Study on mobility patterns and career paths of EU researchers

FINAL TECHNICAL REPORT 3: Extra-EU mobility pilot study

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IDEA Consult

in consortium with:
- **NIFU STEP**
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- **The University of Manchester**

and its subcontractors:
- **Management Center Innsbruck (MCI)**
- **MRB Hellas**

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EXECUTIVE SUMMARY

Mobility of high-skilled employees between the EU and the USA is a topic that is high on the agenda of policymakers in Europe where worries about skill shortage are growing. The share of European countries' working age population that emigrate is found to be increasing while return migration is decreasing (Tritah, 2008). Moreover, Tritah (2008) shows that the quality of the migrants is changing too: there is an increasing concentration in occupations that are crucial in a knowledge-based economy, namely engineers, researchers and university instructors, leading to an increase in the share of US-based European researchers. This EU-US mobility is mainly one-directional, where the EU is a net provider of human resources to the US. This "brain drain" is observed at all levels of research, PhD students, postdoctoral researchers and other academic and industry research personnel (ERAWATCH, 2007). Kannankutty and Burrelli (2007) indicate that out of the 3.35 million immigrant scientists and engineers in the US in 2003, 19 percent were born in Europe. In 2005-06, 29% of the total number of foreign scholars in the US came from the EU-27 (IPTS, 2007).

Giannoccolo (2005) argues that the EU brain drain has to be reversed in order to reach the necessary extra investment in research personnel, a key input factor in the knowledge-based economy. Many countries in Europe have already developed measures to encourage researchers to remain in or to return to their country of origin but the effect of these policies remains unclear (Laudel, 2005). Understanding the motivations and facilitating/hampering factors underlying the phenomenon is an important input in the formulation of policies to attract researchers (back) to Europe. Moguérou (2006) lists some caveats that have to be taken into account when discussing the brain drain problem. He argues that a correct conclusion on the brain drain problem cannot be made until issues like return migration of European PhDs, the net balances of brain gain and brain loss in relation to the stock of PhDs, and the quality of the PhDs who circulate are looked into properly.

The extra-EU study tries to contribute to this discussion by investigating what is driving EU researchers to the US and what is the reason for their return or no return to Europe.

Evidence from the National Survey of College Graduates (NSCG)

The focus in the NSCG lies on the mobility of EU researchers to the US, their stay rates and influencing factors. Even though the groups of researchers targeted by this survey are not considered representative groups, the findings of this US-based survey can provide a general picture which can be compared to the findings of the current extra-EU survey on mobility of researchers.

The 2003 NSCG was drawn from those residing in the United States on October 1, 2003 or residing abroad as U.S. military personnel. A major drawback which has to be taken into account is that the base sample of the NSCG is only refreshed once every ten-years, resulting in gaps in our knowledge of how the workforce is changing over the decade between the decennial censuses. Therefore, we are likely to undercount for example the number of scientists and engineers who are in the United States on temporary visas.

The focus for this report has been on recent adult migrants in the U.S who had been trained in S&E fields and had emigrated, on initial visas for a period of six months or longer, to the U.S. as adults since 1989, and who were now employed in S&E occupations. This is called the 'recent cohort' of adult migrants (representing over 50% of all adult migrants educated in S&E and employed in S&E occupations in 2003) trained in S&E fields and occupied in S&E fields in 2003 to which this exercise for the purposes of this report has been based.

For the recent cohort of EU27 migrants, the top three "first most important" reasons for coming to the U.S. were: (1) job or economic opportunities, (2) educational opportunities, and (3) the scientific or professional infrastructure. The same reasons were mentioned as the "second most important reasons" for moving to the US.

We also found that EU27 migrants tend to be employed less often than migrants from other countries in the business/industry sector, but more often in the higher education, government and other education sectors. Related to this, we found that EU27 migrants were overrepresented relative to recent migrants from other countries in terms of devoting time towards performing basic research, applied research and "other" work activities. On the other hand, EU27 migrants spend less time than other migrants doing development, design or computer applications.

Evidence from the Extra-EU survey

Design of the survey and target groups

The study on the extra-EU mobility has two main target groups and two additional ones:

- Group M1 (EU-US mobile): EU researchers (researchers who have received their highest degree in the EU) and have worked or are currently working in the US.
- Group M2 (US-EU mobile): US researchers (researchers who have received their highest degree in the US) and have worked or are currently working in the EU.
- Group M3: Researchers who have been mobile after receiving highest degree but do not belong to any of the two groups mentioned before.
- Group M4: Researchers who have not been mobile after receiving highest degree.

For all four groups the total population of researchers is unknown, resulting not only in the fact that the survey is not representative but also, that we had to rely on convenience sampling in order to approach researchers who could potentially belong to one of these groups. Web-based search and indirect sampling methods were used to reach the target groups. This indicates that the survey sample is not a statistically representative one and as such the conclusions that can be derived from the survey cannot be generalized to the underlying researchers' population. Consequently, it is recommended that no indicators are not 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 sur-

vey covers a relatively large sample of around 5 500 researchers, therefore the results and findings, though not representative of the underlying population, provide a very useful 'picture' of the characteristics and opinions of the researchers who have been or not mobile between the EU and US as well as among other regions.

The main results from the EU-US mobility survey

(1) General characteristics

The socio-demographic characteristics of the respondents show that are the following:

- 56 percent of the 5544 respondents reside in the EU, 30 percent in the US and 14 percent in other countries.
- 867 respondents belong to the EU-US mobility group (M1); 321 to the US-EU mobility group (M2); 2429 to the 'other' mobility group (M3) and 1927 to the non-mobile group (M4).
- A larger part of the respondents are men (53%) and a majority (74%) of the respondents are married or co-habiting.
- More than half of the respondents (52%) obtained their highest educational attainment in the past ten years.
- Most of the respondents (86%) hold a PhD.
- Nearly one third has been mobile as a student and 29 percent has worked in industry as a student.

With respect to the respondents' employment situation and their career path, we found that:

- 15 percent are currently PhD-researchers while 42 percent are post-doctoral researchers.
- Nearly half of the respondents (45%) are involved in some form of formal collaboration with academic researchers from other countries.
- Regarding the future prospects of their career, it appears that EU-residents are in general confident but to a lesser extent than non-EU-resident researchers.
- 85% of the researchers are working in the public sector and most of them have always been in that sector (75%). This is expected since the web-based sampling mainly targeted researchers working in this sector.
- The respondents are quite mobile with respect to both employers and countries: around half of the researchers have worked for two to three employers since graduation with a lower percentage for the non-mobile group suggesting that employer- and geographical mobility go hand in hand.

(2) Experience of mobility

(2.a) Motivations for mobility

The motivations for becoming mobile (or non-mobile) can be grouped in two large parts, namely personal and professional motivations. The top-three motivations

were clearly professional: personal education and research agenda, career progression goals and prospects to work with leading experts ("star scientists").

A striking finding was that the survey results indicate that researchers who are/have been mobile from the EU to the US have stronger professional motivations to move to the US than those who move in the other direction, while researchers who move from the US to the EU have stronger personal/cultural motivations than those moving from the EU to the US. This implies that EU-based researchers have higher incentives to move to the US in order to fulfil their professional ambitions than their US-based colleagues moving to the EU.

For researchers who do not become mobile professional factors are not the driving force for their decision not to move abroad but personal reasons appear more important in dissuading a researcher to move to another country for work. It seems therefore that professional motives tend to drive mobility while personal motives drive non-mobility.

(2.b) Influencing factors of mobility

Next, we examined the factors that influence the researchers' decision to become mobile; for those who have considered mobility these external factors may play an important role in the decision to actually move. The external factors that were considered are of practical (e.g. social care provisions, immigration regulations or work permission for family members) and of research-related nature (obtaining funding for own research and potential loss with professional network at the location where one previously worked).

It was clear that these factors seem to play a minor role in the decision to become mobile. The key factor appeared to be obtaining funding for own research, with 41 percent of those moving from the EU to the US finding it important and 31 percent of those moving in the other direction (US to EU) considering it as an important factor. Furthermore, 52 percent of the non-mobile mentioned that it was an important factor in their non-mobility decision. Also language was important for nearly one third of the researchers moving from the EU to the US while cost and quality of accommodation was important for around one fourth of the US researchers moving to the EU. Even though in general, the practical factors are not nearly as important as the research-related ones, they are more important for US-EU mobile researchers than for the EU-US mobile researchers (except for "language"). This implies that researchers driven abroad by strong professional motivations (such as the EU-US mobile) tend to have a higher "tolerance level" against practical difficulties.

Where obtaining funding is the key influencing factor for the mobile researchers, it is even more important for the immobile researchers: more than half of the immobile researchers have mentioned it as an important to extremely important influencing factor. Not being able to obtain funding for research appears therefore to be an important dissuading/hampering factor of mobility.

(2.c) Perceived effects of mobility

The survey also includes questions on the perceived effects of mobility (these are not necessarily the same as actual effects). The respondents were asked to evaluate whether the effects of being mobile have been negative, neutral or positive. The effects can be grouped under (1) direct or outcome effects such as a decrease/increase in publication or patent output, or decreased/increased access to infrastructure; and (2) indirect or network effects such as decreased/increased

access to an international network of professionals or decreased/increased general recognition in the research community.

The findings reveal that the perceived effects of mobility have been positive on all aspects for all mobility groups, with a slight deviation for the US-EU mobility group. The strongest effects have been reported on the network or indirect effects (professional experience as a researcher, access to an international network of professionals and general recognition in the research community were top three effects).

A comparison of the reported effects among the three mobility groups indicates that mobility affects the career of EU researchers mobile to the US most positively while the perceived effects appear somewhat lower for the US researchers mobile to the EU (and the effects of the "other mobility" group fall in-between). In general, it appears that researchers whose mobility decision is mainly driven by professional reasons (such as for the EU-US mobile group) tend to report higher career effects while researchers whose mobility decision is inspired to a stronger degree by personal reasons tend to report higher personal effects. This suggests that researchers seem to be able to realise the expectations they have of mobility.

(2.d) Motivations of return mobility

Regarding the aspect of "return mobility", for EU-US mobile researchers, this seems strongly driven by birth region attraction while this does not seem so much the case for US-EU mobile researchers. While in general, personal motivations are driving EU-US researchers back to the EU, it is mainly professional and financial reasons that drive US-EU researchers back to the US. Not unexpectedly, the return motivations appear to be the opposite as the motivations to become mobile.

When analysing the responses of people who have stayed in either the EU or the US, we find that while the reasons to return to the region of graduation are the opposite of the motivations to become mobile, the reasons to stay are the same as the motivations to become mobile. It is mainly professional and financial reasons that motivate EU graduates to stay in the US and mainly personal reasons that motivate US graduates to stay in the EU. Especially career progression reasons seem to be important to motivate researchers to stay in the US. Financial motives do not seem to play a role in shorter-term stays (shorter than two years) but become important for longer term stays (stays of more than two years).

(3) Comparison between EU and non-EU countries as a research environment

Further, the survey looked into the researchers' opinion about how the EU as a research environment compares to other parts of the world.

In all cases and among all mobility groups, the EU scores on average lower than the US and some other countries as an environment to work as researcher. This is especially true when it comes to the effect of the location where one works as a 'reference' for one's career, and also in terms of collaboration with top-class researchers. These results do not only stem from those researchers whose opinion is based on actual experience but also from those who may not have been working in the EU and instead are basing their opinions on perceptions.

(4) Research environment as attractiveness factor of mobility

The respondents were asked to indicate the country that was most attractive in their view for potential future mobility. Looking at all respondents' opinions, irre-

spective of their mobility group and whether they had been in the country or not, the US seems to be the country that is most attractive for researchers. Since the answers include those of respondents who have actually been in the EU/US as well as of those who have not, it is a collection of opinions based on past experiences but also on perceptions. The researchers who actually worked in the US have an even stronger preference for this country.

When aggregating the preferred countries by geographic regions (US, EU15, EU12, other), we see that the EU15 appears to be the most attractive region; however we have to keep in mind that birth-country attraction plays a role in this result as 55% of the sample is born in the EU15.

Additional to knowing *which locations* are most attractive as locations to work as researcher, the analysis can be enriched if complemented with information on *which elements* researchers consider to indicate a location as attractive. The respondents were therefore asked to provide the three most important keywords describing their most attractive country for future mobility.

For all groups "funding" and "research" are the most often mentioned keywords. Obviously, "research" can capture many things such as research agenda, freedom in research, doing research rather than teaching, etc. Therefore this keyword is rather difficult to interpret. Funding seems an important characteristic of a research environment. Keeping in mind that this factor also appeared as the most important influencing factor of the decision to become mobile (or not mobile), good funding opportunities appear key in attracting or keeping researchers.

1 INTRODUCTION

1.1 Objectives

1.1.1 Target groups

As described in the proposal for this project, the objective of work package 5 (WP) has been to develop a pilot study on the extra-European mobility of researchers to the US with the initial goal of shedding light on the mobility patterns and career paths of EU-researchers who have worked in the US. While designing this work package, however, the team decided to further expand the main objective to also include US researchers who have been working in the EU.

The aim of this report is to focus on (1) the general characteristics, (2) the motives and (3) the influencing factors of EU researchers who have been mobile in the US and to compare these factors with the respective characteristics, motivations and influencing factors of the 'mirror' group (the US researchers who have been mobile in the EU).

Additionally the team provided the opportunity to researchers who do not belong to either of these groups to provide their opinions. Thus, in addition to the two main target groups for this survey:

- EU researchers who have been working in the US, and
- US researchers who have been working in the EU,

We are able to provide information on EU and non-EU researchers who have been mobile between regions other than the US and EU and researchers who were not mobile.

1.1.2 Research questions

The proposal for this work package identified as the main topics for research the total number of researchers moving to the EU, their disciplines, the motivations of those researchers becoming mobile to the US, and the total number of those mobile researchers who returned to the EU.

Since the target groups of the survey were broadened to include not only EU researchers mobile to the US, the team also expanded the research topics investigated. These now include:

- The perceived effects of mobility,
- The factors affecting decision to return (or decision not to return) to the country of graduation[1],

[1] A mobility event is defined in the MORE study as a move from the country of highest educational attainment (country of origin) to another country to work as researcher (destination country).

- A comparison of the research environment in Europe to that in the US and, where possible, to other non-EU countries.

1.1.3 Add-ons to the survey

As indicated above and in comparison to the initially proposed design for this work package (ref. Technical proposal), the Extra-EU mobility (pilot) survey provides two main add-ons:

- The inclusion of the 'mirror group', i.e. the US researchers mobile in the EU. In addition, the questionnaire offered the possibility researching the motivations of non-EU-US mobile researchers as well as non-mobile researchers.

- A comparison among the two main mobility groups (EU-US and US-EU) on: the perceived effects of mobility; the differences in the factors affecting decision to return (or decision not to return) to the country of graduation; and the research environment in Europe, the US and other non-EU countries.

1.2 Outline of the report

The report starts in Part 1 with the presentation of the results from the 2003 National Survey of College Graduates in the US. Part 2 provides a description of the findings stemming from the analysis of the dataset of the extra-EU survey of the MORE project. Specifically, chapter 3 provides a description of the sampling method and the main topics covered by the questionnaire. Chapter 4 continues with the description of the sample and its regional coverage, looking at the main socio-demographic characteristics of the sample as well as information on the respondents' education and training. Chapter 5 provides information of the current employment of the researchers. Chapter 6 presents findings concerning the career paths of researchers and their general experience of mobility, including a description of the four main mobility groups of this survey. Chapter 7 analyses the motivations and influencing factors of mobility for the different mobility groups. Chapter 8 focuses on the perceived effects of mobility indicated by the respondents. Finally, Chapter 9 describes the findings concerning the attractiveness of different EU and non-EU locations as research environments as well as the factors influencing the respondents' decisions to return or not to return to their home country. Finally, Part 3 provides the overall conclusions drawn from this report.

Part 1 THE NATIONAL SURVEY OF COLLEGE GRADUATES

2 EVIDENCE FROM THE NATIONAL SURVEY OF COLLEGE GRADUATES

The following sections present results from the National Survey of College Graduates in the US. The primary objective of this analysis is to present data on 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. Subsequently, for this group of immigrants we investigate their motivation for coming to the U.S. and the role they play in the U.S. scientific community.

2.1 Data issues: Potential data sources on mobile researchers to the US

There are several good candidates for data on foreign talent in science and engineering in the United States. These are the decennial U.S. population census (www.census.gov), the Current Population Survey (www.census.gov/cps), the new American Community Survey (www.2010census.biz/acs/), the Survey of Doctorate Recipients, the National Survey of Recent College Graduates, and the National Survey of College Graduates. The latter three are all contained in SESTAT, the Scientists and Engineers Data System, sponsored by the National Science Foundation (www.nsf.gov/statistics/SESTAT/). Here we discuss why we have chosen to work exclusively with the NSCG.

Data from the decennial U.S. population survey cannot be used to meet this project's objectives because, among other things, it lacks information on the field in which a degree was earned and where/when it was earned. Thus, neither can we distinguish between life scientists and physical scientists, for example, as defined by field of education, nor do we know whether they have been educated here or abroad, or in both locations.[2] Furthermore, we cannot study career outcomes in terms of the important questions of whether those trained in S&E remain employed in S&E, move to non-S&E employment or are not working. Unfortunately, data from the Current Population Survey (CPS) and the American Community Survey suffer from these same failings.

Although the Survey of Doctorate Recipients (SDR) and the National Survey of Recent College Graduates (NSRCG) include data on both the educational field and the employment field of scientists and engineers in the United States[3] only the NSCG includes talent from abroad who have not subsequently received at least a baccalaureate degree in the United States. Moreover, the NSCG is the only part of SESTAT that includes individuals whose only degree is a medical degree. Yet these individuals are an important group in the scientific community.

[2]The NSCG, on the other hand, reports an individual's last three degrees, including field, level and location.

[3] The SDR samples new (since the previous census) and existing Ph.D.-level scientists and engineers who were educated in the United States, while the NSRCG samples new (since the previous census) bachelor's and master's degree recipients in science and engineering disciplines as identified by U.S. institutions of higher education,

The NSCG draws a sample of all college graduates from the long form respondents to the previous decennial U.S. population census, with oversampling of those who reported they worked in S&E occupations. The 2003 NSCG was drawn from those residing in the United States on October 1, 2003 or residing abroad as U.S. military personnel. The 2003 NSCG also includes a sample of respondents from the 2001 NSRCG to cover new S&E degree recipients between April 15, 2000 and June 30, 2000. By using the analysis weights that have been added to each record in the survey data,[4] we can obtain "unbiased" estimates that are "representative" of the entire science and engineering community in the U.S.[5]

Unfortunately, the NSCG has one major drawback. Since the base sample of the NSCG is only refreshed once every ten-years, there are gaps in our knowledge of how the workforce is changing over the decade between the decennial censuses. This means that we are likely to undercount the number of scientists and engineers who are in the United States on temporary visas. For example, the 2003 NSCG does not include immigrants with only degrees earned abroad if they came to the U.S after April 1, 2000

The primary objective of working with the NSCG is 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. Once we identify this group of immigrants, we will investigate their motivation for coming to the U.S. and the role they play in the U.S. scientific community. To do so, we carry out the following steps:

1. Describe the composition of the S&E workforce in the U.S. by field of study, highest degree, country of birth, and country of highest degree. Here all those with degrees in S&E are included regardless of their employment sector. Thus, migrants who came to the U.S. at any age and during any time period are included at this stage of the analysis.

2. Determine the distribution of scientists and engineers with S&E degrees who are employed solely in S&E occupations, by field of study, highest degree, country of birth, and country of highest degree. Here we omit those with S&E degrees who are employed in non-S&E occupations, but retain migrants who came to the U.S. at any age and during any time period.

3. Determine the distribution of immigrant scientists and engineers who came to the U.S. as adults and are employed in S&E occupations. Here we omit both those employed in non-S&E occupations and those who came to the U.S. as children (less than age 18). For this group, we explore their visa status upon entry to the U.S., and their primary and secondary reasons for coming to the U.S.

4. Determine the distribution of immigrant scientists and engineers who are employed in S&E occupations and who came to the U.S. as adults since the 1980s, i.e., over the period 1990-2000. For this most recent cohort, we also explore their primary and secondary reasons for coming to the U.S. as well as their employment sector and primary work activity.

[4] See, Weighting Strategy at http://www.nsf.gov/statistics/sestat/weighting.cfmSESTAT.

[5]In addition, since both associate degrees holders and non-degree holders working in S&E are not sampled, they are underrepresented in the scientific workforce estimates.

Before proceeding, a few definitions are needed. The National Science Foundation (NSF) defines S&E fields[6] as:

- Computer and mathematical sciences,
- Biological, agricultural, and environmental life sciences,
- Physical and related sciences,
- Engineering,
- S&E-related fields, and
- Social and related sciences.

Occupations are defined similarly using the same broad categories as above.[7] In terms of education, the (highest) degree earned is either a Bachelor's degree (e.g., BS, BA, AB), Master's degree (e.g., MS, MA, MBA), Doctorate (e.g., PhD, DSc, EdD., etc) or Other Professional degree (e.g., JD, LLB, MD, DDS, etc.).[8]

2.2 Presentation of data from the 2003 National Survey of College Graduates (NSCG)

2.2.1 The scientific workforce in the U.S. in 2003 as defined by field of study

First, we examine the composition of the U.S. scientific workforce from the perspective of field of study. From a public policy point of view, nations are concerned with having an educational system that prepares its students for productive roles in the knowledge-based economies of the 21st century. This requires strong programs in S&E. In describing the scientific workforce in the U.S., we highlight the EU27 countries as well as China and India, two of the major sources of foreign talent in the U.S.[9]

Overall, for all S&E fields of study at all degree levels, the U.S. scientific workforce in 2003 numbered about 16.2 million, with 2.8 million (or 17.2%) born abroad, with 13.5% having been born in EU27 countries. As shown in Annex 1 Tables A1-2-1 until A1-2-5, the three biggest sources of talent overall were China, India, and the United Kingdom; within the EU27, Germany and France were the second and third largest suppliers after the United Kingdom. The larg-

[6] S&E-related fields include health fields, science and math teacher education, technology and technical fields, architecture and actuarial science. See, National Science Foundation, 2005.

[7] In terms of occupation, those with medical degrees who consider themselves medical scientists fall into the category of biological, agricultural, and environmental life scientists, while those who consider themselves practitioners are classified as employed in a S&E-related occupation. SE-related occupations also include S&E managers, S&E precollege teachers and S&E related postsecondary teachers. A complete listing of S&E degree fields and S&E occupations is presented in Annex 1, Table A1-1.

[8] See, National Science Foundation, 2003.

[9] In identifying the birth country or country of highest degree, the few cases that were listed as Europe, not specified, or Southern Europe, not specified, were included in the "other" category and not in the EU27 counts. Because the citizenship category of native born includes individuals born abroad to American parents, we eliminated these cases from the country of birth counts so that we could focus on the distribution of immigrants by country of birth.

est S&E discipline were so-called science-related fields, accounting for 31.6% of all degrees awarded. In this broad discipline, just 16.0% were foreign born and only 4.2% were born in EU27 countries.

As Table 2-1 shows, in terms of highest degree earned for all S&E fields of study combined, the most prevalent degree was at the baccalaureate level, accounting for almost two-thirds of all S&E degrees. While almost a third of all doctorate holders in S&E fields in the U.S. were born abroad, the share coming from EU27 countries was 6.4%. This represents the EU27's largest share of scientific manpower at any degree level in the U.S.

Table 2-1: S&E degree recipients in the U.S. by highest degree level and country of birth, 2003

	All S&E degrees	Bachelor's	Master's	Doctorate	Professional
Number	16 196 062	10 490 000	3 430 671	1 030 656	1 241 685
% Foreign-born	17.2	14.1	20.6	31.6	23.0
% EU27	2.3	1.7	3.1	6.4	2.6

Source: Annex 1, Tables A1-2-1 to A1-2-5

The distribution shown in Table 2-1 changes considerably when country of highest degree and not country of birth is examined, since many foreign students come to the U.S. for their higher education and often remain after completing their studies (Finn, 2007). This is shown in Table 2-2.

Table 2-2: S&E degree holders in the U.S. by highest degree level and country where earned, 2003

	All S&E degrees	Bachelor's	Master's	Doctorate	Professional
Number	16 196 062	10 490 000	3 430 671	1 030 656	1 241 685
% Foreign educated	8.9	8.2	7.5	11.8	15.6
% EU27- educated	1.6	1.0	2.2	4.9	2.2

Source: Annex 1, Tables A1-3-1 until A1-3-5

Not surprisingly, given the flow of foreign students into American colleges and universities especially at the doctoral level, we see that, by comparing Table 2-1 and Table 2-2, the percentage of degree-holders who are foreign educated falls at all levels of education, but most dramatically at the doctoral level – from 31.6% to 11.8%. While the percentage receiving degrees in EU27 countries falls as well relative to the percentage born in EU27 countries, the declines are less substantial. Moreover, both tables indicate that migration to the U.S. is highest for those scientists and engineers who possess doctorate or professional degrees (which include medical doctors) earned abroad, a finding consistent with the literature on international mobility.

Among the EU27 countries, the United Kingdom is the largest producer of S&E degree-holders who are in the U.S. in 2003 (see Annex 1, Tables A1-2-1 until A1-2-5). Moreover, as a group, EU27-educated scientists and engineers outnumber the next largest supplier of scientific manpower in the U.S. at that time. These finding highlights the problem that the MORE study is investigating.

Thus far we have gained an overview of the educational background of immigrant scientists and engineers in the U.S. in terms of their highest degree level, country of birth and country of highest degree. But scientists trained in one area of science may work in a different area of science, may work in non-S&E occupations

or may not work at all, being unemployed or out of the labor force.[10] Since the task of the MORE study is to understand the mobility of those "doing" science, we focus in the next section on those scientists and engineers, as defined by field of study, who are employed in S&E occupations in the U.S. in 2003.

2.2.2 The scientific workforce in the U.S. in 2003: Individuals educated in S&E fields and employed in S&E-occupations

Overall, for all degree levels, Table 2-3 shows that only 7.7 million (47.5%) of the more than 16 million individuals holding degrees in S&E fields were employed in S&E occupations in 2003. Furthermore, the highest retention rate in S&E occupations was at the professional level, consisting primarily of medical doctors, and the lowest retention rate was at the bachelor's level. Not surprising, those with the least invested in their education – those with bachelor's degrees in S&E fields, are the most likely to leave science.

The percentage of the scientific workforce – those educated and employed in S&E, that is foreign born is higher at all degree levels than the percentage of foreign born degree-holders found in Table 2-1. For all degree levels except the master's and professional level, the percentage born in EU27 countries employed in S&E exceeds the percentage from these countries holding degrees in S&E. In other words, the foreign born and, in particular, those born in the EU27, were less likely to leave S&E occupations than their American-born counterparts.

Similarly, comparing Table 2-3 with Table 2-2, we see that with the exception of the master's and professional degree levels, the percentage foreign educated and the percentage EU27 educated represent a larger share of their groups holding S&E degrees. Table 2-3 also shows that at every degree level, the share held by those educated in the EU27 among the foreign educated is higher than the share held by those born in the EU27 among the foreign born suggesting that scientists and engineers educated in the EU27 are relatively less likely than their counterparts from other foreign countries to leave science. Finally, Table 2-3 indicates that immigrant scientists and engineers employed in S&E occupations in the U.S. are most likely to hold the doctorate degree. This is true for all foreign immigrants as well as those from the EU27.

Of those foreign born scientists and engineers employed in S&E occupation in the U.S., the three biggest sources of talent were China, the EU27, and India; within the EU27, the three biggest sources were the United Kingdom, Romania and Germany (See Annex 1, Tables A1-3-1 until A1-3-5). Furthermore, of those foreign educated scientists and engineers employed in S&E occupations in the U.S., the three biggest educators were China, the EU27 and the United Kingdom; within the EU27, the three biggest educators were the United Kingdom, Romania and Germany. These results once again highlight the brain drain issue facing countries within the EU27, especially the United Kingdom.

[10] The numbers falling into the latter two categories tend to be relatively small for those educated in S&E fields with most of the movement out of scientific occupations accounted for by the movement into non-S&E occupations such as business.

Table 2-3: Individuals educated in S&E fields and employed in S&E occupations in 2003, by highest degree level, nativity and location of highest degree

	All Levels	Bachelor's	Master's	Doctorate	Profes-
Number Employed S&E	7 690 304	4 161 316	1 783 848	682 714	1 062 426
%S&E degrees	47.5	39.7	52.0	66.2	85.6
%Foreign-born	20.2	16.0	24.1	34.4	21.3
%EU27-born	2.5	1.7	1.2	6.9	2.3
%Foreign-educated	9.6	8.9	7.4	12.4	14.0
%EU27-educated	1.7	1.0	2.0	5.2	2.0

Source: Annex 1, Table A1-4-1 until Table A1-4-5 and Table A1-5-1 until Table A1-5-5.

Before investigating the reasons why scientific talent from the EU27 migrates to the U.S. we must make another adjustment to the estimates of scientific manpower in the U.S. Thus far our data contain individuals educated in S&E who migrated to the United States at all ages, including childhood. But children are not likely to make their own decisions concerning emigration. Consequently, to really understand the factors that have played an important role in the mobility of EU scientists, we need to restrict the population of migrants to those who have chosen to come to the United States as adults (age 18 or older). Thus, in the next section, we take a close look at the distribution of adult migrants to the United States.

2.2.3 Scientists and engineers who came to the U.S. as adults and are employed in S&E occupations in 2003

In total, adult[11] immigrants in the scientific workforce as defined above number about 1.2 million and account for approximately 80% of the entire population of immigrant scientists and engineers who were employed in S&E occupations in 2003. This percentage varies by field of employment as shown in Table 2-4. Indeed, scientists and engineers who first entered the United States as adults were more likely to be employed as biological or physical scientists than employed as social scientists or in S&E-related occupations such as health practitioners, S&E managers, architects or actuaries.

[11] Adult immigrants are determined by comparing the year of arrival for a stay of 6 months of longer with their age in the year 2003. Unfortunately, we do not know if they subsequently returned home and re-entered the United States at a later date.

Table 2-4: All immigrant scientists and engineers and those who entered the U.S. as adults employed in S&E occupations, by S&E occupation, 2003

	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
All immigrants	1 556 412	395 302	97 567	59 752	41 549	266 602	695 641
Adult immigrants	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
% Adult	79.7	83.6	87.3	87.0	72.9	80.5	75.9

Source: Annex 1, Tables A1-3-1 until A1-3-5 A3 and Tables A1-6-1 until A1-6-5. Subgroups may not add to total due to rounding.

Moreover, as Table 2-5 shows those with a bachelor's degree as the highest degree earned account for 40% of all scientists and engineers who came to the U.S. as adults and are employed in S&E occupations; those with a master's degree, 30%; those with a doctorate, 17%; and those with a professional degree, 13%. At every degree levels, Indian natives account for the largest percentage of adult immigrants employed in the life sciences in the U.S. Chinese natives account for the largest percentage of adult immigrants employed in computer and mathematical occupations at all degree levels except the doctorate and professional level.

Overall, the largest share of EU27 scientists and engineers who came to the U.S. as adults and are employed in S&E occupations was at the doctorate level, where those born in the EU27 account for 18.6% of all those with the doctorate as the highest degree.[12]

Scientists and engineers from EU27 countries possessing a bachelor's as their highest degree enjoy their largest share of all degree holders employed at that level in engineering (11.9%); those with a master's as the highest degree, in the social and related sciences (31.7%); those with a doctorate as the highest degree, in the physical sciences (24.5%); and those with a professional degree as their highest, in the social and related sciences (45.9%). Furthermore, the EU27's share of immigrant scientists and engineers who came to the U.S. as adults and are employed in S&E occupations exceeds the share coming from the more populous countries of India and China in five instances: at the master's level, in the social and related sciences; at the doctorate level, in the physical sciences, in the social and related sciences, and in the S&E-related occupations; and at the professional level, in the social and related sciences.

[12] Details about the individual countries in the EU27 are available in Annex 1, Tables A1-6-1 until A1-6-5.

A similar analysis to that presented in Table 2-5 can be done in terms of country of highest degree rather than country of birth. Table 2-6 presents a summary of these findings. Overall, compared with Table 2-4, it is once again evident that neither India nor China educates many of their native-born scientists and engineers who were employed in S&E occupations in the U.S. in 2003. On the other hand, the EU27 still educates a large percentage of their native-born scientists and engineers who have migrated to the U.S. as adults and are employed in S&E occupations in 2003.[13] Indeed, Table 2-6 shows that, at the doctoral level, the EU27 educate a greater percentage of immigrant scientists and engineers employed in the biological/life sciences than were born in the EU27. This is also true for EU27 migrants possessing the professional degree as the highest degree earned who are now employed in computer and mathematical occupations or in S&E-related occupations.

Table 2-5: Immigrant scientists and engineers who entered the U.S. as adults and are employed in S&E occupations, by highest degree level, country of birth, and S&E occupation in 2003

	All S&E	Comp/Math	Bio/Ag/Env /Life	Physical	Social	Engineering	S&E Related
All degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
%Born EU27	11.5	9.3	16.3	16.1	24.7	13.9	9.9
%Born India	11.6	16.4	29.1	19.9	4.8	12.6	5.0
%Born China	20.3	33.9	13.4	18.5	6.0	18.4	14.7
Bachelor's degree	495 760	128 898	9 328	11 795	3 628	84 526	257 585
% all levels	40.0	39.0	10.9	22.7	12.0	39.4	48.8
%Born EU27	9.3	10.7	6.9	3.8	0.0	11.9	8.4
%Born India	4.3	4.7	12.8	14.2	0.0	6.3	2.8
%Born China	17.9	37.2	8.9	21.2	6.3	12.1	10.5
Master's degree	372 192	159 076	11 357	12 991	9 517	88 747	90 504
% all levels	30.0	48.1	13.3	25.0	31.4	41.4	17.1
%Born EU27	11.0	6.5	12.8	10.0	31.7	16.3	11.4
%Born India	17.8	22.8	43.4	28.5	5.5	13.8	9.5
%Born China	28.1	37.1	18.6	18.2	5.6	25.0	20.3
Doctorate degree	159 732	41 724	58 398	26 968	15 801	41 306	28 862
% all levels	17.2	12.6	68.5	51.9	52.2	19.2	5.5
%Born EU27	18.6	16.4	18.9	24.5	24.4	12.9	20.8
%Born India	22.3	27.0	26.6	18.5	5.8	22.9	18.4
%Born China	13.4	12.7	13.4	17.7	6.7	17.1	8.7
Professional degree	159 732	905	6 120	237	1 341	0	151 129
% all levels	12.9	0.3	7.2	0.5	4.4	0.0	28.6
%Born EU27	9.7	0.0	12.2	0.0	45.9	0.0	9.4
%Born India	5.6	60.1	51.8	0.0	0.0	0.0	0.0
%Born China	19.1	0.0	10.4	0.0	0.0	0.0	19.7

Source: Annex 1, Tables A1-6-1 until A1-6-5. Subgroups may not add to total due to rounding.

[13] Details for the individual countries with the EU27 are presented in Annex 1, Table Tables A1-7-1 until A1-7-5.

Table 2-6: Immigrant scientists and engineers who entered the U.S. as adults and are employed in S&E occupations, by highest degree level, country of highest degree, and S&E occupation in 2003

	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
All degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
%Educ. EU27	9.2	7.1	15.7	11.6	7.7	12.0	12.0
%Educ. India	3.1	2.3	12.3	6.4	0.4	1.6	2.6
%Educ. China	11.5	20.7	8.2	9.6	0.8	5.2	9.8
Bachelor's degree	495 760	128 898	9 328	11 795	3 628	84 526	257 585
%Educ. EU27	7.5	8.5	5.8	1.8	0.0	11.3	6.1
% Educ. India	2.6	2.2	12.8	14.2	0.0	2.0	2.2
%Educ. China	15.7	33.7	8.9	15.7	1.5	8.7	9.4
Master's degree	372 192	159 076	11 357	12 991	9 517	88 747	90 504
%Educ. EU27	7.8	5.0	7.2	7.4	9.1	13.0	7.6
% Educ. India	2.7	2.0	21.0	6.4	1.3	1.2	2.6
%Educ. China	9.5	15.1	7.1	10.8	1.1	3.3	7.1
Doctorate degree	213 058	41 724	58 398	26 968	15 801	41 306	28 862
%Educ. EU27	15.2	10.7	19.4	18.0	9.3	11.4	19.6
% Educ. India	3.4	2.0	6.8	3.0	0.0	1.9	3.2
%Educ. China	4.2	2.1	8.1	6.5	0.5	2.2	2.4
Professional degree	159 732	905	6 120	237	1 341	0	151 129
%Educ. EU27	9.9	11.2	11.1	0.0	0.0	0.0	9.9
% Educ. India	5.2	60.1	48.5	0.0	0.0	0.0	3.2
%Educ. China	13.0	0.0	10.4	0.0	0.0	0.0	13.4

Source: Annex 1, Tables A1-7-1 until A1-7-5. Subgroups may not add to total due to rounding.

Next, Table 2-7 examines the visa status of these immigrants.[14] The MORE project is especially interested in the numbers (and percent) entering the U.S. on study/training visas or temporary work visas from EU27 countries, although data on all visa types and EU27 region of highest degree are presented in Annex 1, Tables A1-8-1 until A1-8-5.[15]

[14] These include: Permanent US Resident Green Card, Temporary US Resident Visa for temporary work (e.g., H-1B, L-1A, L-1B, etc.), Temporary US Resident Visa for study or training (e.g., F-1, J-1, H-3, etc.),Temporary US Resident Visa as the dependent of another person (e.g., F-2, H-4, J-2, K-2, L-2, etc.),Other Temporary US Resident Visa (O, Q, etc.).

[15] Because cell sizes get small, we do not break down the results by country within the EU27.

Table 2-7: Visa type, highest degree level, and EU27 origins of immigrant scientists and engineers who entered the U.S. as adults and are employed in S&E occupations in 2003

	Total Immigrant Visas	Study/Training	Temporary Work
All Degree Levels	1 240 743	487 699 (39.3%)	248 801 (20.1%)
EU27-visa holders	142 397	49 756	32 674
% EU27-visa holders	11.5	10.2	13.1
Bachelor's degree highest	495 760	79 447 (16.0%)	147 837 (29.8%)
EU27-visa holders	46 294	7 386	13,440
% EU27-visa holders	9.3	9.3	9.1
Master's degree highest	372 192	182 300 (49.1%)	67 280 (18.1%)
EU27-visa holders	40 938	11 199	10 872
% EU27-visa holders	11.0	6.1	16.2
Doctorate degree highest	213 058	158 432 (74.4%)	20 091 (9.4%)
EU27-visa holders	39 618	23 999	6 408
% EU27-visa holders	18.6	15.1	31.9
Professional degree highest	159 732	67 521 (42.3%)	13 593 (8.5%)
EU27-visa holders	15 546	7 171	1 954
% EU27-visa holders	9.7	10.6	14.4

Source: Annex 1, Tables A1-8-1 until A1-8-5. Subgroups may not add to total due to rounding.

Overall, study/training visas and temporary work visas account for almost 60% of all visas initially issued to these emigrants who were 18 or older when they first entered the U.S. for a period of six months or longer. Nearly three-quarters of those holding doctorates as their highest degree entered on study/training visas, while temporary work visas were most prevalent at the bachelor's degree level.

EU27-visa holders account for 11.5% of all visas at all degree levels, holding nearly 50,000 study/training visas and 33,000 temporary work visas upon initial entry into the U.S. EU27 migrants, however, account for 18.6% of all visas issued to immigrants whose highest degree is at the doctoral level. But EU27 migrants are more prevalent among the temporary work visa holders at this degree level than those with study/training visas, accounting for nearly a third of the former but less than one-sixth of the latter group.

Table 2-8 provides details on the occupational distribution of EU27 migrants by highest degree earned and visa type. Here the highest-degree levels have been collapsed into just two levels: bachelor's degree and master's and above, because the (raw) cell sizes become small in some visa/occupational categories limiting the reliability of the population estimates.

As Table 2-8 shows, for all degree levels combined, study/training visas dominated the visas initially held by immigrants who are now employed in the biological/life sciences, physical sciences and the social sciences; temporary work visas, although substantially less numerous, were most often held by adult immigrants who are now employed as computer/mathematical scientists. Overall, for all S&E occupations combined, those born in EU27 countries held just 10.2% of the study/training visas and 13.1% of the temporary work visas.

Both study/training visas and temporary work visas were much more numerous among immigrants having a more advanced degree than among those holding only a bachelor's degree. Furthermore, study/training visas accounted for more than one-half of all visas issued at the advanced degree levels, although tempo-

rary work visas were more common than study/training visas for those holding no higher than a bachelor's degree. But here, other visas types obviously played a more important role since study/training visas and temporary work visas only account for 46% of the total number of visas that were initially held.

At the bachelor's level, Table 2-8 shows that study/training visas were more often held initially by those now employed in the biological/life sciences and the social sciences. On the other hand, temporary work visas were much more common for those now employed as computer scientists than for those employed in any other S&E occupation. Moreover, at the bachelor's degree level, the data show that EU27 natives often did not account for much more than 10% of the migrants who held initially either of these visa types, although they did account for 20.2% of the temporary work visas initially held by employed as engineers in 2003.

At the advanced degree levels, we find that the three occupations that accounted for the largest share of immigrants who initially entered on study/training visas – biological/life sciences, social sciences, and the physical sciences – were also the three biggest occupations in terms of migrants coming from EU27 countries. With respect to the smaller number of immigrants entering with temporary work visas, EU27 migrants account for more than 60% of those now employed in social science occupations and nearly 40% of those employed as biologists/life scientists.

Table 2-8: Visa type, highest degree level, and EU27 origins of immigrant scientists and engineers who entered the U.S. as adults, by S&E occupation in 2003

	All S&E	Comp/Math	Bio/Ag/Env /Life	Physical	Social	Engineering	S&E Related
All degree Levels							
All visas types	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
Study/training	487 699	132 342	59 298	29 916	20 694	96 715	148 733
% of occupation	39.3	40.0	69.6	57.5	68.3	45.1	28.2
Born EU27	10.2%	7.3%	14.6%	18.2%	18.2%	6.4%	10.8%
Temporary Work	248 801	95 661	8 229	5 953	2 815	36 726	99 416
% of occupation	20.1	28.9	9.7	11.4	9.3	17.1	18.8
Born EU27	13.1%	10.6%	31.0%	15.5%	41.4%	25.9%	8.4%
Bachelor's as the highest degree							
All visas types	495 760	128 898	9 328	11 795	3 628	84 526	257 585
Study/training	79 447	19 287	3 777	2 022	1 657	18 030	34 674
% of occupation	16.0	15.0	40.5	17.1	45.7	21.3	13.5
Born EU27	9.3%	7.8%	13.5%	14.7%	0.0%	6.7%	11.2%
Temporary Work	147 837	53 671	1 562	2 439	971	20 569	68 626
% of occupation	29.8	41.6	16.7	20.7	26.8	24.3	26.6
Born EU27	9.1%	8.9%	0.0%	3.3%	0.0%	24.3	6.5%
Master's or above as highest degree							
All visas types	744 981	201 705	75 876	40 196	26 658	130 053	270 494
Study/training	408 252	113 055	55 521	27 895	19 037	78 685	114 059
% of occupation	54.8	56.0	73.2	69.4	71.4	60.5	42.2
Born EU27	10.4%	7.2%	14.7%	18.5%	19.7%	6.3%	10.7%
Temporary Work	100 963	41 991	6 667	3 514	1 844	16 157	30 790
% of occupation	13.6	20.8	8.8	8.7	6.9	12.4	11.4
Born EU27	19.1%	12.7%	38.2%	24.0%	63.2%	33.2%	12.8%

Source: Annex 1, A1- 9-1 until A1-9-3. Subgroups may not add to total due to rounding.

Table 2-9 examines the most important reasons[16] given by these adult immigrants for their initial entry into the United States for a period of six months or longer. In this table, we focus on all degree levels combined; Annex 1, Tables A1-10-1 until A1-10-3 also has the details broken down by the highest degree earned: bachelor's degree or master's and above.

Table 2-9: Most important reasons given for migrating to the U.S. by adult migrants trained and employed in S&E, by nativity and occupation in 2003

Reason for Migrating	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Family-related							
All migrants	21.4%	17.5%	12.3%	17.8%	11.9%	17.1%	27.9%
EU27 migrants	20.7%	19.4%	7.9%	10.9%	10.5%	16.0%	30.9%
Educational Opportunities							
All migrants	37.2%	37.2%	36.5%	44.3%	66.4%	42.9%	32.6%
EU27 migrants	24.1%	21.6%	23.7%	23.7%	44.8%	18.4%	26.2%
Job/Economic Opportunities							
All migrants	26.2%	33.1%	11.7%	15.2%	10.7%	26.2%	26.2%
EU27 migrants	32.1%	40.5%	23.0%	21.1%	19.3%	46.3%	24.9%
Scientific/Professional infrastructure							
All migrants	9.8%	6.9%	36.3%	19.9%	4.0%	7.2%	7.7%
EU27 migrants	15.0%	13.3%	43.0%	38.9%	7.4%	9.3%	8.9%
Other							
All migrants	5.5%	5.3%	3.1%	2.7%	6.9%	6.7%	5.6%
EU27 migrants	8.1%	5.2%	2.3%	5.5%	17.9%	10.0%	9.2%

Source: Annex 1, Tables A1- 10-1 until A1-10-3.

For all S&E occupations combined, all migrants as well as those from EU27 countries came primarily for educational and job or economic opportunities. Overall, migrants from the EU27 are more likely to have come to the U.S. because of job or economic opportunities, scientific of professional infrastructure or "other" reasons than their counterparts from other countries. In addition, regardless of their occupation in 2003, EU27 migrants were less likely than immigrants from other countries to have come to the U.S. because of educational opportunities. This likely reflects the overall quality of tertiary education in the EU27 region.

Jobs or economic opportunities were one of the two factors most important in the decision of EU27 natives to come to the U.S. This is especially evident for those who are now employed as computer/mathematical scientists or engineers, with over 40% indicating this as their most important reason. This suggests weakness in these job markets in the EU27 region.

Finally, the scientific or profession infrastructure was particularly important to the decision to migrate for those who are now employed in the biological/life sciences and the physical sciences. Moreover, in these two occupations, migrants from the EU27 region list this reason much more frequently (43% and 39% of the time) than those who came to the U.S. from all countries combined (36% and 20% of the time).

[16] Immigrants were asked to indicate the two factors that were most important in their decision to come.

In a similar fashion, Table 2-10 examines the second most important reasons[17] given by these adult immigrants for their initial entry into the United States for a period of six months or longer. Once again, we focus on all degree levels combined; Annex 1, Tables A1-11-1 until A1-11-3 contains the details broken down by the highest degree earned: bachelor's degree or master's and above.

After excluding the respondents who gave no second reason for their decision to migrate to the U.S., Table 2-10 shows that overall, for all S&E occupations combined, jobs or economic opportunities and scientific or professional infrastructure now rank ahead of educational opportunities as the "second" most important reason given by these migrants. This is especially true when one considers all migrants as a group because as Table 2-9 showed, the scientific or professional infrastructure was also the most important primary reason given by EU27 migrants employed in the biological/life sciences or in the physical sciences in 2003. In fact, we find that for all EU27 migrants, except those now employed in S&E-related occupations, the scientific or professional infrastructure is more often chosen than either educational or job or economic opportunities as the second most important reason for initially coming to the U.S.

Table 2-10: Second most important reasons given for migrating to the U.S. by adult migrants trained and employed in S&E, by nativity and occupation in 2003

Reason for Migrating	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Family-related							
All migrants	10.4%	9.1%	5.6%	9.4%	8.3%	9.1%	12.8%
EU27 migrants	8.3%	4.9%	3.4%	5.0%	13.2%	6.4%	13.3%
Educational Opportunities							
All migrants	25.3%	25.0%	28.4%	20.6%	20.0%	21.1%	27.4%
EU27 migrants	22.1%	19.1%	21.4%	24.3%	27.2%	14.6%	27.5%
Job/Economic Opportunities							
All migrants	33.0%	31.0%	26.9%	26.2%	23.6%	32.7%	36.6%
EU27 migrants	31.3%	30.7%	32.0%	23.9%	28.6%	31.8%	33.3%
Scientific/Professional infrastructure							
All migrants	29.7%	32.2%	37.3%	42.8%	46.2%	35.1%	22.2%
EU27 migrants	35.0%	41.1%	38.7%	43.4%	29.4%	42.9%	23.8%
Other							
All migrants	1.7%	2.7%	1.8%	1.1%	1.9%	1.9%	1.0%
EU27 migrants	3.3%	4.2%	4.5%	3.4%	1.5%	4.2%	2.0%

Source: Annex 1, A1- 11-1 until A1-11-3.

In this section, we have focused on scientists and engineers who migrated to the U.S. as adults and were employed in S&E occupations in 2003. But thus far, we have not paid attention to when these migrants initially entered the U.S. Yet we know that social and economic conditions have changed world-wide and in the United States over the last few decades. Since a goal of the MORE study is to ob-

[17] Immigrants were asked to indicate the two factors that were the second most important in their decision to come.

tain a clear picture of EU-U.S. mobility in the recent past, in the next section we refine the analysis once again and by focus only on the most recent cohort of immigrant scientists and engineers, those who came to the U.S. since 1989.

2.2.4 Scientists and engineers who came to the U.S. as adults during the 1990s and are employed in S&E occupations in 2003

Table 2-11 shows that more than 50% of scientists and engineers who came to the U.S. as adults and were employed in S&E occupations in 2003 came to the U.S. since 1989.

Table 2-11: Immigrant scientists and engineers who entered the U.S. as adults and were employed in S&E occupations in 2003, by time period of initial visa

Period of initial visa	Number of Immigrants	Percent of Immigrants
Total	1 240 743	100.0%
Before 1970	76 738	6.2%
1970s	184 094	14.8%
1980s	349 671	28.2%
Since 1989	632 240	51.0%

Source: Calculated from Annex 1, Table A1- 11-1 until A1-11-3. Subgroups may not add up to total due to rounding.

The data (as shown in Annex 1, Tables A1-12-1 until A1-12-3) indicate that there have been marked changes in the initial visa type and the primary reason given for the decision to come to the U.S., but been few changes over time in the second most important reasons given for migration decision. The most recent cohort is typically less likely to have entered the U.S. with a permanent resident visa (Green card) or a study/training visa and increasingly more likely than previous cohorts to have entered on a temporary work visa. In terms of the most important reasons for entering the U.S., over time, immigrant scientists and engineers have been less likely to have come for educational opportunities and more likely to have come because of job or economic opportunities.

EU27 migrants accounted for 72,280 (11.5%) of the 632,240 scientists and engineers in the most recent cohort; moreover, for all S&E occupations combined, EU27 migrants more often held study/training or temporary work visas than any other visa type upon entry to the U.S. (see Annex 1, Tables A1-12-1 until A1-12-3). At all degree levels, the three largest S&E occupations that these recent migrants were employed in as of 2003, both all migrants together and EU27 migrants separately, were in diminishing order, science-related occupations, computer/mathematics occupations and engineering.

Table 2-12 examines the most important reasons given by those adult migrants who first entered the U.S. after 1989, by nativity and occupation in 2003. Educational opportunities, although still relatively important, are no longer as important a reason for the decision to migrate to the U.S. for this more recent cohort than for all cohorts together, as we saw in Table 2-9. For EU27 migrants, educational opportunities were also less often given as the most important reason for their decision to migrate except for those employed in the physical sciences, social sciences and in science-related occupations.

For all groups of recent migrants (except EU27 migrants employed in the physical or social sciences), job or economic opportunities have increased in importance relative to its importance for all cohorts combined (Table 2-9). Similarly, for all

groups of recent migrants (except EU27 migrants employed in engineering), the scientific or professional infrastructure has increased in importance relative to its importance for all cohorts combined. Overall, for the recent cohort of EU27 migrants, the top three "first" reasons for coming to the U.S. are job or economic opportunities, educational opportunities, and the scientific or professional infrastructure.

Table 2-12: Most important reasons given for migrating to the U.S. by the most recent cohort of adult migrants trained and employed in S&E, by nativity and occupation in 2003

Reason for Migrating	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Family-related							
All migrants	21.2%	16.3%	11.7%	18.5%	15.2%	19.0 %	29.8%
EU27 migrants	16.1%	16.4%	7.6%	4.9%	17.5%	18.0%	19.6%
Educational Opportunities							
All migrants	29.1%	29.4%	26.9%	37.1%	59.5%	34.9%	24.2%
EU27 migrants	24.2%	18.1%	14.9%	27.5%	44.0%	19.1%	32.8%
Job/Economic Opportunities							
All migrants	33.6%	42.6%	12.8%	16.3%	16.9%	34.4%	31.8%
EU27 migrants	37.8%	48.6%	27.9%	19.7%	19.0%	52.6%	27.9%
Scientific/Professional infrastructure							
All migrants	12.2%	8.0%	45.7%	25.5%	4.9%	8.7%	9.2%
EU27 migrants	16.3%	13.8%	49.7%	45.9%	8.5%	5.4%	9.4%
Other							
All migrants	3.9%	3.7%	2.9%	2.7%	3.4%	3.0%	4.9%
EU27 migrants	5.6%	3.1%	0.0%	2.0%	10.9%	4.9%	10.3%

Source: Annex 1, Table A1-13.

The second most important reasons given for coming to the U.S. by the most recent cohort of migrants are summarized in Table 2-13. Again, we focus only on those who responded that they had some second reasons (details are provided in Table A1-14). Overall, the table shows that migrants who listed second reasons were mostly employed in either science-related occupations or in computer/mathematical occupations.

For all S&E occupations combined, when comparing the most recent cohort with all cohorts taken together (Table 2-10) Table 2-13 indicates that the scientific infrastructure and jobs or economic opportunities were slightly more important as second reasons for migrating, while educational opportunities were slightly less important. Moreover, the importance of the scientific or professional infrastructure in the decision to migrate increased the most for migrants especially from EU27 countries who were now employed in engineering occupations. In fact, with few exceptions,[18] EU27 migrants chose the scientific or professional infrastructure more often than either educational or job or economic opportunities as the second most important reason for their move to the U.S.

Table 2-13: Second most important reasons given for migrating to the U.S. by the most recent cohort of adult migrants trained and employed in S&E, by nativity and occupation in 2003

Reason for Migrating	All S&E	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Family-related							
All migrants	9.0%	7.5%	6.8%	9.6%	3.5%	8.2%	11.3%
EU27 migrants	6.9%	6.2%	2.0%	0.0%	7.5%	5.3%	2.9%
Educational Opportunities							
All migrants	26.5%	26.3%	31.9%	23.7%	30.4%	20.9%	28.0%
EU27 migrants	22.6%	23.7%	26.8%	28.2%	29.4%	15.7%	20.7%
Job/Economic Opportunities							
All migrants	31.8%	30.1%	28.6%	25.8%	31.8%	29.3%	36.1%
EU27 migrants	30.2%	31.1%	36.9%	19.6%	36.1%	23.2%	33.2%
Scientific/Professional infrastructure							
All migrants	31.0%	32.9%	31.4%	39.9%	34.3%	40.3%	23.8%
EU27 migrants	36.5%	34.4%	30.5%	46.7%	26.9%	52.3%	29.5%
Other							
All migrants	1.8%	3.3%	1.3%	1.0%	0.0%	1.6%	0.8%
EU27 migrants	3.7%	4.5%	3.7%	5.5%	0.0%	3.4%	3.4%

Source: Annex 1, Table A1-14.

Table 2-15 shows the distribution of the most recent cohort of migrants by employment sector: higher education (4yr- colleges and universities, medical schools and research institutes), government, business/industry, and other educational institutions. Details by occupation and highest level of education are available in Annex 1, Tables A1-15 and A1-16-1 and A1-16-2.

[18] The exceptions are EU27 migrants now employed in biological/life science occupations or in science-related occupations who still rank job or economic opportunities ahead of the scientific or professional infrastructure among the second most important reasons for migrating.

Table 2-14: Employment by sector of employment of the most recent cohort of migrants, 2003

	Total	Higher education	Government	Business/Industry	Other education
All migrants	630 239	11 453	26 028	470 676	122 083
% of sector	100.0	1.8	4.1	74.7	19.4
EU27 migrants	72 279	1 430	5 775	43 713	21 361
% of sector	100.0	2.0	8.0	60.5	29.6

Source: Annex 1, Table A1-15. Subgroups may not add to total due to rounding.

For all degree levels and all S&E occupations combined, Table 14 shows that the most common sector of employment for all of these recent migrants was business/industry. This is not surprising given the overall size of this sector in the U.S. economy. EU27 migrants tend to be employed less often than migrants from other countries in business/industry, but more often in the higher education, government and other education sectors.

Finally Table 2-15 provides some idea of what this most recent cohort of migrant scientists and engineers have been contributing directly to the U.S. economy by summarizing their responses to the NSCG survey question: "On which TWO activities..., did you work the most hours during a typical week on this job"? Here we focus on those activities that most directly contribute to science and innovation outputs, namely basic research, applied research, development, design (of equipment, processes, structures), and computer applications (including programming and systems analysis). All other activities have been combined into the "other" category in the table.[19]

Table 2-15: Primary work activities of the most recent cohort of migrants, 2003

	Total	Basic Research	Applied Research	Development	Design	Computer Applications	Other
All migrants	630 239	59 461	59 558	51 203	41 613	178 365	240 039
% of sector	100.0	9.5	9.4	8.1	6.6	28.3	38.1
EU27 migrants	72 279	9 338	10 577	3 889	4 374	13 152	30 949
% of sector	100.0	12.9	14.6	5.4	6.1	18.2	42.8

Source: Annex 1, Table A1-17. Subgroups may not add to total due to rounding.

Table 2-15 shows that EU27 migrants who entered the U.S. since 1989 are over-represented relative to recent migrants from other countries in terms of time spent on performing basic research, applied research and the remaining activities in the category "other." On the other hand, EU27 migrants spend less time than other migrants doing development, design or computer applications.

[19] The other category includes the following activities: accounting, finance, contracts; employee relations- including recruiting and personnel; managing or supervising people or projects; production, operations, or maintenance; professional services [healthcare, financial, etc.); sales, purchasing or marketing; quality or productivity management; teaching; and other work activity. Annex 1, Table A1-18-1 and A1-18-2 provides details by occupation and highest degree level as well.

2.3 Main findings

To understand the magnitudes and reasons for the flow of scientific talent from the EU to the United States, we have utilized data from the 2003 NSCG, the best available database for investigating the issues raised by the MORE study. Systematically, we refined the analysis step by step so that in the final stage we had a representative sample of recent adult migrants in the U.S – those who had been trained in S&E fields, who had emigrated (initial visas was for a period of six months or longer) to the U.S. as adults (aged 18 and older), who had emigrated since 1989, and who were now employed in S&E occupations.

- This recent cohort of adult migrants represented over 50% of all adult migrants educated in science and engineering who were now employed in S&E occupations in 2003.

- For the recent cohort of EU27 migrants, we found that the top three "first" reasons for coming to the U.S. were job or economic opportunities, educational opportunities, and the scientific or professional infrastructure.

- These same reasons were also the top three given by recent EU27 migrants as their "second" most important reasons for their move to the U.S.

- We also discovered that EU27 migrants tend to be employed less often than migrants from other countries in the business/industry sector, but more often than migrants from other countries in the higher education, government and other education sectors.

- EU27 migrants were overrepresented relative to recent migrants from other countries in terms of devoting time towards performing basic research, applied research and "other" work activities. On the other hand, EU27 migrants spend less time than other migrants doing development, design or computer applications.

Part 2 THE EXTRA-EU PILOT MOBILITY SURVEY

3 SURVEY METHODOLOGY AND DESIGN

3.1 Introduction

As described in the introductory part of this report, the aim of this study is to design a pilot study for the analysis of the motives and stay-rates of EU researchers going to the US. Moreover, as indicated earlier, the survey population was broadened to include not only EU researchers moving to the US, but also US researchers moving to the EU. In addition, the survey now includes the opinions of researchers who are mobile but not between the EU and the US and non-mobile researchers.

This chapter provides an overview of the main definitions used in the survey, the target groups of the survey, the sampling method followed, and the main sections of the survey.

3.2 The main definitions

3.2.1 Mobility event

For this survey, 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*.

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 worked for a minimum of three months after receiving this highest degree[20].

A **mobility event** is therefore one where

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

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

3.2.2 EU and non-EU researchers

Due to the definition of a mobility event, an EU researcher is not necessarily defined as an EU national working as a researcher, but rather as a national of any

[20] The team has decided to follow this definition for mobility for this survey, for comparability reasons to the previous surveys. In the future, it will be interesting however to include also the PhD trajectory within the mobility event.

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.

Applying the foregoing definitions, a researcher is mobile from the EU to the US if he has obtained his highest degree in an EU27 country and has subsequently worked as a researcher for minimum of three months in the US. In this study, said researcher is described as an **EU researcher mobile in the US.** (As noted above, an EU researcher mobile in the US is not necessarily a national of one of the EU27 countries).

3.3 Target groups for the extra-EU mobility survey

Unlike the other three surveys linked to the MORE project, this 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 between the US and EU. The pilot survey also includes information on researchers who have been mobile between any other two geographical blocks other than the EU and US and researchers who have never been mobile.

To summarize, the two main target groups of the survey are:

- Group M1 (EU-US mobile): EU researchers (researchers who have received their highest degree in the EU) and have worked or are currently working in the US.

- Group M2 (US-EU mobile): US researchers (researchers who have received their highest degree in the US) and have worked or are currently working in the EU.

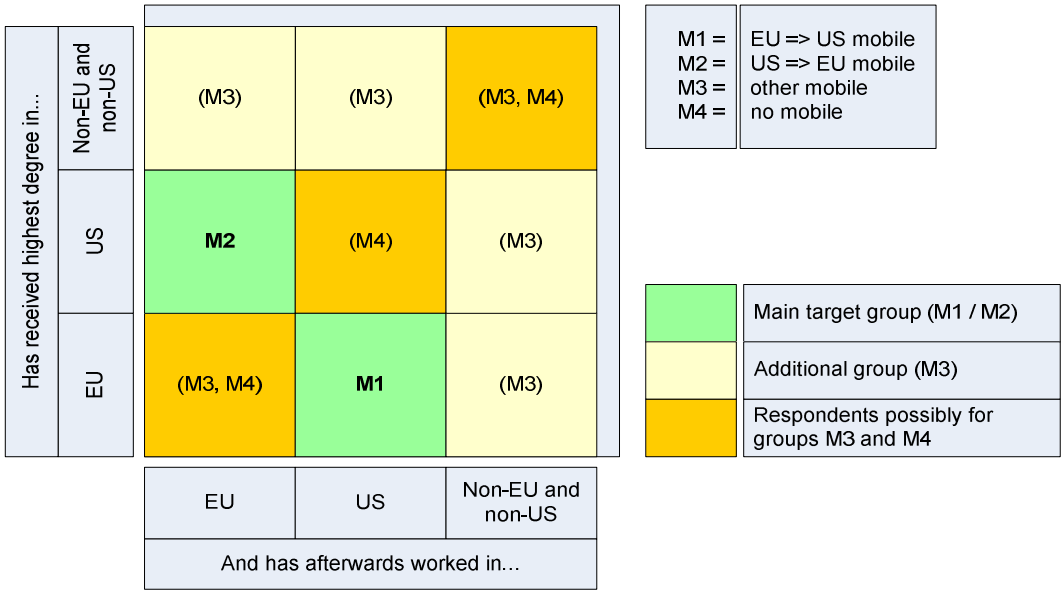
And, to enrich the survey results, the following two groups were added:

- Group M3: Researchers who have been mobile after receiving highest degree but do not belong neither to group M1 nor to group M2.

- Group M4: Researchers who have not been mobile after receiving highest degree.

The following graph summarizes this information.

Figure 3-1: Target groups of the survey



M1 and M2 are the two main target groups who answered the full questionnaire, while M3 and M4 answered an adapted part of the questionnaire.

3.4 Sampling method

This survey has been 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. Two main methods of sampling were used to identify the sample group for the survey:

- Web-based search where we have specified the criteria for which email addresses of researchers will be searched on the web (see 3.4.1)
- Indirect sampling methods (see 3.4.2)

3.4.1 Web-based search

The web was used to extract a large sample of email addresses of people likely to be US academics who previously resided in Europe or European academics who previously resided in the US. To achieve this, the following steps were used:

1. First, a large sample of HTML or PDF CVs or home pages were obtained from US universities, by searching for relevant European countries in a series of searches in major search engines. Two basic searches were used:
   - `CV site:edu @ –apply –application –applicants`
   - `"Home page" site:edu @ –apply –application –applicants`

   Each of the above searches was submitted twice for each relevant European country replacing @: once for PDF files and once for HTML files. The first 1,000 results were recorded from both Yahoo and Bing (formerly Microsoft

Live Search). 1,000 results is the maximum returned by search engines. In addition, query splitting was used to gain additional results if the search engine reported were more than 1000.

The searches were designed to capture the web CV or home page of US academics or researchers in web sites ending in .edu, when the academic was mentioned alongside a relevant European country in that CV or home page. The excluded terms (application, apply, applicants) were used to exclude pages that were advertising jobs and requesting a CV to be sent in. The searches nevertheless still produced many spurious matches, for example due to the country name appearing as a conference or book publisher location.

A similar procedure was used for relevant European countries except that site:edu was replaced with a country-specific search, like site:fr for France, and the word "University" was added, with USA being used as the country name. This change was made, because with the exception of the UK, European countries do not have a generic educational domain name like .edu. Thus, adding in the term "University" was an attempt to narrow down the European results to academic pages within the country. The European searches produced fewer results than the US searches, so additional searches of 670 individual European university web sites were performed, replacing the generic term "university" with the name of one of the most popular US universities from the previous searches. Universities searched for included: Harvard University, University of California, Princeton University, University of Chicago, Columbia University, Stanford University, Yale University and Cornell University. Three types of searches were used:

- `university USA site:at cv –apply –application –applicants`
- `university USA site:at "home page" –apply –application –applicants`
- `"Cornell University" site:kfunigraz.ac.at cv –apply –application –applicants`

Initially attempts were made to translate the searches into local languages, i.e., French, Spanish, Italian and German; however, these searches did not generate many additional emails and this step was abandoned.

2. The second stage was to eliminate duplicates and download all pages identified using the LexiURL Searcher.

3. The third stage was to convert the PDF files into a more easily processed format. The program pdf2html was used for this, with an MSDOS batch file automating the process for the over 100,000 files involved.

4. The fourth stage was to process the HTML files (whether directly downloaded or converted from PDF) to extract email addresses. This was achieved using a program that searched the HTML files for patterns apparently matching email addresses, i.e. containing @ and text immediately before and after. Standard non-academic email addresses, such as those starting with sales@ or info@ were eliminated at this stage. Each email address extracted was marked as filtered if it was extracted from a page in which the country name appeared above any occurrence of the words "publications" or "journal". This heuristic was adopted because most CVs include an email address above any publication list. Furthermore, a country name appearing below an email address is likely to be associated with a publica-

tion rather than a visit location or previous appointment. The filtered email addresses were thus marked for prioritisation in the survey.

5. The final stage was to eliminate duplicates from the combined lists (retaining the filtered addresses when a choice was available) and to perform a final manual check to remove incorrect email addresses.

The overall result of the above process was the creation of two email address lists of academics that had a reasonable chance of being based in the US after having previously worked in a relevant European country and vice versa. This database of email addresses was used to form the main panel of addresses to which the survey was sent.

3.4.2 Indirect sampling methods

The team asked the European Commission to facilitate the sampling process for this survey by forwarding the link to the survey to:

- the Euraxess network;
- the EU Centres of Excellence (CoE) in the US; and
- the coordinators of the ATLANTIS Programme on EU-US Cooperation in Higher Education and Vocational Training.

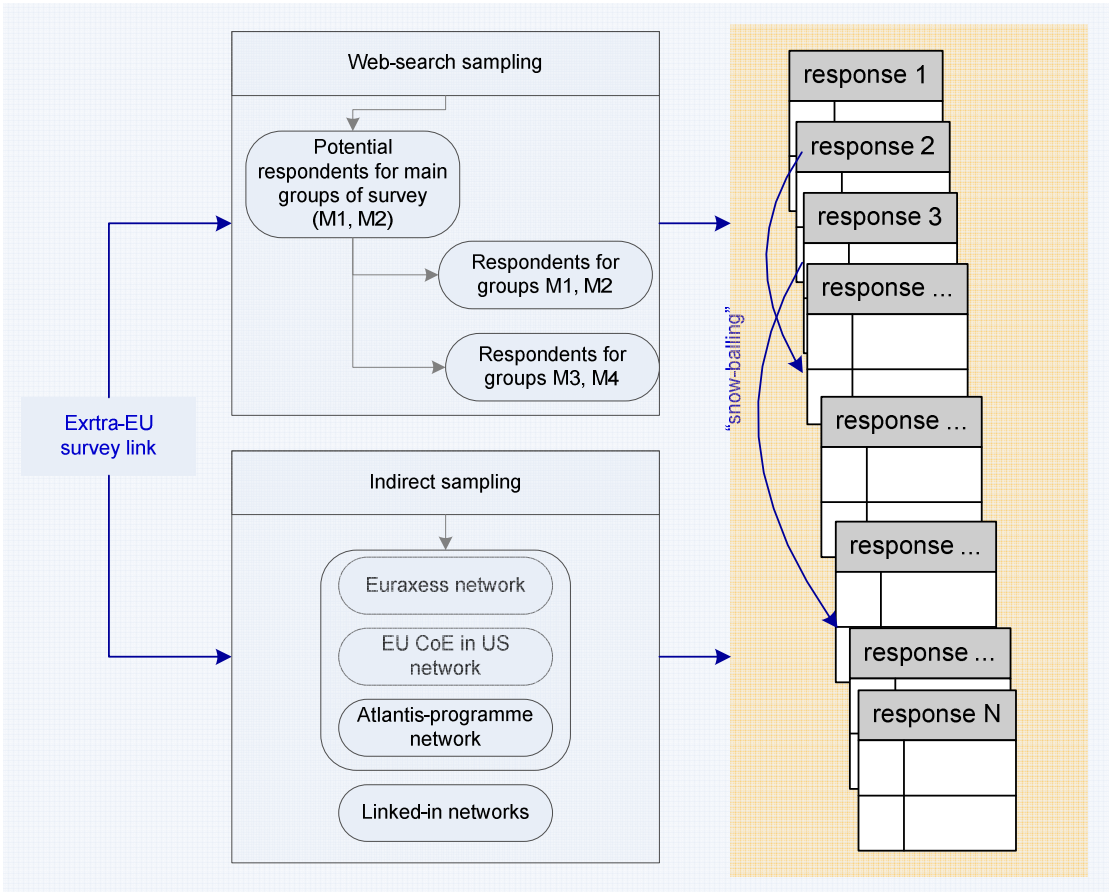
Researchers who received this link from one of these sources could use it to fill in the survey.

The team also announced the survey in the professional network Linked-In (to the groups on Global Mobility Management; Science, Technology and Innovation Policy professionals).

Finally, "snowballing" was used as an additional source to create the survey's sample. All respondents of the survey had the opportunity to forward the link to people who they thought should also be included in the survey.

The following graph summarises the sampling methods employed for this survey.

Figure 3-2: Sampling of this survey



3.4.3 Drawbacks of the sampling approach

As already mentioned, the sampling approach has been based on convenience sampling. This is a consequence of the fact that access to data on the total relevant population, from which a representative sample could be drawn, could not be established (and we have no knowledge of such data actually existing). Therefore, the conclusions that can be derived from the survey cannot be generalized to the overall population.

We explain the main reasons that the sample has not been representative in more detail below:

- The study focuses on the EU-US mobility, i.e. the mobility of EU graduates to the US. In order to construct a representative sample and given that the EU27 is our reference for the MORE study, we would first need to know the population of EU27 graduates who move to the US after their highest education degree. This information however is not available. Subsequently we would need to have access to the contact details of these researchers.
- As the target group of this study has been expanded to include also researchers moving from the US to the EU, we would need to know the population of US researchers moving to the EU as well as contact details for this population. This has not been possible to be established within the scope of the project.

- Additionally, the other target groups of the mobile researchers between regions other than the EU and the US as well as the group of non-mobile researchers would require information on the population of researchers on a world-wide basis.

Given the before-mentioned limitations, together with the fact that the present study is a pilot one and the focus has not been put into the construction of a representative sample, especially as access to such information could not be established, it should be taken into account that the sample analysed is not a statistically representative one. Therefore, the findings and conclusions drawn refer to this particular sample only and cannot be generalized to the whole population.

However, in the future actions should be taken so that follow-up surveys will aim to target a sample representative of the population. This would ideally include (1) access to data study/training visas or temporary work visas from EU27 countries to and from the US on a yearly basis with contact details of 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-performing or research-funding institutions.

However, the data presented in Chapter 2 on the National Survey of College Graduates (NSCG) in the US provide a sample of EU immigrants which is representative of the US science and engineering community. This sample is not representative of the EU research community; however we still provide a comparison of the results of the extra-EU mobility with the NSCG survey in terms of the underlying samples in what follows.

Due to the sampling strategy we see that there is a significant difference in the distribution of US immigrants by country of highest degree. The US immigrants in the extra-EU mobility survey are dominated by researchers who obtained their highest degree in the EU27 (87.6%) which is, due to the sampling strategy and the objectives of the survey, significantly higher than the respective share in the NSCG survey (9.2%). Therefore, the two samples should not be directly compared as their target population is a different one. However, in the section describing the motivational factors of mobility (Chapter 7) we do refer to the findings related to the motivational factors of mobility as presented by the NSCG survey.

3.5 Design and content of the questionnaire

This section provides an overview of the main topics that the questionnaire covers and the differences in terms of questions among the four mobility groups. The questionnaire contains two main parts:

a. **Part I** which addresses all four mobility groups (based on the master questionnaire used in all surveys of the MORE projects); and

b. **Part II** which contains the questions addressed individually to each of the four mobility groups regarding:

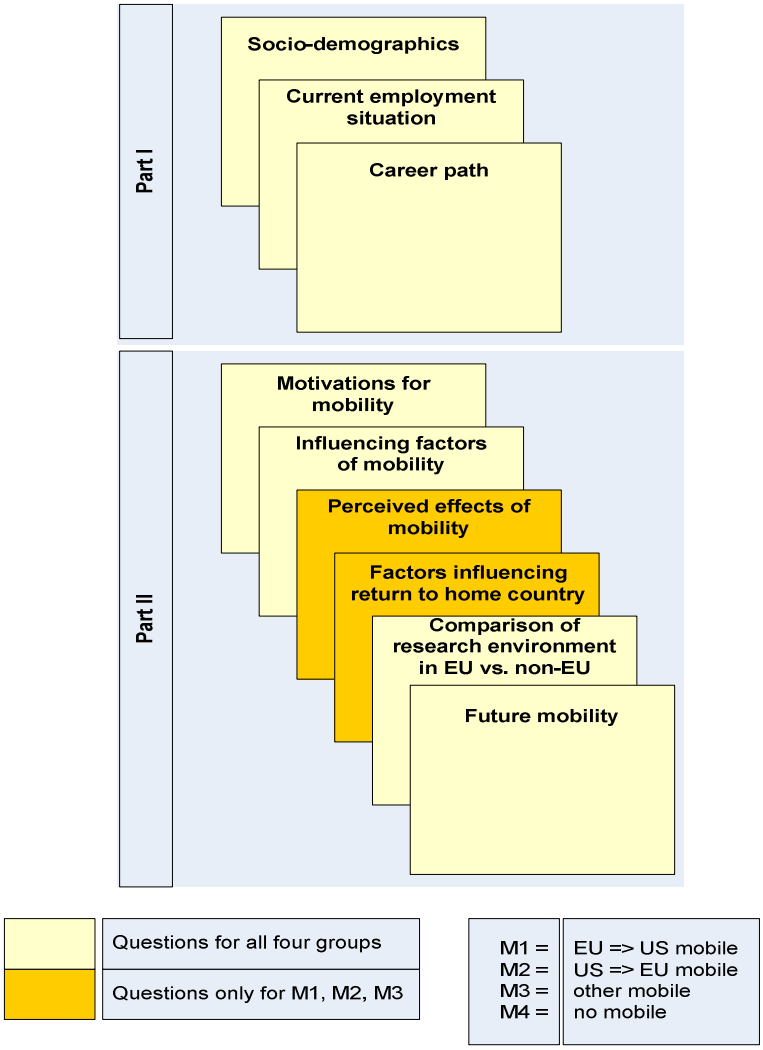
   - their experience of mobility;

   - their motivations, influencing factors and effects of mobility;

- the influencing factors of whether or not to return to their home country;
- the comparison of the research environment in the EU with other non-EU countries; and
- future mobility

The following graph provides a summary of the main topics that this survey has covered.

Figure 3-3: The structure of the questionnaire



3.5.1 General questions – Part I

Part I of the questionnaire begins with a question to determine whether the respondent is currently a researcher according to the definition set forth in the MORE project[21]. Part I then continues with questions on the following topics:

[21] A respondent is considered as researcher if he carries out research and/or supervises research and/or improve or develop new products/processes/services and/or supervises the improvement or development of new products/processes/services.

I.1. **Socio-demographics.** Here the respondent is asked to provide information on his personal and family situation (nationality, age, civil status, children and age of children, country of residence) and on his education and training (countries and years of obtaining diplomas, science field of highest degree, instances of mobility during education or apprenticeships)

I.2. **Current employment situation.** This section asks information about the respondent's current employer (type and location of current employer), the type of contract of the researcher (if (post-)doctoral student, type of contract, years working under current contract) as well as on other characteristics of his current employment, e.g. involvement of international collaboration.

I.3. **Career path and mobility.** This section provides some initial information on the general career paths of the respondents by focusing on the movement between the public and the private sectors. It also provides information on the changes of employers that the respondents have experienced as well the total number of countries where they have worked. This section ends with the 'routing' questions, i.e. those questions that direct the respondents to the correct mobility group in part II.

3.5.2 Mobility questions – Part II

Part II contains the questions which analyse the experience of mobile researchers. The same basic questions are used for groups M1, M2 and M3, though they are adapted according to the unique situation of each group. The relevant questions are also addressed to group M4 (the no-mobility group). In particular, Part II addresses the following topics:

II.1. **Experience of mobility.** This section asks questions on the stay rate in the host county, the personal motivations to become mobile (e.g. career progression goals, getting access to facilities, prospect to work with 'star' academics, financial incentives), the influencing factors of mobility (e.g. pension and social care provision, immigration regulations, funding), the perceived effects of mobility (e.g. on publications, on networking, on access to infrastructure, on general recognition as researcher) and on the factors influencing the decision to return or not to home country.

II.2. **Comparison of the EU as a research environment to the research environments in non-EU countries**. The questionnaire compares the research environment in Europe to that of other countries by focusing on aspects such as accessibility to funding opportunities, references for research careers, access to research infrastructure, opportunities to collaborate with top-class researchers, access to knowledge, attractiveness of remuneration schemes, and opportunities to work in industry.

II.3. **Future mobility.** This part asks questions about the respondent's openness to the possibility of working abroad in the future and on the attractiveness of specific locations as potential destinations in the future.

The following chapters provide the main findings of the survey by topic area.

4 SAMPLE DESCRIPTION

In this chapter we start with a description of the sample of this survey. A presentation of main statistics follows on the main socio-demographic characteristics of the respondents and their education and training.

4.1 Sample size and sub-samples

In this section, we will describe the sample size, the different sub samples and the elimination criteria for the removal of respondents.

The survey was initially sent to 93 183 email addresses. Out of these, 22 206 people viewed the email and 5572 responded (6% of the total invited and 25% of those who viewed the email). Out of the responses, 4571 represented fully completed questionnaires. To this we added 1393 fully completed surveys from the non-panel individuals. Table 4-1 summarizes the outcomes.

The responses belonging to the 'panel' are those who have been directly invited to fill in the questionnaire (contacts derived through the web-search procedure), while the 'non-panel' respondents are those who have accessed the survey indirectly (e.g. via invitation from Euraxess, EU Centres of Excellence in the US, snowballing, etc.)

Table 4-1 Sample size and some response characteristics

Panel	
Number invited (panel size)	93 183
Bounced emails	2 105 (2.3%)
Declined	724 (0.8%)
Reminded (because of no response)	88 745 (95.2%)
Reminded (because of partial response)	1 129 (1.2%)
Saw email	22 206 (23.8%)
Clicked through	6 194 (6.6%)
Told a friend	282 (0.3%)
Total responses	5 572 (6% of total invited) (25% of the persons who saw the invitation email)
Of which ... partially completed	1 001 (18%)
Of which ... reached end	4 571 (82%)
Non – panel	
Responses	1 866
Told a friend	66 (3.5%)
Of which ... partially completed	473 (25.3%)
Of which ... reached end	1 393 (74.7%)
Panel + non-panel	
Responses	7 438
Of which ... partially completed	1 474 (19.8%)
Of which ... reached end	5 964 (80.2%)

Source: MORE extra – EU survey

4.1.1 Net sample size and sub-samples

The initial database, which contained 7438 observations, was checked for inconsistencies and cleaned by applying a number of elimination criteria. Observations were removed if the respondent only partially completed the survey, if the respondent were not currently working as a researcher or if the respondent provided illogical or incorrect dates. Using these elimination criteria resulted in a net sample size of **5544 responses**.

The following table presents an overview of the four different mobility groups.

Table 4-2 An overview of the four mobility groups

Mobility groups	%	N
Mobility group 1 (EU->US)	15.6	867
Mobility group 2 (US-> EU)	5.8	321
Mobility group 3 (other mobile)	43.8	2429
Mobility group 4 (no mobile)	34.8	1927
Total	100	5544

Source: MORE extra – EU survey

In addition to determining if the respondent is currently active as a researcher, question 1 also provided information about the job responsibilities of the respondent. Table 4-3 presents an overview of these results. Since it was possible to tick more than one response, the percentages do not add up to 100%.

Table 4-3 Researchers by activities required in their job

Does your current job encompass	%	N
Carrying out Research	96.4	5343
Improving Products or Processes	72.3	4010
Developing new products or processes	31.4	1739
Supervising Research	21.2	1175
Total	100	5544

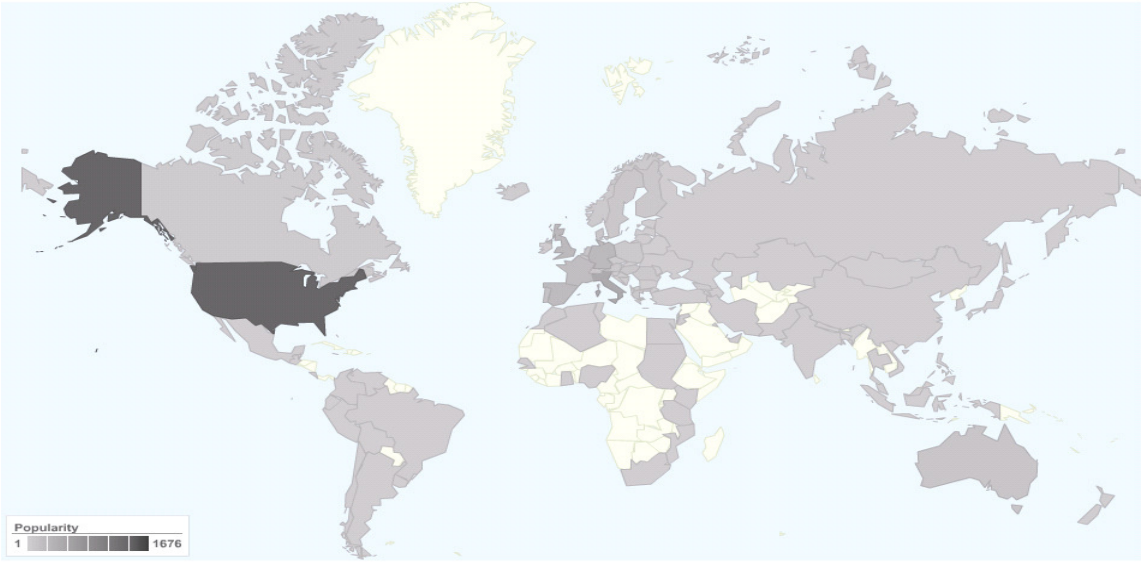
Source: MORE extra – EU survey

As a note to the reader, for the rest of the report, when we mention EU we refer to EU27.

4.2 Regional coverage of the sample

The following figure presents the regional coverage of the sample at country level by country of residence of the respondent. The darker the grey, the more respondents of a particular country of residence have answered the survey.

Figure 4-1 Regional coverage of the sample, by country of residence



Source: MORE extra – EU survey

First, we see that the US is strongly represented in the survey, with 1676 respondents (or 30%). The representation of the EU27 as a whole in the survey is less clear, since all countries are a single unit on the map. But if we sum up the number of respondents of all member states, we have 3116 respondents (or 56%). From the EU27 Member States, Italy is the strongest represented, with 575 respondents or 10.4%, followed by the UK, with 325 respondents or 5.9% and Germany with 318 respondents or 5.7%. Table A2-1 in Annex 2 presents the number of respondents for each of the EU-27 countries. Table 4-4 below summarizes the overall composition of the net survey sample in terms of region of birth, region of residence, and gender.

Table 4-4 Profile characteristics of the net sample

Region of birth	%	N
EU	64.0	3547
US	16.1	890
Other country	20.0	1107
Region of residence	%	N
EU	56.2	3116
US	30.2	1676
Other country	13.6	752
Gender	%	N
Male	65.0	3602
Female	35.0	1942
Total	100	5544

Source: MORE extra – EU survey

4.3 Socio-demographic characteristics

In this section, we describe the socio-demographic characteristics of the respondents in the survey. First, we zoom in on the results by region of residence. Next, we describe the results by region of birth, nationality and region of graduation. In a final paragraph, we focus on the differences by gender, age and family situation.

4.3.1 Region of residence

Table 4-5 shows the distribution of responding researchers by region of residence. It presents the general results, and the results per region of birth and region of graduation.

Table 4-5 Researchers by region of residence per region of birth and region graduation (%)

	Region of Birth			Region of Graduation			Total
	EU	US	Other	EU	US	Other	
Residents of EU	74.7	13.9	30.9	79.7	20.5	26.2	56.2
Residents of US	19.1	82.0	24.2	13.9	71.3	13.6	30.2
Residents of other	6.2	4.0	44.9	6.4	8.1	60.2	13.6
Total	100	100	100	100	100	100	100
Observations	3547	890	1107	3277	1583	684	5544

Source: MORE extra – EU survey

56% of the respondents reside in the EU, 30% in the US and less than 14% in other countries. Looking at the results per region of birth, we see that the US has with 82% the highest percentage of respondents staying in their region of birth. In the EU this percentage is slightly lower, but still three quarters of the respondents born in the EU still live in the EU. These results contrast with the results of the group of other countries where more than half of them have moved to the EU (31%) or the US (24%).

The results per region of graduation slightly differ from the ones per region of birth. Here we see that the EU has the largest percentage of graduating researchers that stay in the EU, while this is only 71% in the US. Thus, we can conclude that graduating in the EU leads to a more permanent stay as opposed to graduating in the US. This result is partially explained by the region of birth: after graduating in another region, researchers likely want to return to their region of birth. The fact that a much higher share of respondents born in the EU graduated in the US (13%) compared to the share of respondents born in the US and graduated in the EU (only 5%) would then explain this difference in Table 4-5 (see Table 4-6).

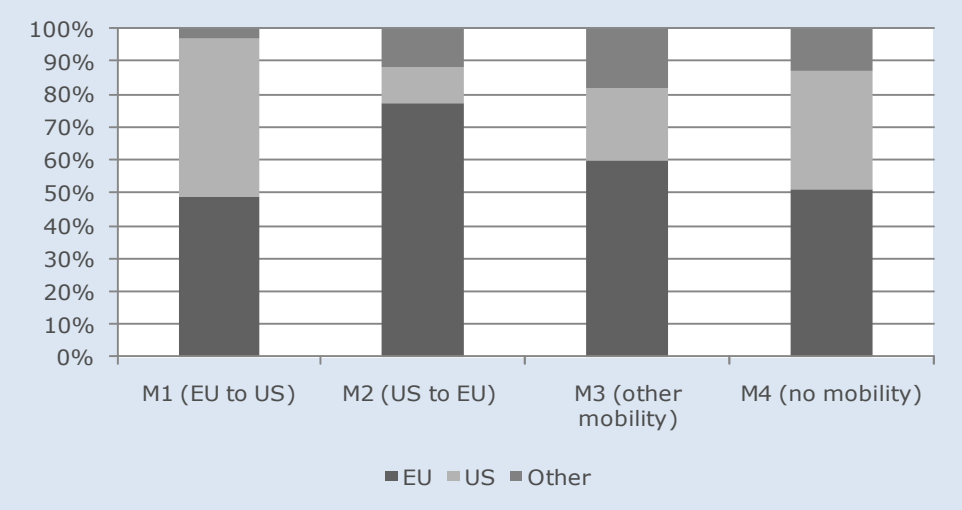
Table 4-6 Researchers by region of graduation per region of birth (%)

	Region of Birth			
	EU	US	Other	Total
Graduated in EU	83.2	5.1	25.3	59.1
Graduated in US	12.9	93.9	26.1	28.6
Graduated in other	3.9	1.0	48.6	12.3
Total	100	100	100	100
Observations	3547	890	1107	5544

Source: MORE extra – EU survey

The next figure shows the region of residence distribution for each mobility group.

Figure 4-2 Region of residence per mobility group



Source: MORE extra – EU survey

Within the three mobility groups, the respondents from mobility group 2 (US to EU) and 3 (other mobility) mainly reside in the EU, with 77% and 60% respectively. The remaining respondents of these two groups are more or less equally distributed between the US and the other countries. Conversely, in mobility group 1 (EU to US) only half of the respondents live in the EU, while the other half live in the US. Only 3% of them reside in other countries. Half of the non-mobile respondents reside in the EU, 36% of them reside in the US and the remaining 13% reside in other countries.

4.3.2 Region of birth, nationality and region of graduation

Table 4-7 presents the distribution across the three nationality regions (EU, US and other) per region of birth, for each mobility group.

Table 4-7 Region of birth and nationality per mobility group (in %)

	M1 Region of birth			M2 Region of birth		
Nationality	EU	US	Other	EU	US	Other
EU	97.0	20.0	43.4	93.6	11.4	13.4
US	2.8	80.0	3.8	3.6	87.7	7.5
Other country	0.3	0.0	52.8	2.9	0.9	79.1
Total	100	100	100	100	100	100
Observations	799	15	53	140	114	67
	M3 Region of birth			M4 Region of birth		
Nationality	EU	US	Other	EU	US	Other
EU	96.2	2.0	14.4	95.4	1.5	12.7
US	1.3	97.2	7.3	3.2	97.5	7.7
Other country	2.5	0.8	78.3	1.4	1.0	79.6
Total	100	100	100	100	100	100
Observations	1514	354	561	1094	407	426

Source: MORE extra – EU survey

In general, for the EU and the US the results are quite expected. For each mobility group, the majority of respondents born in the EU are also EU citizens. The same holds true for the respondents born in the US- the majority are US citizens.

For the group of other countries, this percentage is slightly lower in all mobility groups, but especially in mobility group 1 (EU to US) where only 43% of the respondents born in the group of other countries are classified as having 'EU'-nationality. There are no remarkable differences between the groups of mobile researchers versus the group of non-mobile researchers.

4.3.3 Gender, age and family situation

The following table provides a number of personal characteristics of the responding researchers by region of residence.

Table 4-8 Personal characteristics of researchers by region of residence (%)

	EU	US	Other	Total
	Gender			
Male	65.3	65.8	62.0	65.0
Female	34.7	34.2	38.0	35.0
Observations	3116	1676	752	5544
	Age			
Between 18 and 25	0.8	0.6	0.9	0.8
Between 26 and 35	31.1	23.1	24.6	27.8
Between 36 and 55	53.0	50.7	56.8	52.8
56 or older	15.1	25.6	17.7	18.6
Average age	42.5	46.1	44.3	43.8
Observations	3116	1676	752	5544
	Timing of graduation (of highest educational attainment)			
Before 1980	7.3	14.0	6.5	9.2
Between 1980 and 1989	12.0	17.4	11.7	13.6
Between 1990 and 1999	23.2	26.4	26.2	24.6
Between 2000 and 2010	57.4	42.2	55.6	52.6
Average age at highest graduation (in years)	30.7	30.7	32.4	30.9
Observations	3116	1676	752	5544
	Marital Status			
Married/cohabiting	71.3	77.3	75.2	73.6
Single	22.4	16.9	17.4	20.0
Widowed	0.3	0.6	0.9	0.5
Divorced	4.0	4.4	5.4	4.3
Other	2.0	0.8	1.1	1.5
Observations	3015	1625	737	5377
	Children			
Has (a) child(ren)	53.6	55.7	61.9	55.4
Observations	3097	1667	750	5514
	Number of Children			
1	33.2	33.4	25.7	32.1
2	45.8	47.0	48.6	46.6
3	16.1	14.4	18.3	15.9
4	3.5	3.4	5.0	3.7
5 or more	1.5	1.8	2.4	1.7
Average age of Oldest Child	14.8	17.2	17.1	15.9
Observations	1641	912	459	3081

Source: MORE extra – EU survey

The share of male researchers residing in the EU and US is 65% and 66% respectively, which is somewhat higher than in the group of other countries (62%). The average responding researcher is nearly 44 years old. More than half of the respondents (53%) are between 36 and 55 years old. Researchers residing in the EU are, on average, slightly younger compared to researchers residing in the US and the group of other countries.

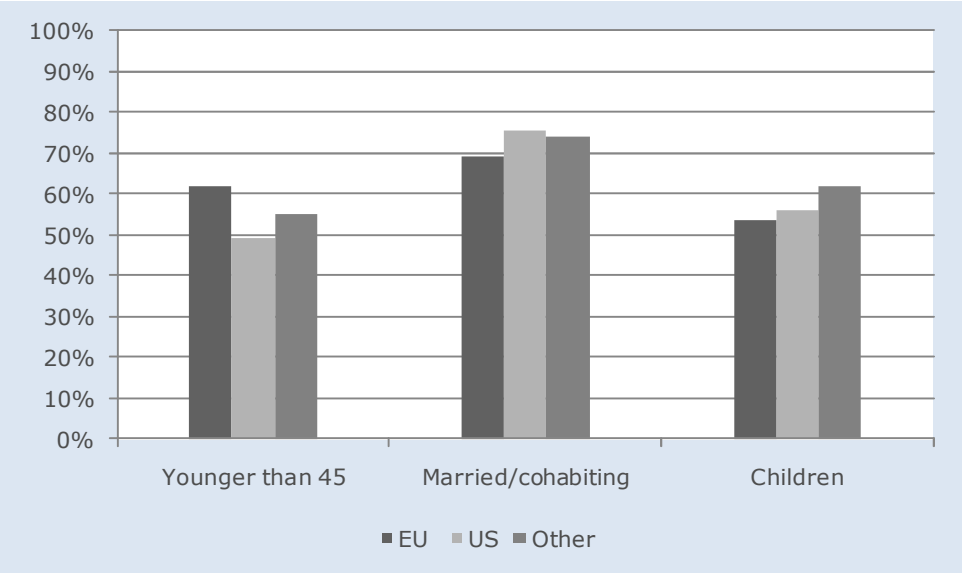
More than half of the respondents (52%) achieved their highest degree between 2000 and 2010. A quarter of the respondents achieved it in the 1990's. Comparing these results with the age distribution, we see that the responding researchers take quite some time before they eventually achieve their highest educational degree. Another explanation is that they have research breaks in their career, alternating academic life with jobs in the private sector, and therefore get their highest degree in a later stage of their working life.

Looking at marital status, we see that nearly 74% of the respondents are married or cohabiting and 20% are single. Only a minor share are widowed or divorced. In the EU, the share of married/cohabiting respondents is somewhat lower than in the other regions of residence, while the share of single respondents is slightly higher.

54% of the EU and 56% of the US respondents have children, compared to 62% in the group of other countries. In addition, the number of children is higher in the group of other countries than in EU and US, with 74% of the respondents having more than 1 child, compared to 66% in the EU and US.

Figure 4-3 below shows the share of researchers younger than 45 years old, married or cohabitating and with children. Looking at the researchers younger than 45 years old, we see that the share in the EU is 62%, which is slightly higher than in the US and other countries of residence (49% and 55% respectively).

Figure 4-3 Share of researchers younger than 45 years old, married/co-habiting, with children, by region of residence



Source: MORE extra – EU survey

Next, we computed a new variable, by looking at the difference in years between attainment of the highest educational degree and the year of birth. This difference is the age at which the respondent achieved his/her highest educational degree.

We assigned these age-results to four age groups. The following table shows the distribution across the four age groups in general and per type of highest educational degree received.

Table 4-9 Age group of obtaining highest educational attainment, per types of highest educational attainment (in %)

Age group obtaining highest educational attainment	Highest educational attainment					
	PhD	graduate	under-graduate	secondary	other	Total
17 - 25 years old	4.3	46.0	78.0	20.0	4.3	10.5
26 - 30 years old	48.4	36.2	14.0	50.0	48.4	46.4
31 - 40 years old	40.7	13.4	4.0	30.0	40.7	36.8
41 years or older	6.6	4.4	4.0	0.0	6.6	6.3
Total	100	100	100	100	100	100
Observations	4741	729	50	10	14	5544
Average age at highest graduation (in years)	31.5	27.6	25.0	27.1	33.1	30.9

Source: MORE extra – EU survey

As expected, respondents that obtained a PhD-degree are on average the eldest group of researchers, followed by the group of respondents with a graduate degree. The majority of the respondents with a PhD-degree (48%) obtained this degree between ages 26 and 30. 41% of respondents obtained their PhD between ages 31 and 40; the majority of which obtained their PhD before the age of 34. From the group of respondents with an undergraduate degree only, 78% obtained this degree between the ages of 17 and 25, which is a very logical result. The results of the group of respondents with only a secondary degree are somewhat surprising, as 80% of the respondents obtained this degree after the age of 25; however, it is important to note that the number of observations (10) is very low.

Table 4-10 provides the results on the same personal characteristics as in Table 4-8, but this time by mobility group.

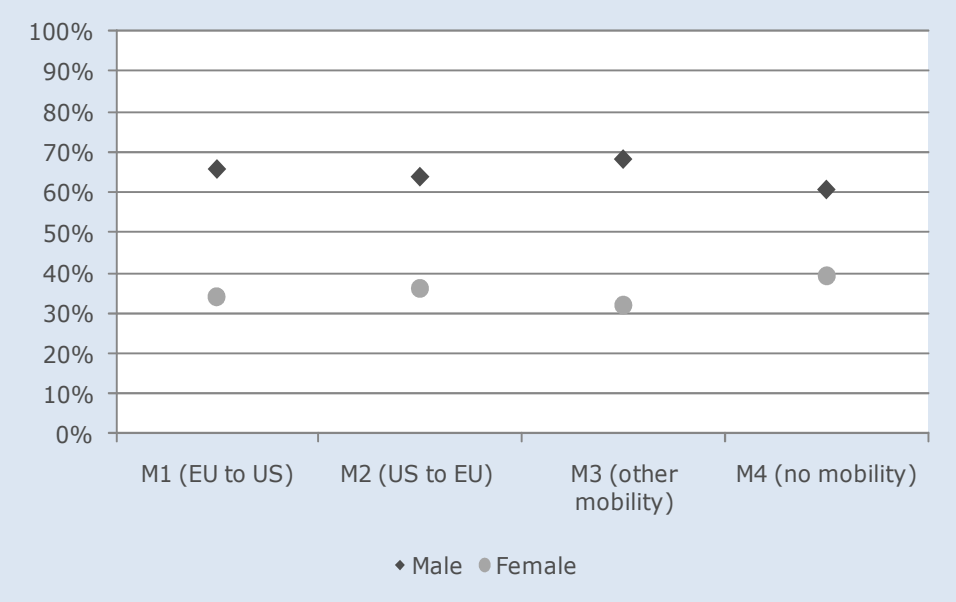
Table 4-10 Personal characteristics of researchers by mobility group (in %)

	M1	M2	M3	M4	Total
	Gender				
Male	65.7	63.9	68.2	60.8	65.0
Female	34.3	36.1	31.8	39.2	35.0
Observations	867	321	2429	1927	5544
	Age				
Between 18 and 25	0.3	0.6	0.5	1.3	0.8
Between 26 and 35	26.3	21.2	25.6	32.4	27.8
Between 36 and 55	54.6	57.0	53.5	50.5	52.8
56 or older	18.8	21.2	20.5	15.8	18.6
Average age	44.0	45.4	44.6	42.6	43.8
Observations	867	321	2429	1927	5544
	Timing of graduation (of highest educational attainment)				
Before 1980	11.3	12.8	10.3	6.3	9.2
Between 1980 and 1989	13.8	13.1	14.6	12.2	13.6
Between 1990 and 1999	25.5	29.3	25.7	22.0	24.6
Between 2000 and 2010	49.4	44.9	49.3	59.5	52.6
Average age at highest graduation (in years)	30.1	31.0	30.8	31.5	30.9
Observations	867	321	2429	1927	5544
	Marital Status				
Married/cohabitating	74.0	76.4	74.5	71.9	73.6
Single	20.1	17.2	18.8	22.1	20.0
Widowed	0.7	1.3	0.4	0.4	0.5
Divorced	3.8	4.1	4.8	4.0	4.3
Other	1.4	1.0	1.5	1.6	1.5
Observations	841	314	2354	1868	5377
	Children				
Has (a) child(ren)	52.9	58.9	58.0	52.5	52.9
Observations	865	319	2415	1915	5514
	Number of Children				
1	31.9	28.0	32.0	33.1	32.1
2	44.9	51.6	45.7	47.7	46.6
3	16.3	16.1	16.9	14.2	15.9
4	4.6	2.7	3.5	3.7	3.7
5 or more	2.2	1.6	1.9	1.2	1.7
Average age of eldest child	15.7	15.4	16.4	15.2	15.9
Observations	454	186	1375	997	3012

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

The share of male students is highest in the group of mobile researchers (with the highest percentage of 68% for mobility group 3 – other mobility) and lowest in the group of non-mobile researchers (mobility group 4 – no mobility with only 61%). This is not surprising, since women are still more restricted due to family-reasons (e.g., pregnancy and raising up children) than men.

Figure 4-4 Male versus female researchers by mobility group

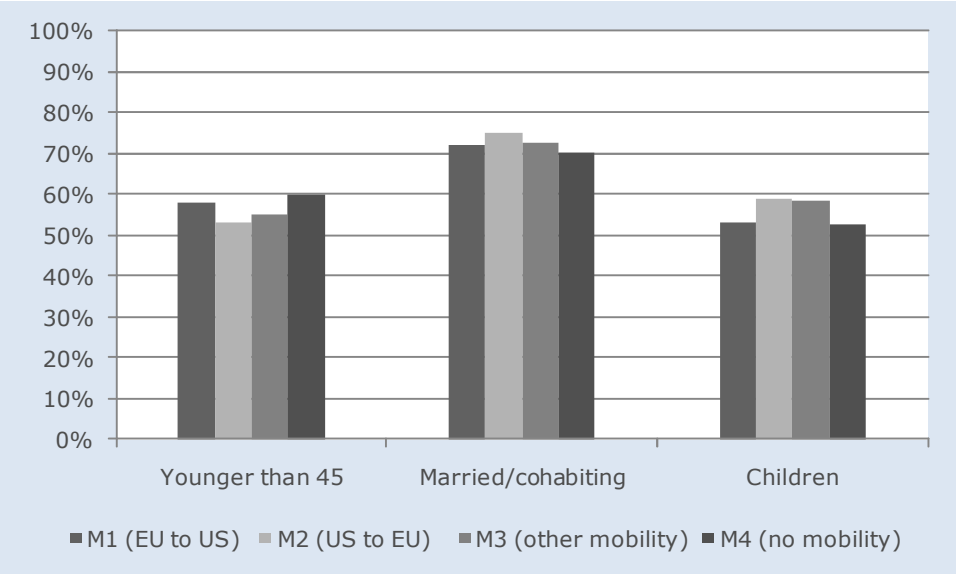


Source: MORE extra – EU survey

Turning back to Table 4-10, we see that researchers in mobility groups 2 (US to EU) and 3 (other mobility) are, on average, also slightly older compared to researchers in mobility groups 1 (EU to US) and 4 (no mobility). This is also illustrated in Figure 4-5 below, where the group of non-mobile researchers has the highest share of respondents younger than 45, closely followed by mobility group 1. There are relatively more married (or cohabiting) and relatively less single respondents in mobility group 2, compared to the three other groups. The group of non-mobile researchers has the lowest percentage of married/cohabitating respondents and the highest percentage of single respondents (see also Figure 4-5).

Nearly 60% of the respondents in mobility groups 2 and 3 have children, compared to 53% and 52.5% in mobility group 1 and 4. This is a remarkable result, as we would expect that persons with children are less mobile than persons without. However, we can take into consideration that since mobility is motivated by better economic opportunities, married researchers with children, having greater needs, might be more motivated to move. Given the lower percentage for mobility group 4 (no mobility), this argumentation does not hold true. The share of respondents with only 1 child is lowest in mobility group 2 (US to EU). Mobility group 1 (EU to US) has relatively more 'larger households' with 6.8% of the respondents having 4 or more children compared to 5.4%, 4.9% and 4.3% for mobility group 3, 4 and 2 respectively. Here the results of mobility group 4 conflict with the results that would be expected, since the group of non-mobile researchers has fewer 'large households' than does the group of mobile researchers, while the opposite would seem to be more logical.

Figure 4-5 Share of researchers younger than 45 years old, married/co-habiting, with children, by mobility group



Source: MORE extra – EU survey

In conclusion, mobility group 4 (no mobility) and 1 (EU to US) contain more 'younger' and 'single' researchers without 'children' than mobility group 2 (US to EU) and 3 (other mobility). This finding is not as expected for the no-mobile groups as we would expect that persons not bound by a relationship and/ or family obligations would be more mobile.

4.4 Education and training

Section four deals with topic 'education and training'. The first two sections discuss the highest educational attainment and the field of science in which the researchers obtained their highest educational diploma. Subsequently, the results on student mobility and work experience in industry as student are presented.

The following table presents the highest educational attainment of researchers by a number of profile characteristics.

Table 4-11 Highest educational attainment of researchers by region of residence, region of graduation and mobility group (in %)

	Region of residence				
	EU15	EU12	US	Other	Total
PhD (or equivalent)	82.4	82.7	91.9	84.2	85.5
Graduate degree	16.3	16.4	6.9	14.0	13.1
Undergraduate	0.9	0.6	0.9	1.1	0.9
Secondary Education	0.2	0.0	0.2	0.1	0.2
Other	0.2	0.3	0.1	0.7	0.3
Total	100	100	100	100	100
Observations	2763	353	1676	752	5544
	Region of graduation				
	EU15	EU12	US	Other	Total
PhD (or equivalent)	83.7	82.5	92.4	78.7	83.7
Graduate degree	14.7	17.0	6.9	19.2	14.7
Undergraduate	1.1	0.3	0.5	1.5	1.1
Secondary Education	0.2	0.0	0.1	0.1	0.2
Other	0.3	0.3	0.1	0.6	0.3
Total	100	100	100	100	100
Observations	2935	342	1583	684	5544
	Mobility group				
	M1	M2	M3	M4	Total
PhD (or equivalent)	92.8	94.4	88.5	77.0	85.5
Graduate degree	6.1	5.0	10.5	21.0	13.1
Undergraduate	0.6	0.6	0.6	1.5	0.9
Secondary Education	0.1	0.0	0.2	0.3	0.2
Other	0.3	0.0	0.2	0.3	0.3
Total	100	100	100	100	100
Observations	867	321	2429	1927	5544

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

Nearly 86% of the respondents have a PhD or equivalent. For the respondents residing in the US, this number is 92%. The results by region of graduation are more or less similar, with the highest share of PhD-degrees in the US. By mobility group, it is group 2 that has the highest share of respondents with a PhD-degree with 94.4%, closely followed by group 1 with 92.8%. The group of non-mobile researchers has a significantly lower share of respondents with a PhD (only 77%). For the whole sample the share of respondents with a degree lower than Graduate (e.g. Undergraduate or lower) is only 1.4%.

4.4.1 Field of science

Table 4-12 presents the highest educational attainment of researchers by a number of profile characteristics.

Table 4-12 Field of science of highest degree by region of residence, region of graduation and mobility group (in %)

	Region of residence				
Field of science of highest degree	EU15	EU12	US	Other	Total
Natural Sciences	42.9	39.4	39.7	38.2	41.1
Engineering and Technology	9.8	11.6	6.7	10.5	9.1
Medical and Health Sciences	5.5	5.7	5.0	4.7	5.2
Agricultural Sciences	3.5	4.2	1.7	6.5	3.4
Social Sciences	29.0	28.3	32.0	30.3	30.0
Humanities	9.3	10.8	14.9	9.8	11.2
Total	100	100	100	100	100
Observations	2763	353	1676	752	5544
	Region of graduation				
	EU15	EU12	US	Other	Total
Natural Sciences	45.3	44.2	31.8	42.8	41.1
Engineering and Technology	9.4	12.3	6.9	11.1	9.1
Medical and Health Sciences	5.7	6.1	3.4	6.9	5.2
Agricultural Sciences	3.5	4.7	1.6	6.7	3.4
Social Sciences	26.5	22.8	41.1	23.1	30.0
Humanities	9.6	9.9	15.2	9.4	11.2
Total	100	100	100	100	100
Observations	2935	342	1583	684	5544
	Mobility group				
	M1	M2	M3	M4	Total
Natural Sciences	50.2	32.4	43.9	34.8	41.1
Engineering and Technology	8.4	8.1	8.7	10.0	9.1
Medical and Health Sciences	7.5	1.9	4.2	6.1	5.2
Agricultural Sciences	3.2	1.6	3.5	3.8	3.4
Social Sciences	21.7	42.1	28.2	34.1	30.0
Humanities	9.0	14.0	11.5	11.2	11.2
Total	100	100	100	100	100
Observations	867	321	2429	1927	5544

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

Most of the respondents obtained their highest educational degree in natural (41%) and social sciences (30%). Medical and health sciences (5%) and agricultural sciences (3.5%) are the least represented. By region of residence, we see that there are relatively more researchers specialised in engineering and technology in the EU12 and the non-EU and non-US countries than in the US and the EU15. The US has the highest percentage of those in the humanities and the lowest percentage of researchers in agricultural sciences (only 1.7%). However, we have to keep in mind that it is not a representative sample and that the total share of researchers with a highest degree in agricultural sciences is very small in this sample.

The differences are larger between the different regions of graduation. In the US, there are relatively less researchers in natural, medical and health and agricul-

tural sciences and engineering and technology, but nearly twice as much researchers in social sciences and 50 to 60% more researchers in humanities compared to the other regions.

Also the fields of sciences are distributed differently between the different mobility groups. Indeed, the results from the respondents in mobility group 2 (US to EU) differ the most from the other mobility groups. We see that half of the researchers in mobility group 1 (EU to US) obtained their highest degree in natural sciences, which compared to the other groups, is by far the highest share. Conversely, researchers in mobility group 1 have relatively less social science graduates than the other groups.

Next, we present the distribution for the variable 'age at obtainment of the highest educational degree' across the four different age groups per field of science. Here, we expect, on average, a higher duration for the medical and health sciences, which are science fields with a longer study-path than other fields. Together with humanities (average age 32.8), the medical and health sciences (average age 32.6) is indeed the field of science where researchers obtain their highest educational degree approximately 2 to 3 years later than other fields, (i.e., the natural sciences (average age 29.8) and engineering and technology (average age 30.1)). In both these fields however we see that there are relatively higher shares of respondent with a PhD. This is however not the case of Natural Sciences where the average age of graduation (highest degree) is relatively low although there is a high share of respondents with a PhD.

Table 4-13 Age group of obtaining the highest educational attainment, by field of science of highest degree (in %)

	Field of science						
Age group obtaining highest educational attainment	Natural Sciences	Engineering and Technology	Medical and Health Sciences	Agricultural Sciences	Social Sciences	Humanities	Total
17 - 25 years old	11.6	15.7	8.6	15.7	8.3	7.6	10.5
26 - 30 years old	54.7	47.7	39.0	42.9	41.1	33.9	46.4
31 - 40 years old	30.7	31.6	39.0	37.2	42.6	46.4	36.8
41 years or older	3.1	5.0	13.4	4.2	7.9	12.1	6.3
Total	100	100	100	100	100	100	100
n	2276	503	290	191	1665	619	5544
Average age	29.8	30.1	32.6	30.6	31.8	32.8	30.9
Share with PhD	88.4	76.3	89.3	80.6	84.3	85.3	85.5

Source: MORE extra – EU survey

4.4.2 Student mobility and work experience in industry as student

Table 4-14 presents the share of researches that have been mobile as a student (during their undergraduate or graduate studies), per field of graduation.

Table 4-14 Share of researchers, having been mobile as a student per field of graduation

	% Mobile as student	n (total)
Natural Sciences	27.1	2276
Engineering and Technology	26.0	503
Medical and Health Sciences	25.9	290
Agricultural Sciences	29.8	191
Social Sciences	36.2	1665
Humanities	44.4	619
Total	31.7	5544

Source: MORE extra – EU survey

The field of humanities consists of the highest percentage of respondents having been mobile as a student (44%), in contrast to the fields of medical and health science and engineering and technology, both with a share of only 26%.

The high percentage in humanities is caused by the high percentages in the subfields of languages and literature (49%) and history and archaeology (48%). The subfields with the highest share of researchers having been mobile as a student are industrial biotechnology (67%) and medical engineering (61%), both of which are categorized in the field of engineering and technology. Subfields with the lowest share are 'other' unspecified medical sciences, materials engineering and agricultural biotechnology with only 13%, 14% and 16% respectively. Next, Table 4-15 provides the share of researches that have had work experience in the industry as student, per field of graduation.

Table 4-15 Share of researchers having had work experience in industry as student per field of graduation

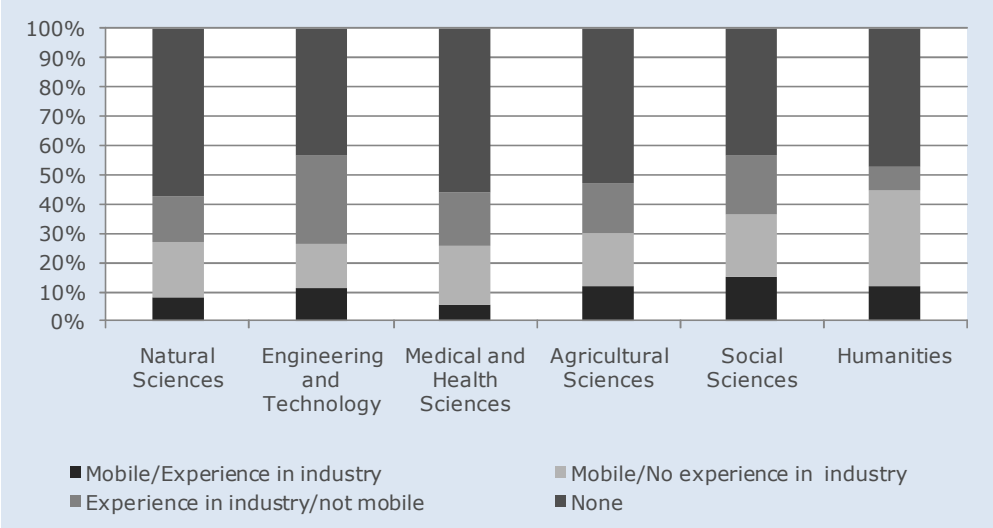
	% work experience in industry as student	n (total)
Natural Sciences	24.0	2276
Engineering and Technology	41.4	503
Medical and Health Sciences	24.5	290
Agricultural Sciences	27.7	191
Social Sciences	35.1	1665
Humanities	20.0	619
Total	28.6	5544

Source: MORE extra – EU survey

The results show a different picture compared to the results of having been mobile as a student. The field of engineering and technology has the highest share of researchers that have work experience in industry as student (41%), while humanities has the lowest share with a percentage only half as high. Subfields with a high share of researchers having had work experience as student in industry are 'other' unspecified engineering and technologies, environmental engineering (51%) and materials engineering (all with 50%), while environmental biotechnology (14%), philosophy, ethics and religion (8%) are situated at the lower end.

Remarkable is the fact that none of the respondents in the subfield of industrial biotechnology has had work experience in industry as student.

Figure 4-6 Share of researchers having been mobile as student and had work experience in industry as student, per field of graduation

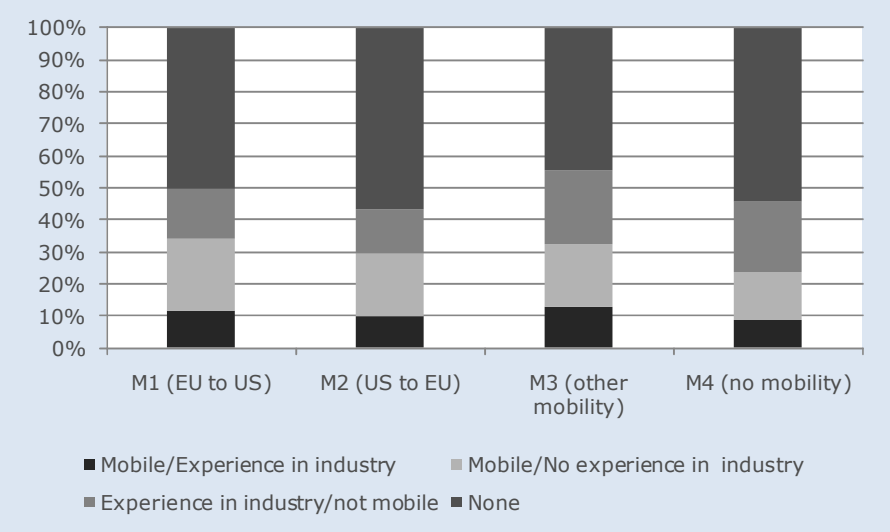


Source: MORE extra – EU survey

With 15% the field of social sciences presents the highest share of responding researchers that have been both mobile as a student and have had work experience in industry as student, while the medical and health sciences presents the lowest, with only 6%. Conversely, medical and health sciences present the highest percentage of researchers that have not been mobile as a student nor have had work experience in industry as student.

Figure 4-7 shows similar results, but now from the perspective of the different mobility groups.

Figure 4-7 Share of researchers having been mobile as student and had work experience in industry as student, per mobility group



Source: MORE extra – EU survey

Mobility group 2 (US to EU) has the highest percentage of researchers that have not been mobile as a student (57%), nor have had work experience in industry as student, closely followed by the group of non-mobile researchers (55%). In the group of non-mobile researchers, half of the remaining respondents have only had work experience in industry as student. In mobility group 3 (other mobility) the share of researchers that have had work experience in industry as student is also larger than the share of researchers that have been mobile, while in mobility group 1 (EU to US) and 2 (US to EU) the proportion is the reverse.

4.5 Main findings

In the net-sample, the EU 27 is strongly represented (as region of residence) with 3116 respondents or 56%, followed by the US with 1676 respondents or 30%. From the EU27 Member States, Italy has the largest share, with 575 respondents or 10.4%, followed by the UK with 325 respondents or 5.9% and Germany with 318 respondents or 5.7%.

56% of the respondents are residing in the EU, 30% in the US and less than 14% in other countries. By region of birth, the US has the highest percentage of respondents staying in their birth region with 82%. In the EU this percentage is slightly lower, but still three quarters of the respondents born in the EU, still live in the EU.

Within the three mobility groups, the respondents from mobility group 2 and 3 mainly reside in the EU, with 77% and 60% respectively. Conversely, for mobility group 1 only half of the respondents live in the EU, while the other half live in the US. Half of the non-mobile respondents reside in the EU, 36% of them reside in the US and the remaining 13% reside in other countries.

In general, for the EU and the US the results are as expected. For each mobility group, the majority of respondents born in the EU are also EU nationals. The same holds true for the respondents born in the US of which the majority are US nationals.

There are no remarkable differences between the groups of mobile researchers versus the group of non-mobile researchers.

The share of male researchers residing in the EU and US is 65% and 66% respectively, which is somewhat higher than in the group of other countries (62%). The share of male students is lowest in the group of non-mobile researchers, with only 61%.

More than half of the respondents (53%) are between 36 and 55 years old. Researchers residing in the EU are, on average, slightly younger compared to researchers residing in the US and the group of other countries. Researchers in mobility groups 2 (US to EU) and 3 (other mobility) are, on average, slightly older compared to researchers in mobility groups 1 (EU to US) and 4 (no mobility).

More than half of the respondents (52%) achieved their highest educational degree between 2000 and 2010. A quarter of the respondents achieved their highest degree in the 1990s.

54% of the respondents residing in the EU and 56% of the respondents residing in the US have children, compared to 62% in the group of other countries. Nearly 60% of the respondents in mobility groups 2 and 3 have children, compared to 53% and 52.5% in mobility group 1 and 4. We would, however, expect that persons with children are less mobile than persons without.

Nearly 86% of the respondents have a PhD or equivalent degree. For the respondents residing in the US, this number is 92%. The group of non-mobile researchers has a significantly lower share of respondents with a PhD. Overall, only 1.4% have not obtained a graduate degree.

Most of the respondents achieved their highest educational attainment in natural (41%) and social sciences (30%). Researchers that graduated in the US are relatively less represented in natural, medical and health and agricultural sciences and engineering and technology, but there are nearly twice as many researchers in social sciences and 50 to 60% more researchers in humanities compared to the other regions (EU and group of other countries).

The fields of science and humanities contain the highest percentage of respondents who have been mobile as a student (44%), in contrast to the groups of medical and health sciences and engineering and technology researchers, both with a share of only 26%.

The high percentage of respondents in humanities who have been mobile as a student is caused by the high percentages in the subfields of languages and literature (49%) and history and archaeology (48%). The subfields with the highest share of researchers having been mobile as a student are the fields of industrial biotechnology (67%) and medical engineering (61%), both within the field of engineering and technology.

The field of science with the highest share of researchers that have had work experience in industry as student is the field of engineering and technology (41%), while humanities has the lowest share with a percentage of only half as high.

Subfields with a high share of researchers having had work experience in industry as student are environmental engineering and materials engineering (both 50%), while environmental biotechnology (14%), philosophy, ethics and religion (8%) are situated at the lower end. None of the respondents in the subfield of industrial biotechnology has had work experience in industry as student.

Medical and health sciences have the highest percentage of researchers that have not been mobile as a student, nor have had work experience in industry as student.

Mobility group 2 (US to EU) has the highest percentage of researchers that have not been mobile as a student (57%), nor have had work experience in industry as student, closely followed by the group of non-mobile researchers (55%). In the group of non-mobile researchers, half of the remaining respondents have only had work experience in industry as student.

5 CURRENT EMPLOYMENT OF RESEARCHERS

This chapter describes the current employment situation of the researchers that have responded to the survey. In the first section, we describe the current employment situation, including the job tasks of the researchers and their current status. In the second section, we present the results regarding the principal employer (the type of employer, the location of the researcher and his/her employer) and the type of contract (contract status and years of employment). In the third section, we describe the level of formal collaboration of the researchers. Finally, the fourth section concludes with the career prospects of the respondents.

5.1 Current employment situation

5.1.1 Tasks of researchers in their jobs

Table 5-1 shows which type of activities of the responding researchers are required to perform as part of their jobs.

Table 5-1 Researchers by activities required in their job, by region of residence (in %)

Does your current job encompass	EU	US	Other	Total
	In %			
Carrying out Research	95.3	98.7	95.5	96.4
Improving Products or Processes	70.8	73.9	75.0	72.3
Developing new products or processes	31.3	27.0	41.4	31.4
Supervising Research	21.0	18.3	28.3	21.2
Observations	3116	1676	752	5544

Source: MORE extra – EU survey

96% of the respondents indicated that their current job encompasses the carrying out of research. 72% of them reported that they also have to improve products or processes. Only 31% state that their job encompasses the developing of new products or processes. And only 21% supervise the research. By region of residence, we see that the share of researchers having to carry out research is nearly 99% in the US, which is slightly higher than in the other regions. For all other kinds of tasks, the respondents from the group of countries outside EU and US have the highest share.

Table 5-2 Researchers by activities required in their job, by mobility group (in %)

Does your current job encompass	M1	M2	M3	M4	Total
			In %		
Carrying out Research	97.5	97.8	96.4	95.6	96.4
Improving Products or Processes	78.7	77.9	75.4	64.7	72.3
Developing new products or processes	29.2	24.0	29.8	35.5	31.4
Supervising Research	21.2	19.0	21.0	21.7	21.2
Observations	867	321	2429	1927	5544

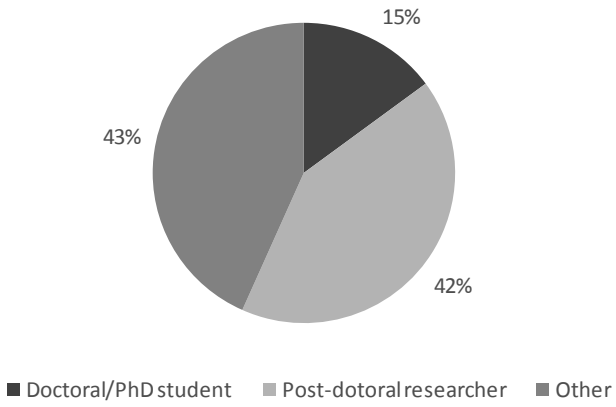
Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

Looking at the results per mobility group, we find that the respondents in mobility group 2 (US to EU) must carry out research the most, while they must develop new products and processes and supervise research the least. The group of non-mobile researchers have the highest share of respondents that need to develop new products and processes in their job. For these researchers, their job focus is less on the improvement of products or processes, compared to the group of mobile researchers.

5.1.2 Current status as researcher

The following figure presents the share of researchers according to their status as researcher (i.e. currently doctoral researchers, or post-doctoral researchers or other type of researcher).

Figure 5-1 Share of researchers per current status as researcher



Source: MORE extra – EU survey

15% of the respondents are PhD researchers, 42% are post-doctoral researchers and the remaining 43% act as another type of researcher. Next,

Table 5-3 presents the current 'status' (doctoral, postdoctoral or other type of researcher) of the researchers by region of residence and region of graduation.

Table 5-3 Current status per region of residence and region of graduation (in %)

	Region of Residence			Region of Graduation			
Current status	EU	US	Other	EU	US	Other	Total
Doctoral / PhD student	16.6	11.4	16.1	15.3	10.4	23.8	15.0
Post-doctoral researcher	41.3	44.1	39.6	43.0	43.4	33.5	41.9
Other	42.1	44.5	44.3	41.7	46.2	42.7	43.1
Total	100	100	100	100	100	100	100
Observations	3116	1676	752	3277	1583	684	5544

Source: MORE extra – EU survey

By region of residence, the results only differ marginally across the three regions. In the US there are somewhat less researchers working as PhD researchers and relatively more post-doctoral researchers. The differences are slightly higher by region of graduation. The US and the EU have the highest share of post-doctoral researchers with 43%, compared to the group of other countries, with only 33.5%. Conversely, the share of PhD researchers in other countries is 8 to 10 percentage points higher than in the EU and the US.

Finally, Table 5-4 presents the current status of the researchers by mobility group.

Table 5-4 Current status per mobility group (in %)

	Mobility group				
Current status	M1	M2	M3	M4	Total
Doctoral / PhD student	7.8	6.2	12.2	23.0	15.0
Post-doctoral researcher	44.9	43.3	42.6	39.6	41.9
Other	47.3	50.5	45.2	37.4	43.1
Total	100	100	100	100	100
Observations	867	321	2429	1927	5544

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

An interesting result is the high share of PhD researchers in the group of non-mobile researchers (23%) compared to the groups of mobile researchers (with a share of 6% to 12%), which could be related to the younger age on average of the respondents in this group. Within the group of mobile researchers, we see that the share of PhD-students in mobility group 3 (other mobility) is nearly twice as high as the share within mobility group 2 (US to EU). Mobility group 1 (EU to US) has the highest share of post-doctoral researchers.

5.2 Principal employer and type of contract

5.2.1 Location of researcher and of principal employer

The following table presents the distribution across the three regions of residence by region of the current employer. The respondents have been asked to fill in information about their current employment status; in case respondents had currently more than one employer they have been asked to include information about their principal or main employer.

Table 5-5 Region of residence by region of the current employer (in %)

	Region of current employer			
Region of residence	EU	US	Other	Total
Residents of EU	97.1	3.5	5.9	56.2
Residents of US	1.5	95.3	1.7	30.2
Residents of other	1.4	1.1	92.4	13.6
Total	100	100	100	100
Observations	3101	1696	747	5544

Source: MORE extra – EU survey

The majority of the respondents reside in the same region as the location of their employer. For the EU, this share is highest with 97%, followed by the US with 95% and the group of other countries with 92%. Countries with the most differences between the country of employer and the country where the researcher is working/residing are the US (72 observations), Italy (32 observations), Germany (25 observations), the UK and Spain (both 15 observations).

5.2.2 Type of principal employer and contract status

Table 5-6 provides the distribution of different types of employers based on a number of characteristics.

Table 5-6 Field of science, contract status and years of employment per type of employer (in %)

	Type of employer						
Field of science	HEI	Public RI	Private RI	Company	Self employed	Other	Total
Natural Sciences	38.0	60.6	48.4	43.4	28.3	23.5	41.1
Engineering and Technology	8.9	7.0	9.5	25.2	9.4	3.9	9.1
Medical and Health Sciences	5.1	3.8	10.0	5.6	7.5	15.7	5.2
Agricultural Sciences	3.3	6.1	1.1	0.7	0.0	2.0	3.4
Social Sciences	32.4	17.0	26.3	20.3	34.0	39.2	30.0
Humanities	12.4	5.5	4.7	4.9	20.8	15.7	11.2
Total	100	100	100	100	100	100	100
Contract status	HEI	Public RI	Private RI	Company	Self employed	Other	Total
Fixed (less than 1year)	3.9	2.8	2.6	2.1	0.0	5.9	3.7
Fixed (1-2 years)	11.3	15.0	21.6	4.9	0.0	15.7	11.9
Fixed (more than 2 years)	20.1	24.6	21.6	7.0	0.0	11.8	20.1
Open ended	47.7	45.2	36.3	75.5	3.8	35.3	47.2
Non-employment contract	5.1	3.9	12.6	2.8	0.0	9.8	5.2
Self-employed	0.3	0.4	1.6	3.5	86.8	5.9	1.3
Other	11.6	8.1	3.7	4.2	9.4	15.7	10.7
Total	100	100	100	100	100	100	100
Years of employment	HEI	Public RI	Private RI	Company	Self employed	Other	Total
Less than 1 year	8.4	13.4	14.2	11.2	11.3	25.5	9.5
1-2 years	15.0	18.6	28.9	23.1	13.2	19.6	16.1
3-4 years	15.6	14.5	18.4	27.3	24.5	15.7	15.9
5-9 years	20.8	16.3	16.3	14.7	17.0	9.8	19.8
10 years or more	40.2	37.2	22.1	23.8	34.0	29.4	38.6
Average years of employment*	10.0	9.4	6.3	6.3	9.5	6.1	9.7
Total	100	100	100	100	100	100	100
Observations	4419	688	190	143	53	51	5544

Source: MORE extra – EU survey; * For computational reasons, the option 'less than 1 year' is changed by value '0.5'.

When we look at the distribution of the different types of employers across the six fields of science, we see that the highest shares of researchers have obtained their highest degree in the field of natural sciences and work for a research institute, a higher education institution or a company. There are nearly no researchers in this sample working for private research institutes whom have obtained a highest degree in agricultural sciences. However, we have to keep in mind that this is not a representative sample. Only 4% of the researchers working for public research institutes have obtained their highest degree in medical and health sciences. Companies form an exception in the field of engineering and technology; while only 4 to 9.5% of researchers working for the other types of organisations

have obtained their highest degree in this particular field the share of researchers working for a company is 25%.

Next, looking at the contract status per type of employer, we see that three quarters of the respondents working for a company have an open ended contract, while in higher education institutions and research institutions this share is substantially lower (48% for higher education institutions, 45% for public and 36% for private research institutions). The share of fixed contracts in these types of organisations is relatively higher than in companies. The share of non-employment contracts is highest in the group of researchers working at private research institutions. Finally, the years of employment under the current contract status is, on average, highest in higher education institutions (10.1 years), followed by self employed researchers (9.5 years) and those employed by public research institutions (9.4 years) and lowest in private research institutes and companies (both 6.3 years). Table 5-7 presents the results on the same variables, but now per region of residence.

Table 5-7 Field of science, contract status and years of employment per region of residence (in %)

	Region of residence			
Field of science	EU	US	Other	Total
Natural Sciences	42.5	39.7	38.2	41.1
Engineering and Technology	10.0	6.7	10.5	9.1
Medical and Health Sciences	5.5	5.0	4.7	5.2
Agricultural Sciences	3.6	1.7	6.5	3.4
Social Sciences	28.9	32.0	30.3	30.0
Humanities	9.5	14.9	9.8	11.2
Total	100	100	100	100
Contract status	EU	US	Other	Total
Fixed (less than 1year)	4.2	3.0	3.1	3.7
Fixed (1-2 years)	11.5	11.3	14.6	11.9
Fixed (more than 2 years)	21.9	14.2	25.8	20.1
Open ended	47.6	49.4	40.7	47.2
Non-employment contract	5.4	5.4	4.0	5.2
Self-employed	1.7	0.8	0.7	1.3
Other	7.8	15.9	11.2	10.7
Total	100	100	100	100
Years of employment	EU	US	Other	Total
Less than 1 year	10.3	7.7	10.2	9.5
1-2 years	16.8	14.2	17.6	16.1
3-4 years	16.4	15.6	14.8	15.9
5-9 years	19.1	22.1	17.6	19.8
10 years or more	37.4	40.4	39.9	38.6
Average years of employment*	9.4	10.2	9.6	9.7
Total	100	100	100	100
Observations	3116	1676	752	5544

Source: MORE extra – EU survey; * For computational reasons, the option 'less than 1 year' is changed by value '0.5'.

Looking at the field of science, the distribution of the three regions does not strongly differ. The group of US residents has a slightly lower share of researchers that obtained their highest degree in the field of engineering and technology

(6.7%) compared to the other regions (10% in the EU and 10.5% in the group of other countries). There are, however, relatively more researchers residing in the US with a highest degree in the field of humanities. There are relatively more researchers residing outside the US and the EU with a highest degree in agricultural sciences. But with only 6.5%, this is still a very limited share.

When examining the distribution of the contract status for each of the regions, we observed a smaller share of researchers residing in the US with a fixed contract of more than 2 years, but a larger share of researchers with a contract other than the six specified types of contracts. Relatively less researchers residing outside the EU and the US have an open ended contract, but there are relatively more researchers with a fixed contract of 1 to 2 years, compared to the EU and US-residents.

The distribution by years of employment does not strongly differ between the regions. In the US, there are slightly less researchers who have worked less than 1 year under their current contract status, while there are slightly more researchers who have worked 10 years or more under their current contract status. The fact that researchers seem to work a relatively longer period under the current contract status is confirmed by looking to the average years of employment. Table 5-8 shows the results for each mobility group.

Table 5-8 Field of science, contract status, years of employment per mobility group (in %)

	Mobility group				
Field of science	M1	M2	M3	M4	Total
Natural Sciences	50.2	32.4	43.9	34.8	41.1
Engineering and Technology	8.4	8.1	8.7	10.0	9.1
Medical and Health Sciences	7.5	1.9	4.2	6.1	5.2
Agricultural Sciences	3.2	1.6	3.5	3.8	3.4
Social Sciences	21.7	42.1	28.2	34.1	30.0
Humanities	9.0	14.0	11.5	11.2	11.2
Total	100	100	100	100	100
Contract status	M1	M2	M3	M4	Total
Fixed (less than 1year)	3.3	2.2	3.3	4.6	3.7
Fixed (1-2 years)	11.6	12.1	11.9	11.9	11.9
Fixed (more than 2 years)	18.3	20.9	20.4	20.3	20.1
Open ended	49.1	50.5	48.1	44.6	47.2
Non-employment contract	5.7	1.6	4.6	6.3	5.2
Self-employed	0.6	1.2	1.4	1.6	1.3
Other	11.3	11.5	10.4	10.7	10.7
Total	100	100	100	100	100
Years of employment	M1	M2	M3	M4	Total
Less than 1 year	8.5	14.6	9.6	9.0	9.5
1-2 years	17.3	19.9	15.4	15.9	16.1
3-4 years	14.2	15.3	16.4	16.3	15.9
5-9 years	21.5	15.6	18.5	21.4	19.8
10 years or more	38.5	34.6	40.1	37.4	38.6
Average years of employment*	9.8	8.3	10.1	9.2	9.7
Total	100	100	100	100	100
Observations	867	321	2429	1927	5544

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility
* For computational reasons, the option 'less than 1 year' is changed by value '0.5'.

The largest differences by mobility group are in the field of social sciences, natural sciences and medical and health sciences. Researchers in mobility group 2 (US to EU) are more likely to have obtained their highest degree in social sciences compared to the other mobility groups,(42% compared to 34% in M4 – no mobility, 28% in M3 – other mobility, and only 22% in M1 – EU to US). The share of respondents in mobility group 2 who obtained their highest degree in medical and health sciences is extremely small, with only 2% compared to 4% in M3, 6% in M4 and 7,5% in M1. Half of the researchers in mobility group 1 obtained their highest degree in the field of natural sciences, a share that is higher than any other mobility group. The results for the non-mobile researchers do not deviate noticeably from the results for the mobile researchers; although a slightly lower share of the non-mobile researchers obtained their highest degree in the field of natural sciences (6 percentage points below) the share of the total group of respondents).

There are no remarkable differences observed regarding the current contract status between the researchers in the different mobility groups. The most notable differences observed are the limited share of respondents with a non-employment contract in mobility group 2 (US to EU) and a slightly lower share of respondents with an open ended contract in the group of non-mobile researchers, compared to the group of mobile researchers.

Looking at the years of employment under the current contract status, we notice that the researchers in mobility group 3 (other mobility) have worked the longest under their current contract status, with 10.1 years on average, and the researchers in mobility group 2 (US to EU) the shortest, with only 8.3 years on average. The group of non-mobile researchers has a slightly higher percentage of respondents that have worked under their current contract status for 5 to 9 years, compared to the groups of mobile researchers.

5.3 Formal collaboration

In this section, we describe the level of formal collaboration of the responding researchers. The following findings refer to respondents' experience with collaboration with other countries or the industry sector. For the former case (international collaboration), we should note that EU researchers consider international collaboration also within EU, while this cannot be the case for US researchers (i.e. within-US).

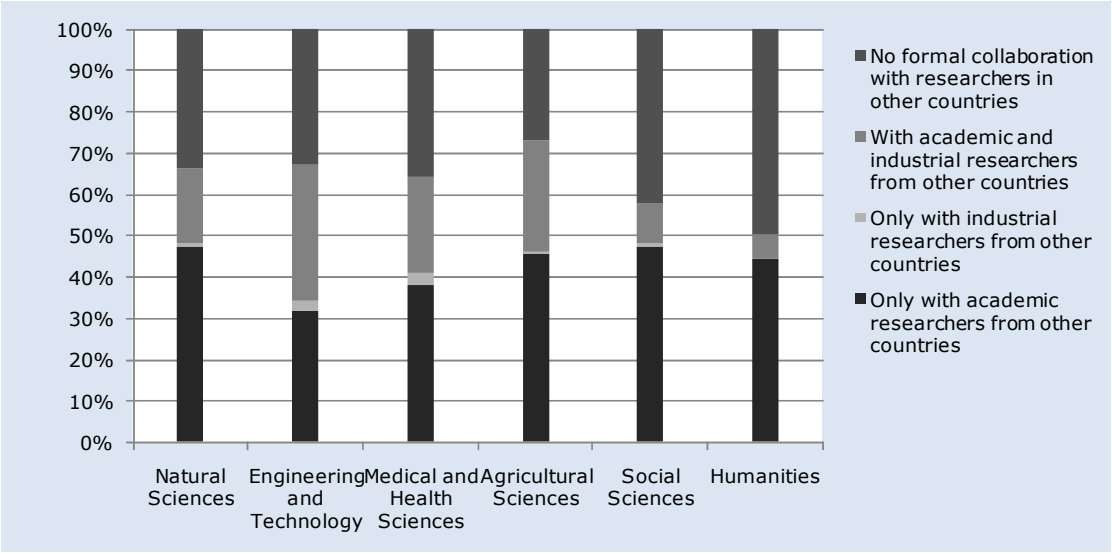
Table 5-9 Formal collaboration per region of residence (in %)

	Region of residence			
Formal collaboration	EU	US	Other	Total
Only with academic researchers from other countries	47.8	38.3	49.1	45.1
Only with industrial researchers from other countries	1.1	0.9	1.1	1.0
With academic and industrial researchers from other countries	19.5	8.9	17.4	16.1
No formal collaboration with researchers from other countries	31.6	51.8	32.4	37.8
Total	100	100	100	100
n	3116	1676	752	5544

Source: MORE extra – EU survey

45% of the respondents reports that their current work as researcher involves formal collaboration, but only with academic researchers from other countries. 38% of the researchers are not involved in formal collaboration with researchers from other countries. Looking at the results by region of residence, we observe that the share of researchers not involved in formal collaboration with other countries is highest in the US, with 52%. The distribution between the EU and the group of other countries (non-EU/non-US) is quite similar.

Figure 5-2 Formal collaboration per field of science



Source: MORE extra – EU survey

Looking at the results per field of science, we see that the current work of the respondents that obtained their highest degree in humanities and social sciences involves the least formal collaboration with other countries (50% and 58% respectively), in contrast to the highest share (73%) in the agricultural sciences. The field of engineering and technology has the highest share of researchers reporting that their job encompasses formal collaboration both with academic as well as industrial researchers from other countries (33%, which is 17 percentage points above the average).

Next, Table 5-10 presents the results per mobility group.

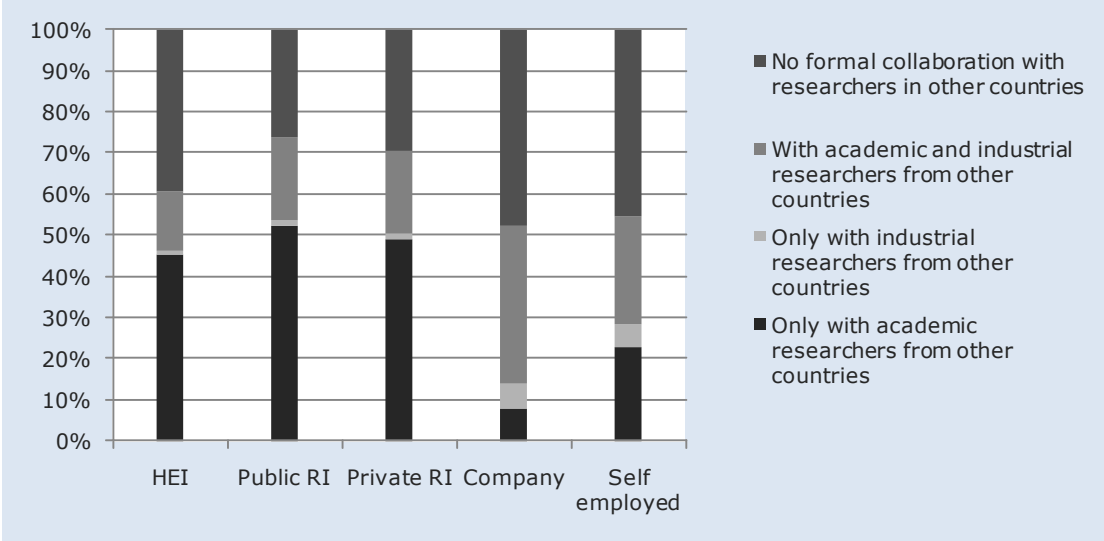
Table 5-10 Formal collaboration per mobility group (in %)

	Mobility group				
Formal collaboration	M1	M2	M3	M4	Total
Only with academic researchers from other countries	47.5	43.6	50.1	37.8	45.1
Only with industrial researchers from other countries	1.0	0.3	1.2	0.9	1.0
With academic and industrial researchers from other countries	16.7	13.7	17.5	14.3	16.1
No formal collaboration with researchers in other countries	34.7	42.4	31.1	47.0	37.8
Total	100	100	100	100	100
Observations	867	321	2429	1927	5544

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

The group of non-mobile researchers has the highest share of respondents that hold a job which does not involve formal collaboration with researchers from other countries. This is quite expected. Mobility groups 3 (other mobility) and 1 (EU to US) have the highest share of respondents involved in collaboration both with academic and industrial researchers (17.5% in M3 and 16.7% in M1 compared to 14.3% in M4 – no mobility, and 13.7% in M2 – US to EU). Figure 5-3 presents the results per type of employer.

Figure 5-3 Formal collaboration per type of employer



Source: MORE extra – EU survey

Here we see that the collaborative activities of companies are quite distinct from those of the other types of employers. First, researchers working for a company are the least involved in formal collaboration with researchers from other countries. About half of the researchers working for a higher education institution or research institute state that when they formally collaborate with researchers from other countries, it is only with academic researchers (52% for public researchers, 49% for private researchers and 45% for higher education institutes).

5.4 Prospects of career as researcher

This final section of chapter 3 deals with the respondents' career prospects as a researcher. The following table shows the future prospects per region of residence.

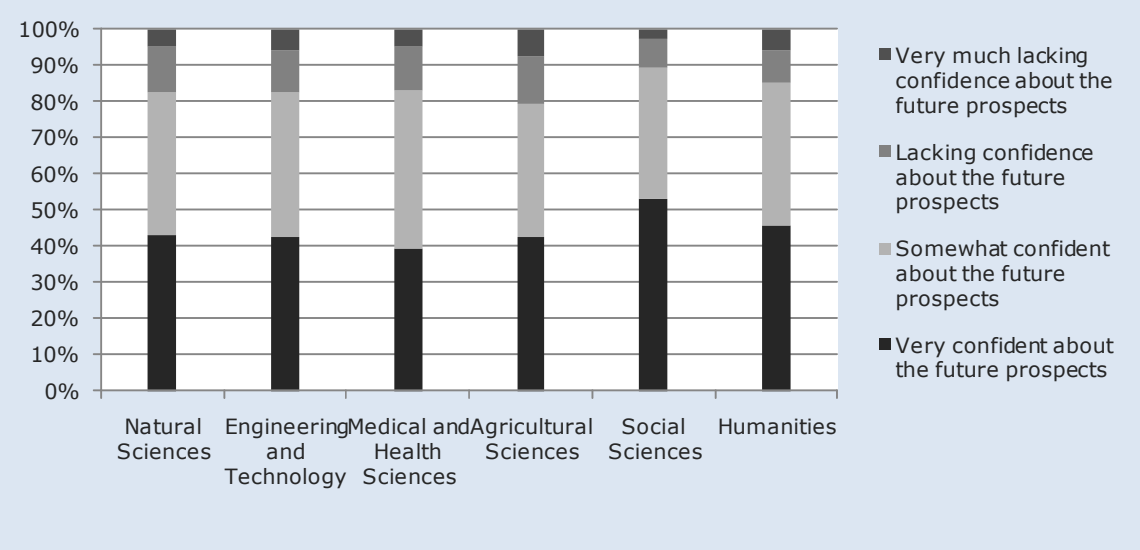
*Table 5-11 Future prospects for research career per region of residence (in %)**

	Region of residence			
Future prospects for research career	EU	US	Other	Total
Very confident about the future prospects	38.1	57.6	51.9	46.0
Somewhat confident about the future prospects	41.5	34.9	35.3	38.6
Lacking confidence about the future prospects	13.8	5.6	10.8	10.9
Very much lacking confidence about the future prospects	6.6	1.9	1.9	4.5
Total	100	100	100	100
Observations	2976	1637	730	5343*

Source: MORE extra – EU survey; * 201 respondents reported 'non applicable'

85% of the respondents in the survey are very (46%) to somewhat (39%) confident about the future prospects for their research career. Only 4.5% report that they are very much lacking confidence about their future prospects. Looking at the results by region of residence, we see that the distribution of the US and the distribution of the group of other countries do not strongly differ. Conversely, the respondents living in the EU have a different answering behaviour. They are remarkably less confident compared to the respondents living outside the EU.

Figure 5-4 Future prospects for research career per field of science



Source: MORE extra – EU survey

The results by field of science show that the researchers that obtained their highest degree in social sciences and humanities are the most confident (89% and 85% respectively at least somewhat confident), while researchers in agricultural sciences are the least (79% at least somewhat confident).

Table 5-12 presents the results per mobility group. While there are no remarkable differences between the groups, the non-mobile researchers are slightly less confident about the future prospects for their research career.

Table 5-12 Future prospects for research career per mobility group (in %)

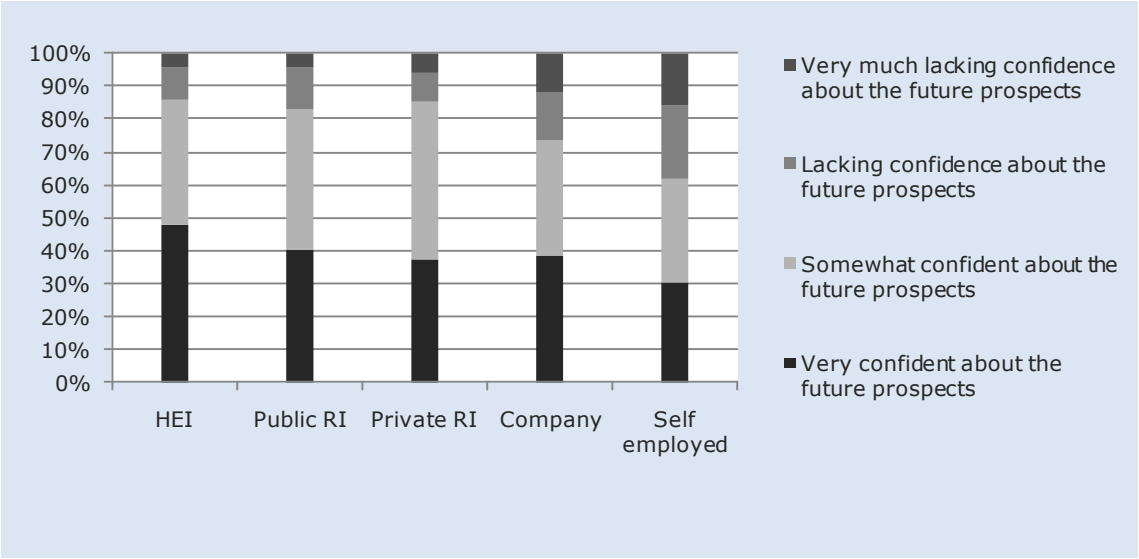
	Mobility group				
Future prospects for research career	M1	M2	M3	M4	Total
Very confident about the future prospects	47.7	52.6	46.8	43.1	46.0
Somewhat confident about the future prospects	40.7	36.0	37.9	39.1	38.6
Lacking confidence about the future prospects	8.1	7.1	11.2	12.3	10.9
Very much lacking confidence about the future prospects	3.5	4.2	4.1	5.5	4.5
Total	100	100	100	100	100
Observations	828	308	2347	1860	5343

Source: MORE extra – EU survey; M1: EU-> US; M2: US-> EU; M3: other mobility; M4: no mobility

Figure 5-5 shows that respondents working for a higher education institution are by far the most confident with about half of them reporting being very confident about their future prospects. The researchers working for a company, and especially self employed researchers, are the least confident. In fact, 16% of the self

employed declared that they lack confidence about their future research career prospects. These results are not surprising as having a self-employment position is related in general with higher risks and less security.

Figure 5-5 Future prospects for research career per type of employer



Source: MORE extra – EU survey

Finally, Figure 5-6 presents the results per employment status. We would expect the highest confidence to be expressed by researchers with an open ended contract. This is confirmed by the survey results, where 90% of those with open ended contracts report that they are confident about their future projects. 55% claim to be very confident, which is twice as high as the share of the total group of respondents. Further, we see that the shorter the duration of the fixed contract, the lower the confidence of the respondent. We also see that respondents who are self employed are quite uncertain about their future prospects as a researcher.

Figure 5-6 Future prospects for research career per employment status

Source: MORE extra – EU survey

5.5 Main findings

Out of the 5544 total respondents in the net-sample, 15% are PhD-students, 42% are post-doctoral researchers and the remaining 43% are another type of researcher.

By region of residence, the results only differ marginally across the three regions. A notable result by mobility group is the high share of PhD-students in the group of non-mobile researchers (23%) compared to the groups of mobile researchers (with a share of 6% to 12%). Within the group of mobile researchers, we see that mobility group 1 (EU to US) has the highest share of post-doctoral researchers.

The highest shares of researchers who have obtained their highest degree in the field of natural science work for a research institution, a higher education institution or a company. Three quarters of the respondents working for a company have an open ended contract, although in higher education institutions and research institutions, this share is substantially lower, with only 48% for higher education institutions, 45% for public and 36% for private research institutions.

In the sample, researchers working in higher education institutions, public research institutions and the self employed are working, on average, longer under their current contract status (10 years, 9.3 years and 9.4 years respectively) compared to researchers working in private research institutes and companies (both 6.2 years).

We do not see remarkable differences between the regions of residence with respect to the field of science in which the researchers obtained their highest educational degree. The group of US residents has a slightly lower share of researchers that obtained their highest degree in the field of engineering and technology (6.7%) compared to the other regions (10% in the EU and 10.5% in the group of other countries). There are, however, relatively more researchers residing in the US with a highest degree in the field of humanities.

Half of the researchers in mobility group 1 (EU to US) obtained their highest degree in the field of natural sciences, a share that is higher than in the other mobility groups. The results of the non-mobile researchers do not deviate noticeably from the results of the mobile researchers.

There is a slightly lower share of respondents with an open ended contract in the group of non-mobile researchers, compared to the group of mobile researchers. Looking at the years of employment under the current contract status, we notice that the researchers in mobility group 3 (other mobility) work the longest under their current contract status, with 10 years on average, and the researchers in mobility group 2 (US to EU) the shortest, with 8.4 years on average. The group of non-mobile researchers has a slightly higher percentage of respondents that have been working under their contract status 5 to 9 years, compared to the group of mobile researchers.

45% of the respondents report that their current work as a researcher involves formal collaboration, but only with academic researchers from other countries. 38% of the researchers are not involved in formal collaboration with researchers from other countries. Looking at the results by region of residence, we observe that the share of researchers not involved in formal collaboration with other countries is the highest in the US, with 52%.

Looking at the results per field of science, we see that the current work of the respondents that obtained their highest degree in humanities and social sciences involves formal collaboration with other countries the least (50% and 58% respectively), in contrast to the highest share (73%) in agricultural sciences.

The group of non-mobile researchers has the highest share of respondents that have a job that does not involve formal collaboration with researchers from other countries. This is quite expected. Mobility groups 3 (other mobility) and 1 (EU to US) have the highest share of respondents involved in collaboration both with academic and industrial researchers (17.5% in M3 and 16.7% in M1 compared to 14.3% in M4 – no mobility, and 13.7% in M2 – US to EU).

We see that the collaborative activity of respondents working for a company is quite distinct from the collaborative activity of those working for other types of employers. Indeed, researchers working for a company are the least involved in formal collaboration with researchers from other countries. About half of the researchers working for a higher education institution or a research institution indicate that when they formally collaborate with researchers from other countries it is only with academic researchers.

85% of the respondents in the net-sample are very (46%) to somewhat (39%) confident about the future prospects for their research career. Only 4.5% report that they very much lack confidence about their future prospects. Looking at the results by region of residence, we see that EU-residents are remarkably less confident compared to the respondents living outside the EU.

The results by field of science show that researchers that obtained their highest degree in social sciences and humanities are the most confident.

Looking at the results by type of employer, we see that the respondents working for a higher education institution are by far the most confident, with half of them reporting to be very confident about their future prospects. Researchers working for a company, and especially the self employed, are the least confident. In fact, 16% of the self employed declare that they very much lack confidence regarding their future research prospects. These results are not surprising as having a self-employment position is related in general with higher risks and less security.

We would expect the highest confidence concerning future career prospects to be expressed by researchers with an open ended contract. This is confirmed by the results, where 90% of those with an open ended contract are confident about their future career prospects. Furthermore, as expected, we find that the shorter the duration of the fixed contract, the lower the confidence expressed by the respondent. In addition, respondents who are self employed are quite uncertain about their future prospects as a researcher.

6 CAREER PATHS AND INTERNATIONAL MOBILITY

6.1 Introduction

In this chapter we first give an overview of the different characteristics of the career path of the respondents in the survey. The issues discussed include: (1) whether the respondents have been working in the public versus the private sector or shifted between the two; (2) the number of employers that respondents have had since graduation; (3) the number of countries they have worked in since graduation and (4) the duration of their most recent stay (for stays longer than three months) in the country that the researcher has been mobile to (or has mainly been working in as a researcher for the non-mobile group).

Second, we delve deeper into the characteristics of international mobility by looking at general indicators of mobility, such as whether one is living in the country that one was born in or graduated in, the number of countries one has worked in since graduation, and whether one has been mobile as a student or not. We will compare these mobility indicators by region of residence and by mobility group in order to draw conclusions on mobility characteristics.

6.2 Career paths

6.2.1 Sectoral mobility

We begin with an overview of how researchers residing in the different regions are distributed over "career paths" (Table 6-1). The distribution is very similar for all residence regions. Three-fourths of the respondents have always worked in the public sector. Another 10 percent is currently in the public sector, but with a different history (either from the public sector via the private sector and then back, or from the private to the public sector). Overall, 85 percent of researchers in all regions are currently employed by the public sector. Only 3 percent have always worked in the private sector and another 3 percent is currently working in the private sector but was formerly in the public sector.

Table 6-1 Career path by region of residence

	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total					
Always public	77.3	75.1	77.0	75.8	75.4	76.4
Always private	3.0	3.7	3.0	3.2	2.1	3.0
Public to private and back	5.1	5.4	5.1	4.1	3.9	4.7
Public to private	2.9	3.4	2.9	3.7	4.0	3.3
Private to public and back	0.5	0.8	0.5	0.7	1.5	0.7
Private to public	4.7	5.9	4.9	4.8	5.7	5.0
Other	6.6	5.7	6.5	7.7	7.4	7.0
Total	100	100	100	100	100	100
Observations	2763	353	3116	1676	752	5544

Source: MORE extra – EU survey

We should however keep in mind here that the sample is not representative of the underlying population and these findings are largely dependent on the sampling strategy that has been followed for this survey.

6.2.2 Changes of employers

Table 6-2 shows that half of the respondents have worked for two to three employers since they graduated. Nearly one in four has worked for zero to one employer (zero if the respondent considers himself as not having graduated yet) and around one in five has worked for four to five employers. A minority has worked for more than five employers. Again, the distribution is very similar over the regions of residence. For EU12 residents we see that employer mobility is lower than for researchers residing in the other regions.

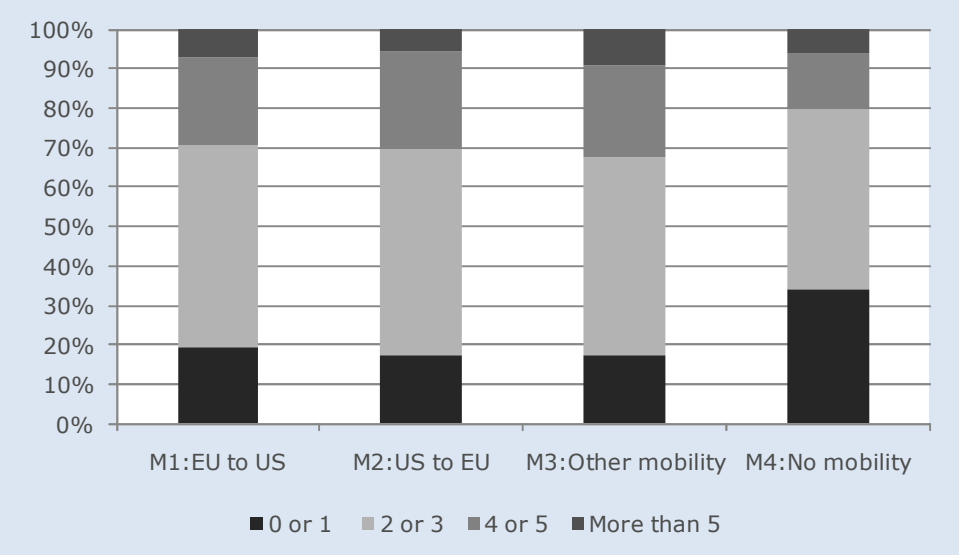
Table 6-2 Number of employers by region of residence

	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total					
0-1	23.3	25.5	23.6	23.6	23.1	23.5
2-3	48.5	51.3	48.8	50.4	46.5	49.0
4-5	20.6	16.1	20.1	19.7	20.2	20.0
More than 5	7.5	7.1	7.5	6.3	10.1	7.5
Total	100	100	100	100	100	100
Observations	2763	353	3116	1676	752	5544

Source: MORE extra – EU survey

Figure 6-1 shows that in all mobile groups (mobility groups M1, M2 and M3) the percentage of researchers that has worked for zero to one employer since graduation is lower (nearly 20%) than the total average (23%) whereas this percentage is higher in the non mobile group (M4) (34%). So non-mobility goes together with a not so frequent shift in employers.

Figure 6-1 Number of employers by mobility group



Source: MORE extra – EU survey

6.2.3 Number of countries worked abroad and duration of stay

In total half of the respondents worked in two to three different countries after graduation. This percentage is higher in the EU15 (56%) and much lower in the EU12 (36.5%). The result for the US researchers lies somewhere in between, with 44% having worked in two to three countries. The percentages of researchers in the categories with four to five or more than five countries where they worked, are very similar across the regions, the trade-off lies between the zero/one and the two/three categories. From these results it appears that EU15 resident researchers have been most mobile in terms of working in different countries abroad, followed by the "other regions", while US resident researchers and lastly EU12 resident researchers appear the least mobile in terms of working in other countries.

Table 6-3 Number of countries worked by region of residence

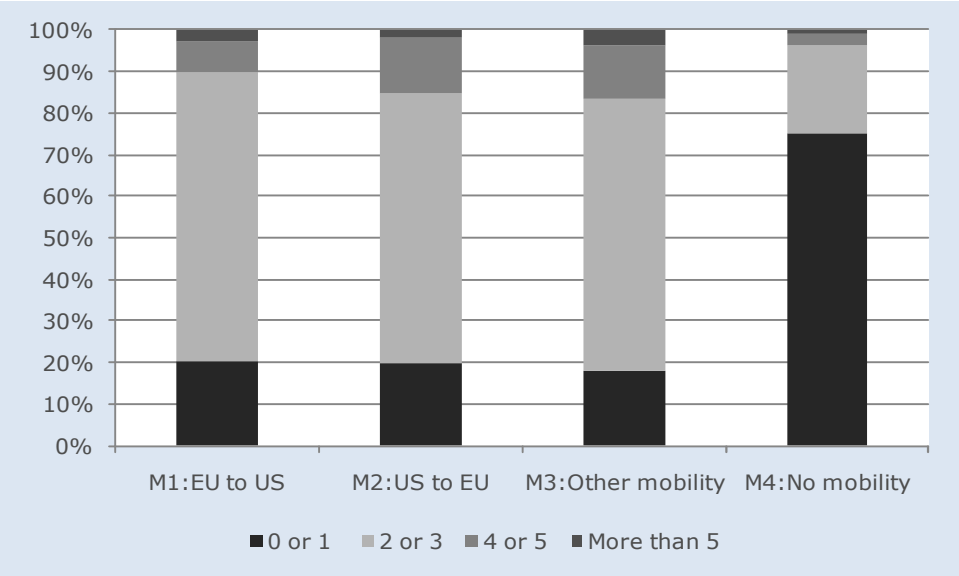
	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total					
0-1	33.0	49.9	34.9	46.7	34.3	38.4
2-3	56.0	36.5	53.8	44.2	51.2	50.5
4-5	8.9	11.0	9.2	6.4	11.3	8.6
More than 5	2.1	2.5	2.2	2.8	3.2	2.5
Total	100	100	100	100	100	100
Observations	2763	353	3116	1676	752	5544

Source: MORE extra – EU survey

Figure 6-2 shows the differences by mobility groups. The three mobile groups are very similar with a nearly equal percentage (around 80%) of researchers in the combined "two or more countries worked in" category. As expected, it is the non-mobile group that differs from the general picture. In the case of non-mobile researchers, 75% have worked in zero to one countries following graduation, which is much higher than for mobile researchers, where only 20% have worked in zero to one countries.

The fact that 25 percent of the non-mobile researchers have worked in more than two different countries may seem as a contradiction at first, but bearing in mind the definition of non-mobility, a respondent is non-mobile if he or she, after obtaining his/her highest degree, has not worked for a minimum of three months in a country other than the graduation country, then being non-mobile and having worked in different countries after graduation is possible. This can occur, for example, if the respondent has answered the question "in how many countries have you worked since graduation?" by including stays after graduation which are shorter than three months or if he or she did not consider "graduation" to be the moment when the highest degree was attained. If the respondent attaches the "graduation" time to another (lower) degree that was obtained, he/she may well have been working in a different country before obtaining his/her highest degree.

Figure 6-2: Number of countries worked abroad by mobility group



Source: MORE extra – EU survey

Table 6-4 shows the duration of the latest stay by region of residence. The largest percentages can be found in either the long-term stays of more than three years (51%) or the very short-term stays between three and six months (18%). The remaining 30 percent is equally distributed over the other durations.

Of the researchers currently residing in the US, a considerably higher share (63%) stayed for more than three years and a considerably lower share (13%) was on a short-term visit for less than six months. In the EU27, the percentage of long-term visitors (44%) is much lower than in the US, while the percentage of short-term visitors (21%) is much higher than in the US.

We have to be careful while interpreting these results because they include all researchers residing in a region irrespective of their mobility group, including the non-mobile group which represents 1927 respondents

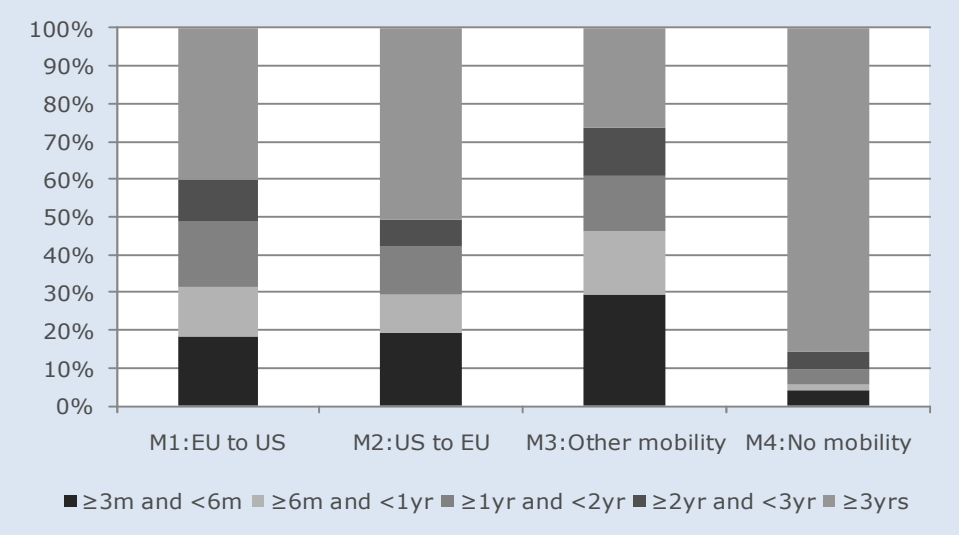
Table 6-4 Duration of latest stay by region of residence

	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total					
≥ 3 and < 6 months	20.5	26.9	21.2	12.6	18.4	18.3
≥ 6 and <12 months	11.3	12.7	11.5	8.7	11.2	10.6
≥ 1 year and < 2 year	13.4	10.2	13.0	9.1	9.2	11.3
≥ 2 years and < 3 yea	10.5	7.4	10.1	6.4	12.2	9.3
≥ 3 years	44.3	42.8	44.2	63.1	49.1	50.6
Total	100	100	100	100	100	100
Observations	2763	353	3116	1676	752	5544

Source: MORE extra – EU survey

Figure 6-3 shows indeed that 86 percent of the respondents belonging to the non-mobile group have answered "more than three years" as the duration of their latest stay. The "other mobility"-group has the relatively highest percentage of short-term visits (29%). Those going from the US to the EU have relatively more researchers (51%) who stay long-term, compared to those going from the EU to the US (40%).

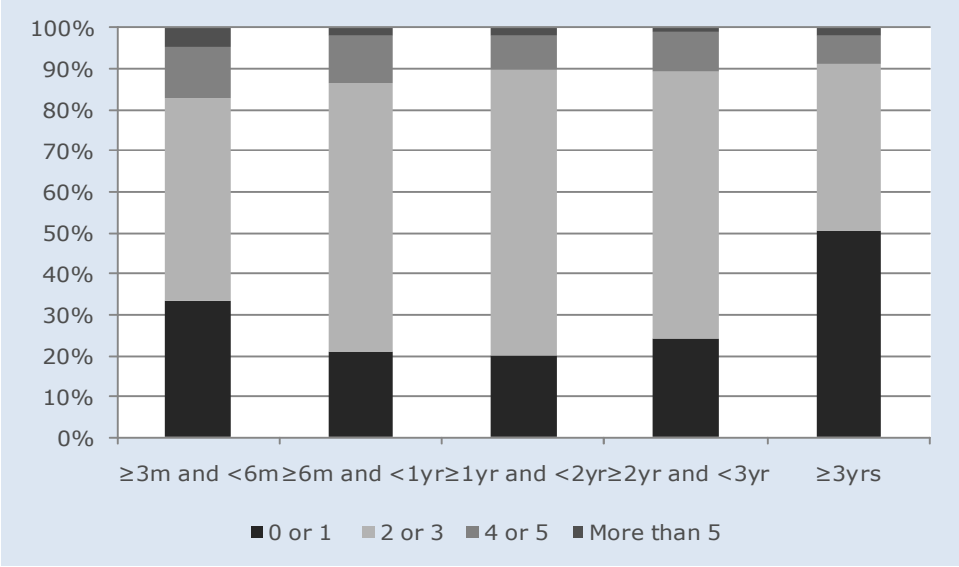
Figure 6-3 Duration of latest stay by mobility group



Source: MORE extra – EU survey

In Figure 6-4 we visualize the relationship between the number of countries a researcher has worked in and the duration of his/her latest stay. We find a U-shape relationship between the length of stay and the percentage of researchers having worked in zero to one country (hence an inverted U-shape between the length of stay and the percentage of researchers having worked in two or more countries after graduation).

Figure 6-4 Number of countries worked abroad by duration of latest stay



Source: MORE extra – EU survey

6.3 International mobility

In this section we present some indicators of international mobility by region of residence and by type of mobility.

6.3.1 General indicators on mobility

The mobility indicators we propose are the following: 1) whether one's country of residence is the same as one's country of birth, 2) whether one's country of residence is the same as one's region of graduation, 3) whether one has been mobile as a student or not, and 4) how many different countries one has worked in since graduation. **Error! Reference source not found.** gives a summary of these indicators by region of residence.

Of all 5544 respondents in the net-sample 41.2 percent are not residing in his or her birth country. The percentage is especially high for researchers living in the US, where more than half of them (56.4 percent) were not born there. Of the researchers living in the EU27 nearly one third were not born there. For the EU12 researchers, only one in eight were not born there. From the results on this indicator the US appears the most attractive region for researchers worldwide, having a researcher population where the foreign born part is larger than the US born.

For the second indicator, whether one's country of residence is the same as one's region of graduation, the percentage for the total group of respondents is slightly lower – only 35.6 percent do not live in the region where they graduated. For this indicator, the US and EU27 have the same score. However, it is apparent that the EU27 score is driven by the EU15 score since for the EU12, only 19 percent did not graduate there.

Based on the first and second indicator our survey findings suggest the following conclusions:

(1) The US appears to attract researchers both for education and employment,

(2) the EU15 resident researchers of foreign origin seem to get educated in the EU15 and remain there to work, but the EU15 does not attract many researchers having graduated somewhere else, and

(3) in the EU12, researchers seem to leave to be educated elsewhere and then return to the EU12. The EU12 seems to be the least attractive region for foreign born and foreign educated researchers.

Table 6-5 Indicators of mobility

	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total					
Country of residence=country of birth	66.0	87.8	68.7	43.6	51.7	58.8
Country of residence≠ country of birth	33.8	12.2	31.3	56.4	48.3	41.2
Country of residence =region of graduation	65.7	81.0	67.5	67.4	45.5	64.4
Country of residence ≠region of graduation	34.3	19.0	32.5	32.6	54.5	35.6
Mobile as researcher and as student	25.8	19.8	25.2	23.4	22.1	24.2
Mobile as researcher, not as student	43.4	41.6	43.2	35.5	44.5	41.0
Not mobile as a researcher, mobile as a student	6.6	7.4	6.7	9.4	6.6	7.5
Not mobile as a researcher, not as a student	24.2	31.2	25.0	31.7	26.7	27.3
Nr. countries worked since graduation: 0 to 1	33.0	49.9	34.9	46.7	34.3	38.4
Nr. countries worked since graduation: 2 to 3	56.0	36.5	53.8	44.2	51.2	50.5
Nr. countries worked since graduation: 4 to 5	8.9	11.0	9.2	6.4	11.3	8.6
Nr. countries worked since graduation: more than 5	2.1	2.5	2.2	2.8	3.2	2.5
Nr. countries worked since graduation: >=2	67.0	50.0	65.2	53.4	65.7	61.6
Total number of observations	2763	353	3116	1676	752	5544

Source: MORE extra – EU survey

For the indicators "mobile as researcher, "mobile as a student" and "mobile as researcher, not mobile as a student", the regions do not differ much from each other, with the exception of the EU12. Between 35 and 38 percent of all mobile researchers were mobile as students (see Table 6-8) while only around one fifth of the non-mobile researchers have been mobile as a student (around one fifth). On the basis of this, student mobility seems to indicate future mobility, which seems lower in EU12.

The indicator "number of countries where worked since graduation is two or more" shows that US based researchers have been the least internationally mobile compared to the EU27 researchers and researchers based in other regions which could be partly attributed to the fact that they do not often leave the US to pursue doctoral study. Within the EU27 there is a large difference between the EU15 and the EU12 with the former having a larger percentage of researchers (67%) who have worked in two or more countries after their graduation, while the latter has a lower percentage (50%).

Overall, the EU12 appears to have the least mobile population of researchers scoring lowest on four of the five mobility indicators, with the exception of 'being mobile as researcher, but not as a student'-indicator, where it ranks the second lowest.

6.3.2 Types of international mobility for this survey

Next we look at the distribution of the four mobility groups, as defined for this study by M1 (mobile from the EU to the US), M2 (mobile from the US to the EU), M3 (mobile but not belonging to the M1 or M2 types of mobility) and M4 (not mo-

bile according to the current definition for mobility), by region of residence at the time of the survey and the duration of their stay.

6.3.2.1 The four groups of mobility for this survey

Of all respondents residing in the EU27, 14 percent have been mobile to the US and 8 percent mobile from the US, whereas from the US researcher population only 2 percent has been mobile to the EU27. We can conclude for the researchers in the sample that there is a larger flow of researchers going from the EU27 to the US than the other way around reflecting the results of other studies. We should however keep in mind that these findings refer to this particular sample and cannot be generalised.

The EU27, however, appears to be more attractive than the US for researchers from other regions (46.7 percent of EU27 researchers are "other mobile" researchers compared to only 32 percent in the US). The US has the largest group of "non-mobile" researchers closely followed by the EU12.

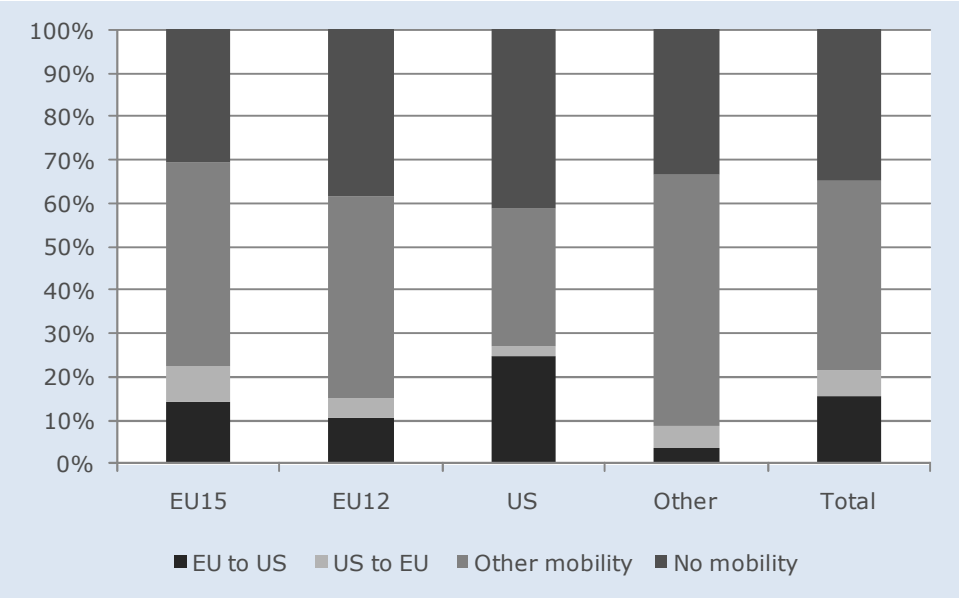
Table 6-6 The four main groups

	Region of residence					
	EU15	EU12	EU27	US	Other	Total
	% of total (Number of observations)					
EU-US (M1)	14.0	10.5	13.6	24.7	3.7	15.6
	(388)	(37)	(425)	(414)	(28)	(867)
US-EU (M2)	8.4	4.5	8.0	2.1	4.9	5.8
	(232)	(16)	(248)	(36)	(37)	(321)
Other international mobility (M3)	46.8	46.5	46.7	32.0	58.0	43.8
	(1292)	(164)	(1456)	(537)	(436)	(2429)
No internationally mobile (M4)	30.8	38.5	31.7	41.1	33.4	34.8
	(851)	(136)	(987)	(689)	(251)	(1927)
Total	100	100	100	100	100	100
	(2763)	(353)	(3116)	(1676)	(752)	(5544)

Source: MORE extra – EU survey

Figure 6-5 clearly shows that the US appears to have the largest share of "non-mobile" researchers suggesting that it is the region that best retains its graduates. The EU15 has the lowest share of non-mobile researchers.

Figure 6-5 The four main groups of mobility



Source: MORE extra – EU survey

Table 6-7 shows that the longer the duration of the latest stay respondents increasingly fall into the non-mobile group and therefore are less likely to belong to any other mobility group. The group who is mobile the US from the EU is mostly represented in the one to two year duration group, while this mobility group is the least represented in the shortest and longest duration groups. The group who visits the EU from the US constitutes around 6 percent of all duration types (with the exception of the 2 to 3 year visit).

Table 6-7 Four groups by duration of latest stay

	Duration of latest stay					
	3m≤x<6m	6m≤x<1yr	1yr≤x<2yr	2yr≤x<3yr	x≥3yr	Total
	% of total					
EU-US (M1)	15.8	18.9	24.0	18.5	12.5	15.6
US-EU (M2)	6.1	5.6	6.4	4.5	5.8	5.8
Other mobility (M3)	70.4	70.0	57.5	59.1	22.9	43.8
Not mobile (M4)	7.7	5.5	12.1	17.9	58.8	34.8
Total	100	100	100	100	100	100
Observations	1012	587	628	514	2803	5544

Source: MORE extra – EU survey

6.3.2.2 Mobility indicators per mobility group

Table 6-8 shows that the four mobility groups differ from each other mostly with respect to the indicators "country of residence different from country of birth" and "country of residence different from country of graduation"; However, they do not show large differences for the other mobility indicators (the non-mobile group obviously does not have observations for two of the mobility indicators). Group M2 (US to EU) scores the highest on the two differentiating indicators as it has both the highest percentage of researchers who do not live in the country where they

are born and do not live in the country where they have graduated. Group M1 (EU to US) has the second highest percentage of researchers not living in the country where they are born or graduated.

Table 6-8 Mobility indicators per mobility group

	Mobility groups				
	M1	M2	M3	M4	Total
	% of total (per mobility group)				
Country of residence=country of birth	46.3	36.4	57.5	69.7	58.8
Country of residence≠ country of birth	53.7	63.6	42.5	30.3	41.2
Country of residence =region of graduation	45.1	11.2	62.2	84.8	64.4
Country of residence ≠region of graduation	54.9	88.8	37.8	15.2	35.6
Mobile as researcher and as student	34.8	35.5	38.1	.	24.2
Mobile as researcher, not as student	65.2	64.5	61.9	.	41.0
Not mobile as a researcher, mobile as a student	.	.	.	21.5	7.5
Not mobile as a researcher, not as a student	.	.	.	78.5	27.3
Nr. countries worked since graduation: 0 to 1	20.2	19.9	18.1	75.2	38.4
Nr. countries worked since graduation: 2 to 3	69.4	64.8	65.3	21.0	50.5
Nr. countries worked since graduation: 4 to 5	7.7	13.4	13.0	2.8	8.6
Nr. countries worked since graduation: more than 5	2.7	1.9	3.7	1.0	2.5
Nr. of countries worked since graduation: 2 or more	79.8	80.1	82.0	24.8	61.6
Total number of observations	871	322	2521	1936	5650

Source: MORE extra – EU survey

6.4 Main findings

In this section, we briefly summarise the conclusions that can be drawn from the information gathered by our survey with respect to career paths and international mobility.

Around 85 percent of the researchers in the survey are working in the public sector and most of them have always been in the public sector (around three-fourths). The distribution over career paths is very similar for all regions of residence and for all mobility groups.

Researchers are quite mobile with respect to employers, around half of the researchers in all regions have worked for two to three employers since graduation and more than ten percent have worked for four or more employers. Again, the distribution is similar over all regions (with a minor exception being the EU12 which has a slightly lower percentage of researchers having worked for four to five employers). Also the non-mobile group (M4) is slightly less "employer-mobile" and has a higher percentage of respondents who have worked for either zero or only one employer after graduation. Further, geographical non-mobility appears to go together with employer non-mobility.

Within the EU, there are large differences with respect to the number of countries in which a researcher has worked abroad. EU15 resident researchers are the most mobile in terms of working in different countries after graduation (33% have worked in zero to one (different) country) and EU12 resident researchers are the least mobile (50% have worked in zero to one country). Even the group of "non-mobile" researchers includes 25% of researchers working in two or more different countries either for less than 3 months or before obtaining his/her highest degree.

Researchers who are mobile from the US to the EU tend to remain for a longer duration than do the researchers who move from the EU to the US (51% versus 40% respectively). There appears to be a U-shape relationship between the length of stay and the percentage of researchers having worked in zero to one country. If researchers are not very mobile in terms of countries where they have worked since graduation, they tend to go on very short or very long visits.

In the next chapter we will go deeper into the motivations of researchers to become mobile and whether these differ according to the direction of the move and other characteristics discussed earlier.

7 MOTIVATIONS AND INFLUENCING FACTORS OF MOBILITY

7.1 Introduction

In this chapter we discuss the motivations that drive researchers to become mobile and well as other influencing --external-- factors. While motivations are the reasons one chooses to become mobile, once the decision to become mobile is made other considerations may influence whether a move is feasible. A motivation, for example, could be the desire to work with star scientists at the destination country, an external factor, such as a problem trying to obtain resident or work permits for family members, might prevent mobility. It is important to distinguish between motivations and external factors from a policy perspective.

In this chapter we look at whether the motivations to become mobile and the factors influencing this decision are different for the four mobility groups and whether these factors differ based on the characteristics of the researcher such as his or her field of science and highest degree earned, career path and experience abroad.

In the survey, all mobility groups were presented with the same motivation and influencing factors, although, as indicated earlier, the question was posed differently to each mobility group. The motivation question was framed as follows: "To what extent were the following aspects important as factor in:

- motivating you to become mobile to the US?" (M1: EU to US);
- motivating you to become mobile to the EU?" (M2: US to EU);
- motivating you to become mobile to [country different from graduation country]?" (M3: other mobility);
- dissuading you to become mobile?" (M4: no mobility).

The question where the respondent was asked about the extent to which external factors influenced his/her decision to become mobile was addressed to each mobility group in a similar fashion.

All personal motivations and external factors presented in the survey were compulsory questions where the respondent was to score each motivational or influencing factor from 1 (a factor the he or she judged "not important at all" in the decision to become mobile) to 5 (an "Extremely important" factor). The respondent was also allowed to answer "Not applicable (NA)".

In the remainder of this chapter we present the average score of the motivational and influencing factors. We have excluded respondents who answered "not-applicable" and categories with ten or fewer respondents.

We have focused on seven possible motivational factors based on the international mobility literature and interviews with researchers who have been mobile. These factors can be grouped into two main categories, the personal motivations (related to person-specific preferences) and the professional motivations (related to professional objectives and goals). These are listed below:

- Personal motivations:
    1. Personal, family-related factors
    2. Personal interest in the culture of the (destination) country
- Professional motivations:
    3. Personal education and/or research agenda (i.e. content and direction of research)
    4. Career progression goals
    5. Getting access to the facilities/equipment necessary for research
    6. Prospect to work with leading experts ('star scientists') at destination country
    7. Salary and other financial incentives

In the following sections, we focus on the significance that these different motivational factors have had on the researchers' mobility decision. We also investigate the role that various influencing external factors have had on the mobility decision.

7.2 Motivations

7.2.1 The general picture

Respondents were required to rate the importance of seven motivational factors in their decision to become mobile. These included personal motivations such as "personal/family factors" or "personal interest in the culture of the country" and professional motivations such as "career progression goals" or the "prospect to work with leading experts" or financial motivations such as "salary and other financial objectives".

Table 7-1 Motivations for mobility by mobility group

	Mobility groups				
	M1	M2	M3	M4	Total
	Average score				
Personal/family factors	2.49	3.66***	2.68	3.61$^{\Delta\Delta\Delta}$	3.05
Personal education and/or research agenda	4.18	3.67***	4.07	2.86$^{\Delta\Delta\Delta}$	3.65
Career progression goals	4.22	3.56***	3.89	3.08$^{\Delta\Delta\Delta}$	3.65
Getting access to facilities/equipment	3.54	2.90***	3.28	2.81$^{\Delta\Delta\Delta}$	3.14
Prospects to work with leading experts ('star' scientists)	4.06	3.11***	3.60	2.74$^{\Delta\Delta\Delta}$	3.35
Salary and other financial incentives	2.84	2.56***	2.64	2.93$^{\Delta\Delta\Delta}$	2.77
Personal interest in the culture of the country	2.62	3.32***	2.84	2.28$^{\Delta\Delta\Delta}$	2.64
Observations[a]	867	321	2429	1927	5544

Source: MORE extra – EU survey

[a] Averages are based on all observations belonging to M1, M2, M3 and M4, but due to the respondents who answered "NA", the actual number of respondents on which the average is based can differ for each motivation.

*** Difference between group M1 and M2 is significant at 1%; $^{\Delta\Delta\Delta}$ Difference between the mobile group of researchers (M1, M2, M3) and the non-mobile group (M4) is significant at 1%.

In Figure A2.1 we present a visual overview of the importance of the motivations for the different mobility groups. It shows the percentages that find a motivation "not important" (combining the respondents who have answered either "not important at all" or "not important"), "neutral" or "important" (combining the answers "important" and "extremely important". We will compare these results with the averages presented above.

Financial and cultural motivations do not seem to be an important factor in the decision to become mobile (average score less than 3). All of the professional motivations seem to be fairly important with the highest importance found for "personal education and/or research agenda" and "career progression goals".

Focusing on the group of researchers that has been or is mobile from the EU to the US (M1 in Table 7-1), we find that "career progression goals" is the most important motivational factor followed by "personal education or research agenda" and "prospects to work with leading experts". These motivations have an average score which is higher than the average score for the total (all groups combined). We can reach a similar conclusion by looking at the distribution in Figure A2.1: 80 percent of the researchers going from the EU to the US find the first two motivations important and less than ten percent finds them not important. "Prospects to work with leading experts" follows with more than 70 percent finding it important and around ten percent finding it not important. Personal or financial motivations seem the least important for going to the US.

The opposite is true for the researchers who graduated in the US and are moving to the EU. For those researchers personal motivations are very important. "Personal/family factors" share first place with "personal education and/or research agenda" followed by career progression goals. See also the results in Figure A2.1 where around 60 percent of the researchers going from the US to the EU finds these motivations important. Personal/family factors and interest in the culture are the two exceptions where the motivational score going from the US to the EU is higher than for those going from the EU to the US (and significant at 1%). The EU-to-US mobile researchers indicate that all of the professional motivations are more important to them than do the US to EU mobile researchers (and significant at 1%). Financial motivations do not play an important role; they are the least important for those going from the US to the EU and third least important for those going from the EU to the US.

The radar graph in the second part of Figure 7-1 shows that respondents in group M2 score much higher on the two personal motivations while respondents in group M1 score much higher on all professional motivations. For both groups, financial motivations do not play an important role.

When comparing the non-mobile group to the other groups, we find that personal/family factors drive group M2 to become mobile and career progression goals drive the M1 group to become mobile, while these two factors are the motivations that drive the non-mobile group to not be mobile (Figure A2.1 shows that nearly 60 percent of the non-mobile researchers answered that personal/family factors were important in their decision not to become mobile, while slightly over 40 percent answered that career progression goals were important confirming that the most important driver of non-mobility is personal/family factors). All other motivations play a more neutral role in the decision not to become mobile. In the first part of the radar graph in Figure 7-1 we can see that the importance of the motivational factors is always the least strong for the non-mobile group (and the difference is significant at 1%) but for the financial and personal/family factor motivations.

Figure 7-1 Importance of motivations by mobility group

Source: MORE extra – EU survey

Next, we compare the motivations (or de-motivations) for becoming mobile by the respondents international experience (duration of latest stay and number of countries worked since graduation), career path (measured by both the number of employers since graduation and career path in terms of working in the public versus private sector), and educational background (indicated by the highest degree and field of science).

7.2.2 Motivations and experience abroad

Table 7-2 below provides information per duration of stay and per category of number of countries worked abroad for the mobile groups M1, M2, M3.

Based on Table 7-2 motivations to become mobile can be divided in three groups: the typical long-term mobility motivations (duration from three years onwards), the typical shorter term motivations (between three and six months) and motivations that apply for all durations. When the duration is shorter than three years personal and family related factors do not appear to have much influence over the mobility decision. With regards to stays of longer than six months, cultural motivations do not seem to be important.

For the 'personal education and research agenda' motivation and the 'prospects to work with leading experts' motivation, the importance is lowest for durations greater than three years, although both motivations are very important in general. Career progression goals are the second most important motivation for all durations, but the least so for researchers with a stays of less than six months. Getting access to facilities is equally important for all durations. Financial motivations play a stronger role, the longer the duration, but are in general not important. We also see that the longer the duration, the differences in motivations narrows.

Table 7-2 Motivations and experience abroad (only the ob

	Personal/ family factors	Personal education and/or research agenda	Career progression goals	Getting access to facilities/equipment	Prospects to work with leading experts ('star' scientists)	Salary and other financial incentives	Personal interest in the culture of the country	Total
Duration of latest stay								
≥3 and < 6 months	2.52	4.16	3.78	3.28	3.68	2.36	3.03	934
≥6 and <12 months	2.62	4.18	3.90	3.32	3.81	2.47	2.92	555
≥1 year and < 2 years	2.60	4.11	3.98	3.29	3.79	2.70	2.73	552
≥2 years and < 3 years	2.53	4.14	4.10	3.34	3.82	2.87	2.76	422
≥3 years	3.06	3.87	4.01	3.33	3.46	2.94	2.71	1154
Nr. of countries worked abroad								
0-1	2.66	4.15	3.91	3.41	3.66	2.51	2.91	678
2-3	2.72	4.07	4.00	3.33	3.71	2.74	2.78	2396
4-5	2.87	3.88	3.73	3.11	3.46	2.63	2.95	425
More than 5	2.76	3.99	3.68	3.02	3.47	2.63	3.06	118
Total	2.73	4.06	3.94	3.31	3.66	2.68	2.83	3617

Source: MORE extra – EU survey
Average scores per motivational factor are based on all observations belonging to the respective subgroups of "duration of latest stay" and "number of countries worked abroad". Due to respondents who answered "NA" the actual number of respondents on which the average is based can differ for each motivation.

With respect to the number of different countries one has worked in since graduation, we see that personal and family motivations, salary and financial motivations and cultural motivations are not important irrespective of the number of countries that one has worked in. All professional motivations are important irrespective of the number of countries that one has worked in, but consistently strongest if one has worked in zero to three countries.

7.2.3 Motivations and career path

Next, we look at whether the motivational pattern differs by the type of career path that a researcher follows. The most important motivating factors always appear to be the same three, regardless of the number of employers that one has worked for: 'personal education/research agenda', 'career progression goals' and 'prospects to work with leading scientist'. Financial and cultural motivations are always the least important. The average scores do not differ much over the number of employers worked for.

Table 7-3 Motivations and career path

	Personal/family factors	Personal education and/or research agenda	Career progression goals	Getting access to facilities/equipment	Prospects to work with leading experts ('star' scientists)	Salary and other financial incentives	Personal interest in the culture of the country	Total
Nr. of employers worked for								
0-1	3.09	3.60	3.53	3.19	3.35	2.78	2.60	1304
2-3	3.03	3.69	3.71	3.17	3.41	2.75	2.62	2716
4-5	3.03	3.63	3.67	3.07	3.30	2.78	2.72	1109
More than 5	3.05	3.55	3.52	2.94	3.05	2.75	2.77	415
Career path								
Always public	3.00	3.68	3.68	3.17	3.40	2.76	2.63	4237
Always private	3.22	3.45	3.61	2.94	3.03	2.85	2.95	164
Public to private and back	2.95	3.68	3.79	3.19	3.53	2.85	2.59	258
Public to private	3.25	3.47	3.61	3.03	3.22	2.85	2.58	183
Private to public and back	3.45	3.58	3.18	2.95	3.03	2.85	2.85	40
Private to public	3.27	3.49	3.39	3.02	3.21	2.74	2.68	276
Other	3.28	3.50	3.43	3.01	3.02	2.74	2.64	386
Total	3.05	3.65	3.65	3.14	3.35	2.77	2.64	5544

Source: MORE extra – EU survey

Average scores per motivational factor are based on all observations belonging to the respective sub-groups of "number of employers worked for" and "career path". Due to respondents who answered "NA" the actual number of respondents on which the average is based can differ for each motivation.

For all types of career paths the motivations "personal education and/or research agenda" and "career progression goals" have played the most important role in the decision to become mobile, with the sole exception of the career path 'private to public and back' for which 'personal/family factors' come second to 'personal education and/or research agenda'. Getting access to facilities/equipment appears to be a less important motivation for those with private career path ("always private" and "private to public and back") than for those with a mainly public career path ("always public" and "public to private and back"). Also the motivation to work with star scientists is more important in the mainly public path than in the mainly private path.

7.2.4 Motivations and education

For all fields of science, 'personal education and/or research agenda' is one of the top three motivations to become mobile. Prospects to work with star scientists is less important in social sciences and humanities where "personal/family factors" and "getting access to facilities/equipment" respectively come on the third place.

"Getting access to facilities" is least important as a motivation to become mobile in the social sciences and "prospects to work with leading experts" scores lowest in humanities compared to the other fields. The financial motivation is most important in the engineering and technical sciences while "interest in the culture of the country" is most important for those in the humanities. There is not a great

deal of difference in the importance of various motivational factors according to the educational background of the researcher. Although typically, the top two motivations (personal education and/or research agenda and career progression goals) are more important for researchers with a postgraduate background than for the others.

Table 7-4 Motivations and education

	Personal/ family factors	Personal education and/or research agenda	Career progression goals	Getting access to facilities/equipment	Prospects to work with leading experts ('star' scientists)	Salary and other financial incentives	Personal interest in the culture of the country	Total
Field of science								
Natural sciences	2.91	3.72	3.73	3.16	3.50	2.72	2.54	2276
Eng.&technical sciences	3.12	3.57	3.70	3.23	3.46	3.02	2.61	503
Medical&health sciences	3.16	3.64	3.70	3.47	3.65	2.79	2.54	290
Agricultural sciences	3.03	3.63	3.57	3.44	3.58	2.86	2.62	191
Social sciences	3.19	3.57	3.54	2.90	3.16	2.78	2.68	1665
Humanities	3.05	3.66	3.58	3.35	2.97	2.66	3.00	619
Highest educational attainment[a]								
Postgraduate	3.04	3.69	3.70	3.15	3.38	2.76	2.65	4741
Graduate	3.07	3.38	3.27	3.05	3.12	2.81	2.57	729
Undergraduate	3.43	3.33	3.52	3.18	3.33	2.80	2.78	50
Other	2.77	4.21	4.14	3.71	3.57	2.75	2.77	14
Total	3.05	3.65	3.65	3.14	3.35	2.77	2.64	5544

Source: MORE extra – EU survey

[a] Secondary education degree not represented because ten or fewer observations

Averages are based on all observations belonging to the respective subgroups of "number of employers worked for" and "career path". Due to respondents who answered "NA" the actual number of respondents on which the average is based can differ for each motivation.

7.3 Influencing factors

In this section we investigate which external factors were taken into account when deciding to become mobile once the researcher had decided to move. This question was presented to all four mobility groups and adapted accordingly. For the first group, researchers moving from the EU to the US, the question was: "During the period of time when you have been deciding to become mobile, to what extent have the following factors been important in influencing your decision to work in the US?". The destination country is adapted to: (1) EU for group M2, (2) country x for groups M3 and M4 where country x is the country of latest mobility (M3) or of non-mobility (M4).

The external influencing factors considered in the survey were:

- Practical influencing factors:

1. Pension and social-care provision at destination country
2. Immigration regulations
3. Language
4. Work permission for partner/other family members
5. Availability of adequate schools for children
6. Quality and cost of accommodation

- Research-related influencing factors:

7. Obtaining funding for own research
8. Potential loss of contact with professional network of location where previously worked

7.3.1 The general picture

Once again, we examine the differences in the importance of the influencing factors between mobility groups and groups distinguished by their international experience, career path and educational background.

Table 7-5 Influencing factors by mobility group

	Mobility groups				
	M1	M2	M3	M4	Total
	Average score				
Pension and social care provision [US/EU/country x]	1.70	2.67***	1.84	2.47 $^{\Delta\Delta\Delta}$	2.08
Immigration regulations	2.00	2.33***	1.97	2.42 $^{\Delta\Delta\Delta}$	2.15
Obtaining funding for own research	3.06	2.94	2.98	3.43 $^{\Delta\Delta\Delta}$	3.13
Language	2.93	2.64***	2.73	2.53 $^{\Delta\Delta\Delta}$	2.70
Work permission for partner/other family members	2.28	2.67***	2.15	2.93 $^{\Delta\Delta\Delta}$	2.48
Availability of adequate schools for children	2.16	2.74***	2.09	2.60 $^{\Delta\Delta\Delta}$	2.32
Quality and cost of accommodation	2.44	2.83***	2.54	2.89 $^{\Delta\Delta\Delta}$	2.65
Potential "loss" of contact with professional network of location where previously worked	2.20	2.30	2.13	2.76 $^{\Delta\Delta\Delta}$	2.36
Observations[a]	867	321	2429	1927	5544

Source: MORE extra – EU survey

[a] Averages are based on all observations belonging to M1, M2, M3 and M4 but due to the respondents who answered "NA" the actual number of respondents on which the average is based can differ for each influencing factor.

*** Difference between group M1 and M2 is significant at 1%; $^{\Delta\Delta\Delta}$ Difference between the mobile group of researchers (M1, M2, M3) and the non-mobile group (M4) is significant at 1%.

Similar to the motivations described in the former section, we also include a visual presentation of the importance of the influencing factors in annex 2 (Figure A2.2).

On average not many of the external factors seem to be important having average scores below three. Only "obtaining funding for own research" seems to be important when one considers the decision to move. As much as 41 percent of those mobile from the EU to the US consider it as important and 31 percent of the researchers moving in the opposite direction also consider it important. Also noteworthy is the fact that 52 percent of the non-mobile consider "obtaining fund-

ing for own research" as an important influencing factor suggesting that it plays the role of barrier to mobility when funding is not easily made available.

Among all groups combined, "language" and "quality and cost of accommodation" are also of some importance. Pension and social care provisions and immigration regulations are of the least concern.

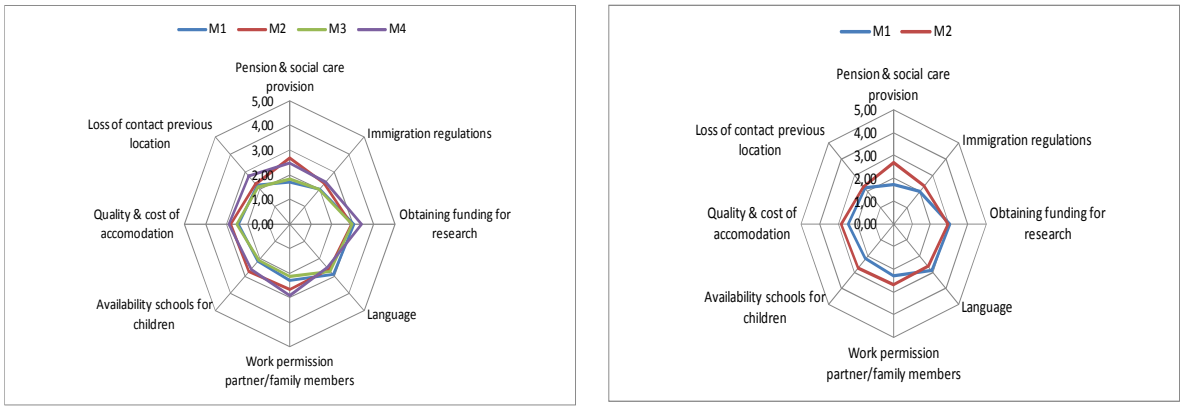
Even though "obtaining funding for own research" appears to be a more important issue when one moves from the EU to the US, the difference is not significant. The difference is significant however, between the mobile and non-mobile group with the latter attaching a higher importance to the issue.

From this sample we see that researchers moving from the EU to the US seem less concerned about pension and social care provisions in the US, or if they do, it does not affect their decision to become mobile. Researchers moving in the other direction (US to EU) seem slightly more concerned about pension and social care provisions in the EU (around 30 percent of the US-EU mobile researchers finds this an important concern), and also about immigration regulations (which 20 percent finds important), work permission for partners (more than 30 percent of the US-EU mobile researchers considers this important), availability of adequate schools (also considered as important by more than 30 percent of the US-EU mobile researchers) and cost and quality of accommodation (considered important by more than 20 percent). Hence we can conclude that "practical" considerations play an important role for around one fourth to one third of the researchers moving from the US to the EU.

This is also clear from the second part in the radar graph in Figure 7-2. The first part of the graph shows that mobile groups M1 (EU to US) and M3 (other mobility) appear to attach the same importance to the issues presented.

Except for one influencing factor, the factors are significantly more important for the non-mobile group than for the mobile group. This seems obvious as it might be these external factors that caused the researchers to remain immobile, even if they had the desire to be mobile. However, the non-mobile group, judges most factors as not important. Therefore we may conclude that the true reason they are not mobile lies in the motivational factors rather than in the external factors.

Figure 7-2 Importance of influencing factors by mobility group



Source: MORE extra – EU survey

7.3.2 Influencing factors and experience abroad

Table 7-6 shows that, generally, none of the influencing factors plays a strong role. "Obtaining funding for research", "language" and "quality and cost of accommodation" seem to be the most important considerations (but remain fairly unimportant). In general, there also appears to be a positive correlation between the length of stay and the importance of an issue.

Regarding the number of countries where researchers have worked, none of the factors appear to be important. The "obtaining funding for own research" factor is of most importance.

Table 7-6 Influencing factors and experience abroad

	Pension and social care provision	Immigration regulations	Obtaining funding for own research	Language	Work permission for partner/ family members	Availability of adequate schools for children	Quality and cost of accommodation	Potential "loss" of contact with professional network of previous location	Total
Duration of latest stay									
≥3 and < 6 months	1.60	1.76	2.84	2.77	1.88	1.80	2.53	2.06	934
≥6 and <12 months	1.70	1.91	2.99	2.91	2.02	2.03	2.58	2.02	555
≥ year and < 2 years	1.82	1.99	2.85	2.76	2.28	2.10	2.41	2.20	552
≥2 years and < 3 years	1.88	2.04	3.07	2.76	2.44	2.13	2.48	2.30	422
≥3 years	2.17	2.25	3.16	2.71	2.48	2.54	2.62	2.24	1154
Nr. of countries worked abroad									
0-1	1.82	1.93	2.97	2.93	2.06	1.98	2.57	2.12	678
2-3	1.91	2.05	3.01	2.77	2.29	2.21	2.51	2.20	2396
4-5	1.84	1.95	2.93	2.59	2.16	2.25	2.68	2.09	425
More than 5	1.74	1.95	3.09	2.51	2.05	2.07	2.59	1.97	118
Total	1.88	2.01	2.99	2.77	2.23	2.17	2.54	2.16	3617

Source: MORE extra – EU survey

7.3.3 Influencing factors and career path

As Table 7-7 shows, there is no difference in the importance (or unimportance) of the different influencing factors based on number of employers. The average scores lie very close to each other for each of the employment sizes.

For all career paths, the three most important influencing factors remain the same as observed previously with a clear first place for "obtaining funding for own research". In the "always private" career path, the funding factor is of less importance and shares first place with "quality and cost of accommodation". In the

"private to public and back" career path, "language" and "quality and cost of accommodation" play a slightly larger role than in any of the other paths.

Table 7-7 Influencing factors and career path

	Pension and social care provision	Immigration regulations	Obtaining funding for own research	Language	Work permission for partner/ family members	Availability of adequate schools for children	Quality and cost of accommodation	Potential "loss" of contact with professional network of previous location	Total
Nr. of employers worked for									
0-1	2.13	2.19	3.15	2.76	2.49	2.18	2.69	2.46	1304
2-3	2.08	2.14	3.16	2.70	2.50	2.34	2.65	2.36	2716
4-5	2.03	2.11	3.07	2.63	2.43	2.43	2.64	2.27	1109
More than 5	2.04	2.16	3.12	2.68	2.39	2.29	2.62	2.35	415
Career path									
Always public	2.06	2.12	3.13	2.70	2.45	2.28	2.62	2.34	4237
Always private	2.26	2.27	2.93	2.85	2.51	2.49	2.95	2.40	164
Public to private and back	1.92	2.25	3.24	2.70	2.65	2.42	2.74	2.49	258
Public to private	2.13	2.26	3.10	2.69	2.66	2.41	2.67	2.33	183
Private to public and back	2.28	2.65	3.11	3.03	2.39	2.57	3.03	2.47	40
Private to public	2.08	2.17	3.10	2.67	2.51	2.37	2.70	2.48	276
Other	2.23	2.25	3.19	2.61	2.55	2.52	2.78	2.51	386
Total	2.08	2.15	3.13	2.70	2.48	2.32	2.65	2.36	5544

Source: MORE extra – EU survey

7.3.4 Influencing factors and education

As Table 7-8 illustrates, there appears to be a consistent pattern regarding the importance of the influencing factors. For all fields of science "obtaining funding for own research" receives the highest importance when deciding to become mobile, with "language" and "quality and cost of accommodation" factors in second and third place. For all fields, pension and social care provisions and immigration regulations are of least importance. The same conclusions hold for the different educational backgrounds.

Table 7-8 Influencing factors and education

	Pension and social care provision	Immigration regulations	Obtaining funding for own research	Language	Work permission for partner/ family members	Availability of adequate schools for children	Quality and cost of accommodation	Potential "loss" of contact with professional network of previous location	Total
Field of science									
Natural sciences	2.05	2.14	3.12	2.61	2.49	2.30	2.59	2.31	2276
Eng.&technical sciences	2.24	2.29	3.21	2.70	2.53	2.50	2.79	2.55	503
Medical&health sciences	2.27	2.24	3.27	2.73	2.70	2.56	2.80	2.50	290
Agricultural sciences	2.19	2.27	3.19	2.80	2.59	2.36	2.69	2.42	191
Social sciences	2.06	2.13	3.04	2.78	2.43	2.29	2.66	2.40	1665
Humanities	1.98	2.03	3.28	2.77	2.33	2.25	2.69	2.23	619
Highest educational attainment[a]									
Postgraduate	2.05	2.11	3.11	2.70	2.46	2.34	2.63	2.35	4741
Graduate	2.25	2.33	3.27	2.66	2.55	2.19	2.76	2.52	729
Undergraduate	2.39	2.48	3.02	2.86	2.91	2.53	3.09	2.45	50
Other	2.33	2.27	2.83	2.46	3.00	-	2.58	2.00	14
Total	2.08	2.15	3.13	2.70	2.48	2.32	2.65	2.36	5544

Source: MORE extra – EU survey

[a] Secondary education degree not represented because ten or fewer observations

7.4 What drives researchers to move to the US or to the EU?

In this section the aim is to compare both the motivations and the influencing factors driving European graduates to the US (group M1) versus those that are driving US graduates to the EU. From the tables above we saw that US graduates come to the EU primarily for personal and/or cultural reasons while European graduates move to the US primarily for professional reasons. With respect to the influencing factors, the summary tables did not show a strong difference between the two mobility groups, and overall, the influencing factors did not appear to be of importance.

To test whether these results also hold in a multivariate setting (logit model), where we investigate the effect of the motivations and influencing factors together with the effect of other explanatory variables such as sex, age, educational background, employment background etc, we introduce the following dependent variables. For mobile EU graduates we tested what drives them towards the US rather than to another region by creating a variable equal to one if mobile EU graduates move to the US and zero if they move elsewhere. Similarly for US

graduates, we define a variable equal to one for mobile US graduates who move to the EU and zero if they move elsewhere. We only consider mobile EU and US graduates in this analysis and test whether the factors driving EU graduates to the US and US graduates to the EU are the same.

Table 7-9 shows the results of these regressions (using the statistical software package STATA). The column titled "EUgrads" analyses how the explanatory variables affect the decision of mobile EU graduates to choose the US over other regions, while the column titled "USgrads" analyses how the explanatory variables affect the decision of mobile US graduates to choose the EU over other regions.

In columns (1) and (2) we include a set of explanatory variables including: gender, age (and age squared), educational background (highest degree earned, experience (in years since graduation), field of science, marital status, number of children, region of birth, the number of employers one has worked for, whether the researcher was also mobile as a student, and the type of position the respondent holds (whether the respondent is a PhD student, a post-doctoral researcher or has another position). In columns (3) and (4) we add the different motivations a person might have to become mobile and in (5) and (6) we add the influencing factors to see whether they have any power in explaining the mobility decision of a researcher. Generally, the set of explanatory factors seems to be better in explaining the decision of the US graduates to move to the EU than the other way around (regressions (2), (4) and (6) show a higher pseudo R^2).

The results in the first part of the table suggest that the variables that affect the choice of an EU graduate to move to the US and of a US graduate to move to the EU are somewhat similar but that some differences exist.

1. General variables (part 1 of Table 7-9)

Educational attainments, marital status, the number of children and the position a researcher holds do not seem to have an effect on the mobility direction for both groups. Even the field of science does not have an impact, though it appears that being in the medical and health sciences positively affects the decision of EU graduates to move to the US rather than elsewhere; however, this effect disappears when motivations and influencing factors are added (in columns (3) and (4) and (5) and (6)).

Male researchers having graduated in the US appear to choose to move to another region as opposed to the EU. The years of experience (measured as "years since graduation") of the EU graduates seem to be positively correlated with moving to the US.

Graduates of the EU who are born either in the EU15 or in the US prefer the US over any other region, while graduates of the US born in the EU15 prefer to move back to the EU. When the motivations and the influencing factors are added, the effect of returning to the region of one's birth disappears for US researchers who graduated in the EU. This suggests that for US born researchers it is not the attraction of the birth country that plays a role but motivations and external considerations (see further). For EU15-born researchers the birth region attraction exists also when taking into account motivations and influencing factors. For EU12 born researchers, there appears to be no birth region attraction.

The number of employers a researcher has worked for appears to affect the choice of the US negatively (for EU graduates), while it appears to affect the choice of the EU positively (for US graduates). But the latter effect disappears when influencing factors are introduced.

2. Motivations

The desire to work with star scientists has a positive effect for both EU and US graduates, by driving EU graduates to the US and US graduates to the EU. Career progression goals seem to drive EU graduates to the US while they do not have a significant effect in the other direction. Personal and family factors seem to drive US graduates to the EU but do not have an effect in the other direction. These results confirm the conclusion based on the summary statistics that researchers move from the US to the EU for personal reasons and move from the EU to the US for career progression goals. A new result is that, once corrected for other effects, the star scientist motivation also drives US graduates to the EU, but does not drive EU graduates to the US.

3. Influencing factors

Influencing factors appear to have completely different effects for both groups. While pension and social care considerations work positively to attract US graduates to the EU, it works negatively in the other direction. Immigration regulations and language drive EU graduates towards the US. The fear of losing contact with a professional network in the base country positively affects the decision of US graduates to move to the EU.

The significance of these influencing factors contradicts slightly the conclusions drawn before where "obtaining funding for own research" seemed to be the most important. In this multivariate context, where other effects are corrected for, it is the practical considerations (pension and social care provisions, immigration regulations and language) that matter most when deciding to move from the EU to the US, while for the US graduates the fear of loss of contact with the network of the 'base' country plays an important role. This drives US graduates to the EU rather than to another region indicating that it might be easier to keep contact with the US network of researchers from the EU.

Table 7-9 Logistic analysis: drivers of EU-US versus US-EU mobility

	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables	EUgrads	USgrads	EUgrads	USgrads	EUgrads	USgrads
Sex = male	-0.136	-0.349*	-0.096	-0.323	-0.050	-0.471*
(Base: female)	(0.100)	(0.180)	(0.113)	(0.198)	(0.150)	(0.264)
Age (in years)	-0.066	-0.170**	-0.091**	-0.119	-0.029	-0.017
	(0.041)	(0.070)	(0.045)	(0.078)	(0.058)	(0.104)
Age squared	0.001	0.002**	0.001*	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Highest educational attainment (Base: other)						
Postgraduate degree	0.301	0.045	0.225		0.359	
	(0.723)	(0.430)	(0.724)		(0.913)	
Graduate degree	-0.455		-0.364	0.040	-0.123	0.403
	(0.758)		(0.768)	(0.491)	(0.965)	(0.658)
Undergraduate degree	-0.073	0.047	-0.240			
	(0.932)	(1.149)	(1.043)			
Years since graduation	0.041***	-0.023	0.048***	-0.036	0.051***	-0.034
	(0.011)	(0.020)	(0.013)	(0.023)	(0.016)	(0.031)
Marital status and children						
Married or cohabiting	0.085	0.004	0.140	-0.131	0.313*	-0.375
(Base category: single)	(0.114)	(0.220)	(0.128)	(0.246)	(0.173)	(0.360)
Number of children	-0.075	-0.080	-0.061	-0.157*	-0.096	-0.148
	(0.046)	(0.075)	(0.051)	(0.083)	(0.066)	(0.116)
Mobile as a student	-0.098	-0.271	-0.029	-0.178	-0.069	-0.373
	(0.098)	(0.177)	(0.107)	(0.197)	(0.136)	(0.258)
Birth region (Base: other region)						
Born in EU15	0.352**	0.816***	0.319	0.764***	0.125	0.592*
	(0.178)	(0.234)	(0.199)	(0.264)	(0.252)	(0.343)
Born in EU12	-0.211	0.025	-0.253	-0.298	-0.229	-0.313
	(0.225)	(0.402)	(0.250)	(0.449)	(0.313)	(0.604)
Born in US	1.016**	-0.585***	0.646	-0.479*	0.483	-0.599*
	(0.424)	(0.220)	(0.502)	(0.250)	(0.658)	(0.334)
Field of science (Base: Humanities)						
Natural sciences	0.001	-0.044	-0.230	-0.092	-0.210	-0.350
	(0.172)	(0.263)	(0.194)	(0.298)	(0.247)	(0.411)
Engineering & Technology	0.016	0.490	-0.081	0.469	-0.211	0.099
	(0.221)	(0.411)	(0.247)	(0.477)	(0.319)	(0.619)
Medical & Health sciences	0.627**	-0.480	0.184	-0.942	0.043	-0.181
	(0.249)	(0.597)	(0.279)	(0.668)	(0.353)	(0.920)
Agricultural sciences	-0.156	0.377	-0.555	0.177	-0.592	-0.527
	(0.290)	(0.651)	(0.344)	(0.787)	(0.423)	(1.212)
Social sciences	-0.049	0.092	-0.237	0.033	-0.262	0.080
	(0.181)	(0.242)	(0.203)	(0.268)	(0.257)	(0.358)
Number employers worked for (Base: 0-1 employers)						
Worked for 2-3 employers	-0.234*	0.553**	-0.232	0.630**	-0.304	0.558
	(0.126)	(0.243)	(0.142)	(0.265)	(0.187)	(0.363)
Worked for 4-5 employers	-0.377**	0.583**	-0.313*	0.491	-0.358*	0.467
	(0.150)	(0.283)	(0.168)	(0.313)	(0.218)	(0.421)
Worked for >5 employers	-0.698***	0.251	-0.502**	0.244	-0.460	0.209
	(0.209)	(0.378)	(0.230)	(0.414)	(0.284)	(0.569)
Position (Base: other position)						
Doctoral researcher/PhD	-0.136	-0.181	-0.134	-0.318	-0.023	-0.347
	(0.212)	(0.374)	(0.240)	(0.450)	(0.292)	(0.601)
Post-doctoral researcher	-0.037	0.050	-0.068	0.185	-0.043	0.086
	(0.102)	(0.175)	(0.113)	(0.192)	(0.141)	(0.252)

Table 7-9 Logistic analysis: drivers of EU-US versus US-EU mobility (continued)

Explanatory variables	(1) EUgrads	(2) USgrads	(3) EUgrads	(4) USgrads	(5) EUgrads	(6) USgrads
Motivations						
Personal/family factors			0.027	0.255***	0.002	0.233**
			(0.039)	(0.071)	(0.053)	(0.098)
Education/research agenda			-0.030	-0.257***	-0.028	-0.083
			(0.057)	(0.100)	(0.071)	(0.127)
Career progression goals			0.297***	-0.025	0.351***	-0.173
			(0.056)	(0.093)	(0.072)	(0.121)
Access to facilities			0.022	-0.064	-0.004	-0.177
			(0.046)	(0.083)	(0.058)	(0.110)
Star scientists			0.194***	0.252***	0.199***	0.278**
			(0.052)	(0.085)	(0.067)	(0.114)
Salary/financial			0.036	0.126	0.086	-0.089
			(0.044)	(0.082)	(0.060)	(0.117)
Cultural interest			-0.068	0.133*	-0.067	0.108
			(0.047)	(0.076)	(0.063)	(0.103)
Influencing factors						
Pension/social care provision					-0.451***	0.624***
					(0.095)	(0.127)
Immigration regulations					0.273***	-0.156
					(0.086)	(0.126)
Funding for own research					-0.053	0.044
					(0.054)	(0.100)
Language					0.113*	-0.172
					(0.059)	(0.105)
Work permission of partner					0.098	0.104
					(0.067)	(0.096)
Adequate schools					0.100	-0.110
					(0.075)	(0.109)
Accommodation					-0.090	0.187
					(0.078)	(0.131)
Loss of contact with "base" country					-0.002	0.221*
					(0.065)	(0.119)
Constant	0.641	4.273**	-0.634	1.971	-2.614	-0.789
	(1.228)	(1.723)	(1.355)	(1.961)	(1.749)	(2.652)
Observations	2174	795	1843	704	1220	499
Pseudo R^2	0.0361	0.120	0.0636	0.164	0.0984	0.248
Chi^2	104.1	127.5	155.7	154.1	160.2	163.0

Source: MORE extra – EU survey
Table shows coefficients and standard errors (in parentheses) of a logistic regression.
*** significant at 1%; ** significant at 5%; * significant at 10%

7.5 Main findings

The strongest conclusion to be drawn from the survey results presented in this section on motivations for mobility is that researchers going from the EU to the US have stronger professional motivations and researchers going from the US to the EU have stronger personal motivations. The desire to work with "star scien-

tists" appears to have a positive effect on both types of mobility, while financial motivations do not appear to play a role in the decision to be mobile.

Specifically for the EU27 researchers being mobile to the US we find that career progression goals, personal education or research agenda, the prospect to work with leading experts and access to facilities and equipment are very important motivations in the mobility decision. This is in line with the conclusions that were drawn based on the NSCG survey where the top three reasons for moving to the US mentioned by EU27 immigrants were job or economic opportunities, educational opportunities and scientific or professional infrastructure which are all of professional nature.

Professional motivations generally play a lesser role in the decision not to become mobile than in the decision to become mobile while career progression goals are the second most important reason not to move. The most important factors in deciding not to become mobile are personal factors.

Based on the career path a researcher followed, we found that the 'personal education and research agenda' motivation and career progression goals are the two most important motivations, while gaining access to facilities and equipment and the prospect to work with star scientists appears more important in the public career paths and less so in the private career paths.

For all fields of science, the same top three motivations were recorded (personal education and/or research agenda, career progression goals, prospects to work with leading experts). The financial motivation is most important for engineering and technical sciences compared to its importance in the other fields of science.

In general, for all mobility groups, the influencing factors have not played a significant role in the decision to actually move. This suggests that the true reasons for being mobile lie in the motivational part.

Only the influencing factor "obtaining funding for own research" appears to be an important influencing factor and significantly more so for those researchers that are not mobile. Quality and cost of accommodation and language follow in importance. Most of the "practical" considerations play a stronger role in US-EU mobility than in the EU-US mobility. Especially "obtaining work permission for partner/other family members" and "availability of adequate schools" were considered important by around 30 percent of the US-EU mobile researchers and "quality and cost of accommodation" and "pension and social care provisions" were considered important by 25 to 30 percent of the US-EU mobile researchers.

In a multivariate context, where other effects are taken into consideration, it is the practical considerations (pension and social care provisions, immigration regulations and language) that matter for EU-US mobility. Pension and social care provisions appear to work positively to attract US graduates to the EU, and negatively in the other direction. For the US graduates the fear of losing contact with the network of the 'base' country plays an important role in becoming mobile to the EU rather than to another region.

None of the influencing factors appear important, but the longer the stay abroad, the more important do the influencing factors become in affecting the decision to become mobile. Obtaining funding for own research appears to be of lower importance in the "always private" career path compared to the other paths. Researchers from all fields of science are influenced by "obtaining funding for own research" and to a lesser extent "language" and "quality and cost of accommodation".

8 EFFECTS OF MOBILITY

8.1 Introduction

In this chapter we discuss the effects of mobility. All mobile groups have been presented with a compulsory section in the questionnaire where they were asked to indicate how their mobility has affected various outcomes such as publication output, patent output and access to infrastructure. The respondents were asked to rate these effects with a score going from 1 to indicate a strongly negative effect to 5 to indicate a strongly positive effect, with 3 as the neutral option. The final aim is to check whether the motivations for mobility have the desired effect and whether different motivations have lead to different effects. The non-mobility group has not been presented with these questions concerning the effects of mobility, and are therefore excluded in the following tables.

The respondents were presented with the following effects:

- Outcome (direct) effects
    1. Publication output
    2. Patent output
    3. Ability to work in the industrial sector
    4. Access to infrastructure and know-how
    5. Future job opportunities in the country where previously worked/studied
- Network (indirect) effects
    6. Access to an international network of professionals active in your field
    7. Professional experience as researcher
    8. General recognition in the research community

8.2 Effects of mobility

8.2.1 The general picture

Table 8-1 shows that network effects are the most important effects from mobility. The strongest effects have been recorded on professional experience as a researcher, followed by access to an international network of professionals and general recognition in the research community. All averages lie on the positive side of three suggesting that in general the effects of mobility are positive.

When zooming in on the different mobility groups, we see that the effects for the researchers that have been mobile from the US to the EU are the smallest among the three groups, while the effects of going from the EU to the US are the largest. Further we observe that the differences between group M1 and M2 are significant.

We also find that mobility on average has had no effect on the group of researchers who moved from the US to the EU. The numbers suggest that being mobile in that direction did not have any effects on patent output and future job opportunities in the country where one previously worked or studied (all direct effects).

Table 8-1 Effects of mobility by mobility group

	Mobility group			
	M1	M2	M3	Total
	Average score[a]			
Publication output	3.92	3.45***	3.76	3.77
Patent output	3.30	2.96***	3.16	3.19
Ability to work in the industrial sector	3.62	3.06***	3.38	3.41
Access to infrastructure and know-how	4.11	3.42***	3.74	3.81
Access to an international network of professionals active in your field	4.24	3.64***	4.06	4.07
Professional experience as researcher	4.51	3.77***	4.23	4.26
Future job opportunities in country where previously worked/studied	3.53	2.99***	3.53	3.48
General recognition in the research community	4.19	3.68***	3.99	4.01
Observations	867	321	2429	3617

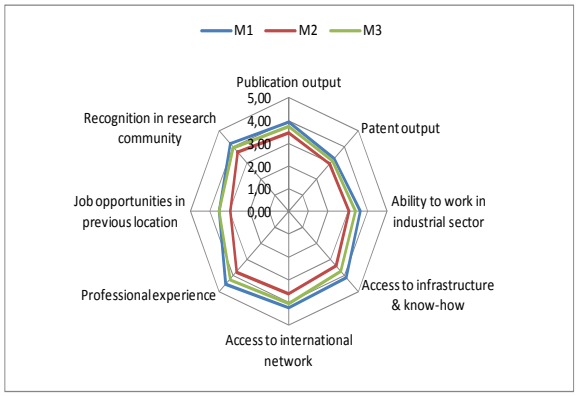
Source: MORE extra – EU survey
[a] Averages are based on all observations belonging to M1, M2 and M3, but due to the respondents who answered "NA", the actual number of respondents on which the average is based can differ for each effect. Cases were the number of respondents is ten or below are omitted.
*** significant at 1%

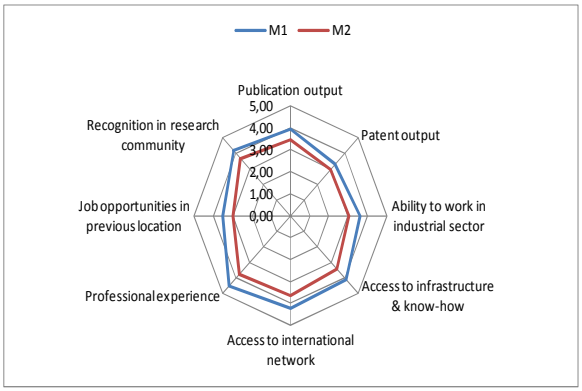
In Figure A2.3 we give a visual presentation of the importance of effects of mobility where the category "decreased" combines the answers "strongly decreased" and "decreased" and the category "increased" combines the answers "increased" and "strongly increased". Confirming the results in the averages table above, we notice that on all effects there is a much higher percentage of the EU-US mobile researchers than the US-EU mobile researchers who answer "increased". The difference is quite striking for "professional experience as a researcher" where nearly all of the EU-US mobile researchers have answered that it increased while only around 70 percent of the US-EU mobile researchers fall in the "increased" category.

In general, the percentage of EU-US mobile researchers who answer that mobility has had a negative effect ("decreased") on the issues presented, is very low - for 6 out of the 8 effects it is under 5 percent - while the effects for US-EU mobile researchers are more often negative (between 10 and 20 percent for most of the effects answered that mobility "decreased" the output or networking issue presented).

The radar graph in Figure 8-1 shows the striking differences. In the second part of the figure we clearly see how all the effects for the researchers who move from the US to the EU are smaller than those for the researchers who move in the other direction. Also when adding the other mobility group (M3) the effects of moving to the EU from the US remain the smallest on all points.

Figure 8-1 Importance of effects by mobility group





Source: MORE extra – EU survey

8.2.2 Effects and experience abroad

When comparing the magnitude of the effects over different durations of stay, Table 8-2 shows that a researcher's professional experience has been most affected by mobility and the positive effect exists regardless of the duration of the stay (but with a small peak for a stay between two and three years). Also the other two strongly positive effects, access to an international network and general recognition in the research community, are of similar magnitude for all durations with the largest effect being for a duration between two and three years. The positive effect on access to an international network, however, seems to decrease after a stay of more than three years, while the effect on general recognition in the research community continues to exist after three years.

The results in Table 8-2 suggest that it is not the number of countries where one has worked that matters, but only the fact that one is mobile. The positive effects of being mobile do not appear to change according to the number of countries one has worked in. Although, the more countries in which a researcher has worked has a positive effect on his or her access to an international network of professionals. Furthermore, publication output seems to be more positively affected if one has worked in more than five countries.

Table 8-2 Effects and experience abroad

	Publication output	Patent output	Ability to work in the industrial sector	Access to infrastructure and know-how	Access to an international network of professionals	Professional experience as researcher	Future job opportunities in previous country	General recognition in the research commu-	Total
Duration of latest stay									
≥3 and < 6 months	3.76	3.15	3.44	3.77	4.09	4.22	3.55	3.96	934
≥6 and <12 months	3.78	3.19	3.43	3.79	4.08	4.26	3.58	3.95	555
≥1 year and < 2 years	3.70	3.13	3.35	3.87	4.12	4.28	3.64	3.98	552
≥2 years and < 3 years	3.79	3.13	3.36	3.88	4.18	4.37	3.67	4.07	422
≥ years	3.81	3.27	3.44	3.80	3.98	4.23	3.23	4.06	1154
Nr. of countries where worked abroad									
0-1	3.79	3.24	3.44	3.84	4.08	4.26	3.43	4.01	678
2-3	3.78	3.19	3.43	3.81	4.07	4.27	3.53	4.02	2396
4-5	3.70	3.09	3.27	3.74	4.00	4.16	3.31	3.97	425
More than 5	3.87	3.15	3.40	3.85	4.16	4.26	3.37	3.99	118
Total	3.77	3.19	3.41	3.81	4.07	4.26	3.48	4.01	3617

Source: MORE extra – EU survey

8.2.3 Effects and career path

As Table 8-3 shows, with respect to the number of employers one has worked for, the ranking of the mobility effects does not change. Indeed, the increase in the professional experience as a researcher is always the largest, followed by the increase in access to an international network of researchers and general recognition in the research community. Moreover, the effects are nearly the same for all categories of number of employers. Thus, we can conclude that this characteristic does not impact the magnitude of the effects.

Looking at career path, the ranking of the effects is the same over all career paths with a minor exception in the "private to public and back" path where the increase in the ability to work in the industrial sector is as important as obtaining general recognition in the research community. The increase in the three most important effects seems slightly lower in the "public to private" path than in the other paths.

Table 8-3 Effects and career path

	Publication output	Patent output	Ability to work in the industrial sector	Access to infrastructure and know-how	Access to an international network of professionals	Professional experience as researcher	Future job opportunities in previous country	General recognition in the research community	Total
Nr. of employers worked for									
0-1	3.75	3.18	3.46	3.87	4.12	4.27	3.58	3.98	646
2-3	3.78	3.22	3.38	3.83	4.07	4.29	3.47	4.02	1836
4-5	3.76	3.13	3.45	3.73	4.03	4.17	3.42	3.99	832
More than 5	3.83	3.14	3.44	3.77	4.04	4.26	3.47	4.08	303
Career path									
Always public	3.79	3.17	3.35	3.83	4.07	4.27	3.48	4.03	2820
Always private	3.71	3.57	3.77	3.83	4.00	4.25	3.37	3.96	86
Public to private and back	3.77	3.23	3.50	3.82	4.14	4.33	3.52	4.04	192
Public to private	3.49	3.14	3.68	3.64	3.94	4.08	3.22	3.76	119
Private to public and back	3.48	3.00	3.75	3.57	4.00	4.27	3.43	3.73	22
Private to public	3.72	3.23	3.44	3.88	4.10	4.26	3.58	3.96	174
Other	3.76	3.14	3.54	3.66	4.04	4.05	3.52	3.94	204
Total	3.77	3.19	3.41	3.81	4.07	4.26	3.48	4.01	3617

Source: MORE extra – EU survey

8.2.4 Effects and education

Even though the three most positive effects of mobility are the same for all fields of science, as Table 8-4 indicates, some differences can be noted. The largest positive effect of mobility can be seen in terms of a researcher's professional experience in the agricultural sciences. The effect of mobility on professional experience is lower, however, in social sciences.

With respect to the highest educational attainment, the largest difference lies in the effect of mobility on future job opportunities in the previous country of residence. This effect is quite a bit larger for researchers with a graduate degree than for those with a postgraduate degree. On the other hand, for the effect of mobility on publication output, the opposite holds true, the effect is larger if the researcher has a postgraduate degree.

Table 8-4 Effects and education

	Publication output	Patent output	Ability to work in the industrial sector	Access to infrastructure and know-how	Access to an international network of professionals	Professional experience as researcher	Future job opportunities in previous country	General recognition in the research commu-	Total
Field of science									
Natural sciences	3.75	3.18	3.38	3.81	4.05	4.31	3.48	4.01	1606
Eng.&technical sciences	3.74	3.25	3.51	3.91	4.06	4.37	3.67	4.07	311
Medical&health sciences	3.88	3.26	3.49	3.99	4.16	4.36	3.46	4.15	172
Agricultural sciences	3.80	3.15	3.65	3.98	4.21	4.46	3.66	4.04	118
Social sciences	3.76	3.17	3.39	3.70	4.04	4.12	3.44	3.94	1007
Humanities	3.86	3.02	3.23	3.84	4.10	4.21	3.40	4.07	403
Highest educational attainment[a]									
Postgraduate	3.78	3.18	3.41	3.80	4.06	4.25	3.45	4.01	3257
Graduate	3.66	3.21	3.46	3.87	4.10	4.28	3.72	3.96	324
Undergraduate	3.64	-	3.15	3.89	4.05	4.21	3.68	4.06	22
Total	3.77	3.19	3.41	3.81	4.07	4.26	3.48	4.01	3617

Source: MORE extra – EU survey

[a] Secondary education degree not represented because ten or fewer observations

8.2.5 Overall effects of mobility

The questionnaire also included a question on the overall effects of mobility both on a researcher's career and on his or her personal and family life. In total, the effect of mobility on the researcher's career is valued as positive to strongly positive and the effect of mobility on a researcher's personal and family life is valued slightly lower, although still positive.

The positive effect on personal and family life is valued most in the group of researchers who move from the US to the EU. The career effects are highest for the group of researchers who moved from the EU to the US. For the researchers who moved from the US to the EU, the effects on the researcher's career are valued the same as the effects on personal and family life. Here we do find a correlation in the motivations that drive researchers to become mobile, mainly when personal and cultural factors play more of a role, the effects on personal and family life are stronger. Where professional motivations are most important, the effects on career are larger than the effects on personal and family life.

For all categories, except the US to EU mobility group, the career effects are generally larger than the personal and family effects. As was suggested earlier, the overall effect on a researcher's career is valued most positively by those who stayed abroad between two and three years, although this group experiences the lowest effects on personal and family life.

The strongest effects on researchers' careers can be found in the primarily public career paths (always public, public to private and back, private to public). In contrast, the strongest effects on personal and family life (characterized by a large difference compared to the other categories) are found in the always-private career path.

The largest overall career effects can be found in the field of medical and health sciences, followed by the fields of engineering and technical sciences and agricultural sciences. The lowest effects are found in the social sciences. Career effects are more or less equal irrespective of whether the researchers have a postgraduate, graduate or undergraduate degree.

Table 8-5 Overall effects on career and personal life

	Overall effects on career as researcher	Overall effects on personal and family life	Total
	Average score		
Total	4.32	3.68	3617
Mobility group			
M1	4.55	3.67	867
M2	3.80***	3.82**	321
M3	4.30	3.66	2429
Duration of latest stay			
≥3 and < 6 months	4.28	3.65	934
≥6 and <12 months	4.35	3.74	555
≥1 year and < 2 years	4.35	3.60	552
≥2 years and < 3 years	4.42	3.50	422
≥3 years	4.27	3.78	1154
Nr. of countries where worked abroad			
0-1	4.27	3.61	678
2-3	4.35	3.67	2396
4-5	4.22	3.74	425
More than 5	4.29	3.93	118
Nr. of employers worked for			
0-1	4.33	3.67	646
2-3	4.35	3.66	1836
4-5	4.26	3.68	832
More than 5	4.24	3.80	303
Career path			
Always public	4.34	3.66	2820
Always private	4.22	4.00	86
Public to private and back	4.31	3.66	192
Public to private	4.01	3.55	119
Private to public and back	4.00	3.52	22
Private to public	4.29	3.76	174
Other	4.23	3.78	204
Field of science			
Natural sciences	4.34	3.60	1606
Eng.&technical sciences	4.39	3.80	311
Medical&health sciences	4.44	3.73	172
Agricultural sciences	4.37	3.79	118
Social sciences	4.21	3.74	1007
Humanities	4.36	3.71	403
Highest educational attainment			
Postgraduate	4.32	3.68	3257
Graduate	4.31	3.62	324
Undergraduate	4.29	3.90	22

Source: MORE extra – EU survey
*** difference between M1 and M2 significant at 1%; ** significant at 5%

8.2.6 Effects and motivations of mobility

Looking at the pair wise correlations between all possible motivations and effects shown in Table 8-6 we see that the strongest positive correlations can be found on the "matching" motivations and effects, for example the motivation for mobility to work with leading experts is most strongly correlated with the effect on access to an international network of professionals. Getting access to facilities and/or equipment is most strongly correlated with the effect on access to infrastructure and know-how, career progression goals with professional experience as researcher and access to international network of professionals.

In general the correlation between professional motivations and effects is high whereas the correlation between personal or cultural motivations and effects is negative or not significant. The graphs in Figure 8-2 confirm that higher personal motivations correspond with lower overall career effects. The relationship between professional motivations and overall professional effects is somewhat more ambiguous.

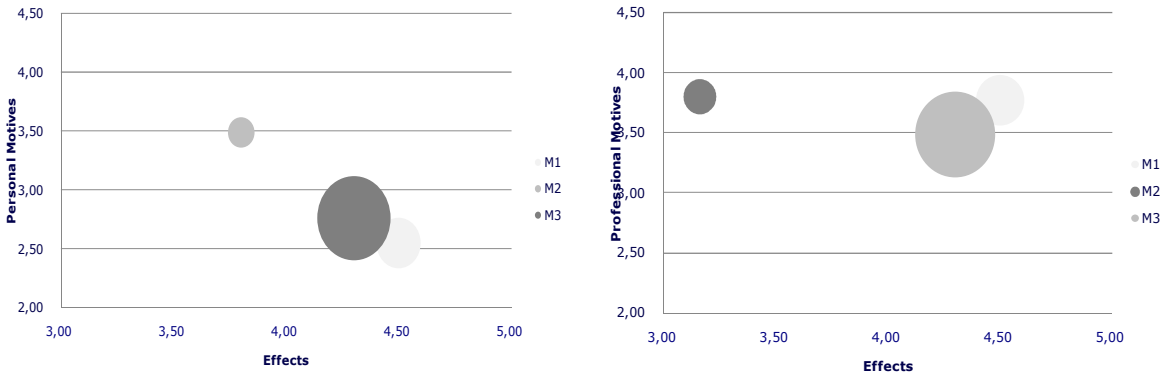
In general the results suggest that researchers can realize the expectations they have of being mobile.

Table 8-6 Correlation between effects and motivations

	Publication output	Patent output	Ability to work in the industrial sector	Access to infrastructure and know-how	Access to an international network of professionals	Professional experience as researcher	Future job opportunities in previous country	General recognition in the research community
Personal/family factors	-0.084	-0.054	-0.039	-0.144	-0.176	-0.186	-0.130	-0.127
Personal education/ research agenda	0.245	0.148	0.168	0.236	0.264	0.291	0.186	0.255
Career progression goals	0.211	0.198	0.174	0.254	0.240	0.301	0.224	0.288
Getting access to facilities/equipment	0.236	0.184	0.125	0.360	0.262	0.276	0.113	0.260
Prospects to work with leading experts	0.239	0.180	0.152	0.331	0.360	0.354	0.239	0.311
Salary and other financial incentives	0.084	0.178	0.161	0.165	0.099	0.097	0.070	0.157
Personal interest in the culture of country	0.020	0.033	0.090	-0.034	0.014	-0.013	0.037	0.017

Correlations with faintest shading significant at 10%; correlations with faint shading significant at 5%; correlations with dark shading significant at 1%.

Figure 8-2 Correlation between motivations and overall career effects



Source: MORE extra – EU survey

8.3 Effects of mobility: does location matter?

In order to determine which variables have an influence on the effects of mobility and more specifically how the direction of mobility (measured by mobility group) and the motivations to become mobile affect the effects of being mobile, we include a multivariate analysis. We consider only the mobility groups M1 (EU to US) and M2 (US to EU) and M3 (other mobility) with other mobility as the base category. For each of the effects we run an ordered logistic regression, which is used to explain discrete variables where the different categories have a specific (decreasing or increasing) order. This is the case here as the respondents were asked to rate the effects from "strongly decreased" (value 1), "decreased" (value 2), "no effect" (value 3), to "increased" (value 4) and "strongly increased" (value 5). We present the results in Table 8-7. The first part contains the same general explanatory variables as were discussed before. The second part contains the effects of motivations and mobility direction (where M1 and M2 will be compared to M3).

1. General effects

There are not so many consistent conclusions to be drawn from the general variables, the effects of which differ quite a lot with respect to the effect under consideration. However, some results are worthwhile mentioning. Having a partner (married or cohabiting) appears to have a positive influence on most of the effects (except for patent output, working in industry and job opportunities in previous country). Being born in the EU12 also appears to have more positive effects than being born in the other regions, at least for publication output, access to infrastructure and know-how and professional experience. For the fields of science, effects seem to be the most positive for Engineering and technical sciences. Researchers working for a public employer appear to reach higher outcomes in publication output and general recognition as a researcher than the researchers connected to a private employer. For the opportunities to work in industry it is the other way around.

2. Motivations

In general, motivations have a strong affect on the effects of mobility: the more important the motivation, the stronger the effect. This is especially the case where a motivation has a corresponding mobility effect, for example between the

"access to facilities"-motivation and the "access to infrastructure and know-how" effect or between the "working with star scientists"-motivation and the "international network of professionals" and "professional experience"-effects but also between the "personal and family" or "cultural interest"-motivations and overall personal effects.

Researchers who are driven by "career progression goals" record strong positive effects on nearly all professional effects (except for "working in industry").

In general, it appears that researchers with the stronger professional motivations also reach the strongest overall professional effects (and no effects on overall personal and family life) while researchers with the stronger personal motivations reach positive personal effects (and no or negative effects on career).

3. Mobility direction

Lastly, we have a look at the differences in the effects by mobility group. The result is quite striking: the results suggest that moving from the EU to the US (M1) has much more positive effects than other types of mobility (including moving from the US to the EU) on nearly all possible effects of mobility (only for job opportunities in previous country) there is no difference). With respect to US to EU mobility, the effects appear to be significantly smaller than for the other types of mobility. Concluding, the results suggest that moving from the EU to the US has the most positive effects on professional outcomes, followed by other types of mobility and lastly, by moving from the US to the EU. It seems to be much more professionally beneficial to move from the EU to the US than the other way around.

On top of the better results in professional life, moving from the EU to the US also has more positive effects on personal and family life of the researchers so on professional and personal domains alike the move from the EU to the US appears to be a better one.

Table 8-7 Ordered logistic analysis: effects of mobility

	(1) Publication output	(2) Patent output	(3) Work in industrial sector	(4) Access to infrastructure/know-how	(5) International network of professionals	(6) Professional experience	(7) Future job opportunities in previous country	(8) General recognition in research community	(9) Overall personal effect
Sex = male	0.175**	-0.133	0.193	-0.187**	-0.102	-0.072	0.191**	0.136	0.117
(Base: female)	(0.081)	(0.181)	(0.133)	(0.090)	(0.083)	(0.087)	(0.081)	(0.085)	(0.137)
Age in years	0.034	-0.055	-0.022	0.025	0.036	0.078**	-0.079**	0.050	0.123**
	(0.031)	(0.067)	(0.049)	(0.034)	(0.031)	(0.032)	(0.031)	(0.032)	(0.053)
Age squared	-0.000	0.000	0.000	-0.000	-0.000	-0.001**	0.001**	-0.001*	-0.001***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Highest educational attainment									
Postgraduate	0.422	-1.459	-0.583	0.081	0.694	0.529	-0.410	-0.555	0.670
	(0.615)	(1.318)	(0.881)	(0.643)	(0.596)	(0.604)	(0.697)	(0.632)	(1.194)
Graduate	0.257	-2.055	-0.403	0.647	0.832	0.601	-0.034	-0.453	0.516
	(0.639)	(1.373)	(0.910)	(0.669)	(0.620)	(0.631)	(0.716)	(0.656)	(1.238)
Undergraduate	0.146	-2.192	-0.531	1.053	0.857	0.283	0.160	0.231	0.803
	(0.848)	(1.571)	(1.060)	(0.830)	(0.798)	(0.823)	(0.861)	(0.843)	(1.690)
Yrs since grad.	0.004	0.041**	-0.021	-0.005	0.002	-0.001	-0.006	0.022**	0.028*
	(0.008)	(0.019)	(0.013)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.015)
Marital status (Base: single)									
Married/cohabit.	0.203**	-0.222	0.153	0.270***	0.185*	0.271***	0.100	0.228**	0.566***
	(0.093)	(0.195)	(0.144)	(0.103)	(0.095)	(0.099)	(0.091)	(0.097)	(0.162)
Nr of children	0.004	0.001	0.011	0.070*	-0.054	-0.046	0.087**	0.030	-0.003
	(0.034)	(0.074)	(0.052)	(0.038)	(0.036)	(0.037)	(0.035)	(0.036)	(0.062)
Mobile as student	0.010	0.107	0.017	0.191**	0.097	-0.083	0.020	0.016	-0.118
	(0.076)	(0.173)	(0.121)	(0.084)	(0.078)	(0.082)	(0.076)	(0.080)	(0.133)
Birth region (Base: other region)									
Born in EU15	-0.114	-0.008	0.046	-0.005	-0.130	0.170	-0.140	-0.098	-0.478**
	(0.098)	(0.208)	(0.151)	(0.109)	(0.100)	(0.104)	(0.098)	(0.102)	(0.215)
Born in EU12	0.254*	-0.043	0.173	0.339**	-0.041	0.523***	-0.238	-0.169	-0.463
	(0.147)	(0.308)	(0.232)	(0.164)	(0.150)	(0.158)	(0.145)	(0.153)	(0.316)
Born in US	-0.171	-0.240	-0.131	0.174	0.316**	-0.004	0.036	-0.115	-0.694**
	(0.133)	(0.391)	(0.241)	(0.155)	(0.138)	(0.144)	(0.135)	(0.141)	(0.272)

	(1) Publication output	(2) Patent output	(3) Work in industrial sector	(4) Access to infrastructure/know-how	(5) International network of professionals	(6) Professional experience	(7) Future job opportunities in previous country	(8) General recognition in research community	(9) Overall personal effect
Field of science (Base: Humanities)									
Natural science	-0.314**	-0.072	0.248	-0.046	-0.232*	0.089	-0.105	-0.426***	-0.194
	(0.129)	(0.347)	(0.293)	(0.150)	(0.134)	(0.140)	(0.131)	(0.138)	(0.229)
Eng&Techn.	-0.368**	0.095	0.518*	0.274	-0.134	0.386**	0.349**	-0.163	-0.117
	(0.173)	(0.377)	(0.315)	(0.190)	(0.178)	(0.186)	(0.171)	(0.182)	(0.299)
Med/Health	-0.371*	0.055	0.198	0.071	-0.263	-0.176	-0.256	-0.459**	-0.180
	(0.203)	(0.452)	(0.378)	(0.222)	(0.207)	(0.216)	(0.207)	(0.213)	(0.328)
Agricultural	-0.459*	0.121	0.741*	0.153	-0.120	0.243	0.053	-0.648**	-0.053
	(0.237)	(0.489)	(0.386)	(0.261)	(0.244)	(0.257)	(0.238)	(0.255)	(0.472)
Social sciences	-0.115	0.155	0.371	-0.190	-0.052	-0.161	-0.016	-0.366***	-0.266
	(0.129)	(0.389)	(0.305)	(0.153)	(0.134)	(0.139)	(0.130)	(0.138)	(0.233)
Number employers worked for (Base: 0-1 employers)									
2-3 employers	0.046	0.220	-0.004	-0.002	0.012	0.170	-0.100	-0.059	0.040
	(0.100)	(0.214)	(0.156)	(0.112)	(0.103)	(0.107)	(0.100)	(0.106)	(0.171)
4-5 employers	0.013	-0.071	0.227	-0.107	0.034	0.047	0.027	-0.033	-0.122
	(0.117)	(0.274)	(0.187)	(0.132)	(0.122)	(0.126)	(0.118)	(0.125)	(0.209)
>5 employers	0.144	-0.021	-0.058	-0.013	0.036	0.560***	0.149	0.286*	0.374
	(0.159)	(0.347)	(0.255)	(0.175)	(0.159)	(0.169)	(0.157)	(0.165)	(0.295)
Position (Base: other position)									
PhD student	0.108	0.224	-0.262	-0.177	0.103	0.446**	-0.087	-0.216	0.037
	(0.163)	(0.308)	(0.232)	(0.177)	(0.164)	(0.174)	(0.163)	(0.169)	(0.320)
Post-doc	-0.153*	-0.337*	-0.183	0.116	0.065	0.178**	0.091	-0.057	-0.078
	(0.079)	(0.184)	(0.128)	(0.088)	(0.081)	(0.084)	(0.079)	(0.083)	(0.137)
Public employer	0.360**	-0.086	-0.720***	0.183	0.049	0.006	0.086	0.409***	0.178
	(0.146)	(0.274)	(0.184)	(0.151)	(0.144)	(0.150)	(0.139)	(0.147)	(0.223)

	(1) Publication output	(2) Patent output	(3) Work in industrial sector	(4) Access to infrastructure/know-how	(5) International network of professionals	(6) Professional experience	(7) Future job opportunities in previous country	(8) General recognition in research community	(9) Overall personal effect
Motivations									
Personal	-0.030	-0.030	-0.008	-0.115***	-0.109***	-0.101***	-0.089***	-0.060**	0.440***
	(0.027)	(0.062)	(0.043)	(0.030)	(0.028)	(0.029)	(0.028)	(0.029)	(0.050)
Research ag.	0.266***	0.099	0.185***	0.107**	0.158***	0.239***	0.112***	0.208***	0.084
	(0.040)	(0.093)	(0.066)	(0.044)	(0.041)	(0.043)	(0.041)	(0.042)	(0.070)
Career progr.	0.187***	0.213**	0.103	0.125***	0.157***	0.283***	0.279***	0.310***	0.072
	(0.038)	(0.093)	(0.063)	(0.042)	(0.039)	(0.040)	(0.038)	(0.040)	(0.071)
Access to facilities	0.182***	0.172**	-0.005	0.371***	0.137***	0.175***	-0.057*	0.148***	0.071
	(0.033)	(0.077)	(0.053)	(0.037)	(0.033)	(0.035)	(0.032)	(0.034)	(0.060)
Star scientists	0.162***	0.060	0.080	0.220***	0.419***	0.315***	0.248***	0.271***	-0.065
	(0.035)	(0.082)	(0.058)	(0.039)	(0.037)	(0.037)	(0.035)	(0.037)	(0.064)
Financial	0.010	0.223***	0.154***	0.134***	0.044	-0.022	0.013	0.122***	-0.030
	(0.032)	(0.072)	(0.051)	(0.035)	(0.032)	(0.034)	(0.032)	(0.033)	(0.055)
Cultural interest	-0.003	0.110	0.187***	-0.061*	0.063*	0.093***	0.114***	0.049	0.319***
	(0.033)	(0.072)	(0.051)	(0.036)	(0.033)	(0.035)	(0.032)	(0.034)	(0.059)
Mobility									
M1: EU to US	0.191**	0.386**	0.432***	0.680***	0.235**	0.531***	-0.059	0.317***	0.356*
	(0.090)	(0.196)	(0.141)	(0.098)	(0.092)	(0.097)	(0.090)	(0.094)	(0.189)
M2: Us to EU	-0.490***	-0.261	-0.657***	-0.220	-0.653***	-0.784***	-0.818***	-0.408***	
	(0.132)	(0.360)	(0.232)	(0.148)	(0.133)	(0.140)	(0.129)	(0.137)	
Observations	2853	774	1219	2467	2870	2884	2743	2879	957
Pseudo R^2	0.063	0.058	0.049	0.104	0.090	0.130	0.056	0.096	0.079
Chi^2	450.2	88.73	138.0	617.4	593.0	769.9	423.1	602.0	206.9

Source: MORE extra – EU survey

Table shows coefficients and standard errors (in parentheses) of 9 ordered logistic regressions where 1=decreased strongly; 2=decreased; 3=no effect; 4=increased; 5=increased strongly; cut-off values are not shown; *** significant at 1%; ** significant at 5%; * significant at 10%.

Note: In regression (9) the variable "M2: US to EU" was dropped due to collinearity.

8.4 Main findings

The effects of mobility are generally (very) positive. The three most important effects of mobility are network effects: mobility appears to have (strongly) positive effects on professional experience, the researcher's international network and his recognition in the researcher community. However, nearly all the effects are significantly higher for researchers moving from the EU to the US than the other way around. Additionally, we find that the percentage of researchers moving from the EU to the US hardly experiences any negative effects of mobility while for those moving the other way around negative (decreasing) effects do seem to exist for between 10 and 20 percent of the researchers.

Although the ranking of the three most important effects is the same in nearly all career paths, effects are generally lower in the "public to private" career path. Obviously, we cannot draw any causal conclusions here, as it might be that public-sector researchers who do not obtain the desired effects of mobility, move to the private sector but also that researchers with a public background do not obtain the desired effects when they move to the private sector.

Overall, career effects appear to be larger than personal and family effects. This holds true for the total sample and for all subgroups but the US to EU mobility group, where career and personal effects are equal. For US to EU mobility specifically, the overall career effect is the lowest and the overall personal and family effect highest compared to other mobility groups.

The strongest overall career effect exists for the group of researchers who stayed between two and three years, those who primarily followed a public career path and those in the medical and health sciences followed by those in engineering and the technical sciences and agricultural sciences. Corrected for other factors, this effect in medical and health sciences disappears and it seems that the other two groups record stronger effects.

There appears to be a correspondence between motivations and effects for the different mobility groups: (1) for EU to US mobile researchers, both the professional motivations and the professional effects are larger; and (2) for US to EU mobile researchers both the personal motivations and the personal and family effects are larger.

This positive correlation between the strength of a certain type of motivation and its corresponding effect is also confirmed statistically. Negative or non-existent correlations exist between personal/cultural motivations and effects while the largest positive correlations are found between "matching" professional motivations and effects. The multivariate analysis confirms this again. Corrected for characteristics of researchers and their mobility, we find that higher professional motivations lead to higher overall career effects while higher personal motivations lead to higher personal effects. In general, this suggests that researchers can realize their expectations of mobility.

Concluding, both the summary statistics and the multivariate results suggest that it is a better career move to be mobile from the EU to the US than the other way around.

9 RESEARCH ENVIRONMENT AS AN ATTRACTIVENESS FACTOR FOR RESEARCHERS

9.1 Introduction

In this chapter we go deeper into what makes a region attractive for researchers and how a region compares to other regions in terms of its attractiveness. To this goal, we looked at the answers to five different types of questions:

1. The comparison question.

   This question was asked to the four mobility groups but in a way which was relevant for the responding group. For the M1 (EU to US) group, the question was asked as follows: "How does working as a researcher in the US compare to working as a researcher in the EU?" For the other mobility groups, the comparison country is the EU and the question becomes: "How does working as a researcher in the EU compare to working as a researcher in the US?" (M2), or "How do you think working as a researcher in an EU country compares to working in country x?" (M3 and M4). The "other mobility" and "no mobility" groups were only required to answer the comparison question if the country of their most recent stay or the country where they have mostly worked as a researcher is not part of the EU.

2. The return to the region of graduation question.

   The reasons why a researcher has returned to his or her region of graduation is asked to two type of researchers, namely (1) those who have been mobile from the EU to the US and have worked in the EU as a researcher after having been to the US, and (2) those who have been mobile from the US to the EU and have worked as a researcher in the US after having been to the EU.

3. The no return to the region of graduation question.

   The reasons why a researcher has not returned to his or her region of graduation is asked to two type of researchers, namely (1) those who have been mobile from the EU to the US and have not worked in the EU as a researcher after having been to the US, and (2) those who have been mobile from the US to the EU and have not worked as a researcher in the US after having been to the EU.

4. The attractiveness of the EU for third countries.

   Under this question, the respondents of group M3 (other mobility) who worked in the EU after having been mobile to a country not part of the EU were asked for the reasons that have been important in their decision to move to the EU (after having worked in country x).

5. The most attractive country in terms of research environment.

As a last question, all respondents were asked which country was the most attractive to them in terms of their potential future mobility regardless of whether one has worked before in that country or not.

In the following sections we discuss the results to these five types of questions.

9.2 Attractiveness factors for mobility

The respondents belonging to mobility group M1, M2, those of M3 who were required to answer because the country they most recently worked in as a researcher was not part of the EU and those of M4 who were required to answer because the country where they mainly worked as a researcher is not part of the EU were asked to compare the EU and the US or country x (not part of EU) with respect to a couple of propositions. Respondents were asked to indicate whether they significantly disagreed, disagreed, were indifferent, agreed, significantly disagreed or had no opinion on the proposition put forward.

For mobility groups M1 and M2 these opinions were based on actual experiences. For the M3 group the opinions are based on experiences for those respondents who have worked in the EU and are based on beliefs for those in the M3 group who have not worked in the EU. For the "no mobility" group the respondent's opinion is based on beliefs rather than actual experience.

9.2.1 The general picture

In general we find that the respondents in mobility groups M1, M3 and M4 who are comparing the US or another region to the EU tend to weakly agree with the propositions which are presented in favour of the region of "destination." The respondents of mobility group M2 tend to weakly disagree with all propositions presented in favour of the EU. This means that the EU comes out as the worst region on nearly all topics, especially when compared to the US.

When we focus on the researchers who have been mobile from the EU to the US, they agree on all propositions that the researcher situation with respect to obtaining funding, career references, research infrastructure, collaboration with top-class researchers, access to knowledge, remuneration schemes and opportunities to work in industry, is better in the US than in the EU. They agree most strongly with the propositions that working in the US is a better reference for their career than working in the EU (80 percent of the EU-US mobile researchers agrees to strongly agrees with this proposition- see Figure A2.4) and that the US offers better opportunities for collaboration with top-class researchers (around 75 percent agrees to strongly agrees).

Looking at the group who has been mobile in the other direction (US to EU), they tend to disagree on all propositions confirming the results described above, that the US as a research environment offers better opportunities than the EU, but they do so less strongly. The averages are lower and also the percentages of researchers agreeing to strongly agreeing are generally lower.

Even when comparing another country to the EU, the latter comes out worse on nearly all propositions, the exception being "access to knowledge is better in country X than in the EU". Knowing that these scores are given by respondents who may not have been even working in the EU as a researcher suggests that the

notion that the EU is worse in terms of research environment is "common knowledge" amongst researchers.

Table 9-1 Attractiveness factors by mobility group

Country X vs Y	M1 US vs EU	M2 US vs EU	M3 other vs EU	M4 other vs EU
			Average score[a]	
Better funding opportunities in X vs Y	3.94	3.42***	3.14	3.17 $^{\Delta\Delta\Delta}$
Working in X is better reference for career	4.08	3.36***	3.48	3.27 $^{\Delta\Delta\Delta}$
Better research infrastructure in X	3.86	3.57***	3.08	3.11 $^{\Delta\Delta\Delta}$
Better opportunities for collaboration with top-class researchers in X	4.04	3.34***	3.34	3.12 $^{\Delta\Delta\Delta}$
Access to knowledge better in X (knowledge not available in comparison region Y)	3.19	3.44***	2.98	2.51 $^{\Delta\Delta\Delta}$
More attractive remuneration schemes in X	3.80	3.72	3.19	3.33 $^{\Delta\Delta\Delta}$
Better opportunities to work in industry in X	3.69	3.66	3.07	3.00 $^{\Delta\Delta\Delta}$
Observations	867	321	1018	957

Source: MORE extra – EU survey

[a] Averages are based on all observations belonging to M1, M2, M3 and M4 who were required to answer but due to the respondents who answered "No opinion" –which has not been taken into account while calculating averages- the actual number of respondents on which the average is based can differ for each attractiveness factor.

*** Difference between group M1 and M2 is significant at 1%; $^{\Delta\Delta\Delta}$ Difference between the mobile group of researchers (M1, M2, M3) and the non-mobile group (M4) is significant at 1%.

The graphs in Figure A2.4 show that most researchers tend to agree to strongly agree with the propositions that the US is a better reference for a career as a researcher, that the US offers better opportunities to collaborate with top-class researchers and that the US offers better funding opportunities than the EU. It is especially the EU-researchers who have been/are mobile to the US that agree strongest on these points with between 70 and 80 percent agreeing to strongly agreeing. The non-mobile group also tends to agree mostly but in this group of researchers we find less than 50 percent agreeing while there also is a large share of non-mobile researchers who do not agree on these points (upto 35%).

The radar graphs in Figure 9-1 give a visual presentation of the striking results. The second part of the figure shows that all the scores for the researchers having been mobile from the US to the EU lie below the "indifferent" line (score of 3) meaning that they disagree with all propositions describing the EU as a better research environment than the US. Quite to the contrary, all scores given by researchers who have been or are mobile between the EU to US all lie above the "indifferent" line meaning that they agree with the propositions describing the US as the better research environment. As for the other mobility groups, they also tend to agree that "another country" is better in terms of research environment than the EU except for the score on "access to knowledge".

Figure 9-1 Attractiveness factors by mobility group

Source: MORE extra – EU survey

9.2.2 Attractiveness factors and field of science

In this section we check whether the general results described above hold true for all fields of science or whether the EU is a better region to work for some fields while the US might be more attractive in other fields.

It appears that the general impression holds true for all fields of science. We find the highest numbers in the M1 part and the lowest in the M2 part. Researchers from all fields of science seem to agree that working in the US is better, at least professionally, than working in the EU. The only proposition the EU does not score the worst on is the "access to knowledge not available in reference country".

Focusing on the researchers who have been mobile from the EU to the US, it is especially true for the medical and health sciences where the US comes out far better than the EU, while for the humanities the result is less strong, but still in favour of the US. This result is confirmed in the M2 part where we see the only slightly positive scores for the EU in the field of humanities. Researchers in engineering and technical sciences also rather strongly agree with the fact that remunerative schemes in the US are better. The strongest agreement that the US is better for ones career was found in the social sciences.

Table 9-2 Attractiveness factors and field of science

	Better funding opportunities	Better reference for career	Better research infrastructure	Better opportunities for collaboration with top-class researchers	Access to knowledge (not available in comparison region)	More attractive remuneration schemes	Better opportunities to work in industry	Total
M1 (US vs EU) by field of science								
Natural sciences	3.95	4.06	3.77	3.98	2.99	3.76	3.67	435
Eng.&technical sciences	4.02	4.07	3.94	4.04	3.17	4.05	3.85	73
Medical&health sciences	4.13	4.13	4.19	4.26	3.51	3.83	3.87	65
Agricultural sciences	4.00	4.08	3.85	4.07	3.64	3.55	3.81	28
Social sciences	3.86	4.21	3.89	4.16	3.41	3.91	3.55	188
Humanities	3.78	3.91	3.95	3.91	3.30	3.63	3.48	78
M2 (US vs EU) by field of science								
Natural sciences	3.40	3.31	3.35	3.13	3.53	3.54	3.60	104
Eng.&technical sciences	3.39	3.26	3.58	3.24	4.00	3.68	3.76	26
Medical&health sciences	-	-	-	-	-	-	-	6
Agricultural sciences	-	-	-	-	-	-	-	5
Social sciences	3.45	3.54	3.81	3.57	3.52	3.90	3.67	135
Humanities	3.38	2.96	3.37	3.16	2.56	3.61	3.64	45
M3 (other vs EU) by field of science								
Natural sciences	3.26	3.46	3.12	3.36	2.83	3.24	3.15	433
Eng.&technical sciences	3.45	3.62	3.22	3.47	2.74	3.31	3.36	98
Medical&health sciences	3.37	3.76	3.54	3.59	2.98	3.18	3.14	61
Agricultural sciences	2.94	3.69	3.09	3.28	3.31	3.33	3.54	36
Social sciences	2.94	3.35	2.98	3.24	3.19	3.15	2.73	292
Humanities	2.68	3.47	2.76	3.25	3.19	2.88	2.53	98
M4 (other vs EU) by field of science								
Natural sciences	3.26	3.25	3.17	3.22	2.4	3.23	3.11	318
Eng.&technical sciences	3.08	3.18	3.00	2.95	2.38	3.4	3.00	80
Medical&health sciences	3.02	3.00	3.07	3.09	2.55	3.04	2.91	50
Agricultural sciences	2.40	2.63	2.06	2.25	2.08	2.77	2.52	38
Social sciences	3.27	3.4	3.27	3.28	2.67	3.59	2.97	360
Humanities	3.03	3.28	2.90	2.79	2.55	3.09	3.00	111

Source: MORE extra – EU survey; Cases were the number of respondents is ten or below are omitted.

9.2.3 Attractiveness factors and position

We also investigated whether the position the researcher is in affects his/her feelings about the relative research attractiveness of the EU.

Table 9-3 shows that the US scores better than the EU on all propositions for all positions, but most strongly for PhD students in group M1. The scores of the other groups, post-doctoral researcher and "other", lie closely together and are generally lower than the scores of the PhD students. On the other hand, the PhD students are also the least negative about the EU when they have moved from the US to the EU. Overall, the US appears the better professional destination for all positions, especially for PhD students.

Table 9-3 Attractiveness factors and position

	Better funding opportunities	Better reference for career	Better research infrastructure	Better opportunities for collaboration with top-class researchers	Access to knowledge (not available in comparison region)	More attractive remuneration schemes	Better opportunities to work in industry	Total
M1 by position								
PhD student	4.03	4.17	4.05	4.34	3.55	3.86	3.80	68
Post-doctoral researcher	3.87	4.10	3.80	4.01	3.17	3.64	3.67	389
Other	3.98	4.05	3.88	4.02	3.14	3.95	3.69	410
M2 by position								
PhD student	2.87	2.84	2.63	2.78	2.74	2.71	2.09	20
Post-doctoral researcher	2.65	2.63	2.48	2.75	2.56	2.32	2.30	139
Other	2.49	2.62	2.37	2.58	2.54	2.19	2.42	162
M3 by position								
PhD student	3.27	3.48	3.06	3.32	3.13	3.31	3.19	108
Post-doctoral researcher	3.19	3.60	3.10	3.43	3.03	3.13	3.13	418
Other	3.07	3.36	3.07	3.26	2.91	3.21	2.99	492
M4 by position								
PhD student	2.83	3.07	2.81	2.91	2.4	2.93	2.67	184
Post-doctoral researcher	3.20	3.23	3.13	3.13	2.44	3.36	3.08	398
Other	3.30	3.39	3.24	3.22	2.64	3.50	3.10	375

Source: MORE extra – EU survey

9.3 Return to region of graduation

In this section we present the results for the reasons leading to return mobility. We only consider the group of researchers who have been mobile from the EU to the US and back and those who have been mobile from the US to the EU and back. The respondents who returned to their region of graduation were required

to indicate for a list of potential factors whether the factor was not important at all to extremely important in their decision to return.

Of all researchers who have been mobile from the EU to the US, 52 percent returned to the EU (447 respondents). Of these, 94 percent were born in the EU. So returning to the EU is apparently strongly driven by the attraction of the birth region. Of those who did not return to the EU and stayed in the US, only ten percent were US born.

Of the researchers who have been mobile from the US to the EU, 30 percent returned to the US (96 respondents). Of these 48 percent were born in the US, so in this case it is not birth region that necessarily motivates return.

Based on the results in section 9.2.1 we would expect a lower percentage of researchers to return from the US to the EU, than from the EU to the US as it seems that researchers consider the US as having a better research environment compared to the EU (see Table 9-1). The fact that this is not the case suggests that there are other motivations driving researchers to become long-term mobile. Alternatively, it may suggest that the positive effects of mobility to the US can be reaped after a limited stay abroad.

Table 9-4 Return mobility: the numbers

	M1: EU to US		M2: US to EU	
	N	%	N	%
Returned	447	51.6	96	29.9
Of which to birth region (born in EU/born in US)	*422*	*94.4*	*46*	*47.9*
Not returned	420	48.4	225	70.1
Of which stayed in birth region (born in US/born in EU)	*10*	*2.4*	*100*	*44.4*
Total	867	100	321	100

Source: MORE extra – EU survey

9.3.1 The general picture

The results in Table 9-5 confirm that those who return to the EU after having been in the US do so because of personal/family reasons, the opposite of what has driven them towards the US. On the other hand, researchers who return to the US after having worked in the EU do so primarily because of career progression and financial reasons, also opposite to what has driven them towards the EU, and to a lesser extent because of personal reasons.

Table 9-5 Return motivations by mobility group

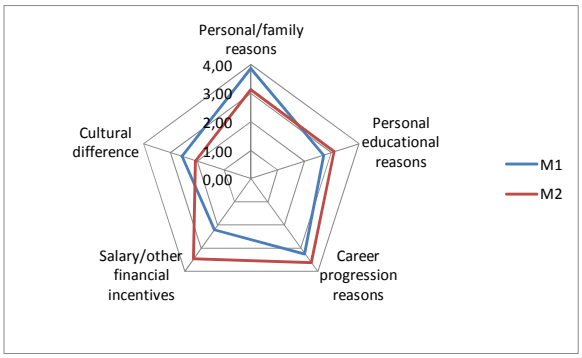
	M1 (return to EU from US)	M2 (return to US from EU)	Total
		Average score	
Personal/family reasons	3.88	3.14***	3.76
Personal educational reasons	2.71	3.10**	2.77
Career progression reasons	3.22	3.63***	3.29
Salary and other financial incentives	2.19	3.46***	2.42
Cultural difference	2.56	2.05***	2.48
Observations	447	96	543

Source: MORE extra – EU survey
*** significant at 1%; ** significant at 5%

In Figure A2.5 we provide a visualisation of the importance of the return factors, which show the percentages of researchers for whom a return reason was "not important" (combining the answers "not important at all" and "not important"), neutral or "important" (combining the answers "important and "extremely important"). We see the differences between the EU-US and the US-EU mobile researchers very clearly. Personal and family reasons were important for nearly 70 percent of those returning to the EU from the US while this was the case for only 40 percent of those returning to the US. Financial motivations were important for less than 20 percent returning to the EU but important for more than half of the researchers returning to the US. Personal educational reasons were important for half of those returning to the US and career progression goals were important for as many as 60 percent.

The radar graph in Figure 9-2 clearly shows the difference in return motivations for both groups. Personal/family and cultural motivations weigh on average stronger in the decision for EU graduates to return to the EU after having been in the US, while professional and financial reasons affect the decision of US graduates who have been mobile to the EU, to return to the US.

Figure 9-2 Return motivations by mobility group



Source: MORE extra – EU survey

9.3.2 Return and experience abroad

Table 9-6 gives an overview of the return motivations by duration of the latest stay. Personal motivations are the most important in driving EU graduates back to the EU after having been in the US, irrespective of the duration of the stay, but for short stays and stays between two and three years, the personal motive plays an important role in driving researchers back to the EU. Also for researchers re-

turning to the US, career progression and financial motivations are most strongly pronounced after short durations and slightly less so after durations of more than three years. There are, unfortunately, too few observations returning from the EU back to the US to conclude anything on the duration between one and three years.

Table 9-6 Return motivations and experience abroad

		Personal/ family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Duration of latest stay							
≥3 and < 6 months	M1	4.05	2.97	3.03	2.22	2.40	129
	M2	3.81	3.44	4.14	3.91	2.00	27
≥6 and <12 months	M1	3.74	2.76	3.17	2.10	2.42	80
	M2	2.54	2.29	3.00	3.21	1.86	14
≥1 year and < 2 years	M1	3.71	2.52	3.30	2.25	2.74	86
	M2	-	-	-	-	-	11
≥2 years and < 3 years	M1	4.19	2.71	3.31	2.40	3.00	46
	M2	-	-	-	-	-	4
≥3 years	M1	3.80	2.48	3.40	2.09	2.51	106
	M2	2.78	3.28	3.63	3.53	2.18	40

Source: MORE extra – EU survey; Cases were the number of respondents is ten or below are omitted.

9.3.3 Return and education

Table 9-7 shows that the personal motivations are stronger for EU return mobility than for US return mobility for all fields of science. For engineering and technical science they are the strongest and even the sole reason for returning back to the EU. The financial motivation is the most important motivation for researchers in social sciences and humanities to move back to the US while career progression goals are the most important motive for researchers in the natural sciences to move back to the US. There are too few observations to be able to draw conclusions on engineering and technical sciences, medical and health sciences and agricultural sciences.

Table 9-7 Return motivation and education

		Personal/ family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Field of science							
Natural sciences	M1	3.86	2.57	3.21	2.12	2.64	197
	M2	3.00	3.44	3.70	3.20	2.00	24
Eng.&technical sciences	M1	4.10	2.33	2.67	2.00	2.35	37
	M2	-	-	-	-	-	3
Medical&health sciences	M1	4.10	2.68	3.16	2.13	2.84	32
	M2	-	-	-	-	-	3
Agricultural sciences	M1	3.76	3.24	3.50	2.31	2.47	19
	M2	-	-	-	-	-	1
Social sciences	M1	3.82	2.84	3.42	2.32	2.41	121
	M2	3.16	2.74	3.34	3.39	2.16	45
Humanities	M1	3.91	3.14	3.13	2.43	2.59	41
	M2	3.24	3.29	3.88	3.94	2.00	20
Highest educational attainment							
Postgraduate	M1	3.89	2.69	3.23	2.19	2.56	419
	M2	3.07	3.07	3.62	3.45	2.04	93
Graduate	M1	3.96	3.14	2.96	2.38	2.75	24
	M2	-	-	-	-	-	3

Source: MORE extra – EU survey; Cases were the number of respondents is ten or below are omitted.

9.4 Factors influencing decision not to return (or to stay)

In this section we present the results on the reasons why respondents do not return to their region of graduation. Here we only consider the group of researchers who have been mobile from the EU to the US and stayed and those who have been mobile from the US to the EU and stayed. These respondents were also required to indicate on the same list of possible factors whether the factor was not important at all to extremely important in their decision to stay. It is the mirror image of the group of researchers who did return to their region of graduation and we expect the results to behave as such.

In total there are 645 respondents who decided not to return consisting of 420 who did not return to the EU after having visited/worked in the US and 225 who did not return to the US after having visited/worked in EU.

9.4.1 General picture

Table 9-8 shows, as expected, that for EU graduates who stay in the US, career progression and salary reasons are the most important, while personal reasons are much less important. For graduates from the US who remained in the EU, personal motivations were the key reason to stay with other reasons on average much less important. The reasons to stay correspond well with the motivations to become mobile and are the opposite of the reasons to return. This is clearly visu-

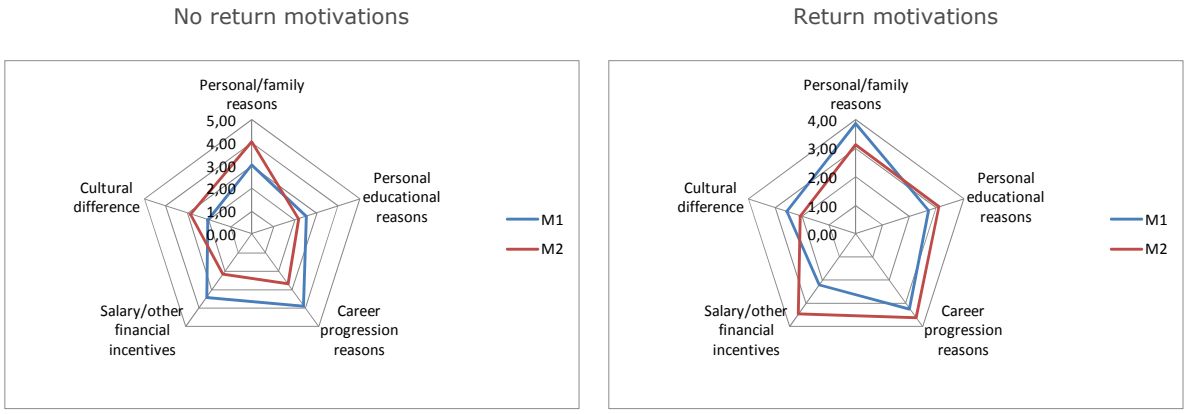
alised in Figure 9-3. Also the bar graphs in Figure A2.6 (showing the percentages of researchers who find a no return reason important, neutral or not important) show clearly the similarity with Figure A2.1 (showing the percentages of researchers who find a mobility motivation important, neutral or not important). The only strong difference we see is in the importance of personal educational reasons for EU-US mobile researchers: 80 percent considered this as an important reason to become mobile from the EU to the US while it is only important for around 25 percent of those staying in the US (not returning to the EU).

Table 9-8 No return motivations by mobility group

	M1 (no return to EU from US)	M2 (no return to US from EU)	Total
		Average score	
Personal/family reasons	3.04	4.02***	3.41
Personal educational reasons	2.52	2.18***	2.40
Career progression reasons	3.90	2.70***	3.48
Salary and other financial incentives	3.41	2.15***	2.97
Cultural difference	2.04	2.87***	2.34
Observations	420	225	645

Source: MORE extra – EU survey

Figure 9-3 No return motivations versus return motivations by mobility group



Source: MORE extra – EU survey

9.4.2 No return and experience abroad

Table 9-9 shows that for researchers moving from the US to the EU and staying there, personal motivation is the only truly important factor for all durations of the latest stay, with the strength of the motivation increasing with the length of the stay. With respect to staying in the US for EU graduates, however, the picture is not the same over all durations of stay. While career progression reasons are the first consideration for all durations, the financial reasons become important for longer term stays of two years or more. For short-term stays of less than a year the personal motive is the most important factor for staying in the US.

Table 9-9 No return motivations and experience abroad

		Personal/ family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Duration of latest stay							
≥3 and < 6 months	M1	3.87	3.13	3.59	2.94	1.81	31
	M2	3.43	2.50	2.83	2.32	2.74	35
≥6 and <12 months	M1	3.11	2.67	3.61	2.78	2.11	31
	M2	3.67	1.73	2.54	2.57	2.71	19
≥1 year and < 2 years	M1	2.56	2.63	3.82	2.87	2.00	65
	M2	3.83	2.40	2.67	2.08	2.72	29
≥2 years and < 3 years	M1	2.40	2.76	4.03	3.50	2.08	49
	M2	3.82	2.73	2.89	2.06	2.35	19
≥3 years	M1	3.18	2.39	3.95	3.59	2.05	24
	M2	4.23	2.01	2.67	2.10	3.03	123

Source: MORE extra – EU survey

9.4.3 No return and education

With respect to the researchers' field of science, the general picture is confirmed in all fields. Career progression reasons are the most important for staying in the US and most strongly so in humanities. Financial motivations follow in importance. Personal motivations are the sole reason to stay in the EU in all fields of science. There appear to be no fields of science where the EU would be a better professional base than the US.

Table 9-10 No return motivation and education

		Personal/ family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Field of science							
Natural sciences	M1	3.13	2.39	3.88	3.35	1.98	238
	M2	3.93	2.28	2.83	2.35	2.80	80
Eng.&technical sciences	M1	3.17	2.56	3.81	3.68	1.93	36
	M2	3.81	2.39	2.71	2.10	3.14	23
Medical&health sciences	M1	2.74	2.88	3.89	3.18	1.86	33
	M2	-	-	-	-	-	3
Agricultural sciences	M1	-	-	-	-	-	9
	M2	-	-	-	-	-	4
Social sciences	M1	3.11	2.65	3.94	3.79	2.21	67
	M2	4.04	2.12	2.50	1.93	2.83	90
Humanities	M1	2.81	2.63	4.21	3.39	2.34	37
	M2	4.29	1.75	2.85	2.29	2.79	25
Highest educational attainment							
Postgraduate	M1	3.07	2.44	3.91	3.40	2.01	386
	M2	4.00	2.13	2.71	2.14	2.85	210
Graduate	M1	2.63	3.53	3.90	3.65	2.16	29
	M2	4.27	2.64	2.45	2.27	3.27	13

Source: MORE extra – EU survey; Cases were the number of respondents is ten or below are omitted.

9.5 Attractiveness of EU for third countries

The respondents who have been mobile but not between the EU and the US belong to Mobility group M3 ("other mobility" group). We have asked these researchers to indicate to which country they have most recently been mobile to (country x). If country x is a non-EU country, we subsequently ask them whether after working in country x they have worked in the EU. Of the 1017 respondents in mobility group M3 who had not been mobile to the EU, 519 or 51% went to the EU afterwards. The other half did not. In this section we compare the reasons of those who did move to the EU with those who did not.

9.5.1 General picture

From Table 9-11 we learn that the reasons for moving to the EU are the same as the reasons for not moving to the EU from other countries; Personal reasons are the most important both for moving and not moving to the EU but seem slightly more important for moving to the EU. Career progression reasons are mentioned as second in importance both for moving and for not moving to the EU. Other reasons do not play an important role.

Table 9-11 Motivations for moving or not moving to EU from third countries

	M3 (turn to EU)	M3 (no turn to EU)
Personal/family reasons	3.88	3.42
Personal educational reasons	2.89	2.41
Career progression reasons	3.42	3.32
Salary and other financial incentives	2.48	2.91
Cultural difference	2.53	1.89
Observations	519 (51%)	498 (49%)

Source: MORE extra – EU survey

The bar graphs in Figure A2.7 which show the percentages of researchers who find a reason important, neutral or not important for moving or not moving to the EU, confirm the primary importance of personal and family reasons for moving to the EU (nearly 70 percent considers this as important to extremely important) and the second place of career progression goals (considered important by around half of the researchers) for moving to the EU while these two motivations share the same importance for not moving to the EU (around half the researchers consider the reasons important). Financial considerations appear less important for moving than for not moving to the EU (20 versus 40 percent respectively of the researchers considers this as important) so financial considerations play rather in the disadvantage of the EU to attract non-EU educated researchers (motivating researchers to return to the US or not to move to the EU from third countries).

9.5.2 Motivations for moving/not moving to EU and experience abroad

Looking at the number of countries a researcher has worked in (Table 9-12), we see that personal reasons are the strongest for all categories followed by career progression goals. Other reasons do not seem important except for the personal education/research agenda which comes as a third reason for moving to the EU if a researcher has not worked in many different countries (zero to one). Generally the motivations to move to the EU appear to be decreasing in strength as the researcher has worked in more countries.

Table 9-12 Motivations for moving or not moving to EU and experience abroad

		Personal/ family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Nr. countries worked abroad							
0-1	To EU	3.95	3.60	3.75	2.98	2.84	70
	Not to EU	3.51	2.81	3.38	2.78	2.10	96
2-3	To EU	3.95	2.80	3.41	2.37	2.54	346
	Not to EU	3.46	2.33	3.40	3.01	1.85	317
4-5	To EU	3.65	2.81	3.30	2.57	2.43	82
	Not to EU	3.12	2.20	2.90	2.69	1.75	64
More than 5	To EU	3.07	2.33	2.93	2.31	1.73	21
	Not to EU	3.38	2.40	3.25	2.81	2.00	21

Source: MORE extra – EU survey

9.5.3 Motivations for moving/not moving to EU and education

As Table 9-13 indicates, for all fields of science the most important reason to move to the EU from other countries is personal motivations followed by career progression goals. For humanities, however, the order is reversed. This is also the case for medical and health sciences and for natural sciences, although the difference is not so large in the latter field. Generally we can conclude that personal motivations and career progression goals are motivating other country researchers from all fields both to move and not to move to the EU.

We can draw a similar conclusion by highest educational attainment. Personal motivations are the most important in both directions followed by career progression goals. The motivations are slightly lower for the group who did not move to the EU.

According to the position a researcher holds, we do observe some differences, however. While post-doctoral researcher and "other" positions follow the general conclusion, PhD students show a different picture. First, we find a third reason for mobility to or away from the EU and second, reasons appear to be stronger in strength. Moving to the EU from other countries is strongly driven by career progression goals, personal motivations and personal education and research agenda and these motivations are higher in strength for PhDs than for others. The same three reasons are also important in not moving to the EU, but lower in strength.

Table 9-13 Motivations for moving or not moving to EU and education

		Personal/family reasons	Personal educational reasons	Career progression reasons	Salary and other financial incentives	Cultural difference	Total
Field of science							
Natural sciences	To EU	3.83	2.67	3.40	2.39	2.51	242
	Not to EU	3.45	2.26	3.48	2.98	1.99	190
Eng.&technical sciences	To EU	4.22	3.06	3.24	2.14	2.73	55
	Not to EU	3.75	2.96	3.38	3.14	2.04	43
Medical&health sciences	To EU	3.82	2.71	3.33	2.46	2.64	30
	Not to EU	2.78	2.94	3.33	2.50	2.00	31
Agricultural sciences	To EU	4.11	3.33	3.60	2.70	2.89	20
	Not to EU	2.91	-	-	-	-	16
Social sciences	To EU	3.97	3.19	3.52	2.76	2.50	129
	Not to EU	3.44	2.39	3.20	2.89	1.79	163
Humanities	To EU	3.33	3.00	3.49	2.53	2.18	43
	Not to EU	3.44	2.50	3.13	2.80	1.77	55
Highest educational attainment							
Postgraduate	To EU	3.89	2.80	3.39	2.47	2.54	471
	Not to EU	3.46	2.36	3.34	2.89	1.86	442
Graduate	To EU	3.83	3.80	3.68	2.69	2.47	42
	Not to EU	3.14	2.71	3.17	3.11	2.17	50
Position							
PhD student	To EU	3.91	3.94	3.96	2.91	2.58	56
	Not to EU	3.55	3.12	3.42	3.03	2.24	52
Post-doctoral researcher	To EU	3.83	2.95	3.41	2.62	2.54	206
	Not to EU	3.29	2.33	3.28	2.76	1.74	212
Other	To EU	3.91	2.59	3.32	2.27	2.51	257
	Not to EU	3.49	2.32	3.32	3.01	1.93	234

Source: MORE extra – EU survey; Cases were the number of respondents is ten or below are omitted.

9.6 Future mobility: attractive locations

All respondents were asked which country location is most attractive to them in terms of their potential future mobility. In this section we present the ten countries that were mentioned most by the total sample, the mobile versus non mobile groups and the four mobility groups, in order of their popularity. Additionally, we group the countries into regions (EU15, EU12, US, other) and do the same exercise. While drawing conclusions, it has to be kept in mind that these results might be heavily biased towards birth country or region and/or towards resident country or region. With more than half of the sample (55%) born in the EU15 and 50 percent currently residing in the EU15 and 30 percent currently residing in the US (16% were born in the US) we expect a strong response for these regions.

Table 9-14 shows that the US is by far the preferred country as one in four respondents answer that the US is the most attractive country in terms of future

mobility. It is followed by the UK, Germany and France. Next in line are mostly EU15 countries with the exceptions of Australia as the sixth and Canada as the eight most popular countries. With respect to the US we can hardly speak of a birth region bias as only 11 percent of those born in the US have mentioned it as their most popular country in terms of future mobility. Of course, given that 82 percent of those born in the US also reside there and then an additional 11 percent who considers it the most attractive in terms of potential future mobility that does not leave many US born researchers who are not now or in the future contemplating residing in the US. So there might be a strong birth country attraction for the US, which also scores high on professional terms.

It is nearly always the same ten countries that appear in the top ten with a different weight for the two first (US and UK) according to mobility type. The US appears slightly more attractive to mobile researchers than to the non-mobile researchers. Not unexpectedly, it is the most attractive region for more than one third of the M1 mobility researchers (see Table 9-17).

Table 9-14 Ten most attractive countries (Total and by mobile/non-mobile)

Rank	All	%	Mobile groups (M1, M2, M3)	%	Non-mobile group (M4)	%
1	US	25.5	US	28.0	US	20.8
2	UK	15.9	UK	13.6	UK	20.1
3	Germany	9.6	Germany	10.1	Germany	8.8
4	France	7.6	France	7.6	France	7.6
5	Switzerland	4.8	Switzerland	5.0	Canada	4.5
6	Australia	4.1	Spain	4.2	Switzerland	4.3
7	Spain	4.0	Australia	4.2	Australia	3.9
8	Canada	3.6	Netherlands	3.3	Netherlands	3.9
9	Netherlands	3.5	Canada	3.2	Spain	3.6
10	Italy	2.8	Italy	2.9	Italy	2.8
Cum.%		81.3		81.9		80.2
Obs	5544		3617		1927	

Source: MORE extra – EU survey

Table 9-15 Ten most attractive countries (by mobility group)

Rank	M1	%	M2	%	M3	%	M4	%
1	US	35.3	US	24.3	US	25.9	US	20.8
2	UK	13.2	UK	17.5	UK	13.3	UK	20.1
3	Germany	10.4	France	9.0	Germany	10.1	Germany	8.8
4	France	6.9	Germany	9.0	France	7.6	France	7.6
5	Switzerland	5.5	Netherlands	6.2	Switzerland	4.8	Canada	4.5
6	Spain	4.8	Switzerland	5.6	Australia	4.3	Switzerland	4.3
7	Australia	4.7	Spain	4.1	Spain	3.9	Australia	3.9
8	Netherlands	2.7	Italy	2.8	Canada	3.8	Netherlands	3.9
9	Canada	2.2	Belgium	2.2	Italy	3.2	Spain	3.6
10	Italy	2.0	Australia/Greece	1.9	Netherlands	3.1	Italy	2.8
Cum.%		87.7		84.4		79.9		80.2
Obs	867		321		2429		1927	

Source: MORE extra – EU survey

When the countries are combined into regions, we see a different picture (see Table 9-16 and Table 9-17). The EU15 appears to be the most attractive region for researchers, especially for the non-mobile ones. For the latter group, the US comes in at the third place as a potential region of future mobility. What is consistent over all groups is the low attraction of the EU12 countries.

Table 9-16 Attractiveness of regions (Total and by mobile/non-mobile)

Rank	All	%	Mobile groups (M1, M2, M3)	%	Non-mobile group (M4)	%
1	EU15	51.7	EU15	49.7	EU15	55.5
2	US	25.5	US	28.0	Other	22.2
3	Other	21.5	Other	21.1	US	20.8
4	EU12	1.4	EU12	1.3	EU12	1.6
Obs	5544	100	3617	100	1927	100

Source: MORE extra – EU survey

Table 9-17 Attractiveness of regions (by mobility group)

Rank	M1	%	M2	%	M3	%	M4	%
1	EU15	44.6	EU15	57.6	EU15	50.4	EU15	55.5
2	US	35.3	US	24.3	US	25.9	Other	22.2
3	Other	19.2	Other	16.2	Other	22.4	US	20.8
4	EU12	0.9	EU12	1.9	EU12	1.3	EU12	1.6
Obs	867	100	321	100	2429	100	1927	100

Source: MORE extra – EU survey

Table 9-18 shows that most respondents have mentioned places where they have been on a research visit or worked before. For the US, this is as high as 78 percent while it is lowest for Australia with only 52 percent who have been there on a work related stay. In anticipating going on a research visit to the country that was mentioned, the large majority was positive, on average 82 percent were anticipating a visit to his/her most likely country of future mobility. This percentage is highest for both the US and Australia, with respectively the highest and lowest percentage of visits in the past. The percentage of respondents who are anticipating employment in their most attractive country is much lower than those who anticipate going there on a research visit. Switzerland and Canada appear to be the most attractive in seeking employment as 70 and 63 percent respectively of those who answered this country also anticipate seeking employment there.

Table 9-18 Working/visiting the ten most attractive countries

Rank	As ranked by "All"	% has worked/been on research visit in country[x]	% anticipates going on research visit to country[x]	% anticipates seeking employment in country[x]
1	United States of America	78.3	84.0	47.5
2	United Kingdom	65.2	81.7	45.8
3	Germany	76.1	83.1	49.4
4	France	73.8	83.3	45.5
5	Switzerland	56.8	78.4	69.7
6	Australia	52.4	84.6	46.3
7	Spain	67.7	75.5	51.8
8	Canada	55.0	81.2	63.4
9	Netherlands	70.6	81.4	50.5
10	Italy	75.8	80.9	41.4
	Total average (N=5544)	69.1	82.3	48.8

Source: MORE extra – EU survey

9.7 Key characteristics of attractive locations

Lastly, a cloud was "drawn" from the answers the respondents of the four mobility groups gave to the question: "Please provide three main keywords or factors that you find most important in defining the most attractive environment for research". *Figure 9-4* shows the results. A keyword became more bold and bigger according to the number of respondents mentioning it.

For all groups "funding" and "research" jump out as the most mentioned keywords. Obviously, "research" can capture many things such as research agenda, freedom in research, doing research rather than teaching, etc. Therefore this keyword is rather difficult to interpret.

For the non-mobility group and the US to EU mobility group "colleagues" were also mentioned quite consistently which is less true for the EU to US mobility group. Additionally we find that "infrastructure" is mentioned more often in the other mobility and EU to US mobility groups.

Figure 9-4 'Clouds' of keywords for attractive research environment

Mobility group 1 (N=711)

Mobility group 2 (N=280)

Mobility group 3 (N=2147)

Mobility group 4 (N=1597)

9.8 Main findings

The results from the survey are quite negative for the EU as it comes out as less attractive to work in as a researcher compared to other regions. The US and other countries are especially better as a reference for the researcher's career and for collaboration with top-class researchers. These results do not only stem from those researchers whose opinion is based on actual experience in both regions, but also from those who may not even have been in the EU. Since the respondents from the mobility group US to EU appear to agree that the EU is less attractive as a research environment, these researchers may not have moved or definitely will not stay for professional reasons as was suggested before.

These general impressions hold for all fields of science, especially for the medical and health sciences. The US generally comes out best compared to the EU for humanities, though the result is somewhat milder.

The US is rated above the EU for post-doctoral and other positions but especially for PhD students. Even though PhD students moving from the EU to the US are most positive about the US compared to researchers in other positions, they are also least negative about the EU.

As can be expected from these results, returning to the EU is strongly driven by the attraction of the birth region. On the contrary, the birth region attraction does not seem to affect the decision to return to the US. Returning from the EU back to the US is done mainly for professional and financial reasons.

Personal motivations are stronger in driving EU graduates back to the EU than they are in driving US graduates back to the US. For engineering and technical sciences they even appear to be the sole reason for moving back to the EU. Financial reasons are the most important reason researchers in humanities and social sciences to move back to the US, while career progression is the most important factor driving researchers in natural sciences back to the US.

While the reasons to return to the region of graduation are the opposite of the motivations to become mobile, the reasons to stay are the same as the motivations to become mobile. This means that predominantly professional and financial reasons keep EU graduates in the US and solely personal reasons keep US graduates in the EU. This is the case in all fields of science. Given all of the results, there appears to be no fields of science where the EU would be a professionally better base than the US.

In terms of future mobility, the US seems to be the most attractive country, followed by EU15 countries, Australia and Canada. Looking at regions, the EU15 comes out as the most attractive region, but it is important to note that this is influenced by birth country attraction as 55% of the sample is born in the EU15.

Based on the "cloud" analysis of the keywords related to what constitutes an appealing research environment, it appears that "funding" and "research" were the most important factors for all groups. While "colleagues" came out as important factor for the non-mobile and the US to EU mobility groups, "infrastructure" came out strongly in the EU to US group and the other-mobility groups.

Part 3 MAIN FINDINGS AND CONCLUSIONS

10 SUMMARY OF FINDINGS AND CONCLUSIONS

10.1 Evidence from the National Survey of College Graduates

This report focused mainly on the mobility of EU researchers to the US, their stay rates and influencing factors. Although the survey was designed to target broader groups, the main focus has remained in analysing the mobility of researchers between the EU and the US. Since the groups of researchers targeted by this survey are not considered representative groups, some indication of the findings of US-based surveys on EU researchers working in the US can provide a general picture which can be compared to the findings of the current extra-EU survey on mobility of researchers.

Therefore, the first chapters of this report provide some facts from the National Survey of College Graduates in the US (NSCG). The 2003 NSCG was drawn from those residing in the United States on October 1, 2003 or residing abroad as U.S. military personnel. However, the NSCG has one major drawback. Since the base sample of the NSCG is only refreshed once every ten-years, there are gaps in our knowledge of how the workforce is changing over the decade between the decennial censuses. Therefore, we are likely to undercount the number of scientists and engineers who are in the United States on temporary visas. For example, the 2003 NSCG does not include immigrants with only degrees earned abroad if they came to the U.S after April 1, 2000.

The primary objective of working with the NSCG has been 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. Once this group of immigrants was identified, their motivation for coming to the U.S. and the role they play in the U.S. scientific community were investigated.

The focus for this report has been look at the 2003 NSCG survey of recent adult migrants in the U.S who had been trained in S&E fields and had emigrated, on initial visas for a period of six months or longer, to the U.S. as adults since 1989, and who were now employed in S&E occupations. This is the 'recent cohort' of adult migrants trained in S&E fields and occupied in S&E fields in 2003 to which this exercise for the purposes of this report has been based.

The following main findings and conclusions that can be drawn from this exercise:

- This recent cohort of adult migrants represented over 50% of all adult migrants educated in science and engineering who were now employed in S&E occupations in 2003.
- For the recent cohort of EU27 migrants, the top three "first" reasons for coming to the U.S. were
    - job or economic opportunities,
    - educational opportunities, and
    - the scientific or professional infrastructure.

- These same reasons were also the second most important EU27 migrants gave for their move to the U.S.

- We also discovered that EU27 migrants tend to be employed

    - less often than migrants from other countries in the business/industry sector, but

    - more often than migrants from other countries in the higher education, government and other education sectors.

- EU27 migrants were overrepresented relative to recent migrants from other countries in terms of devoting time towards performing basic research, applied research and "other" work activities. On the other hand, EU27 migrants spend less time than other migrants doing development, design or computer applications.

10.2 Results from the Extra-EU mobility survey

10.2.1 Design of the survey and main groups

10.2.1.1 Sampling

Although the aim of this study was initially the design of a pilot study for the analysis of the motives and stay-rates of EU researchers going to the US, the present study on the extra-EU mobility is linked to a survey in which there are two main target groups and two additional ones:

- Group M1 (EU-US mobile): EU researchers (researchers who have received their highest degree in the EU) and have worked or are currently working in the US.

- Group M2 (US-EU mobile): US researchers (researchers who have received their highest degree in the US) and have worked or are currently working in the EU.

- Group M3: Researchers who have been mobile after receiving highest degree but do not belong neither to group M1 nor to group M2.

- Group M4: Researchers who have not been mobile after receiving highest degree.

For the main groups of researchers, EU-US mobile and US-EU mobile, as well as for the additional two groups, the population of researchers is not known. Therefore, not only can the survey not be representative but, also, we had to rely on convenience sampling in order to approach researchers who would potentially belong to one of these groups. Two methods of sampling were used:

- Web-based search where we have specified the criteria for which email addresses of researchers will be searched on the web

- Indirect sampling methods

More details on the precise methods of sampling used are provided in Section 3.4. The results of this survey can therefore not be generalised for the overall population.

10.2.1.2 Questionnaire

The questionnaire contains two main parts. **Part I** addressed all four mobility groups with questions on:

- Socio-demographics. The respondents provided information on their personal and family situation, their education and training.

- Current employment situation. Information was asked about the respondents' current employer, the type of their employment contract and on other characteristics of their current employment.

- Career path and mobility. Information was provided on the general career paths of the respondents focusing on the movements between the public and the private sectors, the total number of changes of employers and the total number of countries where they have worked.

Part II contained the questions that were addressed to each of the four mobility groups based on the experience of researchers with mobility. The main topics addressed are the following:

- Experience of mobility. Information was provided on the stay rate at the host county, the personal motivations to become mobile, the influencing factors of mobility, the perceived effects of and the factors influencing the decision to return or not to home country.

- Comparison of EU as research environment with non-EU countries. The respondents were asked to provide their opinion on how the EU countries compare to non-EU countries with respect to research environment focusing on the aspects such as accessibility to funding opportunities, reference for career as researcher, access to research infrastructure, opportunities to collaborate with top-class researchers, etc.

- Future mobility. The respondents provided information on their openness to the possibility to work abroad in the future and their opinion on the attractiveness of specific locations as potential destinations to work as researcher in the future.

10.2.2 A general picture of the sample

The net sample used for the analysis of this survey was 5544 observations, with 867 observations belonging to the EU-US mobility group, 321 to the US-EU mobility group; 2429 to the 'other' mobility group and 1927 to the non-mobile group.

10.2.2.1 Sociodemographics

- 56% of the respondents reside in the EU, 30% in the US and less than 14% in other countries.

- Within the different mobility groups, around half of the EU-US (M1) mobile respondents reside in the EU, while the other half resides in the US. 77% of the US-EU respondents (M2) reside in the EU. For the 'other' type of mobil-

ity (M3), 60% are residents of the EU. Half of the non-mobile respondents reside in the EU, 36% of them in the US and the remaining 13% in other countries. This is a fact related to the sampling strategy used where the main target was researchers with an affiliation to an EU or an US research institution.

- The share of males in the total sample is 65%. The share of male researchers residing in the EU and US is 65% and 66% respectively.

- More than half of the respondents (53%) are between 36 and 55 years old. Researchers residing in the EU are, on average, slightly younger compared to researchers residing in the US and the group of other countries.

- Nearly 74% of the respondents are married or cohabiting and 20% are single while 54% of EU residents and 56% of US residents have children.

- More than half of the respondents (52%) obtained their highest educational attainment between 2000 and 2010. A quarter of the respondents obtained it between 1990 and 2000.

10.2.2.2 Education

- Nearly 86% of the respondents in the sample hold a PhD or equivalent degree. For the respondents residing in the US, this is 92%. The group of non-mobile researchers has a significantly lower share of respondents with a PhD.

- Most of the respondents achieved their highest educational attainment in natural (41%) and social sciences (30%).

- Researchers who graduated in the US are less represented in natural, medical, health and agricultural sciences and engineering and technology, but there are nearly twice as many researchers in social sciences and 50 to 60% more researchers in humanities compared to the other regions (EU and other countries).

10.2.2.3 Student mobility and work experience in industry as student

- In the total sample, 31.7% of the respondents have been mobile as a student and 28.6% of them have had work experience in the industry as a student.

- The field humanities consist of the highest share of respondents having been mobile as a student (44%), in contrast to the group of medical and health sciences and engineering and technology, both with a share of 26%.

- The field of science with the highest share of researchers that have had work experience in industry as a student is the field of engineering and technology (41%), while humanities has the lowest share with a percentage of only half as high. This result can be partly explained by the fact that studies in the fields of engineering and technology can have a more direct link with the private sector which increases the possibilities of for work experience in industry during education.

- The group of US-EU mobile respondents (M2) presents the highest share of researchers that have neither been mobile as a student (57%) nor have had

work experience in industry as student, closely followed by the group of non-mobile researchers (55%).

- Within this sample, 56% of the respondents reside in the EU, 30% in the US and less than 14% in other countries.
- More than half of the respondents (53%) are between 36 and 55 years old. In the total sample 65% of the respondents are male.
- Nearly 74% of the respondents are married or cohabiting.
- More than half of the respondents (52%) obtained their highest educational attainment between 2000 and 2010.
- Around 86% of the respondents in the sample hold a PhD or equivalent degree.
- 31.7% of the respondents have been mobile as a student and 28.6% of them have had work experience in the industry as a student.

10.2.3 Employment situation

10.2.3.1 Current employment

- 15% of the respondents are currently PhD-researchers and 42% are currently post-doctoral researchers. Respondents who are currently PhD students are on average 37 years old, those who are post-doctoral researchers are on average 43 years old, while the rest of the respondents are on average 47 years old. It seems that on average the respondents who are neither PhD students nor post-doctoral researchers are relatively more experienced researchers.
- In higher education institutes and research institutes this share is substantially lower, with only 48% for higher education institutes, 45.5% for public and 37% for private research institutes (three quarters of the respondents working for a company have an open ended contract).

10.2.3.2 International collaboration

- 45% of the respondents report that their current work as a researcher involves formal collaboration with academic researchers from other countries. This finding is related to the sampling strategy, as the target group is researchers affiliated with research institutions (mainly universities), where we expect to find higher shares of researchers collaborating with international academic partners.
- The lowest share of formal collaboration with researchers from other countries is reported by the respondents working in humanities and social sciences (50% and 58% respectively).
- Researchers working for a company are least involved in formal collaboration with researchers from other countries. About half of the researchers working for a higher education institution or a research institute report that when they formally collaborate with researchers from other countries, this is only with academic researchers.

10.2.3.3 Prospects of career as researcher

- 85% of the respondents in the survey are very (46%) to somewhat (39%) confident about the future prospects for their research career. EU-residents are remarkably less confident compared to the respondents living outside the EU.

- The respondents working for a higher education institution are by far the most confident. Not surprisingly (as the industry environment is related to higher risks and higher uncertainty about the future compared to the public sector), researchers working for a company and especially the self-employed are the least confident.

- 90% of researchers with an open-ended contract report being confident about their future projects. For researchers with fix-term contracts, the shorter the duration of the fixed contract, the lower the confidence of the respondents.

- 15% of the respondents are currently PhD-researchers and 42% are currently post-doctoral researchers.

- 45% of the respondents report that their current work as a researcher involves formal collaboration with academic researchers from other countries.

- EU-residents are remarkably less confident about the future prospects for their research career compared to the respondents living outside the EU.

10.2.4 Career paths and experience of mobility

Around 85% of the researchers in the sample are working in the public sector and most of them have always been in the public sector (75%). This is expected since the web-based sampling mainly targeted researchers working in this sector. The distribution over career paths is very similar for all regions of residence and for all mobility groups.

Researchers are quite mobile with respect to employers:

- Around half of the researchers in all regions have worked for two to three employers since graduation.

- The non mobile group (M4) is slightly less "employer-mobile" as geographical non-mobility appears to go together with employer non-mobility.

- Researchers who are mobile from the US to the EU tend to stay for a longer duration than the researchers who move from the EU to the US (51% versus 40% respectively).

10.2.5 Motivations (and de-motivations) of mobility

This survey examined the importance of specific factors in the decision of researchers on whether to work abroad or not. We refer to these as motivations to become mobile. The results refer to the importance researchers attach to these factors as motivations for mobile researchers and as de-motivations for non-mobile researchers. Here motivations refer to the factors motivating the decision of researcher with respect to mobility, both the decision to become mobile and

the decision not to become mobile. We focused on seven main factors as motivations which can be grouped under two main categories, the personal motivations, those related to person-specific preferences, and the professional motivations, those related to professional objectives and goals. These are listed below:

- Personal motivations:
    1. Personal, family-related factors
    2. Personal interest in the culture of the (destination) country
- Professional motivations:
    3. Personal education and/or research agenda (i.e. content and direction of research)
    4. Career progression goals
    5. Getting access to the facilities/equipment necessary for research
    6. Prospect to work with leading experts ('star scientists') at destination country
    7. Salary and other financial incentives

Among all factors examined as (de-)motivations to become mobile, three factors were the top-3 ranked motivations (based on the total sample):

- Personal education and research agenda
- Career progression goals
- Prospects to work with leading experts ("star" scientists)

This finding confirms the opinions of most of the interviewees during the exploratory interviews. There, it was clear that for researchers working in the public sector the main motives to move abroad or not are based on their ambition to progress their career further and to work with leading experts in their field of research.

10.2.5.1 EU-US mobile vs. US-EU mobile researchers

The survey results indicate that researchers who have been mobile from the EU to the US have stronger professional motivations to move to the US while researchers who move from the US to the EU have stronger personal/cultural motivations. This implies that EU-based researchers have higher incentives to move to the US in order to fulfil their professional ambitions than their US-based colleagues moving to the EU. Conversely, US-based researchers assign larger importance to personal factors and getting acquainted with the culture in a EU country when considering moving to the EU.

In more detail, around 80 percent of the EU-US mobile researcher considers career progression goals important for moving and the same percentage for personal education/research agenda. More than 70 percent of the EU-US mobile researchers answered that "prospects to work with leading experts" was an important motivation. The top-3 looks slightly different for US-EU mobile researchers (in terms of percentage of researchers finding the motivation important to extremely important): More than 60 percent considers personal education/research agenda important to extremely important, followed by around 60 percent who considers personal and family reasons important to extremely important and

around 55 percent who considers career progression goals as important to extremely important in the decision to move to the EU. While cultural interest is the least important motivation to move from the EU to the US, it is the fourth most important for moving to the EU in terms of percentage of researchers considering it an important to extremely important motivation.

- EU-US mobile (M1) researchers tend to have stronger professional motivations for their mobility to the US.

- US-EU mobile (M2) researchers tend to have stronger personal and cultural motivations for their mobility to the EU.

10.2.5.2 Mobile vs immobile researchers

Among the overall mobile versus immobile groups of researchers, we find that, in general, professional factors as (de-)motivations for mobility play a less important role in the decision not to become mobile than in the decision to become mobile. For researchers who have already been mobile, professional factors seem to have been an important motivation to work abroad; However, for researchers who do not become mobile professional factors are not the driving force for their decision not to move abroad. Therefore, personal reasons appear more important in dissuading a researcher to move to another country for work.

However, 'career progression goals' form an exception, as this type of professional motivation is the second most important reason not to move abroad. This could be the case for researchers who fear the loss of their professional network contacts because when their intention is to eventually return to their home country.

Professional motives mainly drive mobility, while personal factors mainly drive immobility.

10.2.5.3 Experience abroad

Professional motivations in general do not seem to differ significantly over the duration of stay when this is less than 3 years. However, professional motivations (excluding financial motivations) become less important as the duration of stay increases to longer than 3 years.

Additionally, for those stays of more than 3 years, personal and family factors are more important as drivers for mobility. In the cases where the researcher moves to a country mainly driven by a personal or family-related factor (e.g. to follow spouse, to move back to the country of his/her family, etc.) then these reasons are likely to have a more long-term effect and result in long-term mobility.

On the other hand, cultural motivations decrease in importance for longer stays. Researchers, who are particularly interested in getting acquainted with a culture of a country as a reason to become mobile, fulfil this objective after a relatively short-term stay. These people can also be expected to be interested to move to another country for a short visit.

Although professional motivations, in general, seem to be less important the longer the stay abroad, financial motivations are an exception. Financial incentives do not seem to play a very important role as a motivation to move abroad, but, gains in importance the longer the stay of the mobile researcher.

The longer the stay abroad, …

- the less important the professional motivations (except for financial ones) are as factors driving mobility;
- the less unimportant the financial motivations are as factors driving mobility;
- the more important personal motivations are as factors driving mobility;
- the less important culture-related motivations are as factors driving mobility.

Researchers who have not been mobile or have moved to only one country abroad tend to assign higher importance to personal/family factors as drivers of mobility/immobility. It is reasonable to expect that researchers, who are driven by personal/family factors, tend to assign high importance to this motivation for the specific country in which they have particular personal or family factors.

Professional motivations are increasingly important for researchers who have worked in up to 3 countries. A larger number of countries visited to work as researcher reduce the importance of professional motivations as driver to work abroad. It can be expected that researchers assign high importance to professional factors as drivers to work abroad in a limited set of specific countries. In these countries they expect to find the infrastructure, network, and expertise that can increase their qualities as researchers. Visits to more than 3 countries are increasingly driven by other personal, family or cultural related factors.

10.2.5.4 Career paths and educational background

The top 3 factors, personal education and research agenda, career progression goals and prospects to work with leading experts, are those with consistently high scores of importance for all career paths as (de-) motivations for mobility (e.g. worked only in public sector, worked only in private sector, worked in private sector, then moves to private and beck, etc.).

'Getting access to facilities and equipment' is also an important motivation to work abroad, but much more for the researchers who have worked mainly in the public sector than for mainly in the private sector. This can be explained by the higher possibility of finding significant differences in terms of availability of research infrastructures among different countries in the public sector rather than in the private sector.

Similarly, the prospect to work with "star" scientists is a factor driving mobility which is more important among the researchers working in the public sector than for those working on the private sector. For researchers working in academia and public research institutions direct research output is more crucial for their future career than it is for their colleagues working on the private sector. Working with "star" scientists can have significant impact on the research output of researchers working in the public sector and it can be expected that this is less relevant for researchers working in the private sector.

Among researchers with different educational background, according to science field of their highest educational attainment, these same three factors are the top motivations to work abroad.

The financial motivation is stronger for researchers who graduated within with engineering and technical science degrees. An explanation for this is that in these fields wages can be very attractive, especially for researchers working in the in-

dustry sector. With the possibility of working abroad at a high salary these researchers are thus increasingly interested in the wage they receive when considering mobility.

10.2.6 Factors influencing mobility

This survey examined the importance of specific factors that influenced the final mobility decision. The idea behind this is that there are factors which motivate or de-motivate researchers to become mobile; However, for those who have considered mobility there are external factors which may play an important role in the decision to actually move. The external factors that were considered are:

- Practical influencing factors:
    1. Pension and social-care provision at destination country
    2. Immigration regulations
    3. Language
    4. Work permission for partner/other family members
    5. Availability of adequate schools for children
    6. Quality and cost of accommodation
- Research-related influencing factors:
    7. Obtaining funding for own research
    8. Potential loss of contact with professional network of location where previously worked

In general, for all mobility groups and the non-mobile group, the influencing factors appear not to have played a significant role in the decision to become mobile. This suggests that the true reasons for being mobile or not mobile lie in the motivational part. However, when introducing multivariate analysis we see that influencing factors play a more significant role.

The external factor which appears to affect the decision to become mobile most is obtaining funding for own research, followed by language, and quality and cost of accommodation. However the latter two factors appear to be only fairly important.

This result confirms the opinions expressed during the exploratory interviews where most of the interviewees indicated that finding the resources to fund their mobility move is an important influencing factor.

10.2.6.1 EU-US mobile vs. US-EU mobile researchers

Even though none of the practical-related factors (except for "language") seem to be as significant as the research-related factors, most of these factors seem to play a stronger role in US-EU mobility than the other way around. However, among those, language is more of an issue for the mobile group moving from the EU to US rather than for the group moving from the US to the EU. The fact that English is broadly spoken as a foreign language within the research environments of most of EU countries, including those where English is not the official language, seems to reduce the significance of this factor for the US-based researchers considering to move to the EU.

Researchers moving from the US to the EU seem to attach higher importance to pension and social-care provisions while those moving from the EU to the US look to immigration regulations, work permission for partner, adequate schools for children and quality/cost of accommodation. We can relate this to the previous result that US-EU mobile researchers tend to attach lower importance in professional-related motivations and higher importance in personal/cultural-related motivations than EU-US mobile researchers. This indicates that for EU-US researchers, for whom mainly professionally related factors drive mobility, the 'threshold' above which practical influencing factors start becoming important is rather lower compared to the threshold level of US-EU mobility. When additional factors are taken into account the practical factors are not to be significant for EU-US mobility.

Drivers of mobility and the 'tolerance level' to practical difficulties (other things equal):

- Researchers driven abroad largely by professional factors (EU-US mobile) tend to have a higher 'tolerance level' against practical difficulties and find practical influencing factors of mobility as less important.

- Researchers driven abroad largely by personal/cultural factors (US-EU mobile) seem to have lower 'tolerance levels' to practical problems: their threshold above which practical influencing factors (immigration regulations, accommodation, etc.) start becoming important is lower.

10.2.6.2 Mobile vs immobile researchers

In general most of the external influencing factors of mobility are not important for researchers and their decisions regarding mobility. 'Obtaining funding for own research' seems to be important when one considers the decision to move abroad. There appears to be a significant difference in the importance that mobile vs. non-mobile researchers assign to this factor. Obtaining funding seems an external factor which is more important for immobile researchers than for mobile ones: More than half of the immobile researchers have mentioned it as an important to extremely important influencing factor. Not being able to obtain funding for research appears therefore to be an important dissuading factor of mobility.

10.2.6.3 Experience abroad

For stays as a mobile researcher shorter than 2 years, none of the external influencing factors examined appears to be important. As the duration of stay increases, the importance that researchers assign to most of the factors increases, most notably the 'obtaining funding for own research' factor. Ability to obtain the financial means to do one's own research is also increasingly important for longer durations of stay abroad. We can speculate that access to funding is easier for shorter stays thus resulting in lower scores on the significance of this factor for short durations, but as the duration of stay increases, funding is not obtained as easily and thus the significance of this factor increases.

10.2.6.4 Career paths and educational background

When distinguishing among the career path that the researchers have followed we find that the same pattern is followed with no striking differences among the different groups. Again, 'obtaining funding for own research' seems the most important influencing factor of mobility; However, this factor appears less important in influencing mobility for researchers who work in the private sector, because when applying for a position in the private sector, having access to funding is easier.

Among researchers with different educational backgrounds no particular differences exist in the importance assigned to the different external influencing factors other than the general picture described above.

10.2.6.5 Mobile to the US or to the EU: do drivers matter?

This report has tried to shed light on the differences among the motivations and the influencing factors driving EU graduates to the US (group M1) versus those that are driving US graduates to the EU (group M2). The previous discussion has already indicated that US graduates come to the EU for personal and/or cultural reasons while EU graduates move to the US for professional reasons. With respect to the influencing factors we did not find a strong difference between the two mobility groups and overall the influencing factors were not very important.

In terms of logistic analysis, we examined the factors that affect the decision of EU graduates to move to the US compared to any other destination country, as well as the motives of US graduates to move to the EU compared to any other region.

Years of experience (measured as "years since graduation") seem to have a positive relationship with the probability that EU graduates move to the US rather than any other region; however, the converse is not true. It seems that the US attracts EU researchers at the later stage of their career while the same cannot be said for the US graduates moving to the EU.

EU graduates who are born either in the EU15 or in the US prefer to move to the US over another region. However, when the motivation variables are added, the effect of returning to the country where one is born disappears for the EU graduates born in the US; This suggests that it is not the attraction of the birth country that plays a role but other professional motivations.

On the other hand, US graduates born in the EU15 prefer to move back to the EU while those born in the US would rather move to another region.

Years of experience seem to have a positive relationship with the probability that EU graduates move to the US rather than any other region.

The EU seems to attract EU-born US graduates back mainly because of birth-return mobility.

The multivariate analysis confirms the findings of the descriptive analysis. We concluded that:

- Personal and family factors seem to drive US graduates to the EU while this does not seem to be the case for EU graduates.

- Career progression goals seem to drive EU graduates to the US while they do not have a significant effect in the other direction (for US-EU mobile).

In addition, the multivariate analysis indicates that that the possibility of US graduates moving to the EU rather than to another region increases the more driven the researchers are to work with "star" scientists. So, although professional motivations seem to attract US graduates to the EU to a lesser extent than EU graduates to the US, "star" scientists seem to be a significant factor of mobility both in the US and in the EU.

When introducing multivariate analysis, combining the effects of both motivations and external factors on mobility, we see that practical considerations are an important determination for moving from the EU to the US.

For the US graduates, the fear of loss of contact with the network of the home country plays an important role. This drives US graduates to the EU rather than to another region. This indicates that it might be easier for a US graduate to keep contact with the US when moving to the EU rather than when moving to another region.

Although professional motives seem to drive EU graduates to the US rather than US graduates to the EU, "star" scientists are attractiveness factors of mobility both for the US as for the EU as location to do research.

10.2.7 Effects of mobility

The survey also investigates the perceived effects of mobility on the individual researchers. The respondents were asked to evaluate the benefits that they have experienced due to being mobile abroad in each of the following:

- Outcome (direct) effects
  1. Publication output
  2. Patent output
  3. Ability to work in the industrial sector
  4. Access to infrastructure and know-how
- Network (indirect) effects
  5. Access to an international network of professionals active in your field
  6. Professional experience as researcher
  7. General recognition in the research community

We should note that the effects reported are not necessarily the actual effects but the perceived effects.

The average scores indicate that the effects have been positive on all aspects for all mobility groups, with a slight deviation for the US-EU mobility group. The strongest effects have been reported on the network of indirect effects:

- Professional experience as a researcher,
- Access to an international network of professionals and
- General recognition in the research community.

Additionally the researchers were asked to rank the overall effects they have realised on their professional career as researcher and on their personal and family life.

10.2.7.1 EU-US mobile vs. US-EU mobile researchers

A comparison of the reported effects among the three mobility groups indicates that the overall ranking of the three mobility groups in terms of perceived effects realised is the following:

Rank 1: EU researchers mobile to the US

Rank 2: Mobility with home-destination combination different from EU-US and from US-EU ('other' mobility group)

Rank 3: US researchers mobile to the EU

- Overall, mobility contributes mainly to network-related and more indirect effects on researchers' career.
- Mobility affects more positively the career of EU researchers mobile in the US than that of US researchers mobile in the EU.

Researchers having been mobile from the EU to the US seem to experience the largest positive effects. On the other hand, for researchers having been mobile from the US to the EU some effects are neutral or only fairly positive. Researchers from both groups seem to agree that the larger effects of mobility are on network or indirect effects. Professional experience, the access to an international network of researchers and the general recognition in the research community are consistently the three highest ranked effects across all groups.

While EU-US researchers do not seem to experience negative effects (the percentages that have answered "decreased" on respective effects were very small), negative effects are more likely to exist for the US-EU mobile researchers(with sometimes up to 30 percent of the researchers claiming a "decreasing" effect on the issue presented. Especially with respect to patent output, ability to work in the industrial sector and future job opportunities in the country where one previously worked US-EU mobile researchers seem to experience negative effects.

On average, researchers mobile from the US to the EU have experienced no effects on patent output, on their ability to work in the industrial sector, or on their future opportunities in the US as a result of their mobility to the EU. Also for the EU-US mobile researchers the effects on these three issues were smallest on average (and showing the highest percentages who experienced a "decreasing" effect). That is, the same three effects rank lowest for the EU to US mobile group, looking at averages as well as looking at percentages who mention that there was a decreasing effect. So for the EU-US researchers, the effects of these three issues were the least positive (but still positive on average) and recorded the highest percentages with decreased effects.

Looking to the overall effects on career and personal/family life, effects on career are higher for the EU-US mobile group than for the US-EU mobile group. At the same time, the effects on personal and family life seem to be higher for the US-EU mobility group compared to the EU-US group. Thus, when we compare this with the results on the motivations across the different groups, we see that, researchers, who are motivated with respect to specific targets, tend to achieve their targets:

- For EU to US mobile researchers, professional motivations are more significant and professional effects are larger; and
- For US to EU mobile researchers personal motivations are more significant and personal and family effects are larger.

When it comes to the experiences acquired from mobility, expectations seem to be realized.

- Researchers driven mainly by professional reasons to become mobile tend to report higher effects on their career.
- Researchers driven mainly by personal reasons to become mobile tend to report higher effects on their personal and family life.

10.2.7.2 Experience abroad

The highest effects for nearly all topics examined are reported by researchers who have been mobile between two and three years and sometimes for more than three years. The effects on publication and patent output increase along with an increase in the duration of stay, with the highest scores reported for durations of mobility of more than 3 years. This can be partly explained from the fact that publications and patents developed during the mobility period, or any other period, need more time to be realised.

The effect on the ability to work in the industrial sector (for the importance of this effect compared to the other effects see section 8.2.1, Table 8-1) varies the least among groups of respondents with different durations of their mobility stay. This seems logical as the ability to find work in the industrial sector seems unrelated to the time researchers spend in a given location but rather related to the specific characteristics of the location in terms of the existence of a local business sector related to the field of research.

10.2.7.3 Effects of mobility: does location matter?

Taking the descriptive results one step further, we tried, by means of a multivariate analysis, to determine which variables have an influence on the effects of mobility, the direction of mobility and the motivations to become mobile.

The effects of mobility appear to be consistently larger for researchers with a partner (married/cohabiting) than for single researchers, especially with respect to the overall effect that mobility has on personal and family life of the researcher.

Mobile researchers with a partner seem to realize larger effects of mobility on personal life but also larger effects on their professional career. Policy measures decreasing the barriers of mobility and targeting researchers with family seem that can drive higher effects of mobility.

Researchers born in the EU12 appear to see larger effects of mobility on their publication output, access to infrastructure and know-how and professional experience compared to researchers born in other regions. This may be explained by a relatively lower degree of integration of these countries into the broader scientific community/networks with more developed countries as well as by an overall lower level of infrastructure and know-how.

Researchers with origin from EU12 countries seem to realize larger effects from mobility on their publication output, access to infrastructure and their professional experience.

The finding that the types of motivations for mobility influence the type of the effects of mobility is confirmed here as well. This is especially the case where a motivation has a corresponding mobility effect: Between the "access to facilities" motivation and the "access to infrastructure and know-how" effect; between the

"working with star scientists" motivation and the "international network of professionals" and "professional experience" effects, and between the "personal and family" or "cultural interest" motivations and overall personal effects.

When we take into account the mobility group of the researchers, according to the effects that researches perceive, it seems that moving from the EU to the US is more beneficial professionally than moving from the US to the EU. This result clearly points out significant differences among the research environment in the EU and the US.

As indicated previously (see section 10.2.7.1), the ranking of the mobility groups in terms of effects is confirmed by the multivariate analysis. That is, we see that the effects of moving from the EU to the US are higher than the effects of the control group (other mobility') which in turn shows higher effects than the US-to-EU mobility group.

The research environment in the US seems more 'fertile' in the realization of positive effects from mobility of EU graduates than the research environment in the EU is for US graduates.

10.2.8 Research environment as an attractiveness factor of researchers

The survey looked further into the return mobility of the mobile researchers as well as on their opinion about how EU compares to other parts of the world to do research.

10.2.8.1 Comparison of research environment

In all cases and among all mobility groups, the EU scores on average lower than the US and other countries as an environment to work as researcher (for details see 9.2, Table 9-1). This is especially true when it comes to the effect of location where one works as 'reference' for one's career, and also in terms of collaboration with top-class researchers. We should note, that these results do not only stem from those researchers whose opinion is based on actual experience in both countries but also from those who may not have been in the EU to work and instead are giving opinions based on perceptions.

Some additional results indicate differences in the scores given by researchers in the various fields of science, although for all factors the US outscores the EU:

- For medical and health sciences US generally comes out as a better research environment compared to the EU, while for humanities, even though the numbers still in favour the US the result is somewhat milder.

- Researchers in engineering and technical sciences agree most with the proposition on better remunerative schemes in the US.

- Researchers in social sciences tend to agree the strongest that working in the US is better for one's career.

10.2.8.2 Decision to return vs. to stay at 'home' country

Analysing the return mobility of the two main target groups, we see that:

- 52% of the EU graduates who have been mobile in the US have returned to the EU:

  - 94% of these graduates were born in the EU.
  - Of those who did not return to the EU and stayed in the US, only 2% were US-born.

- On the other hand, 30% of the US graduates who have been mobile in the EU have returned to the US:
  - 48% of these graduates were born in the US.
  - Of those who did not return to the US and stayed in the EU, 44% were EU-born.

For the EU-US mobile researchers, return-mobility is driven strongly by the region of birth, while this does not seem to be as strong for the group of the US-EU mobile researchers.

Returning to the US from the EU is mainly driven by professional and financial reasons while returning to the EU from the US is mainly driven by personal and cultural reasons (for more details see section 9.3.1).

- Personal motivations are stronger in driving EU graduates back to the EU than they are in driving US graduates back to the US, irrespective of the duration of stay.
- Personal motivations are more important in the decision of EU graduates to return to the EU than in the decision of US graduates to return to the US. For engineering and technical sciences they even appear to be the sole reason for moving back to the EU.
- Financial reasons are the most important factors for researchers in humanities and social sciences to move back to the US, while career progression is the most important factor in driving researchers in natural sciences back to the US.

Professional motivations are the main reasons why EU graduates go to the US but it is mainly personal reasons that drive them back to the EU.

On the other hand, personal motivations are the main reasons why US graduates go to the EU but it is mainly professional reasons that drive them back to the US.

When analysing the responses of people who have stayed in either the EU or the US (see section 9.4.1), we find that although the reasons to return to the region of graduation are the opposite of the motivations to become mobile, the reasons to stay are the same as the motivations to become mobile. It is mainly professional and financial reasons that motivate EU graduates to stay in the US and mainly personal reasons that motivate US graduates to stay in the EU.

- Career progression reasons seem to be most important to motivate researchers to stay in the US for all durations of stay.
- Financial motives do not play a role in shorter-term stays (shorter than two years) and only become important for longer term stays (stays of more than two years).

10.2.8.3 Decision to move to the EU or not for mobile researchers other than M1 and M2

When considering the decision of mobile researchers not belonging to the EU-US or the US-EU groups, i.e. those belonging to group M3, who have been mobile in a non-EU country to move to the EU or not, we see that:

- While personal reasons are the most important reason both for moving and not moving to the EU from third countries, they play a slightly stronger role in moving to the EU.

- Career progression reasons are another motivation to move or not move to the EU after being mobile in a non-EU country.

- PhD students show a different picture: an additional reason both for moving and not moving to the EU after being mobile in a non-EU country, is "personal education and research agenda".

10.2.8.4 Future mobility 'hotspots'

Taking into account all respondents' opinions independently of their mobility group, the US seems to be the country considered in which it is most attractive to do research. Here of course the answers include those of respondents who have actually been in the EU as well as of those who have not, therefore it is a collection of opinions based on past experiences but also on perceptions.

The top-10 most attractive locations appear to be the following:	
1. United States of America	6. Australia
2. United Kingdom	7. Spain
3. Germany	8. Canada
4. France	9. Netherlands
5. Switzerland	10. Italy

The researchers who actually worked in the US have a stronger preference for this country.

When aggregating the countries by geographic regions, we see that the EU15 appears to be the most attractive region; however we also observe that birth-country attraction plays a role in this result as 55% of the sample is born in the EU15.

Knowing *which locations* are most attractive as locations to work as researcher is a very important piece of information. However, this analysis can be more informative if complemented with information on *which elements* researchers consider to make a location attractive for research. The respondents were therefore asked to provide the three most important keywords describing their most attractive research environment.

For all groups "funding" and "research" are the most often mentioned keywords. Obviously, "research" can capture many things such as research agenda, freedom in research, doing research rather than teaching, etc. Therefore this keyword is rather difficult to interpret. Funding seems an important characteristic of a research environment.

"Colleagues" are an important characteristic especially for the respondents belonging to the non-mobility group as well as to the US-EU mobile group.

"Infrastructure" is also often mentioned as an important characteristic of an attractive environment for research. This is mainly the case for the EU-US group as well as for the "other" mobility group, but it is not often mentioned in the US-EU group or the non-mobile group.

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ANNEX 1: ADDITIONAL DATA ON THE NATIONAL SURVEY OF COLLEGE GRADUATES IN THE US

Table A1-1-1: Detailed fields of major for highest degree earned.

Field of major for highest degree earned
Math/Comp
Computer and information sciences
Mathematics and statistics
Agricultural and food sciences
Bio/Ag/Env/Life
Biological sciences
Environmental life sciences
Physical
Chemistry
Earth, atmospheric and ocean sciences
Physics and astronomy
Other physical sciences
Social/Related
Political and related sciences
Psychology
Sociology and anthropology
Other social sciences
Engineering
Aerospace, aeronautical and astronautical engineering
Chemical engineering
Civil and architectural engineering
Electrical and computer engineering
Industrial engineering
Mechanical engineering
Other engineering
S&E-Related
Health
Science and mathematics teacher education
Technology and technical fields
Other S&E related fields
Non S&E
Management and administration fields
Education, except science and math teachers
Social service and related fields
Sales and marketing fields
Art and Humanities fields
Other Non-S&E fields

Source: 2003 NSCG documentation.

Table A1-1-2: Occupation for principal job.

Occupation for principal job
Comp/Math
Computer and information scientists
Mathematical scientists
Postsecondary teachers - computer and mathematics
Bio/Ag/Env/Life
Agricultural & food scientists
Biological and medical scientists
Environmental life scientists
Postsecondary teachers - life and related scientists
Physical
Chemists, except biochemists
Earth, atmospheric or ocean scientists
Physicists and astronomers
Other physical & related scientists
Postsecondary teachers - physical and related sciences
Social/Related
Economists
Political scientists
Psychologists
Sociologists and anthropologists
Other social and related scientists
Postsecondary teachers - social and related sciences
Engineers
Aerospace, aeronautical or astronautical engineers
Chemical engineers
Civil, architectural or sanitary engineers
Electrical or computer hardware engineer
Industrial engineers
Mechanical engineers
Other engineers
Postsecondary teachers - engineering
S&E-Related
Health-related occupations
S&E Pre-college Teachers
S&E technicians and technologists
Other S&E-related occupations
Non-S&E
Non-S&E Managers
Management-related occupations
Non-S&E precollege and other teachers
Non-S&E postsecondary teachers
Social services and related occupations
Sales and marketing occupations
Art, humanities and related occupations
Other non-S&E occupations

Source: 2003 NSCG documentation.

Table A1-2-1: Scientists and engineers in the U.S. by field of study, highest degree level and country of birth, 2003 - All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social	Engineering	S&E Re-lated
All Degree Lev-els	161 960 62	1 604 214	1 704 124	839 891	4 246 939	2 690 619	5 110 275
US-born	13 403 265	1 212 145	1 435 414	655 644	3 802 277	2 004 341	4 293 444
Foreign-born	2 792 799	392 069	268 710	184 248	444 662	686 278	816 832
Austria	6 957,83	862,35	753	1 183	397	907	2 854
Belgium	4856	56	718	348	1 115	1 317	1 303
Bulgaria	9 355	514	3 625	770	1 174	2 493	779
Czech Republic	2 693	354	520	798	284	630	107
Denmark	3 718	121	255	323	0	1 014	2 006
Finland	2 328	122	341	0	96	982	788
France	20 716	2 938	2 831	1 704	5 997	5 403	1 843
Germany	59685	5172	7113	3776	16146	12174	15 303
Greece	12 922	1 559	575	724	2 832	4 214	3 019
Hungary	10 680	416	1 280	1 516	1 406	2 187	3 875
Ireland	20 456	2 575	1 429	1 042	8 188	3 221	4 001
Italy	19 376	1 202	1 353	1 088	4 903	5 229	5 600
Luxembourg	125	0	66	59	0	0	0
Malta	864	80	0	0	0	149	635
Netherlands	11 353	1 229	1 711	1 445	2 187	2 540	2 242
Poland	38 247	3 468	2 546	2 810	8 332	12 908	8 185
Portugal	3 271	498	409	0	697	848	819
Romania	20 386	4 401	935	1 267	1 929	5 519	6 334
Spain	8 893	429	985	585	2 824	1 034	3 037
Sweden	5 771	894	0	0	1 226	1 405	2 246
United Kingdom	100 808	8 664	13 119	9 285	21 866	26 503	21 372
Slovakia	3 834	55	159	156	610	274	2 580
Slovenia	294	66	0	84	0	144	0
Estonia	1 439	160	0	188	848	242	0
Latvia	5 175	340	106	1 149	99	1 939	1 541
Lithuania	3 057	438	170	129	0	971	1 350
Cyprus	617	183	0	0	160	274	0
EU27	377 880	36 795	40 997	30 431	83 318	94 520	91 818
India	217 912	49 804	29 245	26 277	15 881	60 980	35 725
China	429 003	90 097	34 754	40 867	47 631	128 387	87 268

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A0-2-2: Scientists and engineers in the U.S. by field of study, highest degree level and country of birth, 2003 - Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social	Engineering	S&E Related
Bachelor's degree highest	10 490 000	1 077 873	1 184 433	503 846	3 095 748	1 917 865	2 713 286
US-born	9 010 764	886 035	1 054 658	422 400	2 795 965	1 529 317	2 322 390
Foreign-born	1 482 288	191 838	129 775	81 446	299 783	388 548	390 896
Austria	3 564	725	259	0	242	499	1 839
Belgium	2 673	0	357	0	1 059	867	389
Bulgaria	3 496	0	3107	226	0	163	0
Czech Republic	1 087	121	130	525	0	313	0
Denmark	1 486	121	0	164	0	206	995
Finland	853	122	0	0	0	619	112
France	7 786	1 438	1 221	579	1 528	2 601	420
Germany	29 123	3 434	1 260	1 024	10 104	7 479	5 822
Greece	5 926	300	106	0	1 787	2 085	1 649
Hungary	4 526	180	359	148	755	1 281	1 802
Ireland	8 780	1 604	302	439	3 747	2 688	0
Italy	11 005	559	554	162	3 797	3 870	2 062
Luxembourg	0	0	0	0	0	0	0
Malta	183	80	0	0	0	0	103
Netherlands	5 336	861	676	810	1 162	957	871
Poland	12 208	1 192	866	417	3 494	4 960	1 279
Portugal	2 080	282	95	0	612	451	641
Romania	8 120	1 792	582	0	1 196	2 245	2 305
Spain	3 092	360	0	0	1 500	252	980
Sweden	1 492	0	0	0	467	234	790
United King-	55 841	4 712	5 746	2 616	14 091	18 496	10 180
Slovakia	506	0	0	0	0	0	506
Slovenia	0	0	0	0	0	0	0
Estonia	1 034	0	0	0	793	242	0
Latvia	3463	0	106	825	99	1 145	1 288
Lithuania	1 278	438	0	0	0	686	155
Cyprus	108	0	0	0	0	108	0
EU27	175 046	18 320	15 727	7 934	46 433	52 446	34 186
India	55 688	9 096	3 434	6 521	7 809	17 798	11 031
China	188 122	32 704	11 551	22 197	33 939	57 406	30 326

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-2-3: Scientists and engineers in the U.S. by field of study, highest degree level and country of birth, 2003 - Master's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social	Engineering	S&E Related
Master's degree highest	3 430 671	455 876	257 789	159 296	861 540	626 206	1 069 964
US-born	2 722 578	288 178	206 930	116 373	761 927	399 003	950 169
Foreign-born	708 092	167 698	50 859	42 923	99 613	227 204	119 795
Austria	1 043	0	170	181	0	149	542
Belgium	601	56	157	0	0	313	76
Bulgaria	4 622	245	134	362	1 033	2 269	579
Czech Republic	788	233	0	0	130	318	107
Denmark	895	0	0	0	0	498	397
Finland	304	0	95	0	0	59	150
France	7 192	748	274	204	3 578	1 990	398
Germany	15 428	1 170	2 703	601	3 896	3 234	3 823
Greece	3 042	1 074	190	178	649	951	0
Hungary	2 746	236	504	410	333	529	734
Ireland	7 316	833	53	185	3 647	533	2 065
Italy	2 920	560	0	191	262	683	1 224
Luxembourg	0	0	0	0	0	0	0
Malta	628	0	0	0	0	96	532
Netherlands	3 394	113	522	134	969	1 260	396
Poland	17 597	1 302	1 024	838	4 148	7 678	2 607
Portugal	664	143	0	0	0	343	178
Romania	6 267	1 691	140	779	84	3 125	449
Spain	2 386	0	0	75	930	697	685
Sweden	2 101	509	0	0	183	925	484
United Kingdom	19 481	2 526	1 014	660	5 255	5 909	4 118
Slovakia	2 319	0	0	0	546	274	1 499
Slovenia	84	0	0	84	0	0	0
Estonia	186	53	0	133	0	0	0
Latvia	1 435	274	0	268	0	794	99
Lithuania	969	0	81	0	0	111	776
Cyprus	291	131	0	0	160	0	0
EU27	104 699	11 897	7 060	5 283	25 803	32 739	21 917
India	89 692	33 996	5 983	8 202	4 637	27 862	9 012
China	161 547	53 469	10 813	11 038	10 850	60 204	15 172

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A0-2-4: Scientists and engineers in the U.S. by field of study, highest degree level and country of birth, 2003 - Doctoral degree is highest.

	All S&E Fields	Comp/ Math	Bio/Ag/ Env/Life	Physical	Social	Engineer-ing	S&E Re-lated
Doctoral degree highest	1 030 656	70 465	261 902	176 749	269 700	146 548	105 292
US-born	705 094	37 931	173 826	116 871	226 274	76 022	74 169
Foreign-born	325 562	32 534	88 076	59 878	43 427	70 525	31 123
Austria	1 877	137	324	1 002	155	259	0
Belgium	744	0	204	348	56	136	0
Bulgaria	1 037	269	385	182	141	60	0
Czech Republic	818	0	391	273	154	0	0
Denmark	723	0	255	158	0	310	0
Finland	646	0	247	0	96	304	0
France	4 770	752	1 336	921	891	812	57
Germany	9 921	568	3 149	2 151	2 073	1 461	518
Greece	2 702	185	279	546	395	1 178	119
Hungary	2 068	0	416	959	231	376	86
Ireland	2 489	138	1 074	418	794	0	65
Italy	3 203	84	798	735	756	675	155
Luxembourg	125	0	66	59	0	0	0
Malta	53	0	0	0	0	53	0
Netherlands	1 733	255	512	501	56	323	85
Poland	5 009	974	655	1 555	618	270	936
Portugal	526	73	314	0	85	54	0
Romania	3 938	918	214	489	649	149	1 519
Spain	2 236	69	985	510	395	85	192
Sweden	1 207	385	0	0	576	246	0
United Kingdom	18 582	1 426	6 359	6 009	2 226	2 099	464
Slovakia	434	55	159	156	64	0	0
Slovenia	210	66	0	0	0	144	0
Estonia	219	107	0	56	56	0	0
Latvia	122	66	0	56	0	0	0
Lithuania	391	0	88	129	0	174	0
Cyprus	219	52	0	0	0	167	0
EU27	66 000	6 578	18 210	17 214	10 468	9 335	4 196
India	59 631	6 712	19 829	11 554	3 310	15 320	2 906
China	40 859	3 924	12 390	7 632	2 842	10 777	3 294

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A0-2-5: Scientists and engineers in the U.S. by field of study, highest degree level and country of birth, 2003 - Professional degree is highest.

	All S&E Fields	Comp/ Math	Bio/Ag/ Env/Life	Physical	Social	Engineering	S&E Related
Professional degree highest	1 241 685				19 951		1 221 734
US-born	964 828				18 112		946 716
Foreign-born	276 857				1 839		275 018
Austria	474				0		474
Belgium	838				0		838
Bulgaria	200				0		200
Czech Republic							
Denmark	614				0		614
Finland	526				0		526
France	968				0		968
Germany	5 212				73		5 140
Greece	1 252				0		1 252
Hungary	1 340				87		1 253
Ireland	1 871				0		1 871
Italy	2 249				89		2 160
Luxembourg							
Malta							
Netherlands	890				0		890
Poland	3 433				71		3 362
Portugal							
Romania	2 061				0		2 061
Spain	1 179				0		1 179
Sweden	972				0		972
United Kingdom	6 905				295		6 610
Slovakia	575				0		575
Slovenia							
Estonia							
Latvia	155				0		155
Lithuania	420				0		420
Cyprus							
EU27	32 134				615		31 520
India	12 901				125		12 776
China	38 476				0		38 476

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-3–1: Scientists and engineers in the U.S. by field of study, highest degree level and country where highest degree earned, 2003- All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/Related	Engineering	S&E Related
All Degree levels	16 196 062	1 604 214	1 704 124	839 891	4 246 939	2 690 619	5 110
US-born	14 759 355	1 461 159	1 570 867	723 962	4 018 892	2 360 678	4 623
Foreign-born	1 436 707	143 055	133 257	115 929	228 047	329 941	486 478
Austria	2 667	0	446	1 126	76	950	69
Belgium	3 787	114	1 034	436	656	621	925
Bulgaria	7 267	514	3 376	649	241	2 343	145
Czech Republic	2 023	220	419	286	546	273	279
Denmark	816	121	252	0	0	272	171
Finland	1 499	0	493	0	0	479	526
France	19 882	3 045	2 393	1 401	6 079	3 873	3 091
Germany	26 615	3 357	3 465	2 155	5 010	6 564	6 064
Greece	4 100	0	84	88	2 458	0	1 470
Hungary	3 810	154	121	182	215	723	2 416
Ireland	11 657	2 010	504	882	999	3 991	3 270
Italy	9 324	0	441	592	535	889	6 867
Luxembourg							
Malta							
Netherlands	8 545	437	595	1 271	1 649	3 058	1 536
Poland	24 944	710	1 151	2 142	5 736	10 260	4 946
Portugal							
Romania	15 372	1 962	0	848	355	4 385	7 822
Spain	7 458	0	657	177	2 039	309	4 275
Sweden	5 099	253	173	0	979	2 110	1 585
United Kingdom	101 843	10 858	12 400	9 132	26 318	27 357	15 778
Slovakia	1 217	0	547	0	0	0	670
Slovenia							
Estonia							
Latvia	2 061	683	0	76	0	1 147	155
Lithuania	2 016	393	0	73	0	474	1 075
Cyprus							
EU27	262 002	24 831	28 551	21 515	53 891	70 078	63 136
India	62 306	5 863	8 136	10 067	5 996	15 300	16 944
China	256 820	48 097	26 490	34 315	39 955	57 197	50 766

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-3–2: Scientists and engineers in the U.S. by field of study, highest degree level and country where highest degree earned, 2003- Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineering	S&E Related
Bachelor's degree is highest	10 490 000	1 077 873	1 184 433	503 846	3 095 748	1 917 865	2 713 286
US-born	9 628 242	994 230	1 112 860	440 189	2 932 056	1 674 715	2 474 192
Foreign-born	861 758	83 643	71 573	63 657	163 692	243 150	239 094
Austria	686	0	0	0	0	686	0
Belgium	1 457	0	357	0	656	443	0
Bulgaria	3 414	0	3 024	226	0	163	0
Czech Republic	366	0	87	0	0	0	279
Denmark	327	121	0	0	0	206	0
Finland	479	0	0	0	0	479	0
France	6 976	1 689	156	498	1 791	1 443	1 400
Germany	12 261	2 053	400	322	2 428	4 464	2 593
Greece	2 636	0	0	0	2 458	0	178
Hungary	1 383	72	0	0	0	279	1 032
Ireland	5 978	1 156	125	439	483	3 775	0
Italy	1 052	0	0	0	182	159	712
Luxembourg							
Malta							
Netherlands	3 041	343	167	810	343	1 014	365
Poland	7 238	0	471	0	1 928	4 055	784
Portugal							
Romania	5 560	569	0	0	81	1 476	3 434
Spain	1 225	0	0	0	973	252	0
Sweden	1 608	0	0	0	467	500	641
United Kingdom	49 546	5 837	3 701	2 424	10 947	18 811	7 827
Slovakia	227	0	0	0	0	0	227
Slovenia							
Estonia							
Latvia	816	237	0	0	0	579	0
Lithuania	932	393	0	0	0	384	155
Cyprus							
EU27	107 210	12 469	8 488	4 720	22 738	39 169	19 627
India	31 440	3 746	2 644	5 528	4 566	11 004	3 951
China	159 020	24 646	12 632	22 543	31 008	46 660	21 532

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-3–3: Scientists and engineers in the U.S. by field of study, highest degree level and country where highest degree earned, 2003- Master's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineering	S&E Related
Master's degree highest	3 430 671	455 876	257 789	159 296	861 540	626 206	1 069 964
US-born	3 174 179	405 710	237 302	135 004	806 572	555 275	1 034 316
Foreign-born	256 492	50 166	20 487	24 292	54 968	70 931	35 648
Austria	367	0	95	107	76	90	0
Belgium	292	114	0	0	0	178	0
Bulgaria	3 101	245	134	362	241	2 120	0
Czech Republic	984	165	0	0	546	273	0
Denmark	141	0	0	0	0	66	75
Finland	95	0	95	0	0	0	0
France	6 569	608	385	156	3 900	1 376	144
Germany	6 176	1 221	447	176	1 673	1 892	767
Greece							
Hungary	1 198	82	0	0	156	226	734
Ireland	2 017	743	135	0	516	129	494
Italy	2 082	0	0	504	83	114	1 380
Luxembourg							
Malta							
Netherlands	3 017	0	0	134	1 196	1 687	0
Poland	13 331	578	404	913	3 808	5 991	1 637
Portugal							
Romania	5 183	1 214	0	779	0	2 830	360
Spain	1 363	0	107	75	980	0	201
Sweden	2 133	0	0	0	450	1 199	484
United Kingdom	26 107	3 071	933	829	13 174	5 466	2 634
Slovakia	471	0	471	0	0	0	0
Slovenia							
Estonia							
Latvia	1 091	447	0	76	0	568	0
Lithuania	866	0	0	0	0	90	776
Cyprus							
EU27	76 584	8 488	3 205	4 110	26 800	24 294	9 687
India	12 804	1 612	1 914	2 771	948	3 366	2 193
China	62 488	23 031	7 936	8 530	8 335	9 131	5 525

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-3–4: Scientists and engineers in the U.S. by field of study, highest degree level and country where highest degree earned, 2003- Doctoral degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineer-ing	S&E Re-lated
Doctoral degree highest	1 030 656	70 465	261 902	176 749	269 700	146 548	105 292
US-born	908 656	61 219	220 705	148 769	260 313	130 688	86 962
Foreign-born	122 000	9 246	41 197	27 980	9 387	15 860	18 330
Austria	1 544	0	352	1 019	0	174	0
Belgium	1 112	0	677	436	0	0	0
Bulgaria	607	269	218	60	0	60	0
Czech Republic	673	55	332	286	0	0	0
Denmark	348	0	252	0	0	0	96
Finland	399	0	399	0	0	0	0
France	4 983	748	1 853	746	388	1 055	194
Germany	5 828	83	2 618	1 657	908	208	354
Greece	348	0	84	88	0	0	176
Hungary	665	0	121	182	60	217	86
Ireland	950	110	244	443	0	88	65
Italy	1 570	0	441	88	270	616	155
Luxembourg							
Malta							
Netherlands	1 538	95	428	327	110	356	222
Poland	2 313	132	276	1 228	0	214	462
Portugal							
Romania	2 614	179	0	69	274	79	2 013
Spain	892	0	550	103	85	57	96
Sweden	1 231	253	173	0	61	411	333
United Kingdom	22 729	1 951	7 766	5 880	2 197	3 080	1 856
Slovakia	75	0	75	0	0	0	0
Slovenia							
Estonia							
Latvia							
Lithuania	73	0	0	73	0	0	0
Cyprus							
EU27	50 491	3 874	16 857	12 685	4 353	6 615	6 106
India	8 425	505	3 578	1 768	481	930	1 164
China	12 130	420	5 922	3 242	612	1 406	528

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-3–5: Scientists and engineers in the U.S. by field of study, highest degree level and country where highest degree earned, 2003- Professional degree is highest.

	All S&E Fields	Comp/ Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineering	S&E Related
Professional degree highest	1 241 685				19 951		1 221 734
US-born	1 048 278				19 951		1 028 327
Foreign-born	193 407				0		193 407
Austria	69				0		69
Belgium	925				0		925
Bulgaria	145				0		145
Czech Republic							
Denmark							
Finland	526				0		526
France	1 354				0		1 354
Germany	2 350				0		2 350
Greece	1 116				0		1 116
Hungary	563				0		563
Ireland	2 711				0		2 712
Italy	4 621				0		4 621
Luxembourg							
Malta							
Netherlands	949				0		949
Poland	2 062				0		2 062
Portugal							
Romania	2 015				0		2 015
Spain	3 978				0		3 978
Sweden	127				0		127
United Kingdom	3 461				0		3 461
Slovakia	443				0		443
Slovenia							
Estonia							
Latvia	155				0		155
Lithuania	145				0		145
Cyprus							
EU27	27 716				0		27 716
India	9 637				0		9 637
China	23 181				0		23 181

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-4-1: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of birth, 2003 – All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/Env/Life	Physical	Social/Related	Engineering	S&E Related
All Degree levels	7 690 304	1 324 123	381 653	276	339 474	1 271 820	4 096
US-born	6 133 892	928 821	284 086	216	297 925	1 005 219	3 401
Foreign-born	1 556 412	395 302	97 567	59 752	41 549	266 602	695 641
Austria	4 566	348	518	477	155	383	2 685
Belgium	2 810	276	202	135	56	327	1 814
Bulgaria	4 553	506	445	326	784	1 386	1 107
Czech Republic	1 599	600	315	143	71	268	201
Denmark	3 478	199	192	140	0	658	2 288
Finland	1 476	561	183	0	96	186	452
France	10 311	4 924	569	795	611	1 389	2 023
Germany	25 755	4 155	3 203	1 730	1 754	5 441	9 472
Greece	6 711	1 241	504	443	235	2 456	1 832
Hungary	5 939	671	182	355	318	980	3 432
Ireland	8 134	1 080	855	359	1 027	1 450	3 363
Italy	9 690	1 655	1 022	450	712	1 536	4 315
Luxembourg	66	0	0	0	0	0	66
Malta	654	80	0	0	0	252	322
Netherlands	5 732	1 179	482	261	181	1 041	2 587
Poland	18 939	3 431	2 054	1 164	544	4 021	7 726
Portugal	1 692	642	252	81	85	391	240
Romania	13 718	4 639	392	471	226	2 991	4 999
Spain	4 904	598	550	510	302	660	2 284
Sweden	3 665	712	0	0	160	523	2 270
United Kingdom	52 941	10 361	4 771	2 485	2 424	12 330	20 570
Slovakia	1 190	0	158	88	0	73	871
Slovenia	210	154	0	0	0	56	0
Estonia	326	107	0	56	0	0	163
Latvia	2 324	66	106	56	0	814	1 282
Lithuania	1 091	116	88	0	0	478	409
Cyprus	297	131	0	0	0	167	0
EU27	192 770	38 433	17 044	10 524	9 741	40 256	76 772
India	154 496	56 741	25 238	10 744	1 933	28 879	30 960
China	269 679	116 772	12 190	10 368	1 977	41 041	87 331

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-4-2: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of birth, 2003 – Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/En /Life	Physical	Social/ Related	Engineer-ing	S&E Re-lated
Bachelor's degree highest	4 161 316	837 905	125 581	109 294	55 134	843 645	2 189 756
US-born	3 495 570	661 791	111 526	95 248	50 394	725 190	1 851 421
Foreign-born	665 747	176 115	14 055	14 047	4 740	118 455	338 335
Austria	2 583	126	99	0	0	216	2 141
Belgium	963	94	0	0	0	0	868
Bulgaria	163	0	0	0	0	163	0
Czech Republic	371	242	0	0	0	0	130
Denmark	1 486	121	0	0	0	85	1 280
Finland	647	465	0	0	0	70	112
France	3 456	2 426	0	0	0	377	653
Germany	8 813	2 478	156	0	0	2 587	3 592
Greece	2 373	74	106	0	0	1 323	870
Hungary	2 679	273	99	0	0	536	1 770
Ireland	2 477	294	0	0	0	1 117	1 066
Italy	3 663	1 308	0	80	0	795	1 479
Luxembourg							
Malta	183	80	0	0	0	103	0
Netherlands	2 023	740	167	0	0	382	734
Poland	3 924	1 145	481	169	0	680	1 449
Portugal	565	462	0	0	0	103	0
Romania	3 728	1 659	0	0	0	609	1 460
Spain	519	80	0	0	0	252	187
Sweden	943	0	0	0	0	153	790
United Kingdom	26 324	6 968	214	378	0	7 414	11 350
Slovakia	227	0	0	0	0	0	227
Slovenia							
Estonia	163	0	0	0	0	0	163
Latvia	1 388	0	106	0	0	0	1 282
Lithuania	555	116	0	0	0	175	264
Cyprus							
EU27	70 215	19 152	1 428	627	0	17 142	31 867
India	26 712	7 629	1 440	1 773	345	6 086	9 438
China	95 973	50 669	1 098	2 497	228	11 127	30 352

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-4-3: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of birth, 2003 – Master's degree is highest.

	All S&E Fields	Comp/ Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineering	S&E Re-lated
Master's degree highest	1 783 848	397 140	78 231	73 030	129 934	332 325	773 188
US-born	1 354 598	222 406	63 795	57 840	117 050	229 591	663 917
Foreign-born	429 251	174 733	14 437	15 190	12 885	102 734	109 271
Austria	431	0	95	107	0	90	139
Belgium	601	111	67	0	0	191	233
Bulgaria	3 208	420	45	121	698	1 097	826
Czech Republic	469	201	0	0	0	196	72
Denmark	895	0	0	0	0	573	322
Finland	250	96	95	0	0	59	0
France	2 670	1 385	155	0	249	613	267
Germany	7 135	890	1 109	301	802	2 069	1 962
Greece	1 579	927	0	286	0	272	94
Hungary	1 316	145	0	0	0	243	928
Ireland	2 899	759	53	0	554	223	1 310
Italy	1 655	204	0	97	97	297	960
Luxembourg							
Malta	418	0	0	0	0	96	322
Netherlands	1 454	184	0	59	181	405	625
Poland	8 245	1 497	199	224	0	3 101	3 223
Portugal	600	107	0	81	0	233	178
Romania	4 800	2 052	70	169	0	2 207	302
Spain	1 626	363	0	0	170	409	685
Sweden	1 213	712	0	0	88	285	127
United Kingdom	8 587	1 679	144	244	688	3 144	2 688
Slovakia	73	0	0	0	0	73	0
Slovenia							
Estonia							
Latvia	814	0	0	0	0	814	0
Lithuania	56	0	0	0	0	56	0
Cyprus	131	131	0	0	0	0	0
EU27	51 123	11 864	2 033	1 689	3 527	16 745	15 264
India	68 798	37 317	4 924	3 914	528	12 918	9 196
China	108 716	60 751	2 113	2 959	621	22 703	19 568

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-4-4: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of birth, 2003 – Doctoral degree is highest

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineer- ing	S&E Re- lated
Doctoral degree highest	682 714	87 240	161 173	93 475	140 579	95 403	104 844
US-born	448 025	43 691	99 197	63 196	118 598	50 096	73 247
Foreign-born	234 689	43 549	61 976	30 279	21 982	45 307	31 597
Austria	1 148	222	324	370	155	77	0
Belgium	672	71	135	135	56	136	139
Bulgaria	982	85	200	205	86	126	280
Czech Republic	759	158	315	143	71	72	0
Denmark	483	79	192	140	0	0	72
Finland	580	0	88	0	96	56	340
France	3 425	1 113	414	795	362	399	342
Germany	6 565	787	1 741	1 429	879	785	944
Greece	1 891	240	398	157	235	861	0
Hungary	1 210	253	83	355	231	201	86
Ireland	1 970	28	802	359	472	110	199
Italy	2 251	143	580	273	526	443	285
Luxembourg	66	0	0	0	0	0	66
Malta	53	0	0	0	0	53	0
Netherlands	1 365	255	315	202	0	254	338
Poland	3 816	788	1.374	772	472	240	170
Portugal	526	73	252	0	85	54	62
Romania	3 258	928	214	301	226	70	1 519
Spain	1 580	155	550	510	133	0	233
Sweden	624	0	0	0	71	85	467
United Kingdom	12 318	1 713	4 283	1 862	1 442	1 772	1 246
Slovakia	315	0	158	88	0	0	69
Slovenia	210	154	0	0	0	56	0
Estonia	163	107	0	56	0	0	0
Latvia	122	66	0	56	0	0	0
Lithuania	335	0	88	0	0	247	0
Cyprus	167	0	0	0	0	167	0
EU27	46 852	7 417	12 506	8 208	5 599	6 264	6 858
India	48 345	11 251	15 704	5 057	988	9 875	5 470
China	29 547	5 351	8 345	4 912	1 128	7 210	2 600

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-4-5: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of birth, 2003 – Professional degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineer- ing	S&E Re- lated
Profesional degree highest	1 062 426	1 839	16 668	513	13 827	447	1 029 133
US-born	835 700	933	9 569	276	11 884	342	812 696
Foreign-born	226 727	905	7 099	237	1 943	105	216 437
Austria	405	0	0	0	0	0	405
Belgium	574	0	0	0	0	0	574
Bulgaria	200	0	200	0	0	0	0
Czech Republic							
Denmark	614	0	0	0	0	0	614
Finland							
France	762	0	0	0	0	0	762
Germany	3 242	0	196	0	73	0	2 974
Greece	868	0	0	0	0	0	868
Hungary	735	0	0	0	87	0	648
Ireland	788	0	0	0	0	0	789
Italy	2 122	0	442	0	89	0	1 590
Luxembourg							
Malta							
Netherlands	890	0	0	0	0	0	890
Poland	2 955	0	0	0	71	0	2 883
Portugal							
Romania	1 932	0	108	0	0	105	1 718
Spain	1 179	0	0	0	0	0	1 179
Sweden	885	0	0	0	0	0	885
United Kingdom	5 711	0	130	0	295	0	5 287
Slovakia	575	0	0	0	0	0	575
Slovenia							
Estonia							
Latvia							
Lithuania	145	0	0	0	0	0	145
Cyprus							
EU27	24 580	0	1 076	0	615	105	22 784
India	10 642	544	3 170	0	71	0	6 856
China	35 444	0	634	0	0	0	34 810

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-5-1: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of highest degree, 2003- All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/Env/Life	Physical	Social/Related	Engineering	S&E Related
All Degree levels	7 690 304	1 324 123	381 653	276 312	339 474	1 271 820	4 096 921
US-born	6 955 423	1 161 694	329 597	248	330 400	1 177 282	3 707
Foreign-born	734 881	162 429	52 056	27 558	9 074	94 538	389 227
Austria	1 324	0	446	280	76	221	302
Belgium	2 061	295	201	223	0	0	1 341
Bulgaria	2 670	506	174	204	0	1.303	483
Czech Republic	883	94	418	159	0	0	212
Denmark	816	121	289	0	0	226	180
Finland	906	343	493	0	0	70	0
France	9 298	4 596	922	626	202	771	2 182
Germany	10 922	3 114	2 059	788	262	1 841	2 857
Greece	994	0	84	0	0	0	911
Hungary	3 174	196	0	59	60	502	2 357
Ireland	7 054	863	350	154	0	1 989	3 699
Italy	5 720	114	727	0	173	295	4 411
Luxembourg							
Malta							
Netherlands	4 370	962	398	330	95	1 215	1 371
Poland	9 939	1 225	1.443	567	0	2 536	4 167
Portugal							
Romania	12 033	3 178	108	169	0	2 467	6 109
Spain	4 855	681	557	0	0	384	3 233
Sweden	2 856	481	269	0	61	915	1 130
United Kingdom	51 708	11 210	5 675	2 768	2 538	12 305	17 211
Slovakia	746	75	0	0	0	0	670
Slovenia							
Estonia							
Latvia	1 329	530	0	0	0	644	155
Lithuania	827	278	0	0	0	141	409
Cyprus							
EU27	134 484	28 862	14 614	6 329	3 465	27 825	53 390
India	38 822	7 440	10 744	3 308	120	3 506	13 703
China	144 570	68 644	7 049	5 009	237	11 449	52 181

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-5-2: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of highest degree, 2003- Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env/Life	Physical	Social/ Related	Engineering	S&E Re-lated
Bachelor's degree highest	4 161 316	837 905	125 581	109 294	55 134	843 645	2 189 756
US-born	3 792 465	743 875	117 451	100 595	52 993	786 671	1 990 878
Foreign-born	368 851	94 030	8 130	8 699	2 141	56 974	198 878
Austria	432	0	0	0	0	131	302
Belgium	256	0	0	0	0	0	256
Bulgaria	163	0	0	0	0	163	0
Czech Republic	87	0	87	0	0	0	0
Denmark	327	121	0	0	0	85	121
Finland	413	343	0	0	0	70	0
France	2 142	1 576	0	0	0	158	408
Germany	2 929	1 765	0	0	0	669	494
Greece	178	0	0	0	0	0	178
Hungary	1 177	0	0	0	0	72	1 105
Ireland	3 510	194	125	0	0	1 750	1 441
Italy	808	0	0	0	0	96	712
Luxembourg							
Malta							
Netherlands	1 240	343	167	0	0	366	365
Poland	581	0	256	73	0	82	170
Portugal							
Romania	3 712	1 155	0	0	0	436	2 120
Spain	252	0	0	0	0	252	0
Sweden	861	0	0	0	0	153	708
United Kingdom	22 472	7 112	119	145	0	6 279	8 817
Slovakia	227	0	0	0	0	0	227
Slovenia							
Estonia							
Latvia	357	357	0	0	0	0	0
Lithuania	519	188	0	0	0	67	264
Cyprus							
EU27	42 645	13 153	755	218	0	10 830	17 689
India	13 183	2 807	1 440	1 678	0	1 652	5 607
China	78 336	43 701	834	1 856	56	7 653	24 237

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-5-3: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of highest degree, 2003- Master's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineer- ing	S&E Re- lated
Master's degree highest	1 783 848	397 140	78 231	73 030	129 934	332 325	773 188
US-born	1 651 149	341 928	72 074	67 219	125 616	304 933	739 380
Foreign-born	132 699	55 212	6 157	5 811	4 318	27 392	33 808
Austria	367	0	95	107	76	90	0
Belgium	292	225	0	0	0	0	67
Bulgaria	1 755	420	45	121	0	1 014	154
Czech Republic	237	94	0	0	0	0	143
Denmark	141	0	0	0	0	141	0
Finland	95	0	95	0	0	0	0
France	2 086	1 501	0	66	142	110	267
Germany	2 633	1 114	345	0	63	788	324
Greece							
Hungary	1 051	75	0	0	0	160	817
Ireland	1 426	669	0	0	0	129	629
Italy	416	114	0	0	0	0	302
Luxembourg							
Malta							
Netherlands	1 531	525	0	59	95	492	361
Poland	5 525	869	130	0	0	2 320	2 206
Portugal							
Romania	4 165	1 765	0	169	0	2 031	199
Spain	957	681	0	0	0	75	201
Sweden	889	481	0	0	0	282	127
United Kingdom	10 689	2.059	110	528	1 560	3 788	2 645
Slovakia							
Slovenia							
Estonia							
Latvia	817	173	0	0	0	644	0
Lithuania	90	90	0	0	0	0	0
Cyprus							
EU27	35 162	10 853	819	1 049	1 935	12 063	8 442
India	9 977	3 258	2 381	826	121	1 072	2 319
China	35 540	23 945	810	1 406	107	2 890	6 382

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-5-4: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of highest degree, 2003- Doctoral degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineer- ing	S&E Re- lated
Doctoral degree highest	682 714	87 240	161 173	93 475	140 579	95 403	104 844
US-born	597 923	74 958	130 037	80 664	138 073	85 230	88 961
Foreign-born	84 791	12 282	31 136	12 811	2 506	10 173	15 883
Austria	525	0	352	174	0	0	0
Belgium	724	71	201	223	0	0	229
Bulgaria	607	85	129	83	0	126	184
Czech Republic	559	0	331	159	0	0	69
Denmark	348	0	289	0	0	0	60
Finland	399	0	399	0	0	0	0
France	3 902	1 418	922	560	60	503	440
Germany	3 336	235	1 177	788	199	384	553
Greece	84	0	84	0	0	0	0
Hungary	596	121	0	59	60	270	86
Ireland	489	0	225	154	0	110	0
Italy	880	0	353	0	173	198	155
Luxembourg							
Malta							
Netherlands	1 235	95	231	271	0	356	282
Poland	2 150	356	1 057	494	0	135	108
Portugal							
Romania	2 271	258	0	0	0	0	2 013
Spain	698	0	557	0	0	57	84
Sweden	978	0	269	0	61	480	168
United Kingdom	15 827	2 040	5 446	2 096	978	2 237	3 030
Slovakia	75	75	0	0	0	0	0
Slovenia							
Estonia							
Latvia							
Lithuania	73	0	0	0	0	73	0
Cyprus							
EU27	35 757	4 754	12 020	5 062	1 530	4 932	7 460
India	7 299	831	3 955	805	0	782	926
China	9 179	998	4 770	1.748	74	906	683

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-5-5: Scientists and engineers defined by field of study, S&E occupation, highest degree level and country of highest degree, 2003- Professional degree is highest.

	All S&E Fields	Comp/ Math	Bio/Ag/En v/Life	Physical	Social/ Related	Engineering	S&E Re- lated
Professional degree highest	1 062 426	1 839	16 668	513	13 827	447	1 029 133
US-born	913 885	933	10 035	276	13 719	447	888 475
Foreign-born	148 541	906	6 633	237	108	0	140 658
Austria							
Belgium	789	0	0	0	0	0	789
Bulgaria	145	0	0	0	0	0	145
Czech Republic							
Denmark							
Finland							
France	1 168	101	0	0	0	0	1 067
Germany	2 023	0	538	0	0	0	1 485
Greece	732	0	0	0	0	0	732
Hungary	350	0	0	0	0	0	350
Ireland	1 629	0	0	0	0	0	1 629
Italy	3 616	0	373	0	0	0	3 242
Luxembourg							
Malta							
Netherlands	363	0	0	0	0	0	363
Poland	1 683	0	0	0	0	0	1 683
Portugal							
Romania	1.885	0	108	0	0	0	1.777
Spain	2 948	0	0	0	0	0	2 948
Sweden	127	0	0	0	0	0	127
United Kingdom	2 719	0	0	0	0	0	2 719
Slovakia	443	0	0	0	0	0	443
Slovenia							
Estonia							
Latvia	155	0	0	0	0	0	155
Lithuania	145	0	0	0	0	0	145
Cyprus							
EU27	20 920	101	1 020	0	0	0	19 799
India	8 363	544	2 968	0	0	0	4 851
China	21 515	0	634	0	0	0	20 881

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-6-1: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of birth, 2003 – All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/Env/ Life	Physical	Social/ Related	Engineering	S&E Related
All Degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
Austria	3 079	222	363	340	85	221	1 848
Belgium	1 983	181	202	135	0	212	1 253
Bulgaria	4 353	506	245	326	784	1 386	1 107
Czech Republic	1 147	493	243	71	0	139	201
Denmark	2 300	121	192	63	0	599	1 325
Finland	1 163	465	183	0	96	126	293
France	8 967	4 697	463	710	493	1 249	1 356
Germany	14 786	2 543	2 144	1 377	1 019	3 432	4 270
Greece	4 551	1 010	398	346	235	1 019	1 542
Hungary	3 996	196	83	299	318	580	2 521
Ireland	8 021	1 080	855	359	1 027	1 450	3 249
Italy	5 317	929	966	129	506	514	2 272
Luxembourg	66	0	0	0	0	0	66
Malta	574	0	0	0	0	252	322
Netherlands	4 217	782	399	261	181	885	1 708
Poland	15 649	2 580	1 896	1 013	432	3 101	6 627
Portugal	534	153	180	0	85	54	62
Romania	12 617	4 484	248	471	0	2 886	4 528
Spain	3 339	407	550	72	0	470	1 840
Sweden	3 118	712	0	0	160	441	1 805
United Kingdom	39 709	8 680	4 007	2 288	2 059	9 657	13 018
Slovakia	542	0	158	88	0	0	296
Slovenia	210	154	0	0	0	56	0
Estonia	107	107	0	0	0	0	0
Latvia	1 002	66	0	0	0	814	122
Lithuania	754	116	88	0	0	141	409
Cyprus	297	131	0	0	0	167	0
EU27	142 397	30 815	13 863	8 348	7 480	29 850	52 041
India	144 234	54 172	24 834	10 372	1 444	27 069	26 343
China	252 223	112 176	11 389	9 635	1 821	39 468	77 734

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-6-2: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of birth, 2003 – Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineering	S&E Re-lated
Bachelor's degree highest	495 760	128 898	9 328	11 795	3 628	84 526	257 585
Austria	1 849	0	0	0	0	131	1 718
Belgium	444	0	0	0	0	0	444
Bulgaria	163	0	0	0	0	163	0
Czech Republic	371	242	0	0	0	0	130
Denmark	1 016	121	0	0	0	85	810
Finland	647	465	0	0	0	70	112
France	2 991	2 346	0	0	0	237	408
Germany	4 022	1 283	0	0	0	1 188	1 551
Greece	1 014	0	0	0	0	144	870
Hungary	1 241	0	0	0	0	136	1 105
Ireland	2 477	294	0	0	0	1 117	1 066
Italy	1 294	582	0	0	0	0	712
Luxembourg							
Malta	103	0	0	0	0	103	0
Netherlands	1 152	343	167	0	0	281	362
Poland	2 457	403	481	73	0	158	1 341
Portugal	80	80	0	0	0	0	0
Romania	3 178	1 579	0	0	0	609	990
Spain	439	0	0	0	0	252	187
Sweden	943	0	0	0	0	153	790
United Kingdom	19 617	5 724	0	378	0	5 187	8 329
Slovakia	227	0	0	0	0	0	227
Slovenia							
Estonia							
Latvia	122	0	0	0	0	0	122
Lithuania	448	116	0	0	0	67	264
Cyprus							
EU27	46 294	13 576	648	451	0	10 081	21 538
India	21 470	6 083	1 195	1 678	0	5 315	7 199
China	88 774	47 930	834	2 497	228	10 240	27 046

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-6-3: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of birth, 2003 – Master's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env/Life	Physical	Social/ Related	Engineering	S&E Related
Master's degree highest	372 192	159 076	11 357	12 991	9 517	88 747	90 504
Austria	292	0	95	107	0	90	0
Belgium	486	111	67	0	0	76	233
Bulgaria	3 208	420	45	121	698	1.097	826
Czech Republic	233	94	0	0	0	68	72
Denmark	513	0	0	0	0	513	0
Finland	95	0	95	0	0	0	0
France	2 521	1 238	155	0	249	613	267
Germany	4 299	734	559	301	459	1 706	539
Greece	1 267	770	0	190	0	213	94
Hungary	1 246	75	0	0	0	243	928
Ireland	2 841	759	53	0	554	223	1 252
Italy	673	204	0	0	97	70	302
Luxembourg							
Malta	418	0	0	0	0	96	322
Netherlands	1 401	184	0	59	181	405	571
Poland	7 025	1.389	199	224	0	2 760	2 453
Portugal							
Romania	4 725	1 977	70	169	0	2 207	302
Spain	1 155	252	0	0	0	218	685
Sweden	1 130	712	0	0	88	202	127
United Kingdom	6 466	1.354	110	130	688	2 833	1 352
Slovakia							
Slovenia							
Estonia							
Latvia	814	0	0	0	0	814	0
Lithuania							
Cyprus	131	131	0	0	0	0	0
EU27	40 938	10 404	1 449	1 301	3 013	14 447	10 324
India	66 342	36 294	4 924	3 698	528	12 290	8 608
China	104 497	58 967	2 113	2 368	535	22 162	18 351

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-6-4: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of birth, 2003 – Doctoral degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/ Env/Life	Physical	Social/ Related	Engineering	S&E Related
Doctoral degree highest	213 058	41 724	58 398	26 968	15 801	41 306	28 862
Austria	809	222	268	233	85	0	0
Belgium	617	71	135	135	0	136	139
Bulgaria	982	85	200	205	86	126	280
Czech Republic	543	158	243	71	0	72	0
Denmark	327	0	192	63	0	0	72
Finland	421	0	88	0	96	56	182
France	3 115	1 113	308	710	244	399	342
Germany	4 891	526	1 389	1 076	489	538	873
Greece	1 692	240	398	157	235	662	0
Hungary	1 021	121	83	299	231	201	86
Ireland	1 970	28	802	359	472	110	199
Italy	1 786	143	524	129	321	443	225
Luxembourg	66	0	0	0	0	0	66
Malta	53	0	0	0	0	53	0
Netherlands	1 170	255	232	202	0	198	282
Poland	3 372	788	1 215	716	360	184	108
Portugal	454	73	180	0	85	54	62
Romania	2 888	928	69	301	0	70	1 519
Spain	860	155	550	72	0	0	84
Sweden	624	0	0	0	71	85	467
United Kingdom	10 932	1 603	3 897	1 780	1 077	1 638	938
Slovakia	315	0	158	88	0	0	69
Slovenia	210	154	0	0	0	56	0
Estonia	107	107	0	0	0	0	0
Latvia	66	66	0	0	0	0	0
Lithuania	162	0	88	0	0	73	0
Cyprus	167	0	0	0	0	167	0
EU27	39 618	6 835	11 020	6 595	3 852	5 322	5 994
India	47 492	11 251	15 544	4 996	916	9 464	5 321
China	28 502	5 280	7 808	4 769	1 057	7 066	2 522

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-6-5: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of birth, 2003 – Professional degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineering	S&E Re-lated
Professional de-gree highest	159 732	905	6 120	237	1 341	0	151 129
Austria	130	0	0	0	0		130
Belgium	436	0	0	0	0		436
Bulgaria							
Czech Republic							
Denmark	444	0	0	0	0		444
Finland							
France	339	0	0	0	0		339
Germany	1 575	0	196	0	73		1 306
Greece	578	0	0	0	0		578
Hungary	489	0	0	0	87		402
Ireland	733	0	0	0	0		733
Italy	1 565	0	442	0	89		1 033
Luxembourg							
Malta							
Netherlands	493	0	0	0	0		493
Poland	2 796	0	0	0	71		2 725
Portugal							
Romania	1 827	0	108	0	0		1 718
Spain	884	0	0	0	0		884
Sweden	420	0	0	0	0		420
United Kingdom	2 694	0	0	0	295		2 400
Slovakia							
Slovenia							
Estonia							
Latvia							
Lithuania	145	0	0	0	0		145
Cyprus							
EU27	15 546	0	747	0	615		14 185
India	8 930	544	3 170	0	0		5 216
China	30 449	0	634	0	0		29 815

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-7-1:Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of highest degree, 2003 – All Degree levels.

	All S&E Fields	Comp/Math	Bio/Ag/Env/ Life	Physical	Social/ Related	Engineering	S&E Re-lated
All Degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
Austria	1 324	0	446	280	76	221	302
Belgium	1 424	295	201	66	0	0	862
Bulgaria	2 670	506	174	204	0	1 303	483
Czech Republic	796	94	331	159	0	0	212
Denmark	816	121	289	0	0	226	180
Finland	596	343	183	0	0	70	0
France	8 108	3 566	763	626	202	771	2 182
Germany	7 647	1 053	1 717	729	262	1 841	2 045
Greece	994	0	84	0	0	0	911
Hungary	2 962	196	0	59	60	502	2 146
Ireland	5 345	863	225	154	0	1 095	3 009
Italy	4 611	114	727	0	173	198	3 398
Luxembourg							
Malta							
Netherlands	4 087	962	398	330	95	1 215	1 089
Poland	9 880	1 225	1 443	567	0	2 536	4 108
Portugal							
Romania	11 958	3 104	108	169	0	2 467	6 109
Spain	2 175	0	557	0	0	384	1 235
Sweden	2 639	481	192	0	0	836	1 130
United Kingdom	43 346	9 672	5 511	2 683	1 469	11 337	12 674
Slovakia	746	75	0	0	0	0	670
Slovenia							
Estonia							
Latvia	1 329	530	0	0	0	644	155
Lithuania	827	278	0	0	0	141	409
Cyprus							
EU27	114 281	23 477	13 348	6 026	2 335	25 788	43 307
India	38 577	7 440	10 499	3 308	121	3 506	13 703
China	143 240	68 338	6 996	5 009	237	11 154	51 507

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-7-2: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of highest degree, 2003 – Bachelor's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineering	S&E Re-lated
Bachelor's degree highest	495 760	128 898	9 328	11 795	3 628	84 526	257 585
Austria	432	0	0	0	0	131	302
Belgium	256	0	0	0	0	0	256
Bulgaria	163	0	0	0	0	163	0
Czech Republic							
Denmark	327	121	0	0	0	85	121
Finland	413	343	0	0	0	70	0
France	2 142	1 576	0	0	0	158	408
Germany	1 982	818	0	0	0	669	494
Greece	178	0	0	0	0	0	178
Hungary	1 177	0	0	0	0	72	1 105
Ireland	2 491	194	0	0	0	856	1 441
Italy	712	0	0	0	0	0	712
Luxembourg							
Malta							
Netherlands	958	343	167	0	0	366	82
Poland	581	0	256	73	0	82	170
Portugal							
Romania	3 712	1 155	0	0	0	436	2 120
Spain	252	0	0	0	0	252	0
Sweden	861	0	0	0	0	153	708
United Kingdom	19 265	5 853	119	145	0	6 003	7 146
Slovakia	227	0	0	0	0	0	227
Slovenia							
Estonia							
Latvia	357	357	0	0	0	0	0
Lithuania	519	188	0	0	0	67	264
Cyprus							
EU27	37 006	10 947	543	218	0	9 563	15 735
India	12 938	2 807	1 195	1 678	0	1 652	5 607
China	77 842	43 503	834	1 856	56	7 357	24 237

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-7-3: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of highest degree, 2003 – Master's degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineering	S&E Related
Master's degree highest	372 192	159 076	11 357	12 991	9 517	88 747	90 504
Austria	367	0	95	107	76	90	0
Belgium	292	225	0	0	0	0	67
Bulgaria	1 755	420	45	121	0	1 014	154
Czech Republic	237	94	0	0	0	0	143
Denmark	141	0	0	0	0	141	0
Finland	95	0	95	0	0	0	0
France	1 203	618	0	66	142	110	267
Germany	1 413	0	345	0	63	788	217
Greece							
Hungary	1 051	75	0	0	0	160	817
Ireland	1 099	669	0	0	0	129	301
Italy	416	114	0	0	0	0	302
Luxembourg							
Malta							
Netherlands	1 531	525	0	59	95	492	361
Poland	5 525	869	130	0	0	2 320	2 206
Portugal							
Romania	4 090	1.690	0	169	0	2 031	199
Spain	276	0	0	0	0	75	201
Sweden	810	481	0	0	0	202	127
United Kingdom	7 843	1 932	110	442	490	3 336	1 532
Slovakia							
Slovenia							
Estonia							
Latvia	817	173	0	0	0	644	0
Lithuania	90	90	0	0	0	0	0
Cyprus							
EU27	29 050	7 975	819	964	866	11 532	6 894
India	9 977	3 258	2 381	826	121	1 072	2 319
China	35 540	23 945	810	1 406	107	2 890	6 382

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-7-4: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of highest degree, 2003 – Doctoral degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env /Life	Physical	Social/ Related	Engineering	S&E Re-lated
Doctoral degree highest	213 058	41 724	58 398	26 968	15 801	41 306	28 862
Austria	525	0	352	174	0	0	0
Belgium	567	71	201	66	0	0	229
Bulgaria	607	85	129	83	0	126	184
Czech Republic	559	0	331	159	0	0	69
Denmark	348	0	289	0	0	0	60
Finland	88	0	88	0	0	0	0
France	3 595	1 270	763	560	60	503	440
Germany	2 953	235	1 177	729	199	384	230
Greece	84	0	84	0	0	0	0
Hungary	596	121	0	59	60	270	86
Ireland	489	0	225	154	0	110	0
Italy	880	0	353	0	173	198	155
Luxembourg							
Malta							
Netherlands	1 235	95	231	271	0	356	282
Poland	2 150	356	1.057	494	0	135	108
Portugal							
Romania	2 271	258	0	0	0	0	2 013
Spain	698	0	557	0	0	57	84
Sweden	840	0	192	0	0	480	168
United Kingdom	13 801	1 887	5 281	2 096	978	1 998	1 561
Slovakia	75	75	0	0	0	0	0
Slovenia							
Estonia							
Latvia							
Lithuania	73	0	0	0	0	73	0
Cyprus							
EU27	32 435	4 453	11 308	4 845	1 469	4 692	5 667
India	7 299	831	3 955	805	0	782	926
China	9 018	891	4 717	1 748	74	906	683

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-7-5: Adult immigrants educated in S&E fields, by S&E occupation, highest degree level and country of highest degree, 2003 – Professional degree is highest.

	All S&E Fields	Comp/Math	Bio/Ag/Env/Life	Physical	Social/ Related	Engineering	S&E Re-lated
Professional degree highest	159 732	905	6 120	237	1 341	0	151 129
Austria							
Belgium	309	0	0	0	0		309
Bulgaria	145	0	0	0	0		145
Czech Republic							
Denmark							
Finland							
France	1 168	101	0	0	0		1 067
Germany	1 299	0	196	0	0		1 103
Greece	732	0	0	0	0		732
Hungary	138	0	0	0	0		138
Ireland	1 267	0	0	0	0		1 267
Italy	2 603	0	373	0	0		2 230
Luxembourg							
Malta							
Netherlands	363	0	0	0	0		363
Poland	1 624	0	0	0	0		1 624
Portugal							
Romania	1 885	0	108	0	0		1 777
Spain	950	0	0	0	0		950
Sweden	127	0	0	0	0		127
United Kingdom	2 436	0	0	0	0		2 436
Slovakia	443	0	0	0	0		443
Slovenia							
Estonia							
Latvia	155	0	0	0	0		155
Lithuania	145	0	0	0	0		145
Cyprus							
EU27	15 790	101	678	0	0		15 011
India	8 363	544	2 968	0	0		4 851
China	20 840	0	634	0	0		20 206

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-8-1: Visa type, degree level, nativity, and location of highest degree for adult migrants trained and employed in S&E occupations, 2003 – All Degree levels.

	Green Card	Temporary Work	Study/ Training	Family De-pended	Other	Total
All Degree levels	332 124	248 801	487 699	82110	90 009	1 240 743
Birth country						
EU27	36 098	32 674	49 756	9 151	14 717	142 397
Non-EU27	296 026	216 127	437 944	72 958	75 292	1 098 346
Highest degree country						
EU27	30 290	35 540	29 135	7 629	11 688	114 281
Non-EU27	301 835	213 260	458 564	74 481	78 322	1 126 462

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-8-2: Visa type, degree level, nativity, and location of highest degree for adult migrants trained and employed in S&E occupations, 2003 – Bachelor's degree is highest.

	Green Card	Temporary Work	Study/ Train-ing	Family De-pended	Other	Total
Bachelor's degree highest	189 299	147 837	79 447	36 193	42 984	495 760
Birth country						
EU27	15 988	13 440	7 386	3 129	6 351	46 294
Non-EU27	173 311	134 398	72 061	33 064	36 633	449 466
Highest degree country						
EU27	11 452	14 713	4 253	1 720	4 868	37 006
Non-EU27	177 848	133 124	75 194	34 473	38 116	458 754

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-8-3: Visa type, degree level, nativity, and location of highest degree for adult migrants trained and employed in S&E occupations, 2003 – Master's degree is highest.

	Green Card	Temporary Work	Study/ Training	Family De-pended	Other	Total
Master's degree highest	67 211	67 280	182 300	28 628	26 772	372 192
Birth country						
EU27	9 843	10 872	11 199	2 495	6 529	40 938
Non-EU27	57 368	56 409	171 101	26 133	20 243	331 254
Highest degree country						
EU27	8 704	10 810	3 016	1 588	4 931	29 050
Non-EU27	58 507	56 470	179 284	27 040	21 841	343 142

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-8-4: Visa type, degree level, nativity, and location of highest degree for adult migrants trained and employed in S&E occupations, 2003 – Doctoral degree is highest.

	Green Card	Temporary Work	Study/ Training	Family De-pended	Other	Total
Doctoral degree highest	19 174	20 091	158 432	9 721	5 641	213 058
Birth country						
EU27	5 759	6 408	23 999	2 375	1 077	39 618
Non-EU27	13 415	13 682	134 433	7 346	4 563	173 440
Highest degree country						

EU27	4 306	8 292	15 992	2 875	971	32 435
Non-EU27	14 868	11 799	142 439	6 847	4 670	180 623

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-8-5: Visa type, degree level, nativity, and location of highest degree for adult migrants trained and employed in S&E occupations, 2003 – Professional degree is highest.

	Green Card	Temporary Work	Study/ Training	Family De-pended	Other	Total
degree is highest	56 440	13 593	67 521	7 567	14 613	159 732
Birth country						
EU27	4 508	1 954	7 171	1 153	760	15 546
Non-EU27	51 932	11 638	60 349	6 414	13 853	144 186
Highest degree country						
EU27	5 828	1 725	5 874	1 446	918	15 790
Non-EU27	50 612	11 867	61 647	6 121	13 695	143 943

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-9-1: Visa type, degree level, and nativity for adult migrants trained and employed in S&E, by S&E occupation, 2003 – Visa type/All Degree levels.

	All S&E Occupa-	Comp/Math	Bio/Ag/Env /Life	Physical	Social	Engineering	S&E Re-lated
Visa type /All De-gree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
Green Card	332 124	57 054	10 092	10 221	3 994	59 582	191 181
EU27 birth	36 098	49 599	1 848	1 469	1 416	10 151	13 760
Non-EU27 birth	296 026	7 455	8 245	8 751	2 579	49 431	177 421
Temporary Work	248 801	95 661	8 229	5 953	2 815	36 726	99 416
EU27 birth	32 674	10 119	2 550	925	1 166	9 515	8 399
Non-EU27 birth	216 127	85 542	5 679	5 028	1 649	27 211	91 018
Study/Training	487 699	132 342	59 298	29 916	20 694	96 715	148 733
EU27 birth	49 756	9 625	8 648	5 446	3 758	6 150	16 129
Non-EU27 birth	437 944	122 717	50 651	24 470	16 936	90 565	132 605
Family dependent	82 110	24 955	5 697	3 446	1 277	9 495	37 240
EU27 birth	9 151	1 668	396	315	244	1 654	4 874
Non-EU27 birth	72 958	23 287	5 301	3 131	1 032	7 842	32 366
Other	90 009	20 591	1 887	2 456	1 506	12 061	51 509
EU27 birth	14 717	1 947	422	193	896	2 380	8 880
Non-EU27 birth	75 292	18 644	1 466	2 263	610	9 680	42 629

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-9-2: Visa type, degree level, and nativity for adult migrants trained and employed in S&E, by S&E occupation, 2003 – Bachelor's degree is highest.

	All S&E Occupa-	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Bachelor's degree is highest	495 760	128 899	9 328	11 796	3 628	84 526	257 585
Green Card	189 299	34 425	3 223	5 195	600	35 481	110 374
EU27 birth	15 988	5 038	138	73	0	4 191	6 547
Non-EU27 birth	173 311	29 387	3 085	5 122	600	31 290	103 827
Temporary Work	147 837	53 671	1 562	2 439	971	20 569	68 626
EU27 birth	13 440	4 767	0	81	0	4 145	4 447
Non-EU27 birth	134 398	48 904	1 562	2 358	971	16 424	64 179
Study/Training	79 447	19 287	3 777	2 022	1 657	18 030	34 674
EU27 birth	7 386	1 496	510	298	0	1 214	3 870
Non-EU27 birth	72 061	17 791	3 268	1 724	1 657	16 816	30 804
Family dependent	36 193	11 892	566	1 029	400	4 399	17 908
EU27 birth	3 129	1 241	0	0	0	343	1 545
Non-EU27 birth	33 064	10 651	566	1 029	400	4 056	16 363
Other	42 984	9 624	200	1 111	0	6 047	26 003
EU27 birth	6 351	1 034	0	0	0	188	5 129
Non-EU27 birth	36 633	8 589	200	1 111	0	5 859	20 874

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-9-2: Visa type, degree level, and nativity for adult migrants trained and employed in S&E, by S&E occupation, 2003 – Master's or higher degree.

	All S&E Occupa-	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Master's or higher degree	744 981	201 705	75 876	40 196	26 658	130 053	270 494
Green Card	142 825	22 629	6 869	5 025	3 394	24 101	80 807
EU27 birth	20 111	2 417	1 709	1 396	1 416	5 959	7 213
Non-EU27 birth	122 715	20 212	5 159	3 629	1 979	18 141	73 594
Temporary Work	100 963	41 991	6 667	3 514	1 844	16 157	30 790
EU27 birth	19 234	5 352	2 550	844	1 166	5 370	3 951
Non-EU27 birth	81 729	36 638	4 117	2 670	678	10 787	26 839
Study/Training	408 252	113 055	55 521	27 895	19 037	78 685	114 059
EU27 birth	42 369	8 130	8 138	5 149	3 758	4 936	12 259
Non-EU27 birth	365 883	104 925	47 383	22 746	15 280	73 749	101 800
Family dependent	45 916	13 063	5 131	2 417	877	5 096	19 332
EU27 birth	6 022	427	396	315	244	1 310	3 329
Non-EU27 birth	39 894	12 636	4 734	2 102	632	3 786	16 003
Other	47 025	10 967	1 688	1 345	1 506	6 014	25 506
EU27 birth	8 366	913	422	193	896	2 193	3 750
Non-EU27 birth	38 659	10 054	1 266	1 153	610	3 821	21 755

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-10-1: Most important reasons for migrating by adults educated and employed in S&E, by degree level, nativity and S&E occupation, 2003 – Immigrants/ All Degree levels.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Immigrants/ All Degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
Family-related reasons	265 416	57 707	10 517	9 280	3 589	36 643	147 480
EU27 birth	29 306	5 990	1 097	907	789	4 774	15 749
Non-EU27 birth	235 109	51 717	9 420	8 373	2 800	31 868	130 931
Educational opportunities	461 124	122 926	31 122	23 025	20 122	91 976	171 954
EU27 birth	34 128	6 656	3 289	1 976	3 351	5 494	13 362
Non-EU27 birth	426 999	116 270	27 834	21 049	16 771	86 483	158 592
Job or economic opportunities	325 024	109 523	10 001	7 923	3 255	56 141	138 181
EU27 birth	45 393	12 465	3 194	1 761	1 445	13 820	12 708
Non-EU27 birth	279 630	97 058	6 806	6 162	1 810	42 321	125 473
Scientific or professional infrastructure	121 461	22 797	30 892	10 372	1 217	15 511	40 672
EU27 birth	21 177	4 107	5 962	3 247	554	2 776	4 531
Non-EU27 birth	100 284	18 690	24 930	7 125	663	12 735	36 141
Other	67 719	17 650	2 672	1 392	2 103	14 309	29 593
EU27 birth	11 394	1 597	321	457	1 341	2 986	4 692
Non-EU27 birth	56 325	16 053	2 351	935	762	11 323	24 901

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-10-2: Most important reasons for migrating by adults educated and employed in S&E, by degree level, nativity and S&E occupation, 2003 – Bachelor's degree is highest.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Bachelor's degree highest	495 759	128 898	9 328	11 796	3 627	84 527	257 586
Family-related reasons	146 043	28 428	2 974	4 234	789	21 467	88 151
EU27 birth	14 567	4 428	138	73	0	1 874	8 143
Non-EU27 birth	131 386	23 400	2 836	4 161	789	19 593	80 007
Educational opportunities	106 004	22 539	2 139	3 803	1 712	21 278	54 533
EU27 birth	6 736	1 213	391	298	0	703	4 131
Non-EU27 birth	99 268	21 325	1 748	3 505	1 712	20 575	50 402
Job or economic opportunities	187 796	58 890	1 911	2 763	971	32 613	90 649
EU27 birth	19 623	6 742	118	81	0	6 716	5 966
Non-EU27 birth	168 173	52 147	1 793	2 682	971	25 897	84 682
Scientific or professional infrastructure	20 821	7 284	1 240	451	155	3 226	8 466
EU27 birth	579	330	0	0	0	177	72
Non-EU27 birth	20 242	6 954	1 240	451	155	3 048	8 394
Other	35 095	11 757	1 064	545	0	5 943	15 787
EU27 birth	4 699	862	0	0	0	611	3 226
Non-EU27 birth	30 397	10 896	1 064	545	0	5 332	12 561

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-10-3: Most important reasons for migrating by adults educated and employed in S&E, by degree level, nativity and S&E occupation, 2003 – Master's or higher degree.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Master's higher degree	744 983	201 706	75 875	40 197	26 658	130 053	270 495
Family-related reasons	119 372	29 279	7 543	5 046	2 800	15 176	59 529
EU27 birth	15 649	1 562	959	833	789	2 900	8 606
Non-EU27 birth	103 723	27 717	6 584	4 213	2 010	12 275	50 923
Educational opportunities	355 120	100 387	28 983	19 223	18 409	70 698	117 421
EU27 birth	27 390	5 442	2 897	1 678	3 351	4 791	9 231
Non-EU27 birth	327 730	94 945	26 086	17 544	15 058	65 908	108 190
Job or economic opportunities	137 227	50 634	8 089	5 160	2 284	23 528	47 532
EU27 birth	25 770	5 723	3 076	1 681	1 445	7 104	6 741
Non-EU27 birth	111 458	44 911	5 013	3 479	839	16 424	40 791
Scientific or professional infrastructure	100 640	15 513	29 652	9 921	1 062	12 285	32 206
EU27 birth	20 598	3 777	5 962	3 247	554	2 599	4 460
Non-EU27 birth	80 041	11 735	23 690	6 675	508	9 686	27 747
Other	32 624	5 893	1 608	847	2 103	8 366	13 807
EU27 birth	6 695	735	321	457	1 341	2 375	1 466
Non-EU27 birth	25 928	5 158	1 287	390	762	5 991	12 340

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-11-1: Second most important reason for migrating by adults educated and employed in S&E, by degree level, nativity, and S&E occupation, 2003 – Reason/ All Degree levels.

	All S&E Occu-pations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Reason/ All Degree levels	1 240 743	330 603	85 204	51 992	30 286	214 579	528 079
No second reason	424 926	125 456	21 862	12 191	14 533	68 556	182 330
EU27 birth	61 312	13 423	4 472	2 052	3 200	13 070	25 095
Non-EU27 birth	363 613	112 032	17 390	10 138	11 333	55 486	157 234
Number who gave second reason	815 817	205 147	63 342	39 801	15 753	146 023	345 749
Of which:							
Family-related reasons	84 747	18 566	3 548	3 735	1 309	13 301	44 287
EU27 birth	6 709	847	318	312	565	1 076	3 591
Non-EU27 birth	78 036	17 719	3 230	3 423	744	12 225	40 695
Educational opportunities	206 206	51 369	17 991	8 192	3 146	30 851	94 657
EU27 birth	17 904	3 319	2 013	1 530	1 166	2 454	7 422
Non-EU27 birth	188 301	48 049	15 978	6 662	1 980	28 397	87 235
Job or economic opportunities	269 269	63 680	17 008	10 411	3 725	47 800	126 645
EU27 birth	25 391	5 347	3 006	1 507	1 223	5 336	8 972
Non-EU27 birth	243 877	58 333	14 002	8 904	2 502	42 464	117 672
Scientific or professional infrastructure	242 088	65 966	23 650	17 036	7 274	51 259	76 904
EU27 birth	28 383	7 143	3 631	2 731	1 259	7 202	6 417
Non-EU27 birth	213 706	58 823	20 019	14 305	6 014	44 057	70 488
Other	13 507	5 567	1 145	427	299	2 813	3 257
EU27 birth	2 696	736	424	215	66	712	543
Non-EU27 birth	10 813	4 832	721	212	233	2 101	2 714

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-11-2: Second most important reason for migrating by adults educated and employed in S&E, by degree level, nativity, and S&E occupation, 2003 – Bachelor's degree is highest.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Reason/ Bachelor's degree is highest	495 761	128 898	9 327	11 795	3 627	84 527	257 585
No second reason	193 213	59 648	3 608	3 093	2 452	29 139	95 272
EU27 birth	25 158	7 117	530	81	0	5 134	12 297
Non-EU27 birth	168 055	52 531	3 078	3 013	2 452	2 405	82 976
Number who gave second reason	302 548	69 250	5 719	8 702	1 175	55 388	162 313
Of which:							
Family-related reasons	43 744	9 481	213	2 100	0	7 988	23 961
EU27 birth	2 531	320	0	0	0	430	1 782
Non-EU27 birth	41 213	9 162	213	2 100	0	7 559	22 179
Educational opportunities	79 014	17 468	1 628	885	73	12 751	46 209
EU27 birth	4 444	1 185	0	0	0	771	2 488
Non-EU27 birth	74 570	16 284	1 628	885	73	11 980	43 720
Job or economic opportunities	115 122	22 783	2 343	2 549	1 007	18 565	67 875
EU27 birth	7 305	2 165	0	73	0	1 475	3 591
Non-EU27 birth	107 818	20 618	2 343	2 476	1 007	17 090	64 284
Scientific or professional infrastructure	58 462	16 929	1 427	3 168	95	14 641	22 203
EU27 birth	5 958	2 198	118	298	0	1 965	1 380
Non-EU27 birth	52 504	14 731	1 309	2 870	95	12 675	20 822
Other	6 206	2 589	108	0	0	1 443	2 065
EU27 birth	898	592	0	0	0	306	0
Non-EU27 birth	5 307	1 997	108	0	0	1 137	2 065

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-11-3: Second most important reason for migrating by adults educated and employed in S&E, by degree level, nativity, and S&E occupation, 2003 – Master's or higher degree.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Master's or higher degree	744 983	201 705	75 875	40 196	26 658	130 054	270 495
No second reason	231 713	65 808	18 253	9 097	12 081	39 417	87 057
EU27 birth	36 155	6 307	3 942	1 972	3 200	7 936	12 799
Non-EU27 birth	195 558	59 501	14 311	7 126	8 881	31 481	74 259
Number who gave second reason							
Of which:							
Family-related reasons	41 003	9 085	3 335	1 635	1 309	5 313	20 326
EU27 birth	4 179	527	318	312	565	647	1 810
Non-EU27 birth	36 824	8 558	3 017	1 323	744	4 666	18 516
Educational opportunities	127 192	33 901	16 362	7 307	3 073	18 100	48 449
EU27 birth	13 461	2 135	2 013	1 530	1 166	1 683	4 934
Non-EU27 birth	113 732	31 766	14 349	5 777	1 907	16 417	43 515
Job or economic opportunities	154 147	40 896	14 665	7 862	2 718	29 235	58 770
EU27 birth	18 087	3 181	3 006	1 434	1 223	3 861	5 381
Non-EU27 birth	136 060	37 715	11 659	6 429	1 495	25 374	53 389
Scientific or professional infrastructure	183 626	49 037	22 223	13 868	7 178	36 619	54 701
EU27 birth	22 424	4 946	3 512	2 433	1 259	5 237	5 037
Non-EU27 birth	161 201	44 092	18 711	11 435	5 919	31 382	49 665
Other	7 302	2 978	1 037	427	299	1 370	1 192
EU27 birth	1 798	144	424	215	66	406	543
Non-EU27 birth	5 504	2 834	613	212	233	964	648

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-12-1: Visa type and primary and secondary reasons for migrating, by period when initial visa issued, for adult migrants trained in S&E –Initial Visa Type.

	Green Card	%	Temp. Work	%	Study/ Training	%	Family De-pended	%	Other	%
					Period when initial visa is used					
Before 1970	26 138	34.1	838	1.1	44 047	57.4	2 853	3.7	2 862	3.7
1970s	72 601	39,4	18 329	10,0	73 470	39,9	5 462	3.0	14 232	7.7
1980s	110 046	31,4	38 114	10,9	148 335	42,4	21 616	6.2	31 560	9.0
After 1989	123 339	19,6	191 519	30,4	221 846	35,2	52 179	8,3	41 356	6,6

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-12-2: Visa type and primary and secondary reasons for migrating, by period when initial visa issued, for adult migrants trained in S&E –Most important reason for migrating.

	Family Related	%	Educational Opportunities	%	Job/ Econ. Opportunities	%	Scientific/Proffes.	%	Other	%
					Period when initial visa is used					
Before 1970	10 430	13.6	45 809	59.7	9 718	12.7	7 063	9.2	3 719	4.9
1970s	36 792	20.0	84 972	46.2	36 226	19.7	12 716	6.9	13 389	7.3
1980s	84 367	24.1	146 960	42.0	67 608	19.3	24 730	7.1	26 008	7.4
After 1989	133 827	21,2	183 384	29,1	211 472	33,6	76 952	12,2	24 604	3,9

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-12-3: Visa type and primary and secondary reasons for migrating, by period when initial visa issued, for adult migrants trained in S&E – Second most important reason for migrating or no second reason

Second most Important reason for migrating	No 2nd reason	%	Family Related	%	Educational Opportunities	%	Job- Economic Opportunities	%	Scientific - Professional Infrastructure	%	Other	%
						Period when initial visa is used						
Before 1970	26 172	34,1	4 866	6,3	9 162	11,9	19 931	26,0	15 755	20,5	852	1,1
1970s	62 008	33,7	15 590	8,5	30 946	16,8	42 204	22,9	31 477	17,1	1 868	1,0
1980s	119 601	34.2	27 259	7.8	56 693	16.2	75 703	21.7	66 960	19.2	3 455	0.9
After 1989	217 145	34,5	37 032	5,9	109 404	17,4	131 431	20,9	127 895	20,3	7 332	1,0

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-13-1: Most important reasons for migrating by the most recent cohort of adult migrants, by nativity and S&E occupations in 2003.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Immigrants/ All Degree levels	630 239	221 077	49 931	26 386	11 623	96 582	224 639
Family-related reasons	133 827	36 116	5 838	4 877	1 768	18 329	66 899
EU27 birth	11 625	3 372	588	214	630	2 614	4 207
Non-EU27 birth	122 203	32 744	5 250	4 662	1 139	15 715	62 692
Educational opportunities	183 384	65 040	13 427	9 786	6 919	33 745	54 467
EU27 birth	17 490	3 719	1 155	1 199	1 583	2 784	7 050
Non-EU27 birth	165 893	61 320	12 272	8 587	5 336	30 961	47 417
Job or economic opportunities	211 472	94 077	6 388	4 293	1 969	33 229	71 516
EU27 birth	27 312	9 960	2 165	861	683	7 653	5 989
Non-EU27 birth	184 160	84 117	4 224	3 431	1 286	25 578	65 527
Scientific or professional infrastruc-	76 952	17 689	22 836	6 718	575	8 395	20 738
EU27 birth	11 801	2 823	3 861	2 003	306	786	2 022
Non-EU27 birth	65 152	14 867	18 975	4 715	269	7 609	18 717
Other	24 604	8 155	1 442	712	392	2 884	11 019
EU27 birth	4 052	636	0	88	392	718	2 218
Non-EU27 birth	20 552	7 519	1 442	624	0	2 166	8 800

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-14-1: Second most important reasons for migrating by the most recent cohort of adult migrants, by nativity and S&E occupations in 2003.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Master's or higher degree	630 239	221 077	49 931	26 386	11 623	96 582	224 639
No second reason	217 145	88 299	13 718	5 510	5 910	29 528	74 181
EU27 birth	30 471	9 460	2 354	458	970	6 919	10 310
Non-EU27 birth	186 674	78 838	11 363	5 053	4 940	22 609	63 871
Number who gave second reason	413 094	132 778	36 213	20 876	5 713	67 054	150
Of which:							
Family-related reasons	37 032	9 921	2 454	1 994	198	5 489	16 976
EU27 birth	2 875	690	110	0	198	407	1 470
Non-EU27 birth	34 157	9 232	2 343	1 994	0	5 082	15 505
Educational opportunities	109 404	34 923	11 546	4 953	1 737	14 046	42 200
EU27 birth	9 457	2 617	1 451	1 101	772	1 199	2 317
Non-EU27 birth	99 947	32 306	10 095	3 852	965	12 847	39 882
Job or economic opportunities	131 431	39 921	10 361	5 377	1 818	19. 18	54 336
EU27 birth	12 632	3 439	1 997	768	948	1 771	3 708
Non-EU27 birth	118 799	36 482	8 363	4 610	870	17 847	50 628
Scientific or professional infrastruc-	127 895	43 618	11 369	8 336	1 961	26 798	35 812
EU27 birth	15 277	3 803	1 653	1 825	706	3 995	3 295
Non-EU27 birth	112 618	39 815	9 717	6 512	1 255	22 803	32 517
Other	7 332	4 395	484	215	0	1 102	1 135
EU27 birth	1 567	501	203	215	0	262	385
Non-EU27 birth	5 765	3 894	281	0	0	840	750

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-15-1: Sector of employment of most recent adult migrants to the U.S., by nativity and S&E occupation, 2003- Total all sectors.

	All S&E Occupations	Comp/ Math	Bio/Ag/ Env/ Life	Physical	Social	Engineering	S&E Related
Total all sectors	630 239	221 077	49 931	26 386	11 623	96 582	224 634
Higher education	11 453	1 283	379	214	159	88	9 329
EU27 birth	1 430	244	0	0	76	0	1 110
Non-EU27 birth	10 023		379	214	84	88	8 219
Government	26 028	4 361	3 732	1 343	60	3 753	12 779
EU27 birth	5 775	194	474	688	0	1 578	2 841
Non-EU27 birth	20 253	4 167	3 258	655	60	2 175	9 938
Business/Industry	470 676	193 589	13 943	13 206	5 733	82 351	161 854
EU27 birth	43 713	16 221	1 981	1 482	2 154	10 320	11 556
Non-EU27 birth	426 963	177 367	11 963	11 723	3 579	72 031	150 299
Other education	122 083	21 844	31 877	11 624	5 671	10 389	40 677
EU27 birth	21 361	3 851	5 314	2 196	1 364	2 656	5 980
Non-EU27 birth	100 721	17 993	26 562	9 429	4 307	7 733	34 697

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-16-1: Distribution of recent adult migrants employed in S&E, by employment sector, highest degree level and nativity, 2003- Bachelor's degree is highest.

	All S&E Occupa-tions	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engin-eering	S&E Re-lated
Bachelor's degree highest	253 053	88 945	5 278	6 276	1 149	35 980	115 425
Higher education	6471	697	0	0	0	0	5 775
EU27	979	156	0	0	0	0	824
Non-	5492	541	0	0	0	0	4 951
Government	9026	2 246	0	378	60	991	5 350
EU27	543	0	0	298	0	245	0
Non-	8 483	2 246	0	81	60	746	5 350
Business/Industry	212 802	83 498	592	3 905	810	33 685	90 312
EU27	17 334	8 363	0	81	0	3 959	4 931
Non-	195 467	75 135	592	3 825	810	29 725	85 380
Other education	24 754	2 504	4 686	1 993	279	1 304	13 988
EU27	4 100	924	391	0	0	478	2.307
Non-	20 655	1 580	4 295	1 993	279	826	11 682

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-16-2: Distribution of recent adult migrants employed in S&E, by employment sector, highest degree level and nativity, 2003- Master's or higher degree.

	All S&E Occupa-tions	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engin-eering	S&E Re-lated
Master's or higher degree	377 187	132 132	44 654	20 110	10 475	60 602	109 213
Higher education	4981	587	379	214	159	88	3 554
EU27 birth	451	88	0	0	76	0	287
Non-EU27	4 531	498	379	214	84	88	3 268
Government	17 002	2 114	3 732	965	0	2 762	7 428
EU27 birth	5 233	194	474	391	0	1 333	2 841
Non-EU27	11 769	1 921	3 258	574	0	1 429	4 587
Business/Industry	257 875	110 090	13 352	9 300	4 924	48 667	71 542
EU27 birth	26 379	7 858	1 981	1 402	2 154	6 361	6 623
Non-EU27	231 496	102 232	11 371	7 899	2 769	42 306	64 919
Other education	97 329	19 341	27 191	9 631	5 392	9 085	26 689
EU27 birth	17 262	2 927	4 923	2 196	1 364	2 178	3 674
Non-EU27	80 068	16 414	22 268	7 436	4 028	6 907	23 015

Source: Tabulations from 2003 NSCG. Subgroups may not add to totals due to rounding.

Table A1-17-1: Primary work activity of most recent adult migrants, by S&E occupation and nativity, 2003 – Total all work activities.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Total all work activities	630 239	221 076	49 931	26 387	11625	96 581	224
Basic research	59 461	8 532	26 024	9 960	2 503	3 874	8 568
EU27 birth	9 338	1 001	4 609	1 862	624	387	853
Non-EU27 birth	50 124	7 530	21 415	8 097	1 879	3 487	7 715
Applied research	59 558	8 420	16 180	7 934	3 369	10 812	12 844
EU27 birth	10 577	1 145	2 630	1 445	1 520	3 101	737
Non-EU27 birth	48 981	7 275	13 550	6 489	1 849	7 712	12 107
Development	51 203	20 710	2 092	2 660	170	20 121	5 449
EU27 birth	3 889	1 611	0	314	0	1 428	537
Non-EU27 birth	47.314	19.100	2.092	2.346	170	18.693	4 912
Design	41 613	9 866	157	537	121	24 497	6.435
EU27 birth	4 374	733	0	128	0	2 724	790
Non-EU27 birth	37 239	9 134	157	409	121	21 773	5 645
Computer applications	178 365	139 964	242	69	0	10 667	27 422
EU27 birth	13 152	9 984	0	0	0	1 034	2 134
Non-EU27 birth	165 213	129 980	242	69	0	9 633	25 289
Other	240 039	33 584	5 236	5 227	5 462	26 610	163
EU27 birth	30 949	6 037	530	617	1 450	5 880	16 435
Non-EU27 birth	209 090	27 548	4 706	4 609	4 012	20 730	147

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-18-1: Primary work activity of recent adult migrants, by S&E occupation and sector, highest degree level and nativity, 2003 – Bachelor's degree is highest.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Bachelor's degree highest	253 054	88 944	5 277	6 276	1 149	35 979	115
Basic research	9 487	669	1 991	2 959	810	991	2 067
EU27 birth	681	80	224	298	0	78	0
Non-EU27 birth	8 806	588	1 767	2 662	810	913	2 067
Applied research	9 91	1.831	2.071	437	0	1 864	3 787
EU27 birth	1 403	114	167	81	0	739	302
Non-EU27 birth	8 589	1 717	1 904	357	0	1 125	3 485
Development	15 604	7 030	119	884	0	6 043	1 527
EU27 birth	1 793	991	0	0	0	802	0
Non-EU27 birth	13 812	6 039	119	884	0	5 242	1 527
Design	17 509	4 771	0	0	0	9 315	3 422
EU27 birth	1 164	332	0	0	0	530	302
Non-EU27 birth	16 346	4 440	0	0	0	8 785	3 121
Computer applications	82 806	62 123	0	0	0	4 818	15 864
EU27 birth	6 618	4 858	0	0	0	494	1 267
Non-EU27 birth	76 187	57 265	0	0	0	4 324	14 597
Other	117 657	12 520	1 096	1 996	339	12 948	88 757
EU27 birth	11 298	3 068	0	0	0	2 039	6 191

Non-EU27 birth	106 358	9 452	1 096	1 996	339	10 909	82 566

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

Table A1-18-2: Primary work activity of recent adult migrants, by S&E occupation and sector, highest degree level and nativity, 2003 – Master's or higher degree.

	All S&E Occupations	Comp/Math	Bio/Ag/Env/Life	Physical	Social	Engineering	S&E Related
Master's or higher degree	377 186	132 133	44 653	20 109	10476	60 601	109
Basic research	49 975	7 863	24 033	7 000	1 693	2 883	6 502
EU27 birth	8 657	921	4 385	1 565	624	309	853
Non-EU27 birth	41 318	6 942	19 648	5 436	1 069	2 575	5 648
Applied research	49 567	6 589	14 108	7 496	3 369	8 948	9 057
EU27 birth	9 175	1 031	2 462	1 364	1 520	2 361	436
Non-EU27 birth	40 392	5 558	11 646	6 132	1 849	6 587	8 621
Development	35 598	13 680	1 973	1 776	170	14 077	3 922
EU27 birth	2 096	620	0	314	0	626	537
Non-EU27 birth	33 502	13 060	1 973	1 462	170	13 451	3 385
Design	24 104	5 095	157	537	121	15 182	3 012
EU27 birth	3 211	401	0	128	0	2 194	488
Non-EU27 birth	20 893	4 694	157	409	121	12 988	2.525
Computer applications	95 559	77 842	242	69	0	5 849	11 558
EU27 birth	6 533	5 126	0	0	0	540	867
Non-EU27 birth	89 026	72 715	242	69	0	5 308	10 691
Other	122 383	21 064	4 140	3 231	5 123	13 662	75 163
EU27 birth	19 651	2 969	530	617	1 450	3 841	10 244
Non-EU27 birth	102 732	18 096	3 610	2 613	3 673	9 820	64 920

Source: Tabulations from 2003 NSCG. Subgroups may not add to total due to rounding.

ANNEX 2: ADDITIONAL INFORMATION ON THE EXTRA-EU SURVEY

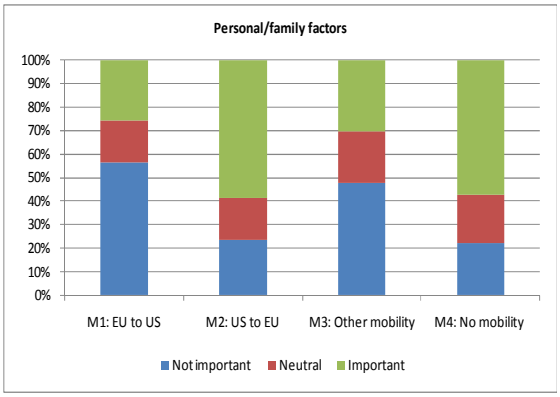
Table A2-1 Representation of the EU27 Member States in the sample (in total and %)

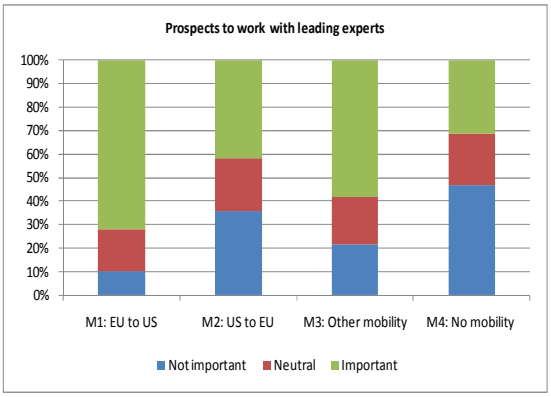
EU-27 country of residence	% of total sample	n
Italy	10.4	575
United Kingdom	5.9	325
Germany	5.7	318
Spain	5.2	291
France	4.6	256
Portugal	3.4	190
Netherlands	3.0	164
Belgium	2.3	127
Sweden	2.0	112
Denmark	2.0	111
Hungary	1.8	99
Greece	1.6	90
Finland	1.5	84
Austria	1.4	78
Romania	1.3	71
Poland	1.3	70
Czech Republic	0.9	49
Ireland	0.6	33
Bulgaria	0.3	17
Estonia	0.2	12
Slovenia	0.2	12
Cyprus	0.2	11
Luxembourg	0.2	9
Slovakia	0.1	6
Lithuania	0.1	4
Latvia	0.0	2
Total	56.2	3116

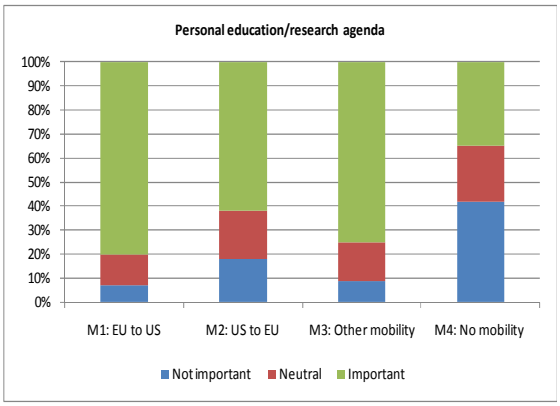
Source: MORE extra – EU survey

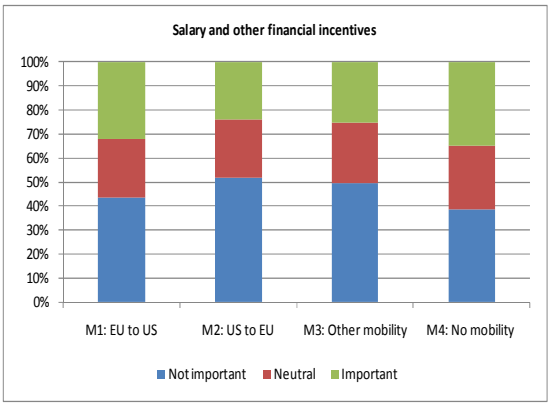
Additional information for chapter 7

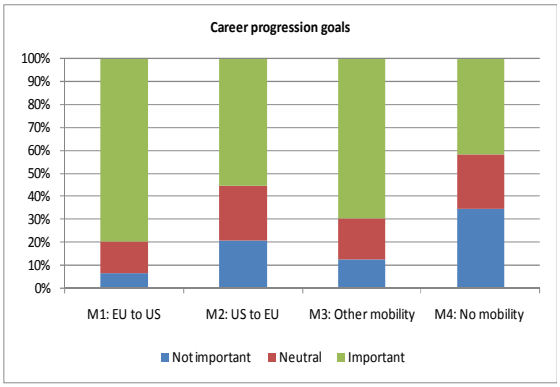
Figure A2.1: Importance of motivations of mobility, by mobility groups

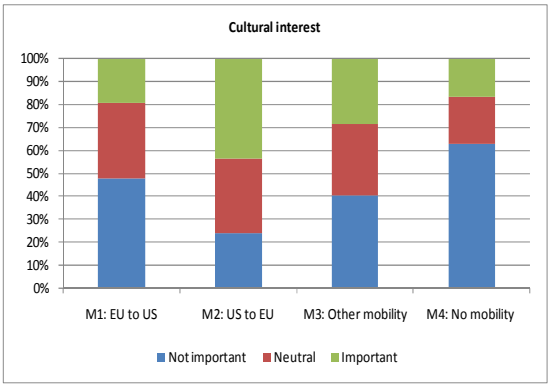












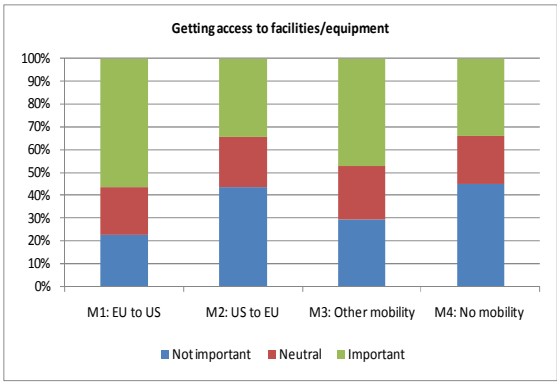
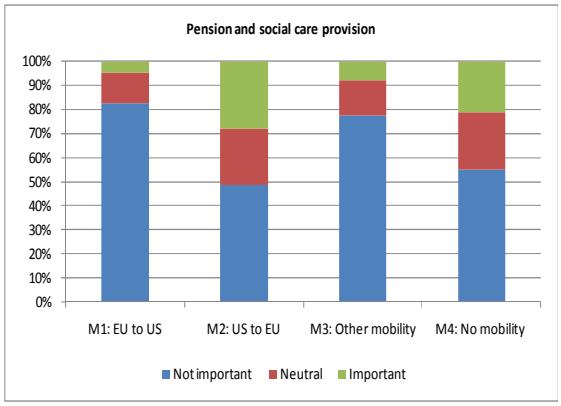
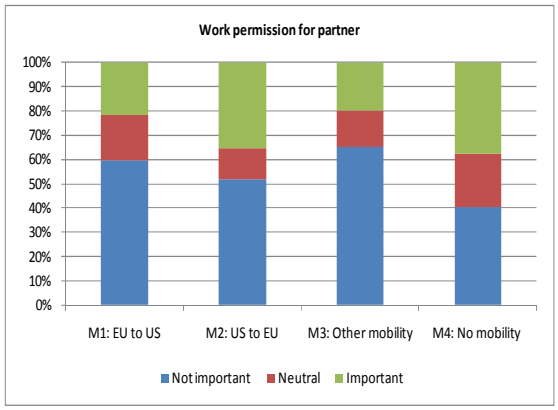
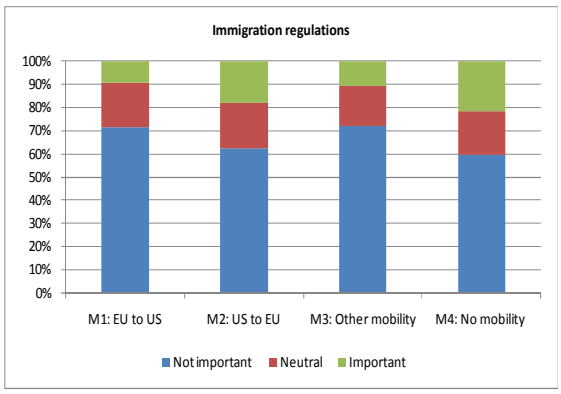
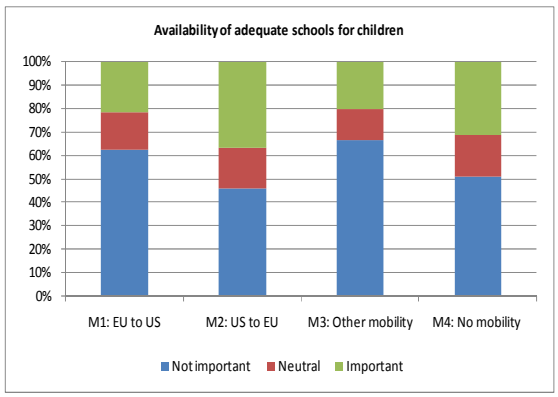


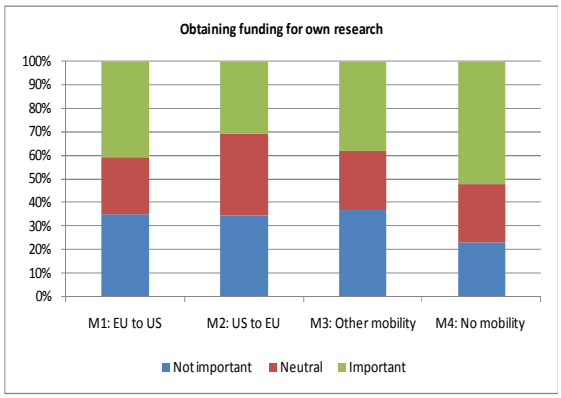
Figure A2.2: Importance of influencing factors of mobility, by mobility groups

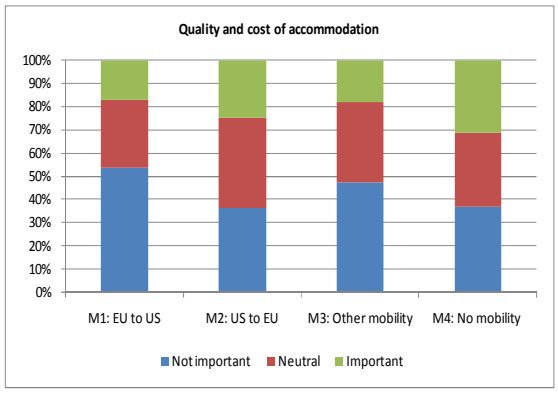


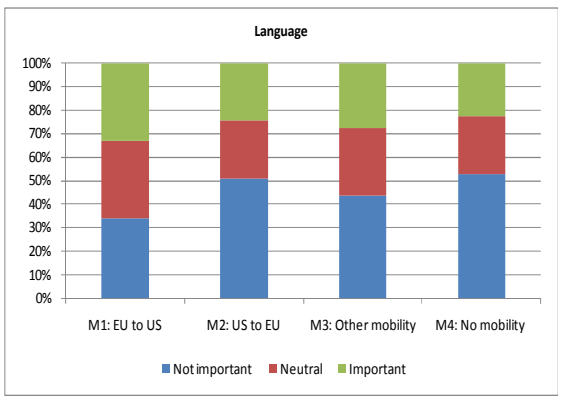


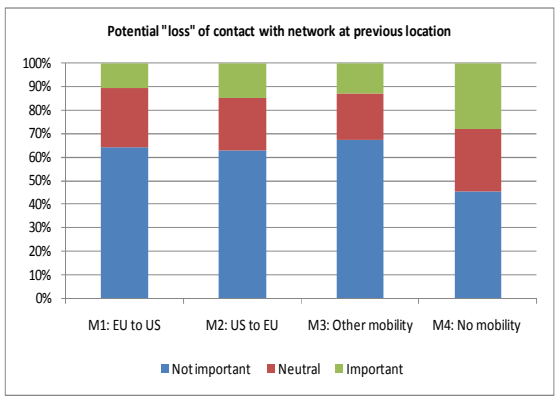






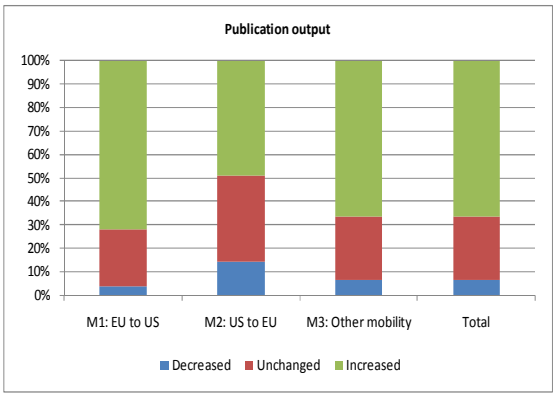


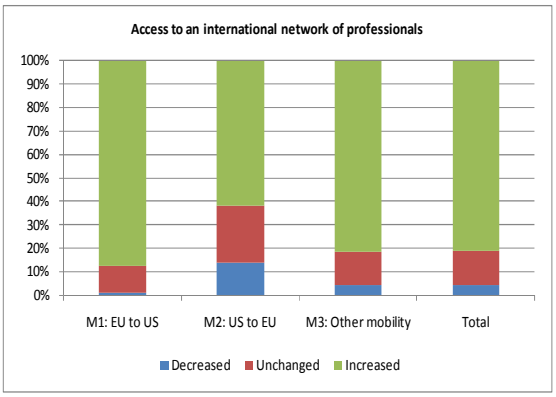


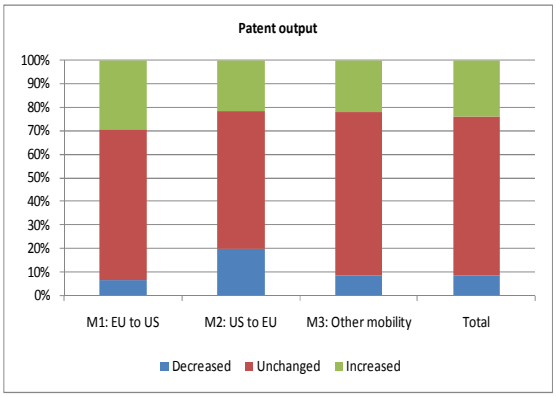


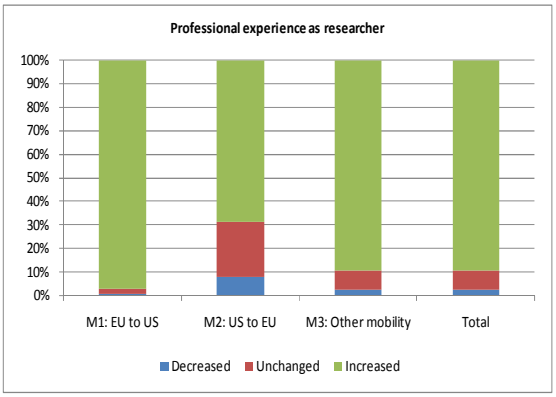
Additional information for chapter 8

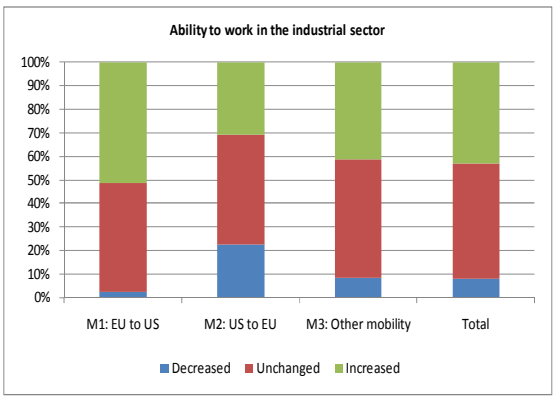
Figure A2.3: Effects of mobility, by mobility groups

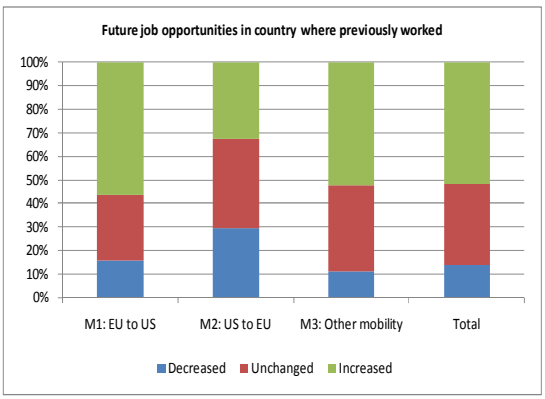


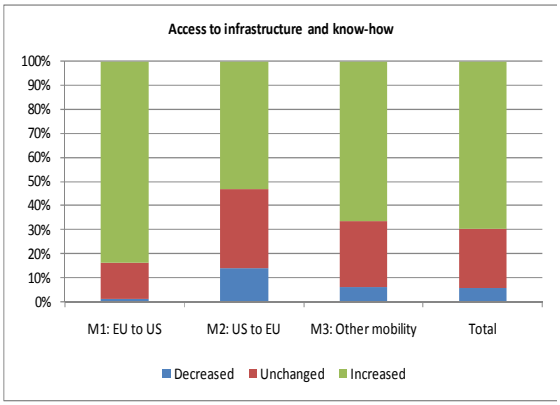


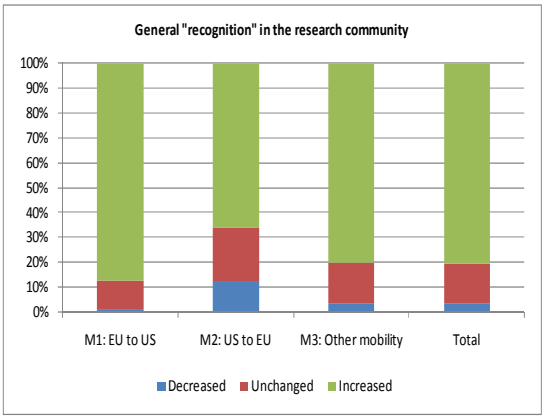






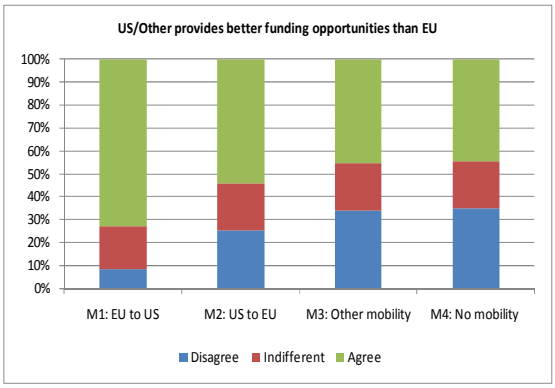


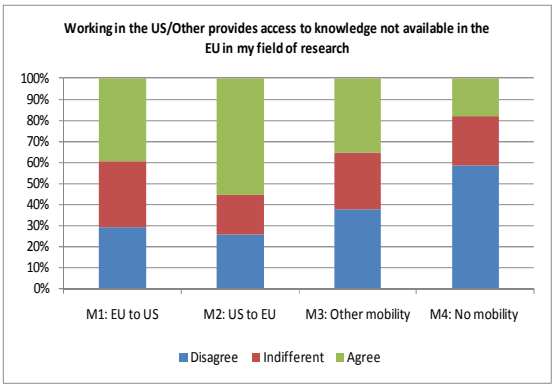


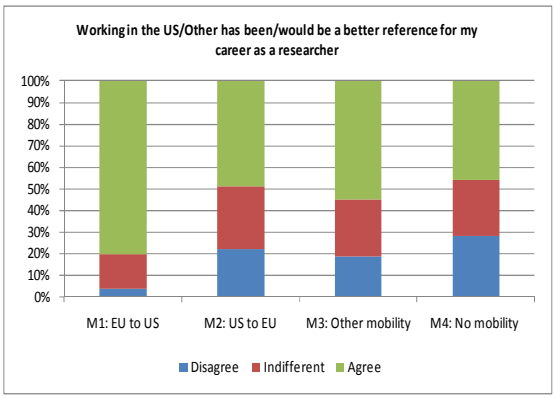


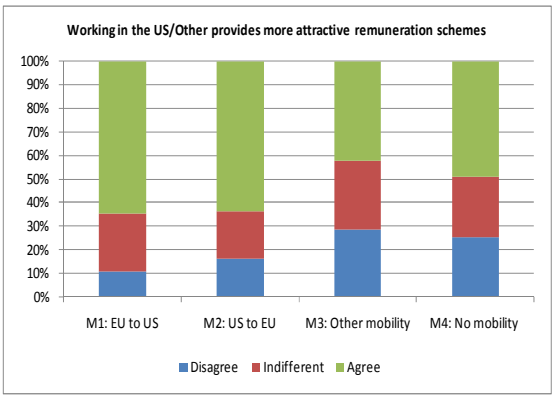
Additional information for chapter 9

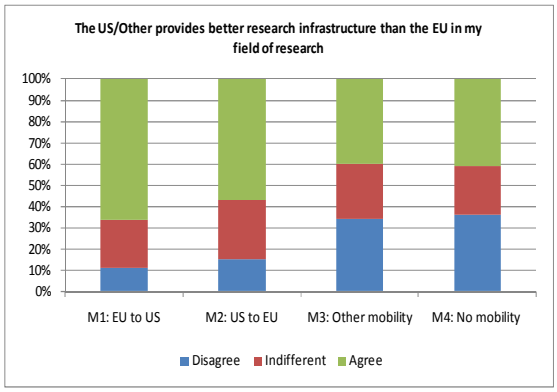
Figure A2.4: Importance of attractiveness factors, by mobility groups

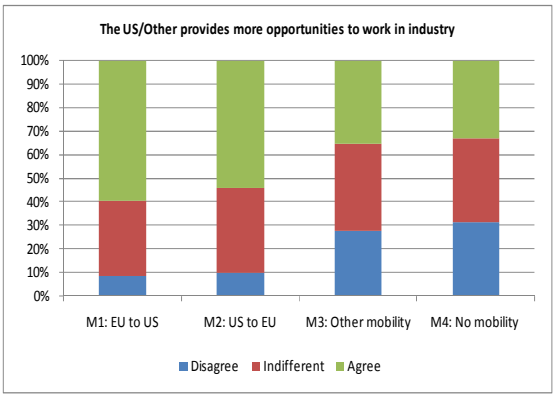












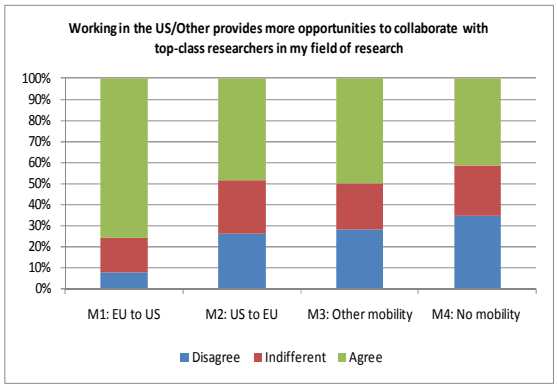
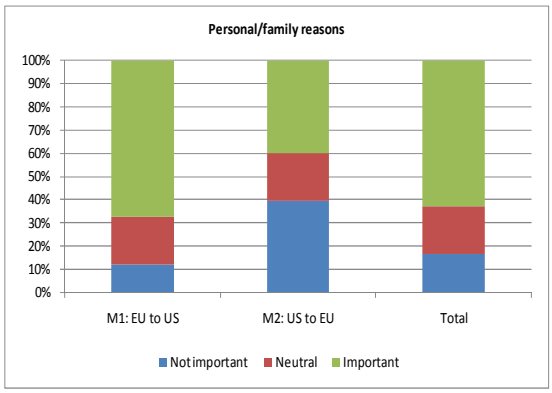
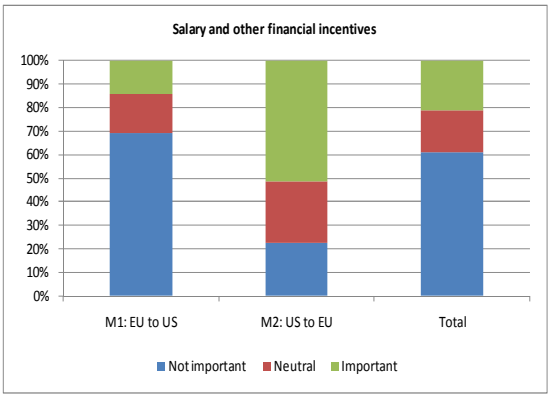
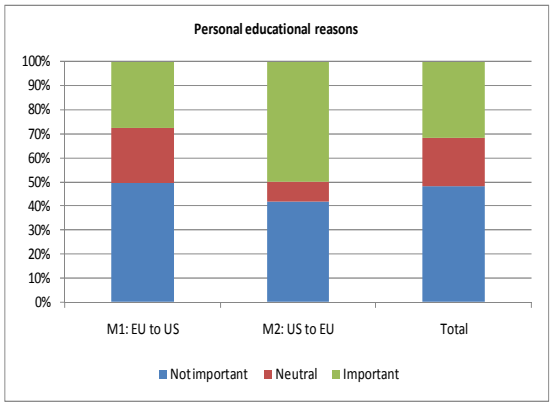
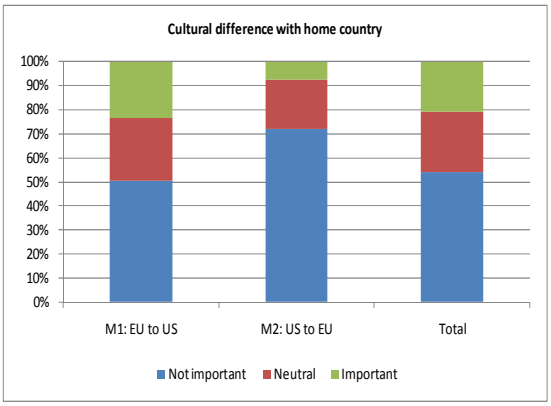


Figure A2.5:: Importance of return motivations, by mobility groups









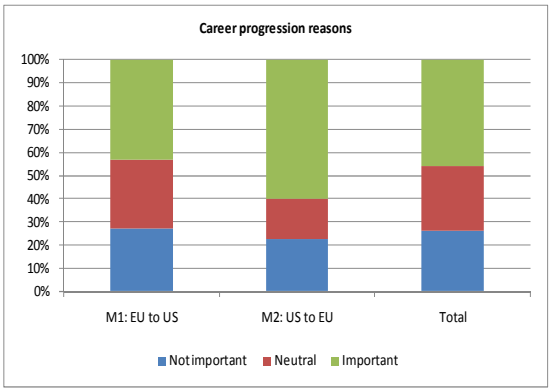
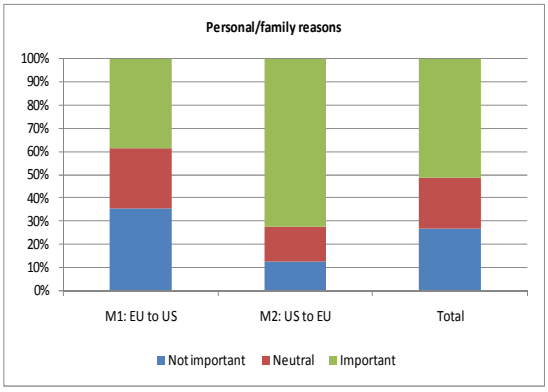
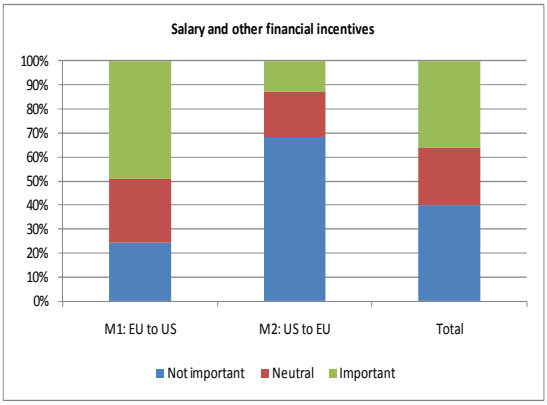
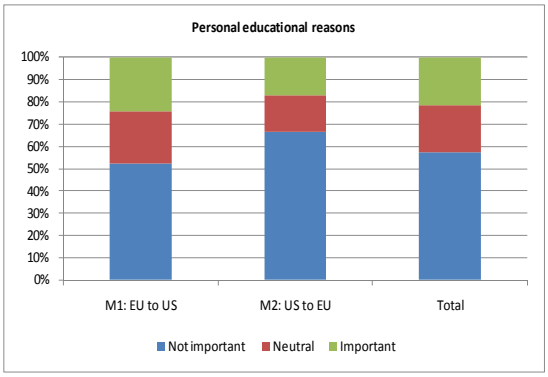
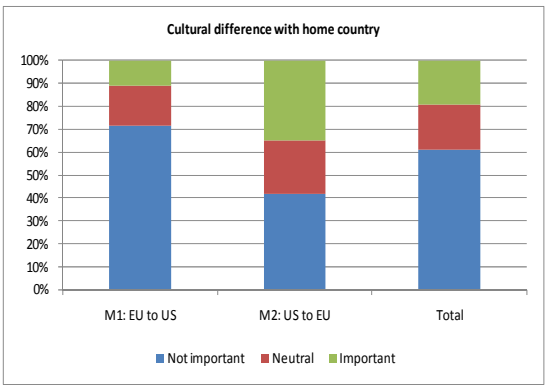

Career progression reasons
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
M1: EU to US
M2: US to EU
Total
Not important
Neutral
Important

Figure A2.6: Importance of no return motivations, by mobility groups









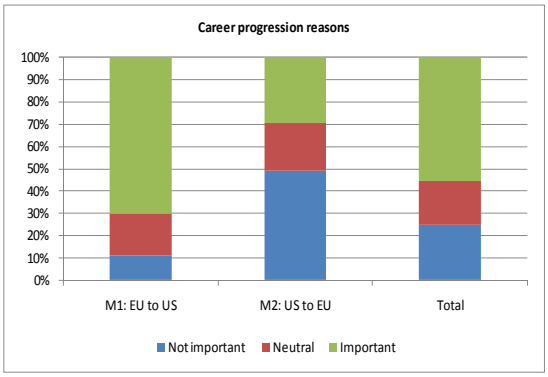
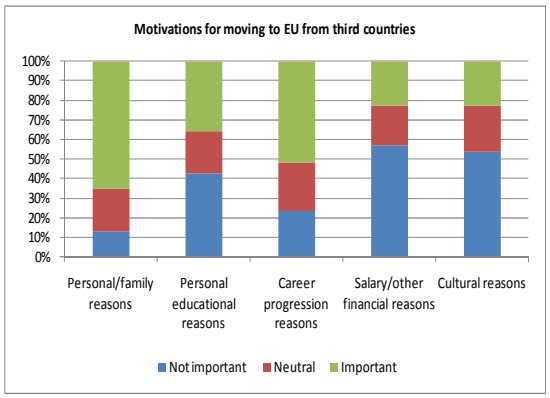
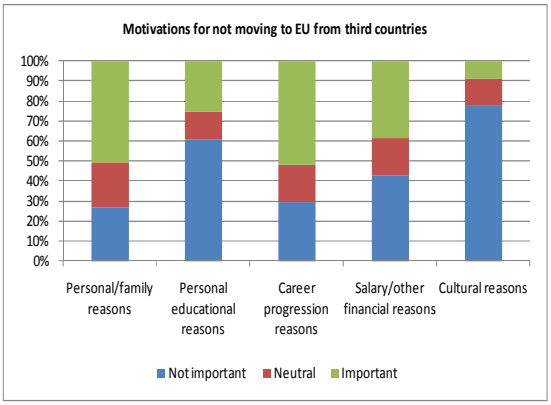


Figure A2.7: Importance of motivations to turn/not to turn to EU from third countries (M3: 'Other' mobility)





ANNEX 3: QUESTIONNAIRE[22]

Introductory information

This questionnaire is part of a study launched by the European Commission to

- investigate patterns of the mobility (geographical as well as between employers) of researchers, scientists and development engineers in Europe.
- better understand the factors inhibiting or supporting the mobility of researchers, scientists and development engineers in terms of job changes across borders.

In this survey we would like to ask you about problems, needs and attitudes towards mobility. Have you been mobile and why / why not? This is very important in order to help the Commission set up better targeted policies.

All completed surveys shall remain strictly private and confidential and shall only be used for the purposes of this study

Thank you very much for your time and support!

For further information about the project, the project team etc., please visit www.researchersmobility.eu or contact us directly at EC-study@researchersmobility.eu.

YOUR ACTIVITIES AS RESEARCHER

1. Are you currently working as a researcher, i.e. do you…

	Yes	No
carry out research?	☐	☐
supervise research?	☐	☐
improve or develop new products/processes/services?	☐	☐
supervise the improvement or development of new products/ processes/services?	☐	☐

Part A: SOCIODEMOGRAPHICS

The information asked in this part of the survey concerns your personal and family situation (age, country of citizenship, marital status, etc.) and your education and training.

This information is very important in order to be able to analyse the effect of family situation, age of children, etc on the willingness of researchers to become mobile. These analyses will be at aggregate level and as already mentioned all completed questionnaires shall remain confidential.

Personal and family situation

2. What is your gender?

☐ Male ☐ Female

3. What is your year of birth?

[22] *Note:*
- *EU=EU27,*
- *Questions marked in grey are decisive for the routing.*

(drop down box)

4. Which is your country of citizenship?

(drop down box)

5. Please list any additional country or countries of your citizenship (you can choose more than one country by using the Ctrl button).

(drop down box)

6. Which is the country of your birth?

(drop down box)

7. What is your country of residence?

(drop down box)

8. What is your marital status?

Married or co-habiting	☐
Single	☐
Widowed	☐
Divorced	☐
Other	☐
Prefer not to disclose	☐

9. Do you have children?

☐ Yes
☐ No
☐ Prefer not to disclose

If Question 9 is Yes:

10. What is the number of your children?

(drop down box)

If Question 9 is Yes:

11. What is the age of your eldest child?

(drop down box)

Education and training

In this section we would like to ask you questions about your diplomas/degrees you attained during your education, the time when these were completed and the countries where you studied.

12. What is your highest educational attainment?

Postgraduate degree (PhD or equivalent)	☐
Graduate degree (master degree or equivalent)	☐
Undergraduate degree (bachelor degree or equivalent)	☐
Secondary education degree (high school, gymnasium, grammar school, lyceum or equivalent)	☐
Other	☐

13. Please indicate the field of science which describes best the field of your highest educational attainment (in case you have more than one diploma at the level of your highest educational attainment, please refer to the diploma which is closer to your current field of work):

(drop down box)

14. Which is the country of graduation for your highest educational diploma? (in case

you have more than one diploma at the level of your highest educational attainment, please refer to the diploma which is closest to your current field of work).

(drop down box)

15. In which year did you obtain your highest educational attainment?

(drop down box)

16. In which country and when did you complete your degrees:

Postgraduate degree (PhD or equivalent) (in case you have more than one diploma at this level of education, please refer to the diploma which is closest to your current field of work).

Country of graduation *(drop down box)*
Year of graduation *(drop down box)*

Graduate degree (master degree or equivalent) (in case you have more than one diploma at this level of education, please refer to the diploma which is closest to your current field of work).

Country of graduation (drop down box)
Year of graduation (drop down box)

Undergraduate degree (bachelor degree or equivalent) *(in case you have more than one diploma at this level of education, please refer to the diploma which is closest to your current field of work).*

Country of graduation (drop down box)
Year of graduation (drop down box)

Secondary education degree (high school, gymnasium, grammar school, lyceum or equivalent) *(in case you have more than one diplomas at this level of education, please refer to the diploma which is closer to your current field of work).*

Country of graduation *(drop down box)*
Year of graduation *(drop down box)*

Other

17. During your undergraduate or graduate studies did you…	Yes	No
… study for more than three months (e.g. ERASMUS) in another country than the country where you obtained your degree(s)?	☐	☐
… work in the industry (e.g. internship, apprenticeship)? *(Please exclude vacation or side jobs unrelated to your programme of study).*	☐	☐

Part B: CURRENT EMPLOYMENT AS RESEARCHER

*In this section we would like to ask you questions about **your current career** as researcher, scientist or development engineer. Please refer your answers to your current work experience. In case you are working for more than one employers, please refer to your **PRINCIPAL or MAIN employer**.*

18. Which of the following categories best describes your current status as a researcher?

☐ Doctoral / PhD student ☐ Post-doctoral researcher ☐ Other

19. In which country is your employer located? (If you are employed by more than one employer, please provide the name of the organisation that you consider to be your principal/main employer as a researcher)

(drop down box)

20. In which country are you currently working? (only in case country of performance of your work differs from the country where your employer is situated)

(drop down box)

21. How long (years) have you been employed by this principal employer?

(drop down box)

22. Your principal employer is:

a university or other higher education institution (HEI)	☐
a public or government research institute	☐
a private, not-for-profit research institute (e.g. research foundation)	☐
a company	☐
self-employment	
other	☐

23. Which type of contract do you currently have?

Fixed term contract, less than 1 year	☐
Fixed term contract, 1-2 years	☐
Fixed term contract, > 2 years	☐
Open ended contract	☐
Non-employment contract (e.g. funded by fellowship/grant)	☐
Self-employed	☐
Other (please specify)	☐

24. How long (in years) have you been working under this contract status?

(drop down box)

25. Does your current work as researcher involve some form of formal collaboration (i.e. contractually based collaboration) with academic or industrial researchers from other countries?

Yes, only with academic researchers from other countries	☐
Yes, only with industrial researchers from other countries	☐
Yes, with academic and industrial researchers from other countries	☐
No	☐

26. Does your current work as researcher involve some form of formal collaboration (i.e. contractually based collaboration) with business sector researchers from the country where you principally work as researcher?

☐ Yes ☐ No

27. Overall, how confident do you feel in the future prospects for your research career?

☐ I feel very confident about the future prospects for my research career
☐ I feel somewhat confident about the future prospects for my research career
☐ I lack confidence about the future prospects for my research career
☐ I very much lack confidence about the future prospects for my research career
☐ NA

Part C: YOUR EXPERIENCE OF MOBILITY

In this section we would like to ask you questions about your previous career as researcher, scientist or development engineer.

a) Career path

28. Which of the following 'career paths' best describes your situation? (please consider only changes of employer, not research visits)

I have **always** been employed as a researcher in the **public sector** (university, other HEI, public or governmental research institute)	☐

I have **always** been employed as a researcher in the **private sector** (company or private research institute)	☐
I **started** as a researcher in the **public sector**, after which I **moved to the private sector** and I have **moved back to the public sector**	☐
I **started** as a researcher in the **public sector**, after which I **moved to the private sector** and I still work in the private sector	☐
I **started** as a researcher in the **private sector**, after which **I moved to the public sector** and I have **moved back to the private sector**	☐
I **started** as a researcher in the **private sector**, after which **I moved to the public sector** and I am still working in the public sector	☐
Other, please specify:	

29. How many employers did you have since your graduation (please also include periods of self-employment)?

(drop down box)

30. In how many different countries have you worked since your graduation (please also include periods of self-employment)?

(drop down box)

b) Geographic mobility

If question 12= Postgraduate degree (PhD or equivalent):

31. After obtaining your Postgraduate degree (PhD or equivalent), have you ever worked as a researcher for a minimum of three months in

☐ the EU	☐ the US	☐ both the EU and the US	☐ neither the EU nor the US

If 31= both to the US and to the EU:

32. Have you worked most recently in

☐ the EU	☐ the US

If 31= neither in the US nor in the EU => Go to 71

If 31 or 32 = EU

33. In which EU country have you worked most recently?

(drop down box)

If 12≠ Postgraduate degree (PhD or equivalent):

34. After obtaining your [12], have you ever worked as a researcher for a minimum of three months in

☐ the EU	☐ the US	☐ both the EU and the US	☐ neither in the EU nor in the US

If 34= both to the US and to the EU:

35. Have you worked most recently in

☐ the EU	☐ the US

If 34= neither in the US nor in the EU => Go to 72

If 34 or 35 = EU

36. In which EU country have you worked most recently?

(drop down box)

FILTER 1 ON here onwards!

Start of questionnaire for GROUP 1 ONLY

D1: VIEWS ON INTERNATIONAL MOBILITY from the EU to the US

routing => group D1:
- Question 14 (E)=EU and 31/34=US (or 32/35=US)

For this survey, you are considered as internationally mobile from the EU to the US. The questions that follow intend to capture your opinion on the barriers and facilitating factors of mobility and the effects of mobility to your personal career.

If you have been mobile to the US more than once please consider your most recent stay for the questions that follow.

37. How long have you been mobile in the US?

(drop down box)

☐ ≥ 3 months and < 6 months
☐ ≥ 6 months and < 1 year
☐ ≥ 1 year and < 2 years
☐ ≥ 2 years and < 3 years
☐ ≥ 3 years

38. When did you stay in the US for the last time as a researcher for at least for three months?

(drop down box)

39. After working in the US, have you worked in the EU as researcher?

☐ Yes ☐ No

PERSONAL MOTIVATIONS TO BECOME MOBILE to the US

40. To what extent were the following aspects important as factors motivating you to become mobile to the US?

	Not important at all				Extremely important	NA
Personal/family factors	☐	☐	☐	☐	☐	☐
Personal education and/or research agenda (i.e. the content and direction of your research)	☐	☐	☐	☐	☐	☐
Career progression goals (possibility for your career as researcher to evolve further)	☐	☐	☐	☐	☐	☐
Getting access to the facilities / equipment necessary to your research	☐	☐	☐	☐	☐	☐
Prospect to work with leading experts ('star scientists') in your field of research at (or close to) your new employer	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Personal interest in the culture of the country (US)	☐	☐	☐	☐	☐	☐

EXTERNAL INFLUENCING FACTORS OF YOUR DECISION TO BECOME MOBILE to the US

41. During the period of time when you have been deciding to become mobile, to what extent have the following factors been important in influencing your decision to work in the US?

	Not important at all				Extremely important	NA
Pension and social care provision in the US	☐	☐	☐	☐	☐	☐
Immigration regulations (e.g. migration law, labour permission law, law of residence permission)	☐	☐	☐	☐	☐	☐
Obtaining funding for own research	☐	☐	☐	☐	☐	☐
Language	☐	☐	☐	☐	☐	☐
Work permission for partner (and other family members)	☐	☐	☐	☐	☐	☐
Availability of adequate schools for children	☐	☐	☐	☐	☐	☐
Quality and cost of accommodation	☐	☐	☐	☐	☐	☐
Potential "loss" of contact with your professional network at the location where previously worked	☐	☐	☐	☐	☐	☐

EFFECTS OF INTERNATIONAL MOBILITY to the US

42. Due to working as an internationally mobile researcher to the US your…

	Strongly decreased	decreased	Remained unchanged	increased	Strongly increased	NA
publication output has	☐	☐	☐	☐	☐	☐
patent output has	☐	☐	☐	☐	☐	☐
ability to work in the industrial sector has	☐	☐	☐	☐	☐	☐
access to infrastructure and know-how (available in the US) has	☐	☐	☐	☐	☐	☐
access to an international network of professionals active in your field (or related fields) has	☐	☐	☐	☐	☐	☐
professional experience as researcher has	☐	☐	☐	☐	☐	☐
future job opportunities in the country where you have previously worked/studied have	☐	☐	☐	☐	☐	☐
your general "recognition" in the research community as a researcher has	☐	☐	☐	☐	☐	☐

43. Overall, the effect of mobility to the US has had …

	significant negative effects	negative effects	no effects	positive effects	signicative positive effects	NA
on your career as researcher	☐	☐	☐	☐	☐	☐
on your personal and family life	☐	☐	☐	☐	☐	☐

44. How does working as a researcher in the US compares to working as a researcher in the EU?

(Please indicate the extent to which you agree/disagree; if you do not have an explicit opinion, please tick "no opinion")

	Significantly disagree	Disagree	Indiffernt	Agree	Significantly agree	No opinion
the US provides better funding opportunities for researchers that the EU	☐	☐	☐	☐	☐	☐
working as a researcher in the US has been (would be) a better reference for my career as researcher	☐	☐	☐	☐	☐	☐
the US provides better research infrastructure than the EU in my field of research	☐	☐	☐	☐	☐	☐
working in the US provides more opportunities to collaborate with top-class researchers in my field of research	☐	☐	☐	☐	☐	☐
working in the US provides access to knowledge not available in the EU in my field of research	☐	☐	☐	☐	☐	☐
working in the US provides more attractive remuneration schemes						
the US provides more opportunities to work in the industry						

If question 39 = Yes:

45. Which of the following factors have been important for your decision to return to the EU after working in the US?

	Not important at all				Extremely important	NA
Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐

Cultural difference between the US and your home country	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

If question 39 = No

46. Which of the following factors have been important for your decision not to return to the EU after working in the US?

	Not important at all				Extremely important	NA
Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Cultural difference between the US and your home country	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

47. Are you open to the possibility of being mobile in the US in the future?

☐ Yes	☐ No	☐ NA (e.g. I am currently mobile in the US)

48. Which country location is most attractive to you in terms of potential future mobility? (independently of whether you have worked in that country as researcher or not)

(drop down box) – not compulsory

49. Have you ever worked in or undertaken a research visit to this country? – *not compulsory*

☐ Yes	☐ No	

50. Would you anticipate…	Yes	No
Moving to that country for a fixed term research visit (without changing jobs)?	☐	☐
Seeking a new employment position in that country?	☐	☐

51. Other things being equal in terms of research environment (funding, career opportunities, reputation, research infrastructure) which country location would be most appealing to you?

(drop down box) –not compulsory

52. Please provide 3 main keywords of factors that you find most important in defining the most attractive work environment for research:

(open field)

53. Could you please provide any other comment or information you wish to share regarding your experience of international mobility to the US, any obstacles to mobility you have encountered and the impacts mobility has had on your career?

(open field)

END of questionnaire for GROUP D1

START of questionnaire for GROUP 2 ONLY

D2: VIEWS ON INTERNATIONAL MOBILITY from the US to the EU

routing => group D2:
- 16 (E)=US and 38/41=EU (or 39/42=EU)

For this survey, you are considered as internationally mobile from the US to the EU. The questions that follow intend to capture your opinion on the barriers and facilitating factors of mobility and the effects of mobility to your personal career.

If you have been mobile to different EU countries, please consider the EU country where you stayed as mobile researcher most recently for the questions that follow.

54. How long have you been mobile in the EU?

☐ ≥ 3 months and < 6 months
☐ ≥ 6 months and < 1 year
☐ ≥ 1 year and < 2 years
☐ ≥ 2 years and < 3 years
☐ ≥ 3 years

55. When did you stay in the EU for the last time as a researcher for at least for three months?
(drop down box)

56. After working in the EU, have you worked in the US as researcher?

☐ Yes ☐ No

PERSONAL MOTIVATIONS TO BECOME MOBILE to the EU

57. To what extent were the following aspects important as factors motivating you to become mobile to the EU?

	Not important at all				Extremely Important	NA
Personal/family factors	☐	☐	☐	☐	☐	☐
Personal education and/or research agenda (i.e. the content and direction of your research)	☐	☐	☐	☐	☐	☐
Career progression goals (possibility for your career as researcher to evolve further)	☐	☐	☐	☐	☐	☐
Getting access to the facilities / equipment necessary for your research	☐	☐	☐	☐	☐	☐
Prospect to work with leading experts ('star scientists') in your field of research at (or close to) your	☐	☐	☐	☐	☐	☐

new employer						
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Personal interest to the culture of an EU country	☐	☐	☐	☐	☐	☐

EXTERNAL INFLUENCING FACTORS OF YOUR DECISION TO BECOME MOBILE to the EU

58. During the period of time when you have been deciding to become mobile, to what extent have the following factors been important in influencing your decision to work in the EU?

	Not important at all				Extremely Important	NA
Pension and social care provision in the EU	☐	☐	☐	☐	☐	☐
Immigration regulations (e.g. migration law, labour permission law, law of residence permission)	☐	☐	☐	☐	☐	☐
Obtaining funding for own research	☐	☐	☐	☐	☐	☐
Language	☐	☐	☐	☐	☐	☐
Work permission for partner (and other family members)	☐	☐	☐	☐	☐	☐
Availability of adequate schools for children	☐	☐	☐	☐	☐	☐
Quality and cost of accommodation	☐	☐	☐	☐	☐	☐
Potential "loss" of contact with your professional network at the location where previously worked	☐	☐	☐	☐	☐	☐

EFFECTS OF INTERNATIONAL MOBILITY to the EU

59. Due to working as an internationally mobile researcher to the EU your …

	Strongly decreased	decreased	Remained unchanged	increased	Strongly increased	NA
publication output has	☐	☐	☐	☐	☐	☐
patent output has	☐	☐	☐	☐	☐	☐
ability to work in the industrial sector has have	☐	☐	☐	☐	☐	☐
access to infrastructure and know-how (available in the EU) has	☐	☐	☐	☐	☐	☐
access to an international network of professionals	☐	☐	☐	☐	☐	☐

active in your field (or related fields) has						
professional experience as researchers has	☐	☐	☐	☐	☐	☐
future job opportunities in the country where you have previously worked/studied have	☐	☐	☐	☐	☐	☐
your general "recognition" in the research community as a researcher has	☐	☐	☐	☐	☐	☐

60. Overall, the effect of mobility to the EU has had …

	significant negative effects	negative effects	no effects	positive effects	signicative positive effects	NA
on your career as researcher	☐	☐	☐	☐	☐	☐
on your personal and family life	☐	☐	☐	☐	☐	☐

61. How does working as a researcher in the EU compares to working as a researcher in the US?

(Please indicate the extent to which you agree/disagree; if you do not have an explicit opinion, please tick "no opinion")

	Significantly disagree	Disagree	Indifferent	Agree	Significantly agree	No opinion
the EU provides better funding opportunities for researchers than the US	☐	☐	☐	☐	☐	☐
working as a researcher in the EU has been (would be) a better reference for my career as researcher	☐	☐	☐	☐	☐	☐
the EU provides better research infrastructure than the US in my field of research	☐	☐	☐	☐	☐	☐
working in the EU provides more opportunities to collaborate with top-class researchers in my field of research	☐	☐	☐	☐	☐	☐
working in the EU provides access to knowledge not available in the US in my field of research	☐	☐	☐	☐	☐	☐
working in the EU provides more attractive remuneration schemes	☐	☐	☐	☐	☐	☐
the EU provides more opportunities to work in the industry	☐	☐	☐	☐	☐	☐

If 56 = Yes:

62. Which of the following factors have been important for your decision to return to the US after working in the EU?

	Not important at all				Extremely important	NA

Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Cultural difference between the US and your home country	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

If 56 = No

63. Which of the following factors have been important for your decision not to return to the US after working in the EU?

	Not important at all				Extremely important	NA
Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Cultural difference between the US and your home country	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

64. Have you actively considered being internationally mobile to the EU in the future?

☐ Yes ☐ No ☐ NA

65. Which country location is most attractive to you in terms of potential future mobility? (independently of whether you have worked in that country as researcher or not)

(drop down box)

66. Have you ever worked in or undertaken a research visit to this country?

☐ Yes ☐ No ☐ NA

67. Would you anticipate…	Yes	No
Moving to that country for a fixed term research visit (without changing jobs)?	☐	☐
Seeking a new employment position in that country?	☐	☐

68. Other things being equal in terms of research environment (funding, career opportunities, reputation, research infrastructure) which country location would be most appealing to you?

(drop down box) –not compulsory

69. Please provide 3 main keywords of factors that you find most important in defining the most attractive work environment for research:

(open field)

70. Could you please provide any other comment or information you wish to share regarding your experience of international mobility to the EU, any obstacles to mobility you have encountered and the impacts mobility has had on your career?

(open field)

END of questionnaire for GROUP D2

For all respondent not belonging to either D1 nor D2:

START of questionnaire for GROUPS D3 AND D4

If 14 = Postgraduate degree (PhD or equivalent):

71. After obtaining your Postgraduate degree (PhD or equivalent), have you ever worked as a researcher for a minimum of three months in any country other than [country 14]?

☐ Yes ☐ No

If 14 ≠ Postgraduate degree (PhD or equivalent):

72. After obtaining your [12], have you ever worked as a researcher for a minimum of three months in any country other than [country 14]?

☐ Yes ☐ No

If 71 or 72 = Yes

73. In which country (most recently)?

(drop down menu)

If 71 or 72 = No

74. In which country have you mainly worked as researcher?

(drop down menu)

FILTER 2 ON here onwards!

CONTINUATION of questionnaire for GROUP 3 ONLY

D3: VIEWS ON INTERNATIONAL MOBILITY

routing group D3 => ∉ D1 and ∉ D2 and 71/72 =YES

For this survey, you are considered as internationally mobile. The questions that follow intend to capture your opinion on the barriers and facilitating factors of mobility and the effects of mobility to your personal career.

If you have been mobile to different countries, please consider the country where you stayed as mobile researcher most recently for the questions that follow.

75. How long have you been mobile (in months) in [country 73]??

☐ ≥ 3 months and < 6 months
☐ ≥ 6 months and < 1 year
☐ ≥ 1 year and < 2 years
☐ ≥ 2 years and < 3 years
☐ ≥ 3 years

76. When did you stay in [country 73] for the last time as a researcher for at least for three months?

(drop down box)

PERSONAL MOTIVATIONS TO BECOME MOBILE

77. To what extent were the following aspects important as factors motivating you to become mobile to [country 73]?

	Not important at all				Extremely important	NA
Personal/family factors	☐	☐	☐	☐	☐	☐
Personal education and/or research agenda (i.e. the content and direction of your research)	☐	☐	☐	☐	☐	☐
Career progression goals (possibilities for your career as researcher to evolve further)	☐	☐	☐	☐	☐	☐
Getting access to the facilities / equipment necessary to your research	☐	☐	☐	☐	☐	☐
Prospect to work with leading experts ('star scientists') in your field of research at (or close to) your new employer	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Personal interest in the culture of [country 73]	☐	☐	☐	☐	☐	☐

EXTERNAL INFLUENCING FACTORS OF YOUR DECISION TO BECOME MOBILE to country 73

78. During the period of time when you have been deciding to become mobile, to what extent have the following factors been important in influencing your decision to work in the EU?

	Not important at all				Extremely Important	NA
Pension and social care provision in country 73	☐	☐	☐	☐	☐	☐
Immigration regulations (e.g. migration law, labour permission law, law of residence permission)	☐	☐	☐	☐	☐	☐
Obtaining funding for own research	☐	☐	☐	☐	☐	☐
Language	☐	☐	☐	☐	☐	☐
Work permission for partner (and other family members)	☐	☐	☐	☐	☐	☐
Availability of adequate schools for children	☐	☐	☐	☐	☐	☐
Quality and cost of accommodation	☐	☐	☐	☐	☐	☐
Potential "loss" of contact with your professional network at the location where previously worked	☐	☐	☐	☐	☐	☐

EFFECTS OF INTERNATIONAL MOBILITY

79. Due to working as an internationally mobile researcher in [country 73] your

	Strongly decreased	decreased	Remained unchanged	increased	Strongly increased	NA
publication output has	☐	☐	☐	☐	☐	☐
patent output has	☐	☐	☐	☐	☐	☐
ability to work in the industrial sector have	☐	☐	☐	☐	☐	☐
access to infrastructure and know-how (available in [country 73]) has	☐	☐	☐	☐	☐	☐
access to an international network of professionals active in your field (or related fields) has	☐	☐	☐	☐	☐	☐
professional experience as researchers has	☐	☐	☐	☐	☐	☐
future job opportunities in the country where you have previously worked/studied have	☐	☐	☐	☐	☐	☐
your general "recognition" in the research community as a researcher has	☐	☐	☐	☐	☐	☐

80. Overall, the effect of mobility in [country 73] has had …

	significant negative effects	negative effects	no effects	positive effects	signicative positive effects	NA
on your career as researcher	☐	☐	☐	☐	☐	☐
on your personal and family life	☐	☐	☐	☐	☐	☐

If country 73 ∉ EU:

81. How do you think working as a researcher in an EU county compares to working as a researcher in [country 73]?

(Please indicate the extent to which you agree/disagree; if you do not have an explicit opinion, please tick "no opinion")

	Significanly disagree	Disagree	Indiffernt	Agree	Significantly agree	No opinion
[country 73] provides better funding opportunities for researchers than the EU	☐	☐	☐	☐	☐	☐
working as a researcher in [country 73] has been (would be) a better reference for my career as researcher	☐	☐	☐	☐	☐	☐

[country 73] provides better research infrastructure than the EU in my field of research	☐	☐	☐	☐	☐	☐
working in [country 73] provides more opportunities to collaborate with top-class researchers in my field of research	☐	☐	☐	☐	☐	☐
working in [country 73] provides access to knowledge not available in the EU in my field of research	☐	☐	☐	☐	☐	☐
working in [country 73] provides more attractive remuneration schemes	☐	☐	☐	☐	☐	☐
working in [country 73] provides more opportunities to work in the industry	☐	☐	☐	☐	☐	☐

If country 73 ∉ EU:

82. After working in [country 73], have you worked in the EU as researcher?

☐ Yes ☐ No

If 82= Yes:

83. Which of the following factors have been important for your decision to move to the EU after working in [country 73]?

	Not important at all				Extremely important	NA
Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Cultural difference between [country 73] and the EU countries	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

If 82= No

84. Which of the following factors have been important for your decision not to move to the EU after working in [country 73]?

	Not important at all				Extremely important	NA
Personal/family reasons	☐	☐	☐	☐	☐	☐
Personal educational reasons	☐	☐	☐	☐	☐	☐
Career progression reasons	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Cultural difference between [country 73] and the EU countries	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐

85. Which country location is most attractive to you in terms of potential future mobility? (independently of whether you have worked in that country or not)

(drop down box) – should not be compulsory

86. Have you ever worked in or undertaken a research visit to this country?

☐ Yes ☐ No ☐ not applicable

87. Would you anticipate…	Yes	No
Moving to that country for a fixed term research visit (without changing jobs)?	☐	☐
Seeking a new employment position in that country?	☐	☐

88. Other things being equal in terms of research environment (funding, career opportunities, reputation, research infrastructure) which country location would be most appealing to you?

(drop down box) –not compulsory

89. Please provide 3 main keywords of factors that you find most important in defining the most attractive environment for research:

(open field)

90. Could you please provide any other comment or information you wish to share regarding your experience of international mobility to [country 73], any obstacles to mobility you have encountered and the impacts mobility has had on your career?

(open field)

END of questionnaire for GROUP D3

CONTINUATION of questionnaire for GROUP 4 ONLY

D4: VIEWS ON NO MOBILITY

routing group D4 => ∉ D1 and ∉ D2 and 71/72=No

91. How long have you been working (in months) in [country 74]?

☐ ≥ 3 months and < 6 months
☐ ≥ 6 months and < 1 year
☐ ≥ 1 year and < 2 years
☐ ≥ 2 years and < 3 years
☐ ≥ 3 years

PERSONAL DEMOTIVATIONS TO BECOME MOBILE

92. To what extent were the following aspects important as factors dissuading you to become mobile?

	Not important at all				Extremely important	NA

Personal/family factors	☐	☐	☐	☐	☐	☐
Personal education and/or research agenda (i.e. the content and direction of your research)	☐	☐	☐	☐	☐	☐
Career progression goals (possibilities for your career as researcher to evolve further) in country 74	☐	☐	☐	☐	☐	☐
Having access to the facilities / equipment necessary to your research	☐	☐	☐	☐	☐	☐
Prospect to work with leading experts ('star scientists') in your field of research at (or close to) your employer in country 74	☐	☐	☐	☐	☐	☐
Salary and other financial incentives	☐	☐	☐	☐	☐	☐
Personal interest in the culture of [country 74]	☐	☐	☐	☐	☐	☐

93. Have you ever considered of becoming mobile to a country other than country 74?

☐ Yes ☐ No

If 93 = Yes => continue to 94

If 93 = No => continue to 95

EXTERNAL INFLUENCING FACTORS OF YOUR DECISION TO BECOME MOBILE

94. During the period of time when you have been considering becoming mobile, to what extent have the following factors been important in influencing your decision not to become mobile?

	Not important at all				Extremely important	NA
Pension and social care provision in countries other than country 74	☐	☐	☐	☐	☐	☐
Immigration regulations (e.g. migration law, labour permission law, law of residence permission)	☐	☐	☐	☐	☐	☐
Obtaining funding for own research	☐	☐	☐	☐	☐	☐
Language	☐	☐	☐	☐	☐	☐
Work permission for partner (and other family members)	☐	☐	☐	☐	☐	☐
Availability of adequate schools for children	☐	☐	☐	☐	☐	☐
Quality and cost of accommodation	☐	☐	☐	☐	☐	☐
potential "loss" of contact with your professional network at the location where previously worked	☐	☐	☐	☐	☐	☐

If country 74 ≠ EU:

95. How do you think working as a researcher in an EU county compares to working as a researcher in [country 74], even though you might have never worked in an EU country?

(Please indicate the extent to which you agree/disagree; if you do not have an explicit opinion, please tick "no opinion")

	Significantly disagree	Disagree	Indifferent	Agree	Significantly agree	No opinion
[country 74] provides better funding opportunities for researchers that the EU	☐	☐	☐	☐	☐	☐
working as a researcher in [country 74] has been (would be) a better reference for my career as researcher	☐	☐	☐	☐	☐	☐
[country 74] provides better research infrastructure than the EU in my field of research	☐	☐	☐	☐	☐	☐
working in [country 74] provides more opportunities to collaborate with top-class researchers in my field of research	☐	☐	☐	☐	☐	☐
working in [country 74] provides access to knowledge not available in the EU in my field of research	☐	☐	☐	☐	☐	☐
working in [country 74] provides more attractive remuneration schemes	☐	☐	☐	☐	☐	☐
working in [country 74] provides more opportunities to work in the industry	☐	☐	☐	☐	☐	☐

96. Which country location is most attractive to you in terms of potential future mobility (independently of whether you have worked in this country or not)?

(drop down box) – should not be compulsory

97. Have you ever worked in or undertaken a research visit to this country?

☐ Yes ☐ No ☐ NA

98. Would you anticipate…	Yes	No
Moving to that country for a fixed term research visit (without changing jobs)?	☐	☐
Seeking a new employment position in that country?	☐	☐

99. Other things being equal in terms of research environment (funding, career opportunities, reputation, research infrastructure) which country location would be most appealing to you?

(drop down box) –not compulsory

100. Please provide 3 main keywords of factors that you find most important in defining the most attractive environment for research:

(open field)

101. Could you please provide any other comment or information you wish to share regarding international mobility and any obstacles to mobility you have encountered?

END of questionnaire for GROUP D4

ANNEX 4: LIST OF INTERVIEWEES

Name	Affiliation
Dirk Czarnitzki	Katholieke Universiteit Leuven
Petra Andries	Katholieke Universiteit Leuven
Catherine Schaumans	Universiteit Tilburg
Italo Colantone	Erasmus University
Whitney Harris	World Ecology Center
Jo Van Biesebroeck	Katholieke Universiteit Leuven