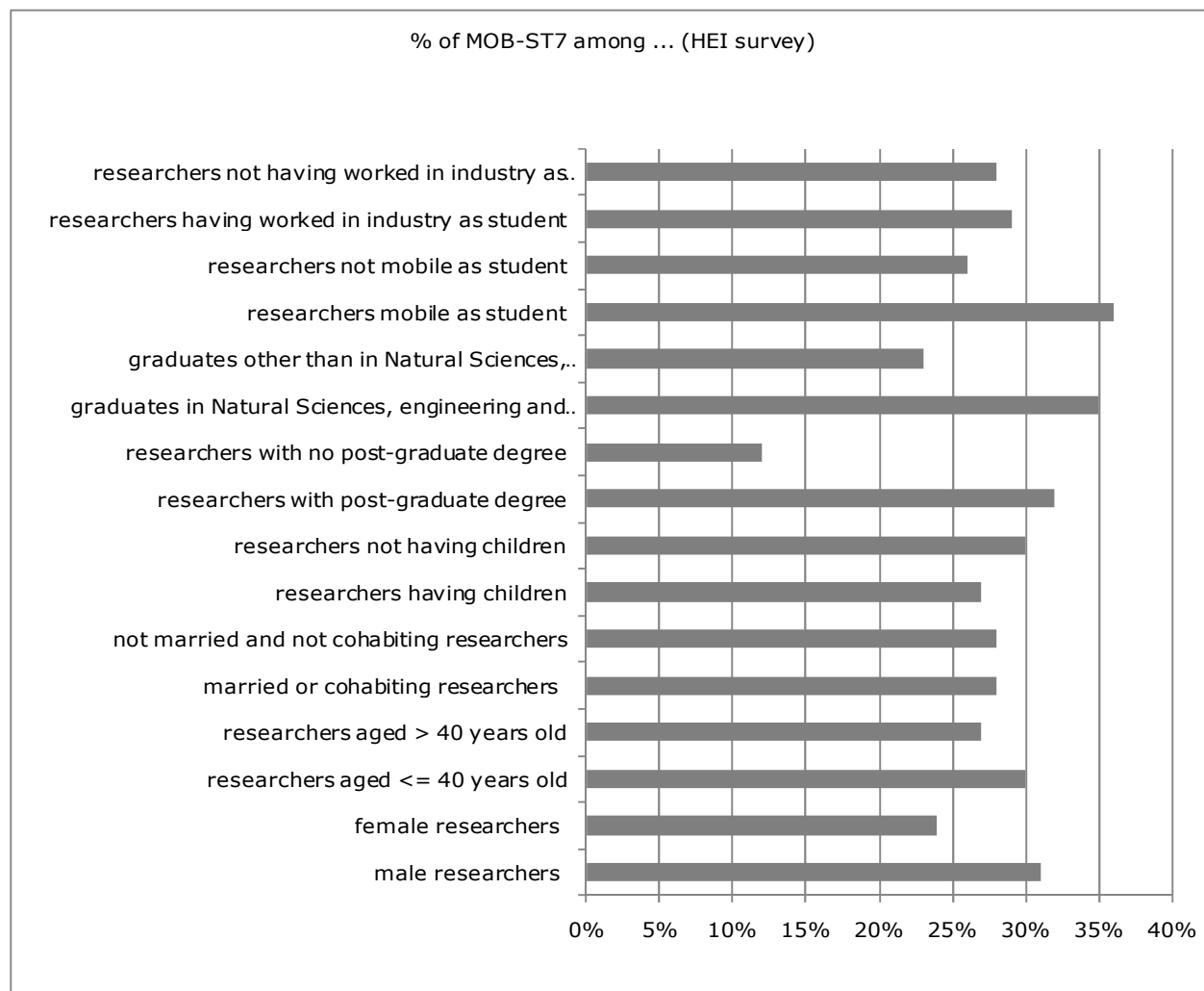
Source: MORE HEI survey



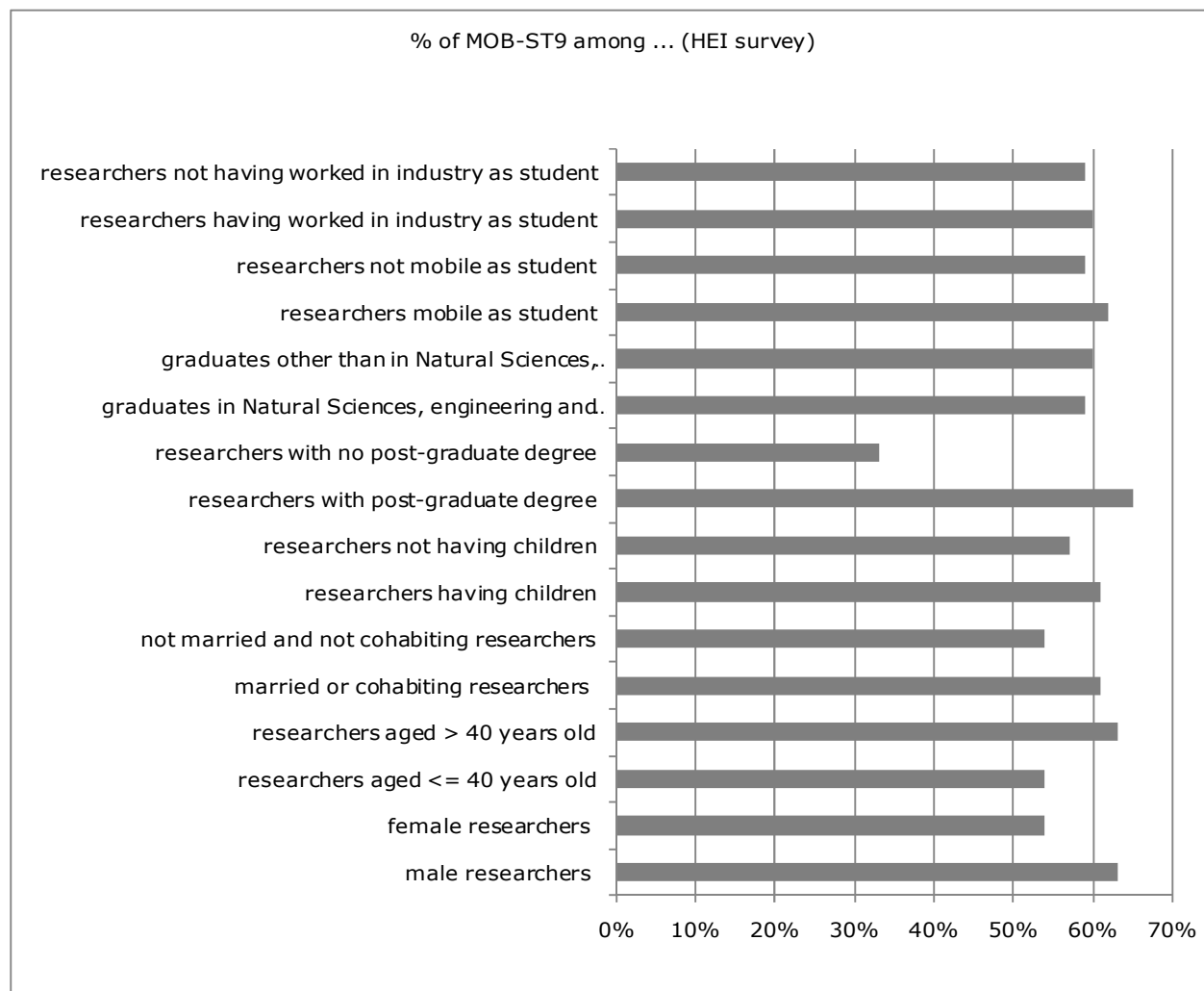
Source: MORE HEI survey



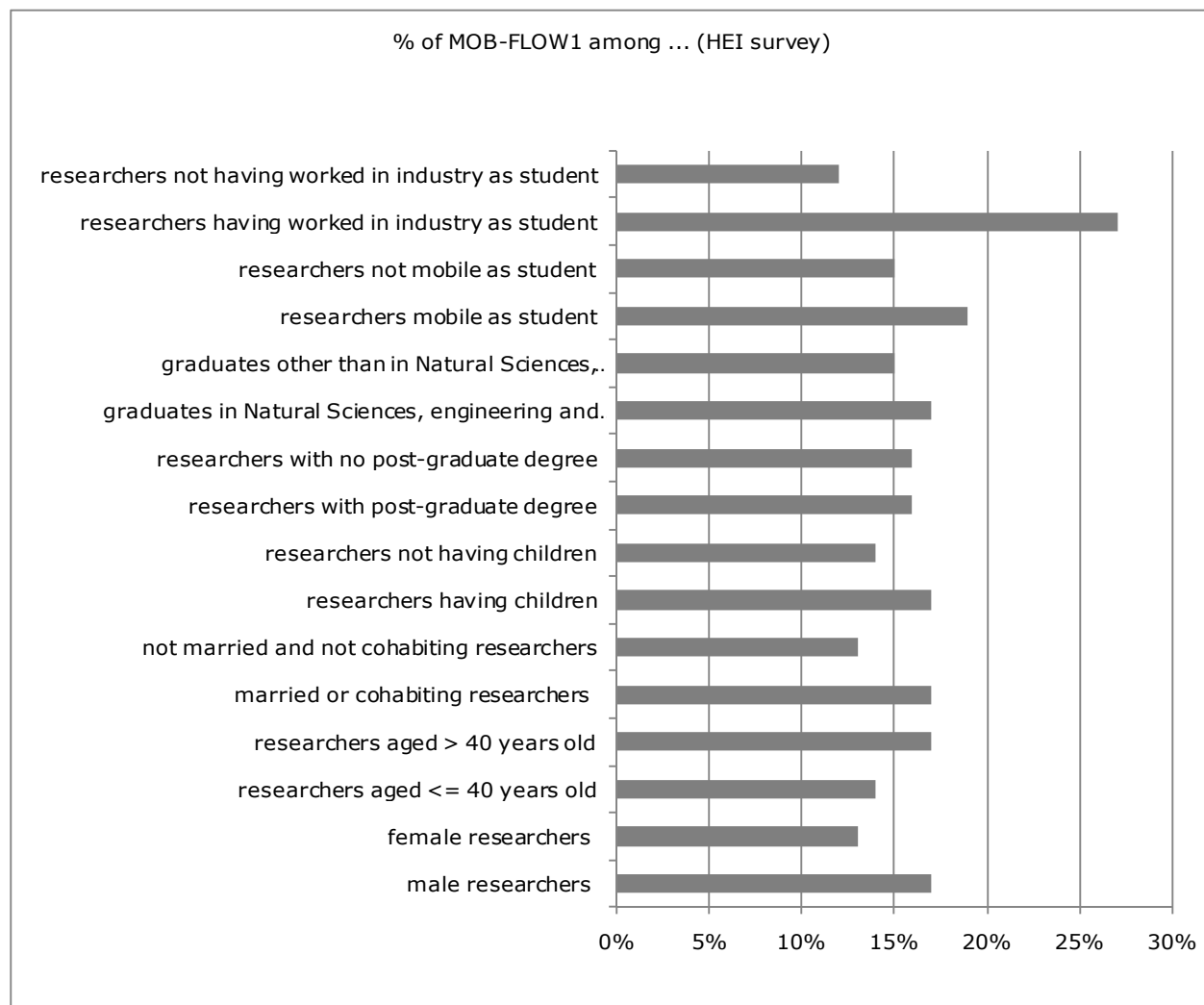
Source: MORE HEI survey



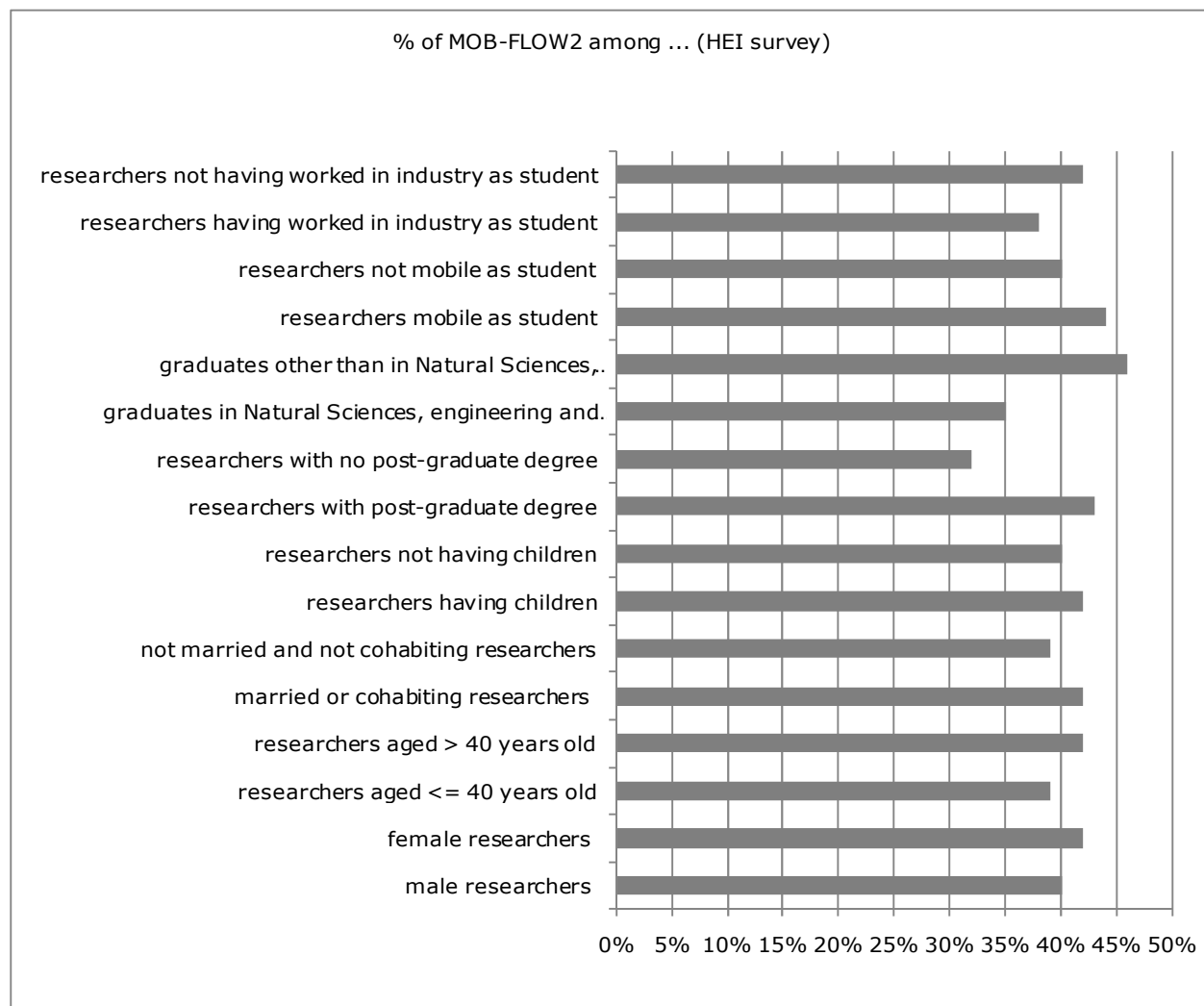
Source: MORE HEI survey



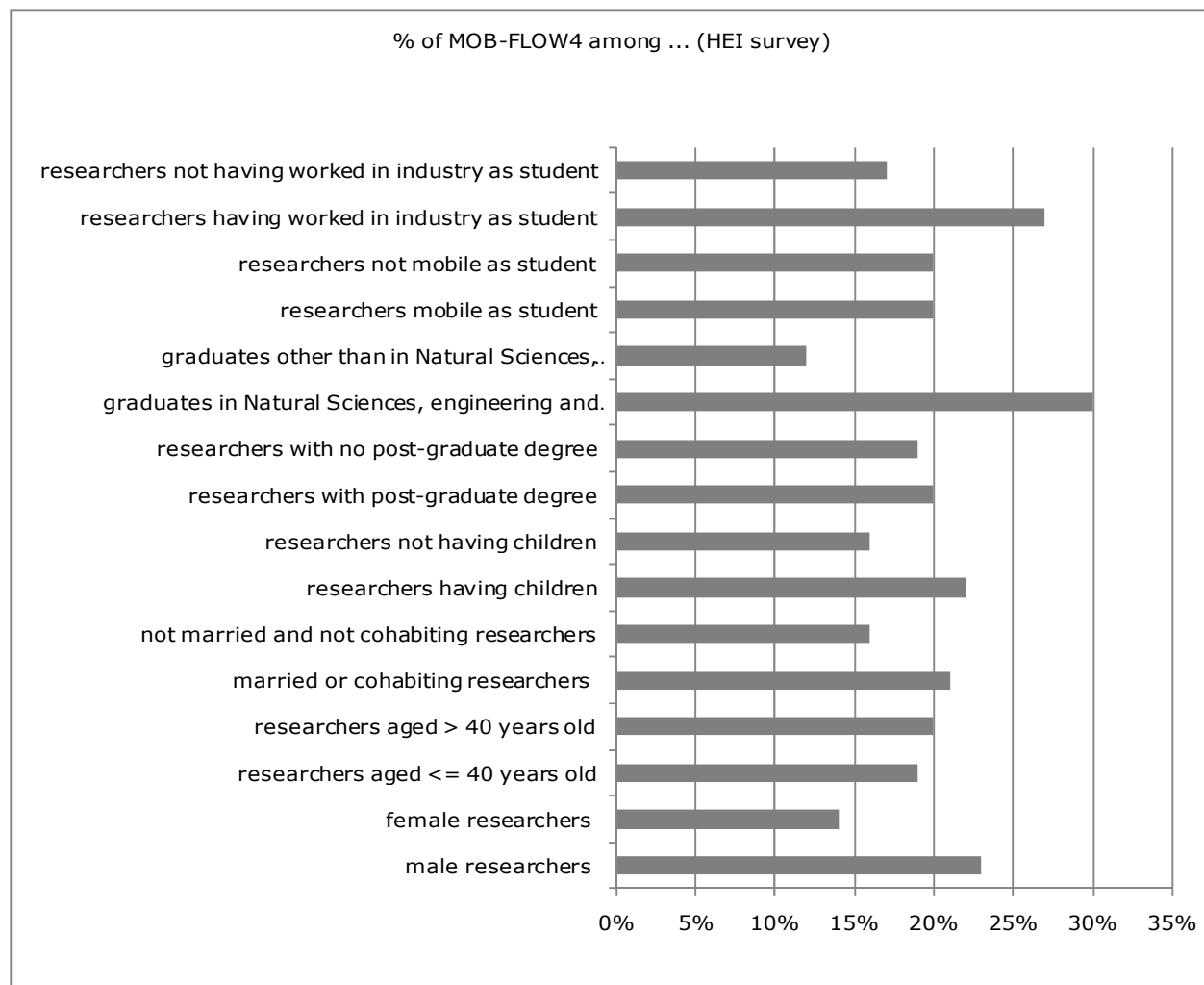
Source: MORE HEI survey



Source: MORE HEI survey



Source: MORE HEI survey



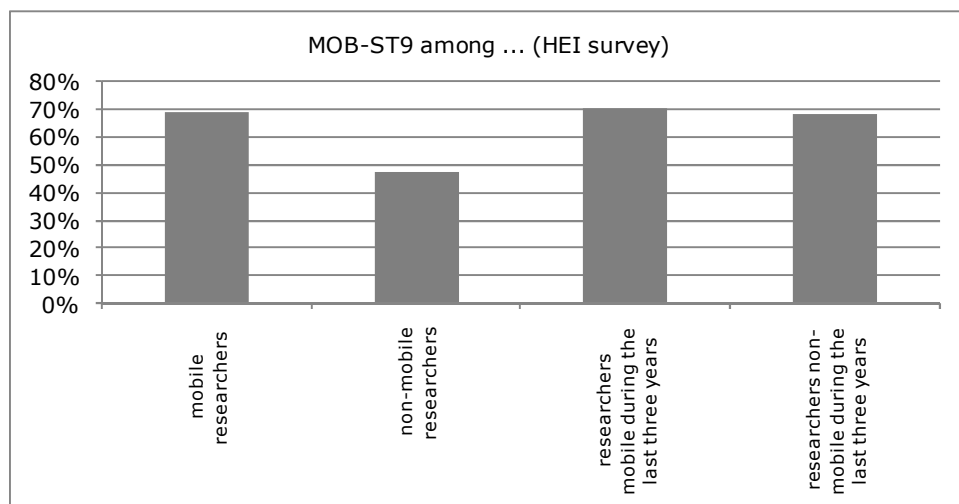
Source: MORE HEI survey

- **Additional information on indicators: MOB-ST1, MOB-ST2, MOB-ST7, MOB-ST9, MOB-FLOW1, MOB-FLOW2, MOB-FLOW4:**

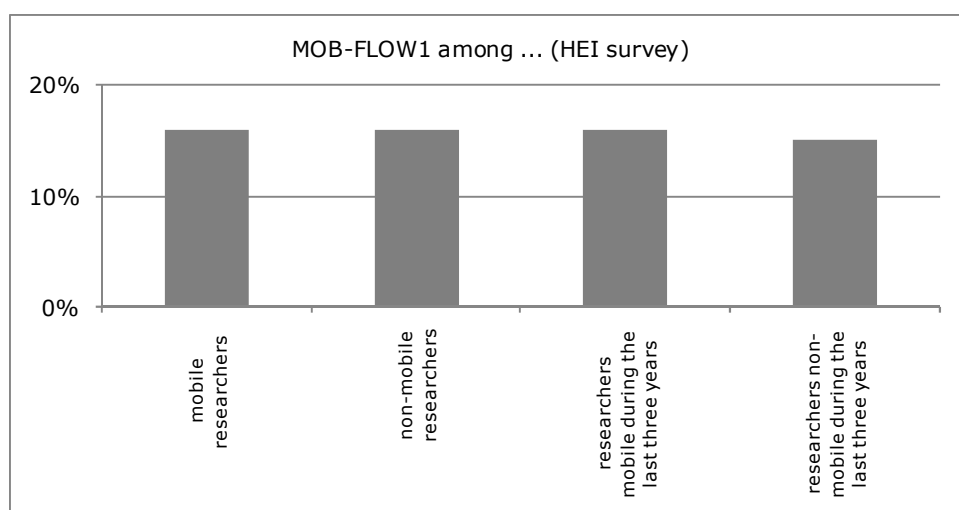
Indicator code	Additional percentages per indicator requested for the HEI survey			
MOB-ST9	Number and share of researchers having moved job at least once from one public research organisation to another			
	% of MOB-ST9 among mobile researchers	% of MOB-ST9 among non-mobile researchers	% of MOB-ST9 among researchers mobile during the last three years	% of MOB-ST9 among researchers non-mobile during the last three years
	69 %	47 %	70 %	68 %
MOB-FLOW1	Number of researchers who "have been employed as a researcher in both the public and the private sector"			
	% of MOB-FLOW1 among mobile researchers	% of MOB-FLOW1 among non-mobile researchers	% of MOB-FLOW1 among researchers mobile during the last three years	% of MOB-FLOW1 among researchers non-mobile during the last three years
	16 %	16 %	16 %	15 %
MOB-FLOW2	Number of researchers whose "current work involves some form of formal collaboration with only academic researchers from another country"			
	% of MOB-FLOW2 among mobile researchers	% of MOB-FLOW2 among non-mobile researchers	% of MOB-FLOW2 among researchers mobile during the last three years	% of MOB-FLOW2 among researchers non-mobile during the last three years
	44 %	36 %	48 %	40 %
MOB-FLOW4	Number of researchers whose "current work involves some form of formal collaboration with both academic and industry researchers from another country"			
	% of MOB-FLOW4 among mobile researchers	% of MOB-FLOW4 among non-mobile researchers	% of MOB-FLOW4 among researchers mobile during the last three years	% of MOB-FLOW4 among researchers non-mobile during the last three years
	21 %	18 %	19 %	23 %

Source: MORE HEI survey

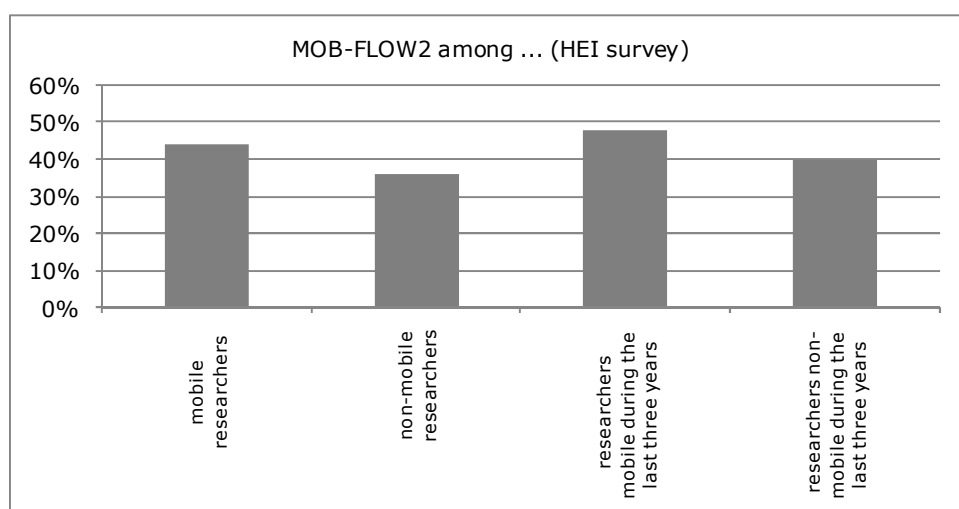
Note that indicator (1) "% among researchers non-mobile during the last three years" (fourth column) is calculated among all mobile researchers, in the same way as indicator (2) "% among researchers mobile during the last three years" (third column). Otherwise, indicators (1) and (2) are not comparable. Therefore: "Researchers non-mobile during the last three years" are mobile researchers, but non-mobile researchers during the last three years.



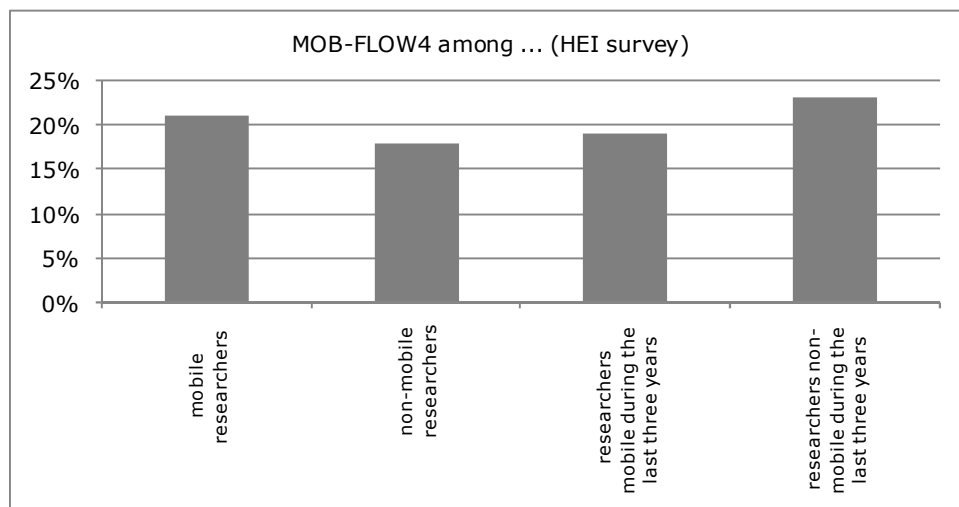
Source: MORE HEI survey



Source: MORE HEI survey



Source: MORE HEI survey

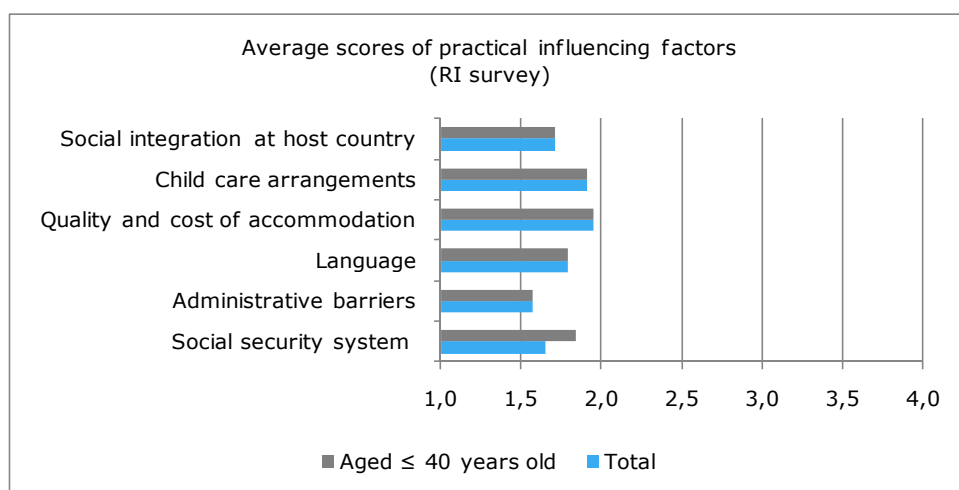


Source: MORE HEI survey

ANNEX 5 ADDITIONAL INFORMATION ON CHAPTERS 9 AND 10

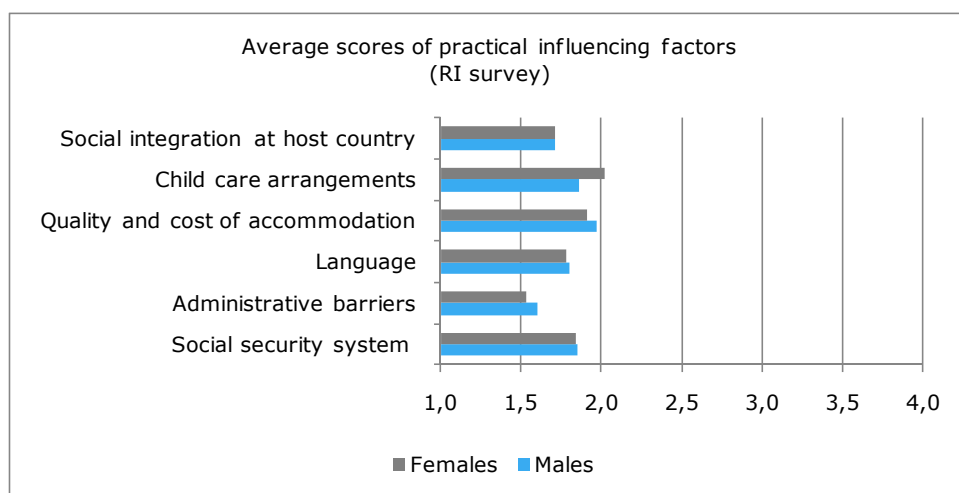
- **Additional figures on practical influencing factors for the RI and the Extra-EU surveys**

Figure 12-1: Practical influencing factors, total and young researchers (RI survey)



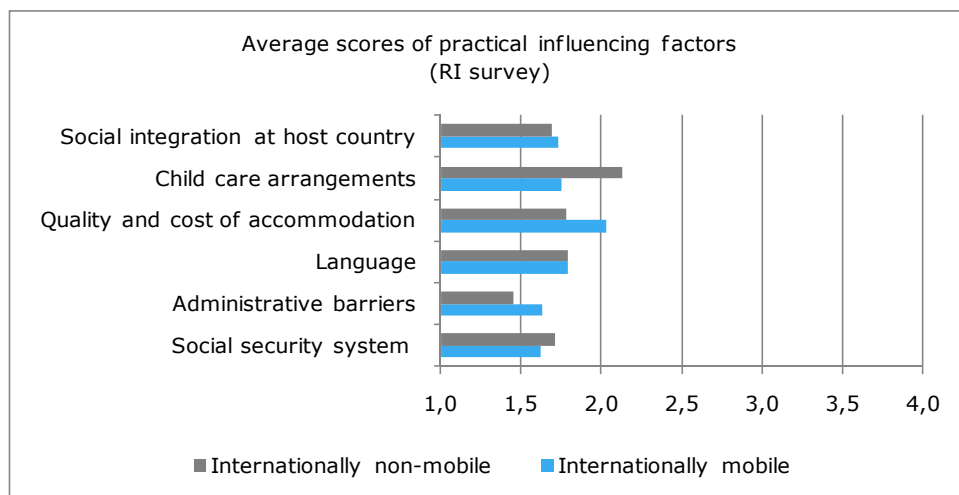
Source: MORE RI survey

Figure 12-2: Practical influencing factors, male and female researchers (RI survey)



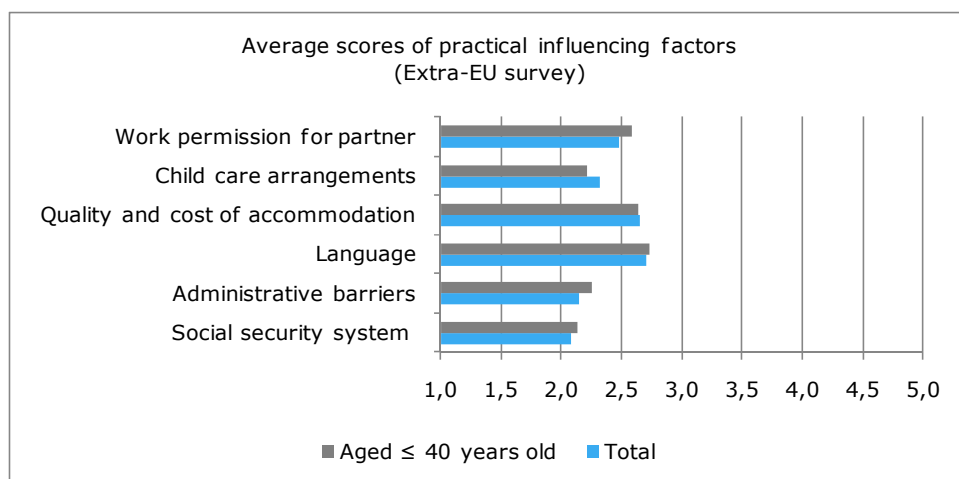
Source: MORE RI survey

Figure 12-3: Practical influencing factors, mobile and non-mobile researchers (RI survey)



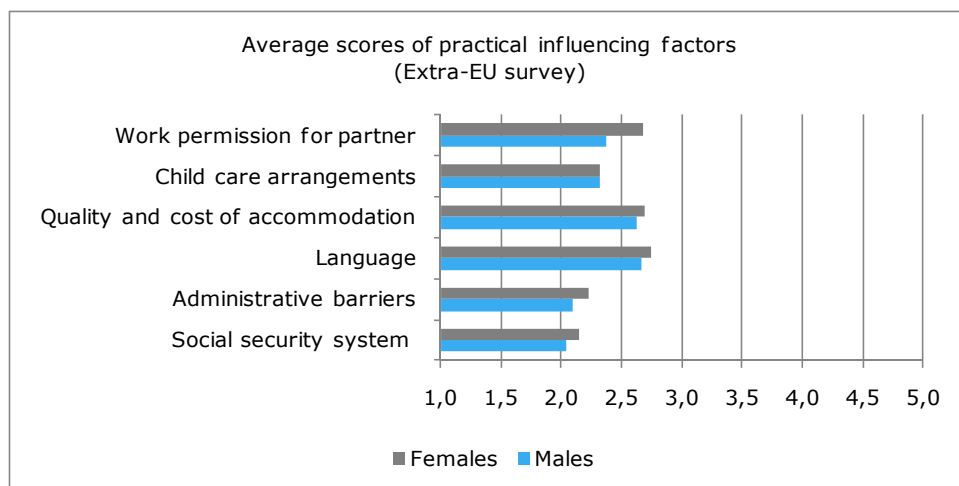
Source: MORE RI survey

Figure 12-4: Practical influencing factors, total and young researchers (Extra-EU survey)



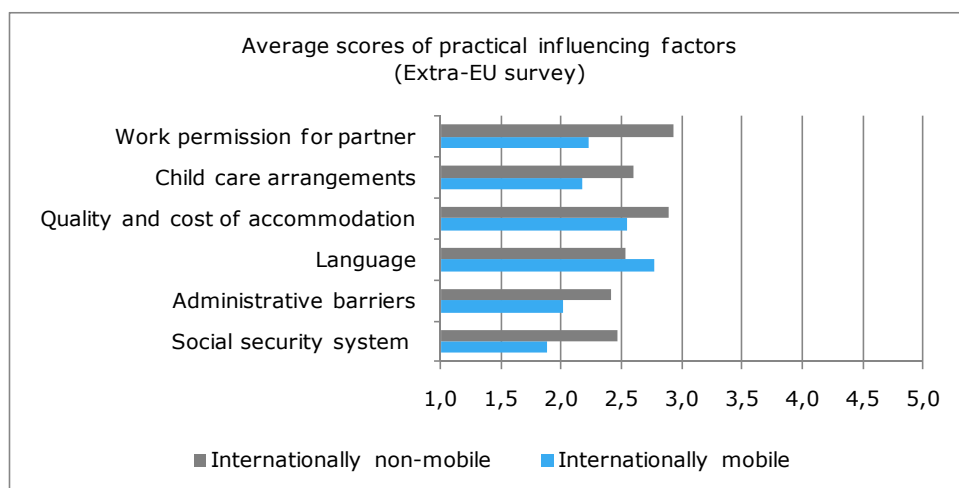
Source: MORE Extra-EU survey

Figure 12-5: Practical influencing factors, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

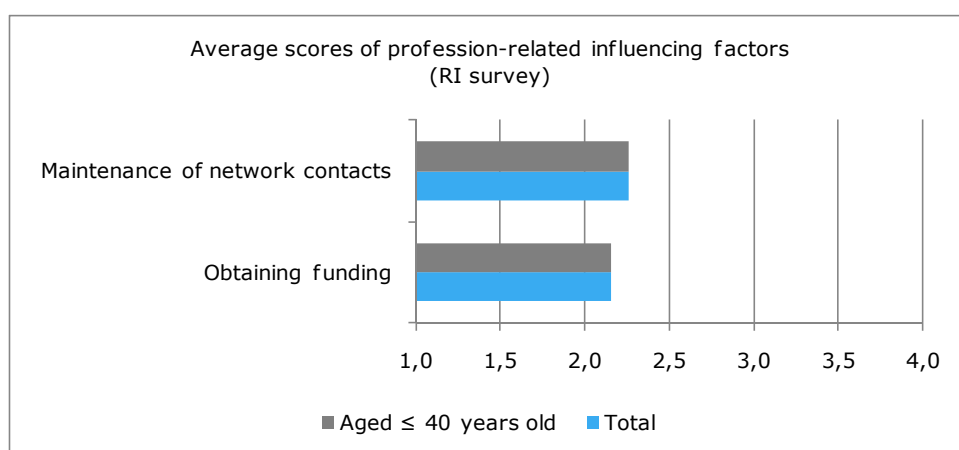
Figure 12-6: Practical influencing factors, mobile and non-mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

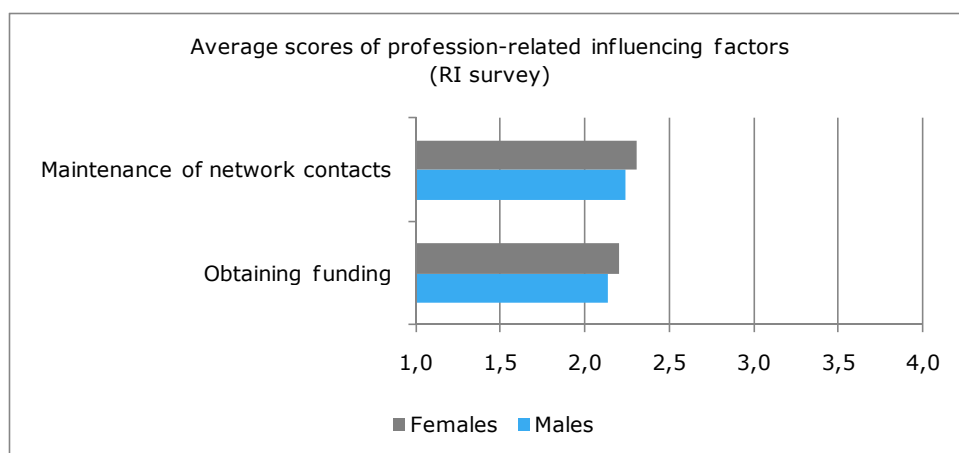
- **Additional figures on profession-related factors for the RI and the Extra-EU surveys**

Figure 12-7: Profession-related factors, total and young researchers (RI survey)



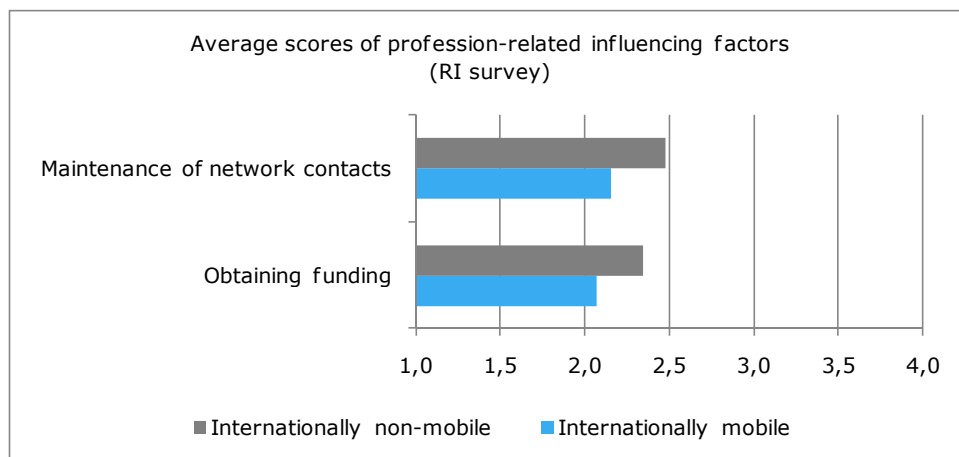
Source: MORE RI survey

Figure 12-8: Profession-related factors, male and female researchers (RI survey)



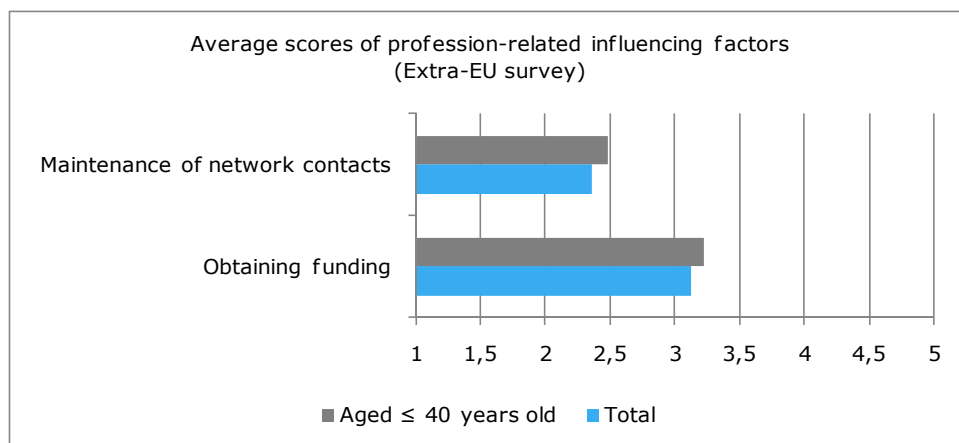
Source: MORE RI survey

Figure 12-9: Profession-related factors, mobile and non-mobile researchers (RI survey)



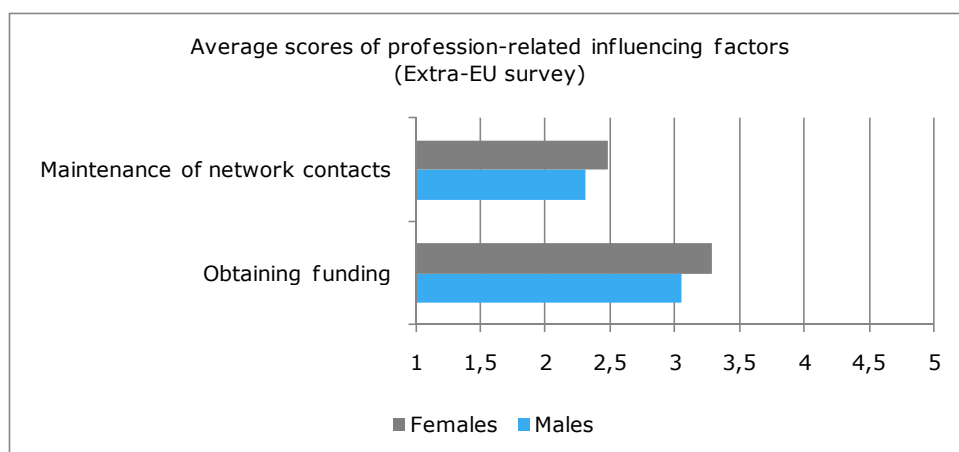
Source: MORE RI survey

Figure 12-10: Profession-related factors, total and young researchers (Extra-EU survey)



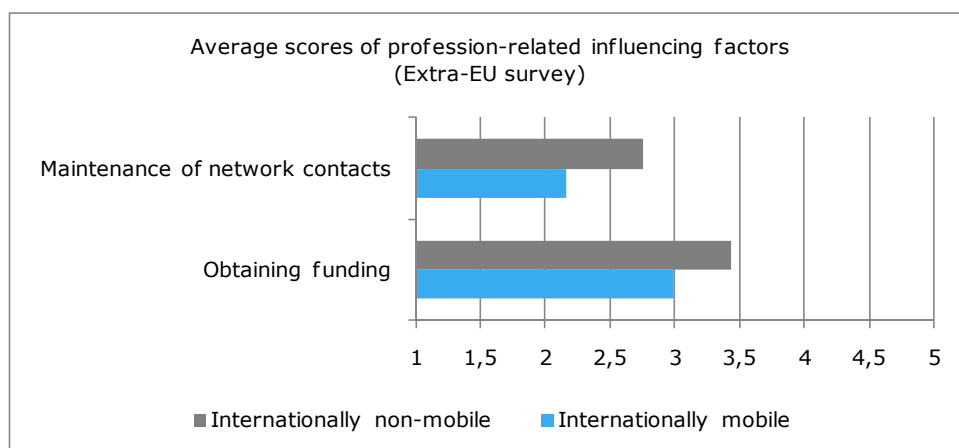
Source: MORE Extra-EU survey

Figure 12-11: Profession-related factors, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

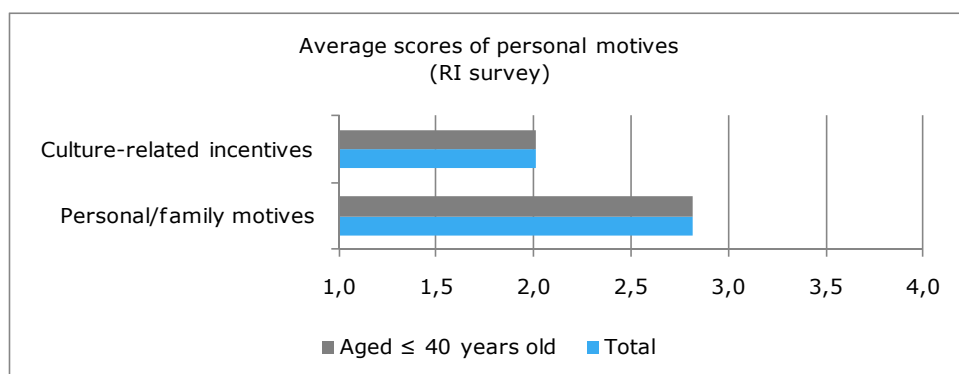
Figure 12-12: Profession-related factors, mobile and non-mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

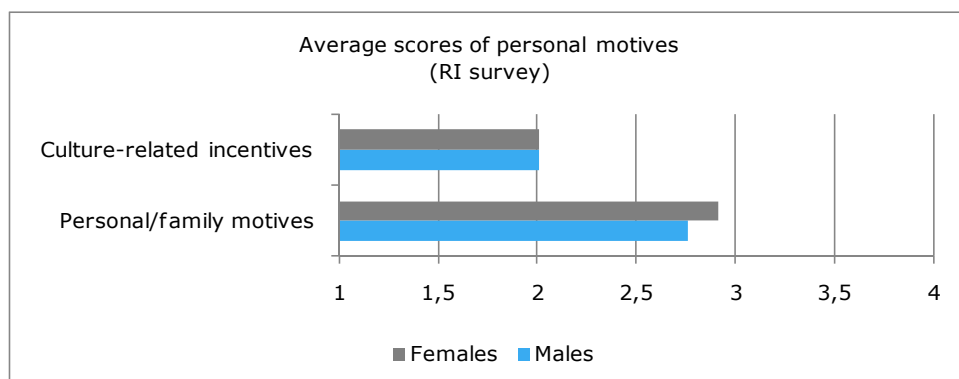
- **Additional figures on personal motives of mobility for the RI and the Extra-EU surveys**

Figure 12-13: Personal motives of mobility, total and young researchers (RI survey)



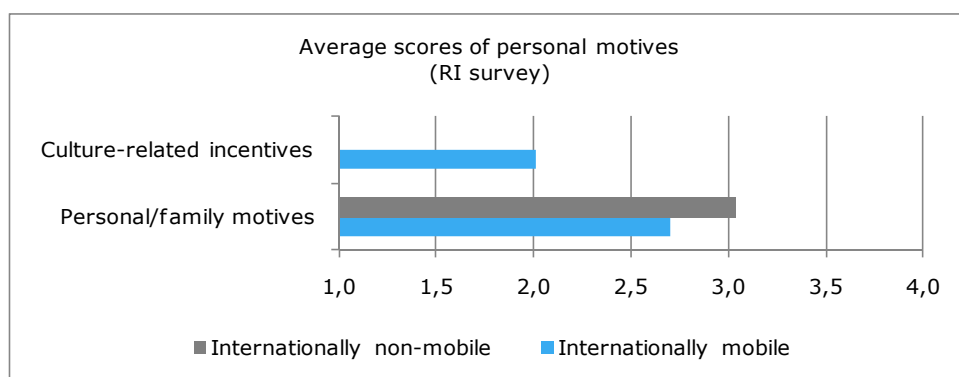
Source: MORE RI survey

Figure 12-14: Personal motives of mobility, male and female researchers (RI survey)



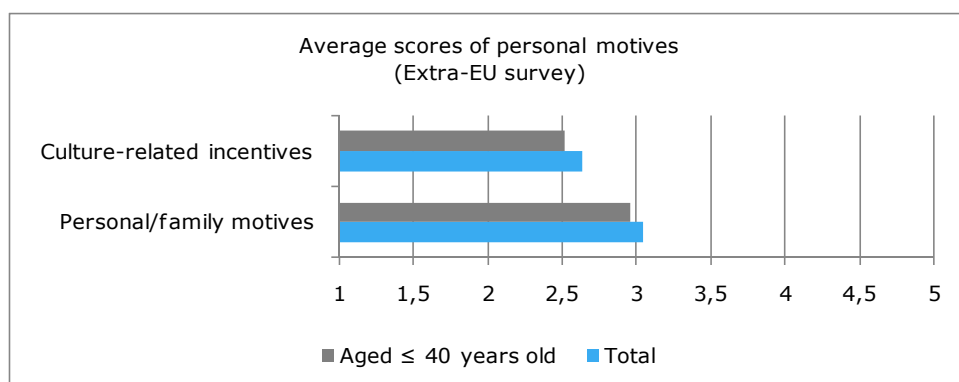
Source: MORE RI survey

Figure 12-15: Personal motives of mobility, mobile and non-mobile researchers (RI survey)



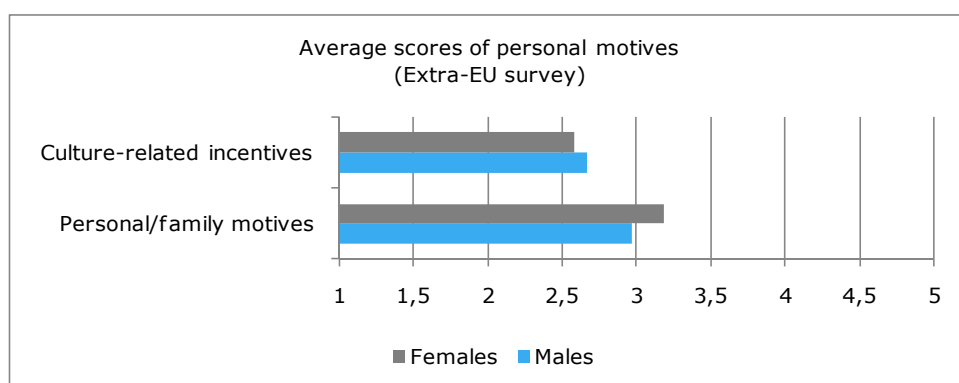
Source: MORE RI survey

Figure 12-16: Personal motives of mobility, total and young researchers (Extra-EU survey)



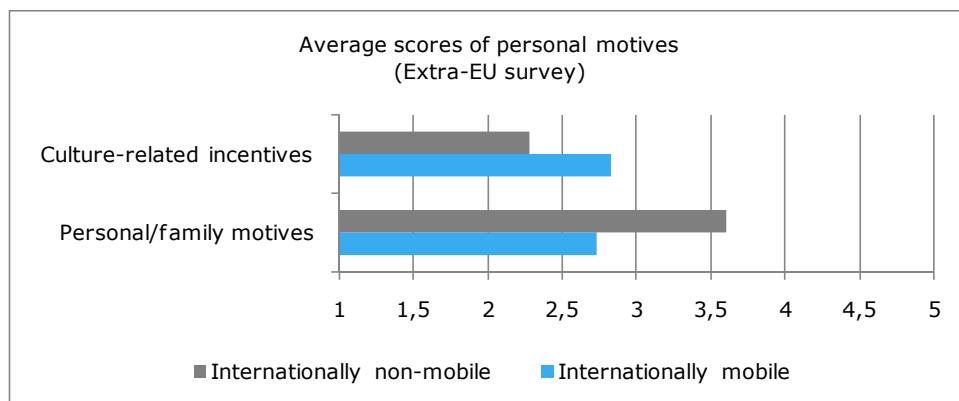
Source: MORE Extra-EU survey

Figure 12-17: Personal motives of mobility, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

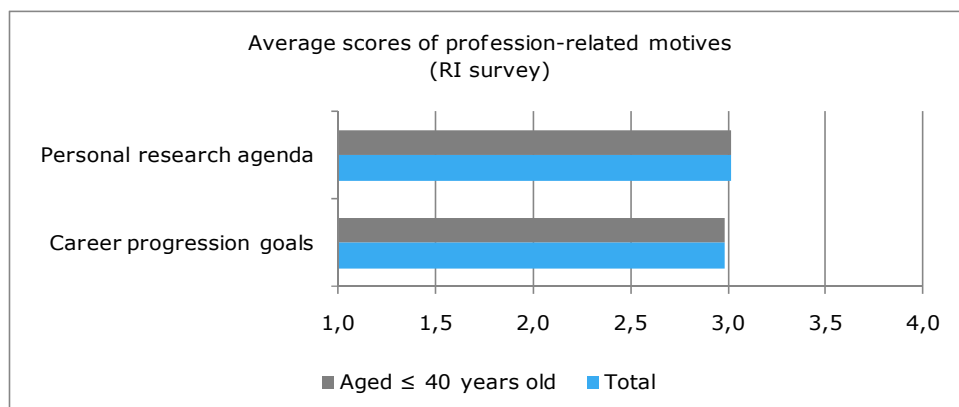
Figure 12-18: Personal motives of mobility, mobile and non-mobile researchers (Extra-EU survey)



Source: MORE Extra-EU survey

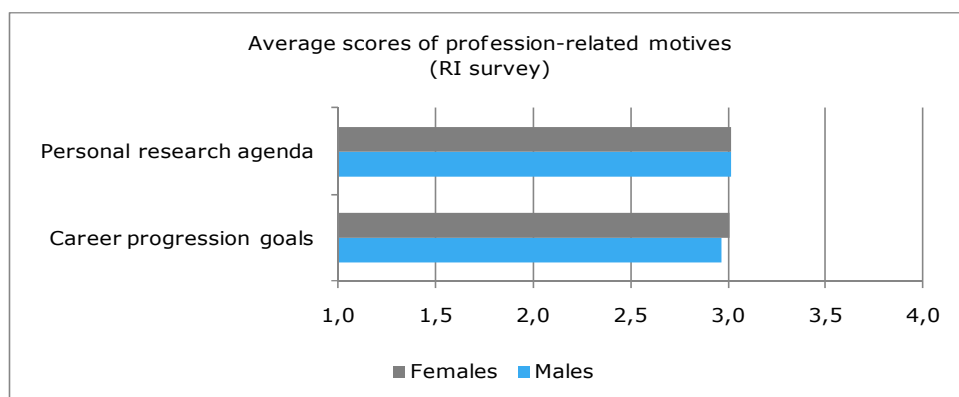
- **Additional figures on Profession-related motives of mobility for the RI and the Extra-EU surveys**

Figure 12-19: Profession-related motives of mobility, total and young researchers (RI survey)



Source: MORE RI survey

Figure 12-20: Profession-related motives of mobility, male and female researchers (RI survey)



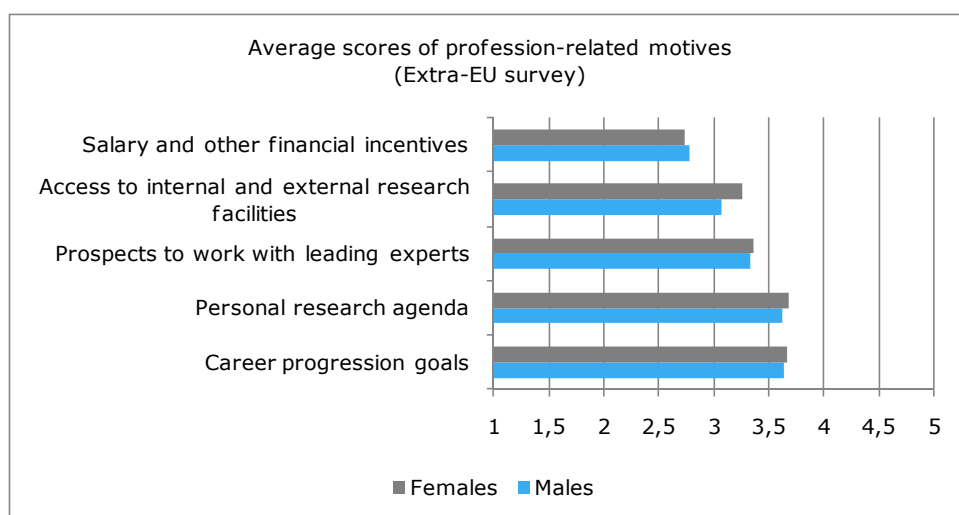
Source: MORE RI survey

Figure 12-21: Profession-related motives of mobility, total and young researchers (Extra-EU survey)



Source: MORE Extra-EU survey

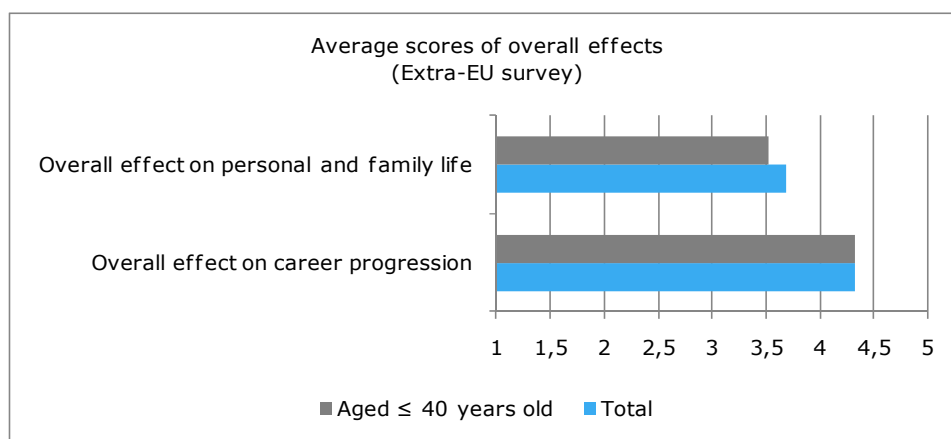
Figure 12-22: Profession-related motives of mobility, male and female researchers (Extra-EU survey)



Source: MORE Extra-EU survey

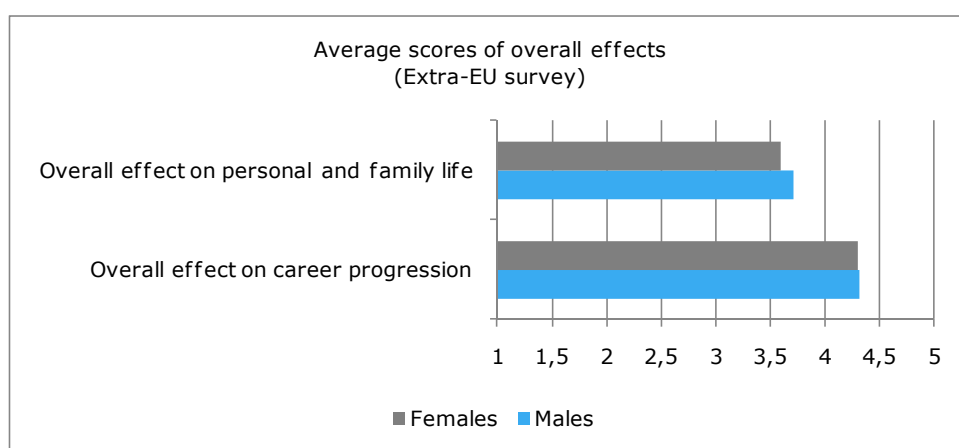
- **Additional figures on general effects of mobility for the Extra-EU survey**

Figure 12-23: Overall effects of mobility, total and young researchers (Extra-EU survey)



Source: MORE Extra-EU survey

Figure 12-24: Overall effects of mobility, male and female researchers (Extra-EU survey)

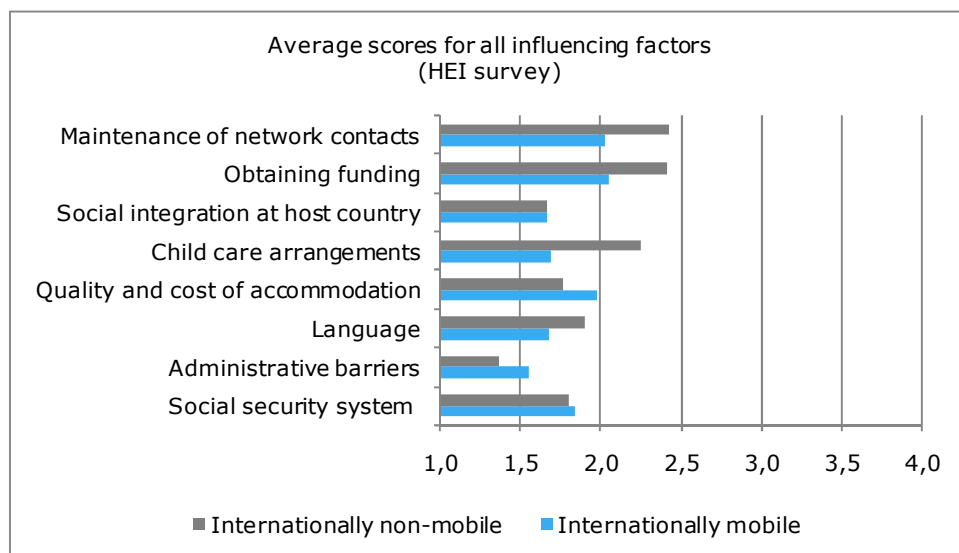


Source: MORE Extra-EU survey

ANNEX 6 SUMMARY GRAPHS ON INFLUENCING FACTORS AND MOTIVATIONS PER SURVEY

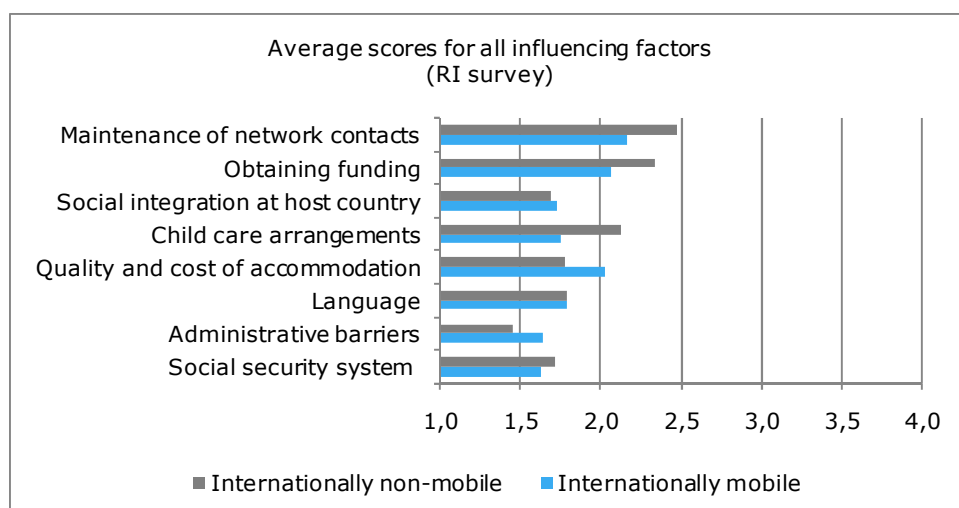
Influencing factors of geographical mobility

- HEI survey



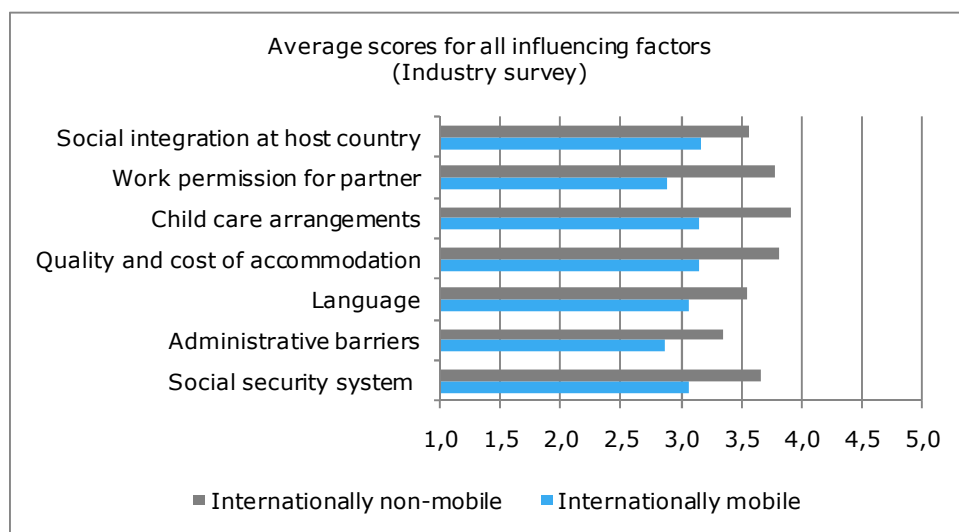
Source: MORE HEI survey

- RI survey



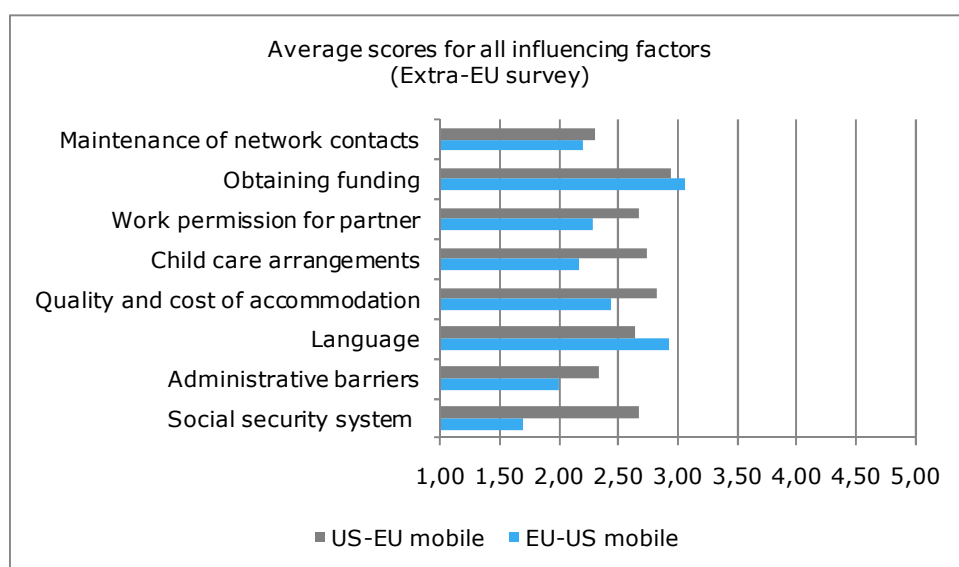
Source: MORE RI survey

- **Industry survey**



Source: MORE Industry survey

- **Extra-EU survey**



Source: MORE Extra-EU survey

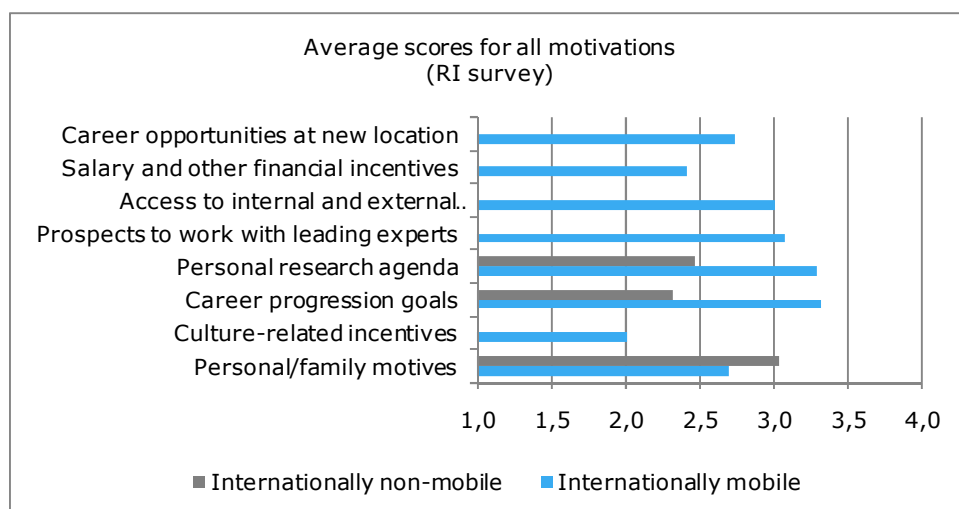
Motivations for geographical mobility

- HEI survey



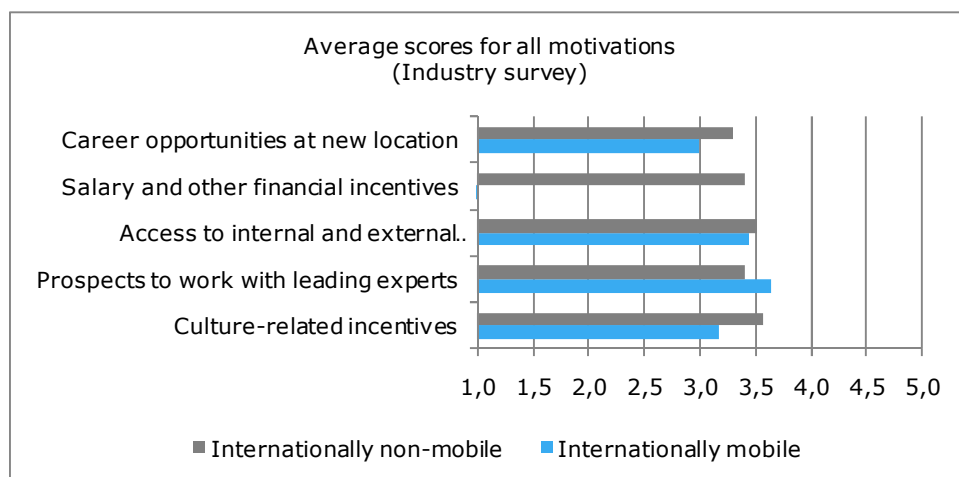
Source: MORE HEI survey

- RI survey



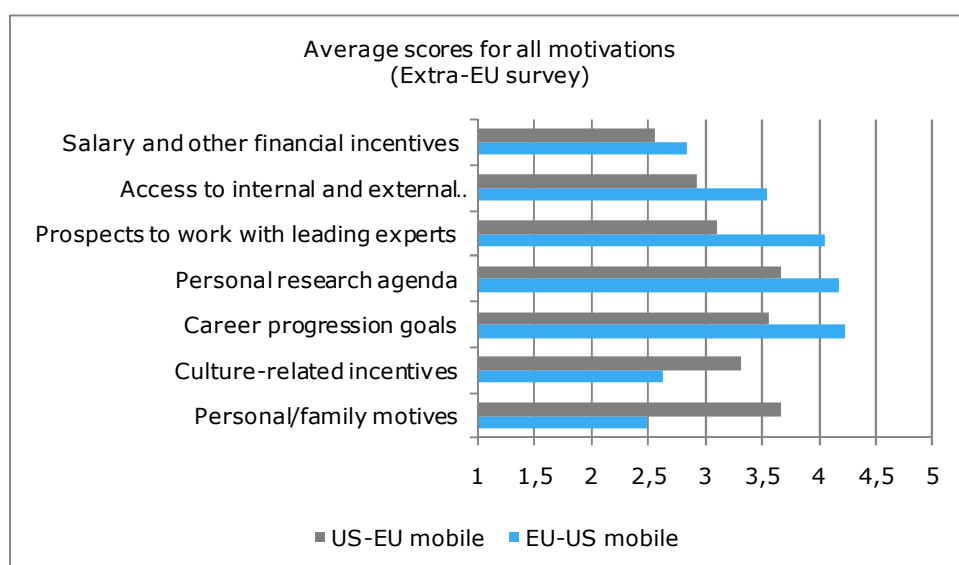
Source: MORE RI survey

- **Industry survey**



Source: MORE Industry survey

- **Extra-EU survey**



Source: MORE Extra-EU survey