IMPAFEL 2

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Impact assessment of the Marie Curie fellowships under the 4th and 5th Framework Programmes of Research and Technological Development of the EU (1994-2002)

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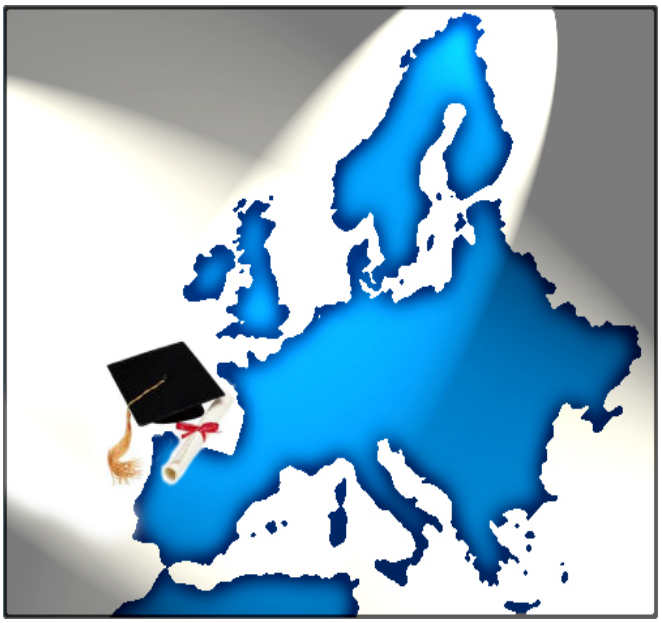

Acknowledgements

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Executive summary

Marie Curie Fellowships are one of the most important opportunities for European researchers who wish to spend some time in a European country different than their own to develop research skills. In the period 1994-2002, almost 12,000 researchers undertook international research training funded by the Marie Curie fellowships of the 4th and 5th Framework Programme of Research and Technological Development of the EU.

In 2002, the Directorate General for Research of the European Commission (Unit RTD D2) issued a call for tender for an independent evaluation designed to assess the impact of the Marie Curie fellowships. An international consortium (APRE – Agency for the Promotion of European Research (I), the Centre for the Study of Law and Policy in Europe of the University of Leeds (UK) and the Hungarian Science and Technology Foundation) undertook the impact assessment.

The assessment was completed in June 2005 after two years of work. The Consortium evaluated the fellowships of the 4th and 5th Framework Programme only. Therefore, the effects of some of the recent developments in the Marie Curie fellowships under the 6th Framework Programme have not been included.

The study made use of an on-line questionnaire, interviews and analysis of background documentation, adopting a combination of objective and subjective measures of impact:

The total population comprised 11,802 fellows and 6,036 supervisors. Only 52% of fellows and 81% of supervisors could be reached; for the others, no valid address could be found. The questionnaire was answered by 47% (2918) of the contacted fellows, and 29% (1389) of contacted supervisors. These data are considered as representative of the entire population.
47% of all grant holders were at post-graduate level (usually during doctorate) and 49% at post-doctorate level or with more than 4 years' equivalent research experience. 61% of all fellowships were in University hosts.

The most important findings are described below.

Characteristics of the scheme
The Marie Curie fellowships seem to be a very useful and successful scheme, greatly appreciated by the majority of those who participated, both fellows and supervisors. The remuneration and bench fees were important in permitting independence, and facilitated researchers moving to countries where remuneration is typically poor.
Evaluation procedures were perceived as meritocratic and objective. Overall, the respondents saw the Marie Curie fellowships as a reference point in setting a good example to regional and national policy makers. Meritocracy and competition are the aspects that, according to fellows' comments, contributed to the prestige of the Marie Curie fellowship. For 45% of fellows the prestige of the Marie Curie fellowship was one of the main reasons for applying, and 49% thought it more prestigious than other fellowship schemes.

Supervision and training

The quality of supervision was rated highly with the majority of fellows rating it as 'extremely good' (38%) or 'good' (33%). Fellows in industry were less likely to report supervision as good (54% compared to 74% of fellows in university). Overall, only 10% rated the supervision as poor.

67% of fellows referred to the opportunities the scheme provided in terms of learning new research skills, both as a major motivation for application, and as a main area of impact.

The qualitative component of the impact assessment furthermore showed a high training impact of the Marie Curie fellowship, in terms of additional scientific skills, complementary skills, and interdisciplinary experience. For many of the post-doctoral fellows, the Marie Curie fellowship allowed them to reach scientific maturity and gain independence as a researcher.

The main training impact, according to both fellows and supervisors, lay in working side to side with the other members of the host research group, which provided exposure to new knowledge and ideas and mentoring of the supervisor and the wider research group.

The fellowships enabled many fellows to change either the ways in which they worked or the focus of their work.

Main perceived impact of Marie Curie fellowships

According to the fellows who answered the questionnaire, the perceived impact of the Marie Curie fellowship was most significant in relation to three factors:

- their international research experience;
- the development of research skills;
- the opportunity to have dedicated time to carry out research.

Supervisors identified the strongest impacts in the areas of:

- research competence;
- time/workforce to do research;
- the ability to attract excellent researchers.

This indicates a strong impact on the building of research groups in Europe.

Transnational mobility

79% of fellows reported that a major reason in applying for the fellowship was to gain international experience. 28% of respondents said that they would definitely not have gone abroad without the Marie Curie fellowship.

For 50% of post-graduate and about one-third of post-doctoral researchers, the fellowship constituted their first exposure to mobility. Fellows who had not been abroad before more frequently thought that the Marie Curie fellowship had a high impact in enabling their mobility (69%), compared to those who already had foreign research experience (55%).

Destinations

The UK was the most popular host country (28% of all fellows), followed by France (17%), Germany (12%), the Netherlands (9%) and Spain and Italy (6% each). The current new Member States and Candidate countries gradually became eligible to participate to the Marie Curie fellowships during the Fifth Framework Programme; however, their participation was still rather limited in the period 1994-2002.

Fellows praised the Marie Curie fellowships for supporting the retention of scientists in Europe and enabling the return of European researchers after a stay in a country outside Europe. In fact, the interview data showed that many preferred Europe for cultural or family reasons.

Origin of fellows
As to the individuals who held these research fellowships, southern Europe exports a significant proportion of fellows. The most numerous nationality groups were Spain (16%), Italy (14%), Germany and France (13% each).

Unbalanced flows of fellows within Europe
Certain countries received more fellows than went abroad. In proportion to the scientific work force per country, this was notably the case for the UK, Denmark, the Netherlands, and Norway. Other countries could be considered 'sending' countries: more nationals left for a Marie Curie fellowship compared to the researchers that these countries played host to. In proportion to the number of researchers in these countries, this was especially so for the Slovak Republic, Iceland and Hungary.

Post-fellowship mobility flows
Over 90% of respondents to the survey had remained in Europe after the end of the fellowship. Return rates to the home country increased over time. Four years after the fellowship, 56% of fellows had returned. Post-docs were more likely than doctoral fellows to return after the fellowship (50% compared to 40%). No clear gender differences emerged, but fellows with children were more likely to return.

Differences in return rates were apparent by the nationality of fellows: Spanish fellows were most likely to return (58%), followed by French (48%), Germans (46%) and Italians (44%). Lowest return rates could be seen in relation to fellows from the UK/Ireland (30%) and South East Europe (27%).
There was a link between duration of fellowships and return: fellows on longer fellowships were less likely to return.
Although valuable, the Marie Curie return grant (which limited eligibility to defined less favoured regions and represented 3% of the total fellows population) did not have a significant impact on return rates in general.

The majority of fellows (67%) said they would probably move again in the next five years, providing evidence of ongoing post-fellowship mobility. This was particularly the case for fellows from Eastern Europe and Baltic countries.

Around a third of fellows returned to their previous institution to work: around a quarter were now working in another institute in their home country. 22% of category 20 and 30% of category 30 fellows remained in the host country; the majority of these working in the host institute.

The interviews identified a range of factors critical to fellows' location decisions, both when choosing the Marie Curie host institution and when returning:

- research intensive areas were a powerful attraction to fellows both because of the level of expertise and resources concentrated in specialist centres but also because of the greater range of employment opportunities for scientists and their partners in research intense clusters.

- Many scientists were heavily influenced in the choice of host institution by their pre-existing connections which typically served to 'channel' mobility.
- The prestige of the institute and reputation of the supervisor had an important influence on location decisions. The two are not necessarily the same.
- The ability for partners and children to accompany fellows, or for fellows to be able to visit family and friends in the home country both cheaply and easily, were very important factors, as was the availability of work positions for partners.
- Researchers were attracted to regions in order to improve their language skills (particularly in English). In other cases their lack of language skills, or those of their partner, restricted their choice of destinations.
- For many respondents the scheme offered them the opportunity to return to or remain in Europe (see below).
- Although the scheme, through its generous allowances, reduces the effects that salary usually play in migration decisions, some fellows referred to the relative costs of living and housing in particular in some regions which shaped their choice of host institute.

The scheme undoubtedly plays a role in shaping the geography of scientific flows. This can be interpreted in a number of ways; firstly it evidently reinforces the patterns of flows away from less research intensive locations in favour of more research rich regions. However, there was evidence that the level of funding provided also supported movements into less favoured regions on the part of scientists who would otherwise be deterred from these moves (because of poor salaries or lack of opportunities). Finally, strong evidence emerged of the impact of the scheme in retaining and encouraging the return of scientists to Europe. These are complex questions which defy simplistic conclusions and demand further study.

Post-fellowship career development

Dispersion to other areas of activity after the research fellowship was found to be fairly limited. Instead, the data showed strong retention in research careers: 90% of respondents who had had either a post-graduate or a post-doctoral Marie Curie fellowship were still active in paid research at the time of answering the questionnaire.

The outcomes from the questionnaires show that the Marie Curie fellows have a more stable contract situation after the fellowship than before. Taking into consideration the time interval which passed since the end of fellowship and the survey, after 4 years 42% of post-graduate and 63% of post-doctoral fellow respondents had a permanent position.

Furthermore, 68% of fellows answered that after the Marie Curie fellowship they operate at a higher level of responsibility at work. The questionnaire answers also show an increase in the level of satisfaction with salary before and after the Marie Curie fellowship.

From these findings it may be concluded that the Marie Curie grant contributes to consolidating the researchers' career position.

A contribution to a sustainable network

The data point to a significant impact of the Marie Curie fellowships in networking between researchers in Europe. On the one hand, the scheme strengthened existing

connections for 34% of post-graduate researchers, 40% of post-doctoral researchers and 73% of senior researchers.
On the other hand, it was a powerful means for generating new contacts. Over 70% of fellows reported that their stay abroad lead to contacts which were influential for their subsequent career progression, and 86% of researchers maintained contacts with their Marie Curie host institution after the fellowship.

Tangible research output

The Marie Curie fellowship had a clear impact on the generation of research output.
The number of publications achieved was linked to the duration of the fellowship and the level of experience of the fellows. For fellowships up to 6 months (which were for 94% at post-graduate level), 57% of fellows produced one or more publication. The percentage rises to 77% for fellowships between 6 months and a year (which were for 65% at post-graduate level), up to 90% of respondents who achieved at least one publication for fellowships of one year or longer (where post-doctoral fellows were represented for 92%). Analysing only post-doctoral fellows, the mean average publication rate during the Marie Curie fellowship was 3.1 publications per year for fellows in universities, 2.6 in research centres, and 1.2 in industries.

Knowledge exchange

The cross-fertilisation of the fellow's background with the competences at the host group were particularly appreciated by most respondents, both fellows and supervisors. Furthermore, in interviews supervisors frequently mentioned the advantage of Marie Curie fellows being able to perform more strategic or exploratory work, whilst permanent staff members were too encumbered with ordinary administration to do so. The Marie Curie projects introduced new dimensions to the research being undertaken in the host group, which often continued after the fellowship. In this sense, even the presence of one Marie Curie fellow could have a significant impact on the research output of the host group, and on the development of science in Europe in a broader sense.

A strong academic orientation: for the future interaction with industry to be encouraged

The majority of Marie Curie fellowships were carried out in an academic setting. The 5th Framework Programme included a special fellowship programme for industry, and 8% of fellowships under study were carried out in an industrial setting.
Among respondents who had already concluded the fellowship, 7% reported that the research project had resulted in one or more patents (one-third owned by the fellow and two-thirds owned by the host organisation).

Industry-academia collaboration was felt to be important by 60% of fellows and 63% of supervisors, but only 18% of fellows had been engaged in such collaboration during the fellowship. Supervisors were of the opinion that in 43% of cases, the work of the fellow had led to the creation of new technologies.

Gender equality and representation

Female researchers made up 40% of all fellows in FP4 and FP5. Fellows and supervisors did not perceive any gender bias in the selection, administration and conditions of the Marie Curie fellowship. Researchers with children participated successfully in the Marie Curie fellowship scheme.

Overcoming fragmentation in Europe

The Marie Curie fellowships allow for European researchers to gain experience in a host institution in a different European country. As such, they contribute to creating links and increasing cohesion in the European Research Area. Many fellows and supervisors spoke of how the fellowship contributes to creating a 'scientific European identity'.

Section 1
Introduction

1.1. The Impact Assessment

In 2002, the Directorate General of Research (Unit RTD D2) of the European Commission issued a call for tender to support an independent study by the name of 'IMPAFEL', designed to assess the impact of the Marie Curie fellowships.

An international consortium (APRE – Agency for the Promotion of European Research (I), the Centre for the Study of Law and Policy in Europe of the University of Leeds (UK) and the Hungarian Science and Technology Foundation) were contracted to undertake this project.
The impact assessment was concluded in June 2005 after two years of work. The project focussed on Marie Curie fellowship contracts issued under the 4th and 5th Framework Programme. Similar fellowships funded by the 'Research Training Networks' action are not included. The findings of the impact assessment are presented in this report.

The research objectives
The tender specifications required the project team to address four dimensions of impact:

- *the careers of individual scientists in terms of key factors such as employability, expertise, mobility, international standing, access to further training, equal opportunities;*
- *host institutions in terms of key sectors, such as development of research capabilities, research quality, collaboration opportunities, educational outputs;*
- *the general development of European science and technology in terms of knowledge creation and transfer, development of new technologies, the creation of spin-off companies;*
- *the general impact of European Union research programmes in terms of public awareness, influence on national and regional research policies and research programme administration.*

The research strategy
The report considers the four levels of impact cited above. 'Impact' has been interpreted in the widest possible sense as the effects produced, directly or indirectly, by the Marie Curie fellowship on these four levels. In response to the objectives stated above, the research team devised an approach that combined a variety of quantitative and qualitative instruments, as described below.

- **Analysis of population of fellows**
  The Commission's data bases on all awarded fellowships contained address information on fellows and supervisors, along with information on the type of fellowship, duration, level, as well as nationality and place of residence. Partial information was available for gender and age.

- **Statistical data gathered using on-line questionnaires**[1]
  Three distinct versions of the questionnaire were used:

  1. A questionnaire targeted fellows who had completed the fellowship at the time of answering the survey.
  2. A questionnaire aimed at 'current' fellows, who were still carrying out their fellowship when replying and therefore were not asked about their situation after the grant, nor were they asked to provide comprehensive information on data available only at the end of the fellowship, such as, for example, number of publications achieved.

[1] The questionnaires, and the percentage of answers obtained by each question, are available on http://impafel.apre.it.

3. A questionnaire for supervisors.

The questionnaires used a combination of multiple choice and open ended questions, allowing for free text input.[2]

- **In-depth interviews**
  Interviews with 75 fellows and 75 supervisors were conducted - either by telephone or in person - recorded, transcribed, and analysed by specific aspects. A few short excerpts are quoted in the report[3].

- **Literature review, policy analysis and secondary analysis** of research findings on related projects.

Information from these last two sources has been used to formulate informed judgements to comment on or complement the statistical findings.

Limitations of the impact assessment

The sheer breadth of the tender objectives and complexity of attempting to measure impact necessarily applied certain limitations to the research approach.

One of the fundamental problems of a study such as this is identifying causation and attempting to isolate variables that are inherently interconnected. It is impossible to say in how far the impact observed is caused by the Marie Curie fellowship specifically.

Also, some tendencies identified in this report are specific to conditions of the Marie Curie fellowships of the previous two Framework Programmes, and may have been superseded by developments of the Marie Curie fellowships under the 6th Framework Programme (2002-2006).

It should furthermore be clear that this is not a programme evaluation, in the sense that only successful applicants took part in the survey, and the assessment focuses on the effects of the Marie Curie fellowship, not on the way in which the scheme is operated.

In fact, some fellows and supervisors volunteered comments on certain aspects of programme administration or burocratic procedures. However, it was evident that these aspects operate at a different level from the factors forming impact. A certain amount of administrative complication was felt by most not to preclude fellows doing good research and benefiting from the training, networking and research opportunities offered by the fellowship.

As to **statistical validity**, the sample is considered to be representative of the Marie Curie fellows and supervisors which were contacted. Due to problems in locating persons who had finished the fellowship a considerable time ago, there is a slight skew towards the more recent fellowships in relation to the entire population. For further details on the composition of the sample please see section 1.3 and Annex 2.

Due to the EC remit to contact a large sample of fellows, combined with the difficulty in finding valid address for fellows, the team sent the questionnaire to all fellows for which a contact address had been found. This entails a certain element of self-selection, in the sense that people who had dropped out of science are likely to be less identifiable and less motivated to reply to a questionnaire about their Marie Curie fellowship.

Due to rounding off of decimals, percentages may not always add up to 100%.

For the statistical error margin, please refer to annex 3.

Structure of the report

Analysis of the empirical findings have enabled us to identify a series of other key dimensions of impact. The areas identified are not discrete but relational and, as such, shape other dimensions of

[2] Further information on the questionnaires is available on the web site http://impafel.apre.it/

[3] Quotations have been rendered anonymous according to the following key: F for fellows / S for supervisors, followed by an identification number, followed by the country code, followed by a gender code (M for male, F for female).

impact. For example, to the extent that the scheme supports effective networking and connections this might also influence career progression or the propensity to publish.

Section 2 of the report considers the impact of the scheme in the following areas:

- European mobility
- Networking
- Research outputs
- Supervision and training
- Intersectoral exchange
- Post- fellowship career trajectories

The following subsections of section 1 present some characteristics of the Marie Curie fellowship which may contribute to create impact, and provide a brief profile of the group of researchers who held a Marie Curie fellowship.

1.2 The Marie Curie Fellowship Scheme

The European Union has invested in the training and mobility of researchers since the launch of the First Framework Programme (FP) of Research and Technological Development, which is the financial tool for implementing the European Union's research policy. In fact, promoting the development of a pool of researchers is one of the four pillars of the European research policy, as laid down in the Treaty of the European Community.
The impact assessment has evaluated the impact of the fellowships funded under the Fourth (1994-1998) and Fifth (1998-2002) Framework Programme. Though a continuation of other forms of fellowships, from the start of this period, these research grants are known under the brand name of "Marie Curie fellowships".

The Marie Curie fellowships are designed to promote **mobility of researchers** throughout the EU and Associated States. An essential requisite is that the fellow should move country, meaning that applicants may not carry out the fellowship in their country of nationality, nor in the country in which they were already living.
In terms of disciplinary focus, the Marie Curie programmes have **no pre-established scientific priorities**. The fellowships are intended to support non-targeted, free research, according to a so-called 'bottom-up' approach. The topic can be chosen by the applicants themselves, and the selection criteria are based on scientific excellence and relevance to the programme objectives.

Applicants had to be **nationals of an EU Member State or of an Associated State**.
Host institutions had to be legal entities established in a European Member or Associated State, which have their own research capabilities, such as universities, research centres, or industrial enterprises.
The Marie Curie fellowships of FP4 and FP5 were subject to an **age restriction** of 35 years. Allowance could be made, however, for applicants who have taken time out to look after children, for military service or because of serious personal problems.

Applications to the scheme are evaluated by teams of independent scientific experts appointed by the Commission, based on a peer review system. **Evaluation criteria** include the quality of the applicant, the scientific quality of the project, and the quality of the host institute. All applications are evaluated jointly at European level. The allocation of grants is not based upon nationality quotas.

Almost 12,000 researchers have been funded by the Marie Curie fellowships of the 4th and 5th Framework Programme during the period 1994-2002.

The EU **investment** amounted to a total of 260,4 million Ecu for the fellowships of the 4th Framework Programme and 556,2 million Euro[4] for the 5th Framework Programme.

1.2.1 Types of Marie Curie fellowship

Although 11 different types of fellowship were awarded under the 4th and the 5th Framework Programme, they can be grouped into four broad categories:

- **'Category 20'** refers to post-graduate researchers who have concluded their first level degree (defined as the degree which entitles them direct access to a PhD course in the country in which the first degree was obtained) and have less than 4 years of post-graduate research experience (full-time equivalent) and not yet completed a PhD.
- **'Category 30'** researchers are those who have completed a PhD or who have equivalent experience by having worked for at least 4 years full-time in research after their graduation. Wherever this report refers to 'post-doctoral' researchers, persons with four years' equivalent research experience are included.
- **'Category 40'** researchers have more than 14 years' post graduate or more than 10 years' post-doctoral experience. These may also be referred to as 'senior' researchers.
- **'Return' fellowships** were established to facilitate the return moves and reintegration of scientists from 'less favoured regions', who had previously received an out-going Marie Curie grant of at least 24 months.

Individual and host fellowships

The Fifth Framework Programme introduced a further distinction, operating as a cross section to the previous division based on the level of research experience: the concept of individual fellowships, and 'host fellowships'.

In the case of **individual fellowships**, the individual scientist applies for funding to go to a specific research group or laboratory. The application is presented by the fellow but with the consensus and previous agreement of the so-called 'host institute', and the combination 'fellow-host' may not be changed.

In the case of **host fellowships**, it is the organisation or institute that applies for funding for a certain number of anonymous 'fellowship-months', and subsequently recruits the most appropriate researchers, respecting formal EC criteria concerning age, nationality, level of experience. The individual researcher then applies directly to the designated 'Marie Curie host organisation'. Supervisors of host fellowships can manage the fellowship-months in their contracts in a flexible way, for example regarding duration, timing, early termination by some fellows, etc. The types of host fellowships are listed below.

- **Marie Curie Training Sites** are aimed at providing the opportunity of a short (3-12 months) research training in a different European country to early stage researchers undertaking a PhD. The research training received is intended to be an integral part of their PhD programme.
- **Marie Curie Industry Host fellowships** are aimed at providing both post-graduate and post-doctoral researchers with the opportunity to undertake research training in an industrial environment, in a country different then their own.
- **Marie Curie Development Host fellowships** have the objective to improve the capacities of research groups in Less Favoured Regions, by hosting post-doctoral researchers (the Marie Curie fellows) from a different European country with particular research competence, to be transferred to the host institute. At the same time, the fellows acquire knowledge and skills from the host institute and gain experience in knowledge transfer.

[4] This includes the funding allotted by the specific programmes of the Framework Programme.

In the Fourth Framework Programme, researchers with all levels of experience were eligible for individual fellowships. In the Fifth Framework programme, researchers needed to have reached post-doctoral or equivalent level to apply for an individual grant, whereas post-graduate researchers were eligible to receive a Marie Curie fellowship via a host organisation, through a Marie Curie Training Site or a Marie Curie Industry Host fellowship.

It was possible to apply (and obtain) more than one Marie Curie fellowship (within certain well-defined limits[5]). About 5% of the researchers in the study group had more than one Marie Curie fellowship during the 4th and 5th Framework Programme. A very small number even had three.

1.2.2 Funding mechanisms of the Marie Curie fellowship

The Marie Curie Fellowship Scheme provides a very consistent and attractive funding structure both for the fellow and the hosting research group[6]. It allows the fellow independence in two important ways.

First of all, the **remuneration of the fellow**, which depends on the level of experience and the host country, is intended to take the form of an employment contract, or similar contract[7] with social security rights of comparable level and scope. The subsistence rates differ from country to country so as to match the normal remuneration of a local researcher in an equivalent employment position, and thereby take into account the cost of living in a given country.

These conditions are a clear indication of the importance attached to the 'status' of the Marie Curie fellow by the European Commission. These researchers are not intended to have modest 'fellowship contracts', but to be on an equal level with the other local researchers in the group.

In practice, though, in countries where the conversion rate of the Euro fluctuated significantly, such as the UK, the value of the standard subsistence allowance might have lost some of its purchasing power. Also, this standard remuneration was set on country basis, but did not take into account differences in the cost of living between peripheral regions and large, expensive cities. For the (then) EU-15 countries, the standard rate for fellows at post-doctoral level[8] ranged between 1700 Euro net monthly (indicative rate, subject to minor fluctuations due to local tax situations) for countries such as Greece and Ireland, to 2350 for Luxemburg. For the (then) candidate or associated countries, the range was between 1300 Euro net monthly for Bulgaria, Lithuania and Romania and 1700 for Cyprus.

In addition, the fellows received a so-called **mobility allowance** of 400 Euro a month, as a contribution to the costs resulting as a consequence of being away from the home country, as well as a single travel allowance, depending on the distance between the home country and the host country.

With very little exception, the respondents who identified **remuneration** as an important impact referred to the relative generosity of the remuneration of the Marie Curie fellowship in comparison with other schemes.

The EU and the UK have focused in recent months on improving the attractiveness of research careers as a means of encouraging the recruitment and retention of scientists. Fellow's responses suggest that the Marie Curie scheme has been highly successful in this respect.

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[5] a limit per type of fellowship (e.g. 12 months for Training Sites, 24 months for Marie Curie individual fellowships for experienced researchers – see section on the duration of the fellowship) and an overal maximum of 4 years.

[6] The mechanism described is based on the rules of the Marie Curie fellowships of the 5th Framework Programme, but are fairly similar to the rules previously in force during the 4th Framework Programme, and therefore held to be an indicative example.

[7] With the exception of Marie Curie Training Sites, where the grant was a lump sum of 1200 Euro intended to integrate a PhD contract from the home institution of the fellow.

[8] The indicative rates given are for researchers at post-doctoral level or with equivalent 4 years' experience. The rate for post-graduate researchers was 70% of the sums listed. For 'category 40' researchers they were multiplied with a factor 150%, 175% or 200% based on the number of years of experience.

Overall, the respondents saw the Marie Curie scheme as an important reference point in setting a good example to national and regional policy makers.

A second source of financial and operational independence was the **contribution to overheads and/or research costs** (or 'bench fee') included in the Marie Curie fellowship: 900 Euro monthly for non-laboratory based research or 1200 Euro for laboratory based research. This funding was intended to also cover **conference participation of the fellow**, to be decided in joint agreement with the supervisor. This part of the grant was not paid directly to the fellow but managed by the host organisation. Some organisations withheld a fixed percentage as a contribution to general costs of the host institute, whereas others allocated it completely to the fellows' activities. In some cases, the fellows were even free to decide themselves how to use this fund.
Obviously, in some fields of research, material costs might be considerably higher than this amount, but on the whole both fellows and supervisors reported satisfaction with this arrangement.

Thus, the **payment of bench fees** is referred to in many cases as a **specific advantage of the Marie Curie scheme**, because it improves the fellows' ability to work effectively and also shapes in important ways their relationship with the host institution. One fellow talked of how this ensured 'proper collaboration and experience exchange', others mentioned how bringing along their own money made them more independent and self-confident.
For many fellows, having the financial means to participate at **conferences and seminars** was a big advantage of the Marie Curie fellowship, compared to many other types of fellowship which do not include such funds.

The **mobility allowance** is also significant for fellows, because it enables them to keep contact with their families and friends in the home country. It facilitates mobility, by contributing to the retention of personal relationships, thus lowering the barrier to go for an international experience.
In the interviews, fellows mentioned how adequate levels of pay increased their status within the host institutions, placing them on a broadly equivalent status to permanent employees. The remuneration and bench fee individual fellows brought along to the institution meant that they did not have to work on other people's projects and, as such had more autonomy. This aspect was also identified as a factor shaping the research field and enabling scientists to pursue more 'risky' or innovative lines of enquiry.
Attractive and competitive salaries offered by the Marie Curie also supported retention both within science and within the EU. Furthermore, the fact of receiving adequate remuneration removed the need to undertake other forms of work both outside and within the research sector and thereby enabled them to focus on their research.

1.2.3 Selection mechanisms of the Marie Curie fellowship

One of the unique characteristics of the Marie Curie fellowships is the evaluation procedure, which is implemented at European level. This was felt, especially by fellows, to contribute to **fair and objective recruitment**. It was also felt to add prestige, since it was considered more difficult to obtain (see also section 1.2.4 below on prestige).

As to equality, the Council Decision setting out the objectives of the Marie Curie Programme for FP5 makes a very clear and unequivocal statement about its commitment to **gender equality and representation**. Referring directly to the 'underuse of the potential of female scientists' it states as one of its core objectives the need 'to develop the Community's human research potential, making special efforts to ensure equality of access and a better balance between men and women'[9].

Does the Marie Curie Fellowship Scheme promote the **exchange of good practice**? Does the scheme promote equality and diversity in employment so that opportunities are available to a wider population? And in so doing, does it promote the attractiveness of research careers?

[9] Excerpt from the Council Decision adopting the specific programe for research, ' Improving the human research potential and the socio-economic knowledge base (1998-2002).

The general impression gained from the work with fellows suggested a perception of the selection mechanisms of the scheme as fair and meritocratic. The comments from the fellows' questionnaires indicate a strong belief in the objectivity of the scheme and its relative benefits in comparison with their experiences at national level[10].
Some respondents specifically pointed to the role that the scheme played in setting a precedent for those countries where the distribution of scientific opportunities was not based purely on merit and excellence.
The selection, administration and conditions of the scheme were not perceived to be gender biased.

Does the scheme attract high quality researchers?
The Marie Curie scheme seems to involve high-quality fellows in the mobility flows, who on the one hand gain knowledge and skills from the experience and on the other make beneficial contributions to the work of the hosting research group.

Supervisors were asked in the questionnaire to comment on the main impact of the fellowship on their research group. The majority stated that they hosted very high quality fellows who were talented, brought new ideas and methods and made valuable contributions to the work of the group.
When asked to comment specifically on the quality of Marie Curie fellows, 40% of supervisors said that Marie Curie fellows were generally of **higher standard** than other fellows: 45% said they are no different and only 1% stated that they are of poorer standard.[11] Supervisors of different nationalities have the same opinion. There is no significant difference of opinions about fellows among supervisors having early stage or experienced fellows.

There were indications that supervisors with the highest number of fellows are less convinced that Marie Curie fellows are of higher standard than other fellows than all supervisors in general (see also table 2 in Annex 2).

In the open-ended questions of the questionnaire and during the interviews, most supervisors spoke very highly of the quality of fellows. An often cited reason was that persons who were prepared to move internationally for their training were very motivated to work hard and learn as much as they could. Of course there were also a minority of supervisors with less positive experience.
Actually, there is a faculty of the supervisor to accept or refuse any given candidate, both in the case of individual fellowships (the fellow and the supervisor apply in joint agreement), and in the case of host fellowships, where the applications of researchers go directly to the host institutions, and fellows are selected by the supervisors. Despite the fact that all circumstances are given for them to find the suitable fellows into their groups, apparently it can be difficult for supervisors to assess the competences of a foreign researcher if they haven't had much opportunity to meet and to get to know them.

The small number of negative comments means it is possible to conclude that the scheme usually supports the mobility of promising and talented scientists, both early stage and experienced, thus creating a prestigious and well-known fellowship.

Does the fellowship give access to a high-quality research environment?
From the fellows' perspective, the ability to access high quality institutions and excellence of supervisors was of paramount importance. The institutes are often described as "strong" and the companies as "global players" or leaders in their area.
The 'quality' of hosts was associated not only with reputation (although that was important in itself) but also with access to quality supervision and research facilities.

[10] It is important to remember that we were speaking to successful applicants. Interviews with unsuccessful applicants might paint a different picture.
[11] Out of 1292 responses. The remaining part were uncertain or had not supervised other fellows.

In general, fellows reported a **high level of satisfaction with the resources available** in the host institutions. Some of them also emphasized the benefit of working in an international environment.

In a few cases, fellows were less satisfied with office/computers, but none of these comments show serious problems that would affect the quality of research significantly.

The **size** and reputation **of the host institution and group** do not necessarily determine the impact of the fellowship. Smaller groups were sometimes chosen and appreciated because fellows thought they could make more impact there.
Furthermore, the time a supervisor can spend with one fellow tends to decrease as the group size grows.

A key dimension which attracted fellows was the **opportunity to work with renowned supervisors**. In many cases, the reputation of the supervisor went hand in hand with that of the institute but, on occasions, fellows chose a less known institution solely due to the reputation of the supervisor.

The questionnaire findings suggest that the majority of supervisors in the Marie Curie scheme have a **long experience of working in research**. Indeed about 60% have worked in research for over 20 years. (Out of 1377 respondents, 6% had less than 10 years', 35% between 11 and 20 years', 36% between 21 and 30 years', and 23% more than 30 years' research experience.)
For more findings on supervision please see section 2.5.

1.2.4 Prestige of the Marie Curie fellowships

The questionnaire invited both supervisors and fellows to name other fellowships and compare them with the Marie Curie scheme. Analysing all the mentioned fellowships together, the results presented below suggest an overall appreciation of the relative attractiveness of the Marie Curie scheme. A breakdown into different categories of fellowship is provided table 6 in annex 2.
On the whole, fellows and supervisors more or less concurred in their responses. Only in the case of 'prestige' were supervisors more ambivalent with similar proportions suggesting the scheme was more or less prestigious than other fellowship schemes. Fellows were more positive in this respect[12].

Table 1.2.1: Comparison of other fellowship schemes with Marie Curie (%)

	remuneration		**travel fund**		**research fund**		**prestige**	
	superv.	fellows	superv.	fellows	superv.	fellows	superv.	fellows
Other fellowships are better	19%	17%	19%	15%	25%	13%	25%	17%
no difference	29%	24%	30%	26%	32%	30%	47%	35%
Marie Curie is better	53%	59%	51%	60%	42%	57%	28%	49%
Total answers	**859**	**1407**	**854**	**1361**	**842**	**1347**	**850**	**1362**

Source: IMPAFEL questionnaire

The interview findings suggest that fellows consider the prestige of the scheme to be quite high. Most of the interviewees explained that this was related to it being a European fellowship, so therefore one competes with the best in Europe, rather than only at national or local level, and to its reputation for being relatively challenging to obtain.

Many fellows, in both the questionnaire and the interviews, outlined the significance of the reputation of the Marie Curie fellowship scheme itself, in the process of securing subsequent

[12] Supervisors were twice as likely to have direct experience of the other fellowship schemes: 51,5% (682) compared to 25,5% (743) of fellows.

employment. There was a perception that the reputation of the Marie Curie fellowship allowed access to employment positions that would otherwise not have been available.

1.2.5 Duration of the Marie Curie fellowships

The different types of Marie Curie fellowships had a maximum allowed duration, as indicated in table 3 in annex 2. The table also indicates the average length of stays, by fellowship type, and the ideal length, as indicated in the questionnaire answers.

On the whole, the duration of the fellowship was considered appropriate by 64% (1376) of the sample of former fellows, while 36% would have preferred a longer fellowship.
Over 50% of the sample did not specify what they considered to be the optimal length. The answers of those who did reply are summarised in table 1.2.3 below.

Table 1.2.2: Ideal total duration according to fellows, by level of experience (at the time of the grant)

		Level of experience of fellows			
		'Cat. 20'	*'Cat. 30'*	*'Cat. 40'*	*All categories*
Ideal **duration in months**	*1-6*	29.5%	2.3%	5.9%	15.1%
	7-12	33.9%	5.1%	32.4%	19.5%
	13-24	18.7%	35.3%	58.8%	28.3%
	25+	17.9%	57.3%	2.9%	37.1%
	total	100%	100%	100%	1064

Source: IMPAFEL fellows' questionnaire

The category '25+' contains 13% of fellows who suggested that the optimal length would be 36 months. If granted, this would more than double the current average duration.

The duration of the fellowships is related to the scientific discipline or field. The natural sciences are generally associated with longer stays, with the actual duration clustering around 24 months.[13] Economists and social scientists generally stayed for shorter periods with around two thirds staying for one year or less.[14]

Similar patterns can be seen in terms of preferences. There was a general preference for longer stays: between 40% and 50% of life scientists, environment and geoscientists and physicists expressed a preference for stays of more than 2 years. Researchers in chemistry, engineering and mathematics and IT predominantly indicated an ideal stay of between one and two years (which is in fact possible within the Marie Curie fellowships). The majority of social, humanities and economic scientists preferred stays of between 6 and 12 months.

Researchers are not only 'brains', but they are individuals with personal lives and preferences, partners and sometimes children. Table 4 in annex 2 shows the relation between duration of fellowship and family situation. Female researchers had on average shorter fellowships (by one month's difference) although preferences in terms of duration were broadly comparable[15].
For researchers with a partner, and especially for those with school-age children, it was very important to be able to schedule the timing of the fellowship sufficiently in advance, and with sufficient accuracy, so as to plan a job for the accompanying partner and school for the children.

1.3 The Marie Curie fellows and supervisors: population profile

This section provides some main characteristics of the population of Marie Curie fellows which may bear relationship to impact.

[13] The 'norm' was 2 years in environment and geosciences (65%), life sciences (62%) and physics (51%).
[14] 39% of economists stayed for less than 6 months. This may reflect the fact that they do not need to conduct large experiments or the potential risks of staying outside of the home environment for too long.
[15] In the group of fellowships with a duration of up to one year, there are 52% females and 43% men, whereas 48% of females had fellowship which lasted more than year, as opposed to 58% of males.

The total number of Marie Curie fellowships considered in this study is 11.802[16].
It has been possible to establish contact with only roughly half the persons in the population. For the other half of the fellows, no valid contact address could be found.
In total 2918 Marie Curie fellows (24.7% of the population) participated in the survey by answering the questionnaire. This translates into quite a satisfactory response rate of roughly half the persons who had been contacted.
The respondents comprised 75% former fellows and 25% current fellows.

The total population of fellows were supervised by 6036 senior researchers, who guided the fellows' research and training activities. Thus, although the majority (73%) of supervisors had only one fellow, several supervisors had more than one fellow [17] .
Twenty-three percent (1389) of the supervisor population completed a specific supervisor questionnaire. The overall response rate was 29%. Relatively more supervisors who had supervised several fellows replied compared to those who had only one.

47% of all 11.802 grant holders were at 'category 20' and 49% at 'category 30' level. 'Category 40' researchers made up less than 2% of the total, and 3% of researchers in the population held a return fellowship[18].

Four main categories of host institutions were identified. The majority of host institutions are based in the university sector.

Table 1.3.1: Host institutions by sector

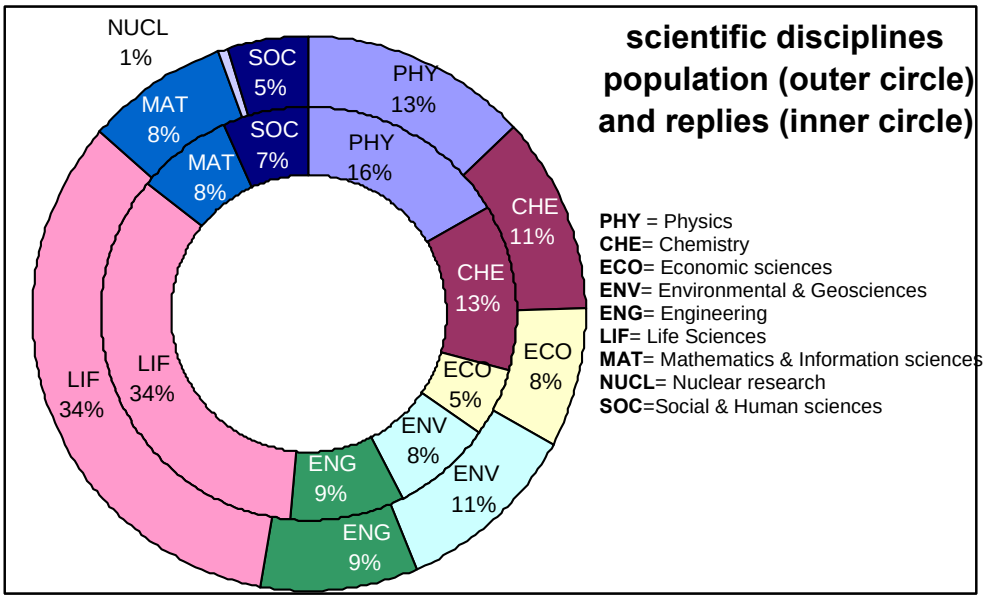
Type of host institution	Population	Respondents
Universities	61%	63%
Public and private research institutes	27%	27%
Large enterprises and SMEs (industry)	8%	7% (5% large companies and 2% SMEs)
Private NGOs, international organisations and 'other'	4%	3%

Source: Marie Curie EC database and IMPAFEL fellows questionnaire

Selection is not based on pre-established disciplinary focus, but proportionate to the disciplinary composition of the applications received. The scheme funds a much higher proportion of fellows in the natural sciences, and in life science in particular, accounting for about one-third of the total population (and survey responses).

[16] Within this population are 630 cases (5.3%) where two or more fellowships were held by the same person.
[17] 12.8% had two fellows, 8.9% had 3-5 fellows, and 5.8% supervised six or more fellows, with a small number of Marie Curie host fellowship supervisors having up to 30 or 40 fellows (most likely working in a co-ordinating role).
[18] Please also see Table 1 in Annex 2.

Figure 1.3.2: Scientific disciplines: population and respondents (%)



Source: Marie Curie EC Database and IMPAFEL fellows questionnaire

A breakdown of the Marie Curie population by gender indicates a prevalence of male fellows (60% of fellows are male and 40% female). The questionnaire respondents are representative of this breakdown: 60.2% men and 39.8% women.
If we consider the representation of women amongst the supervisors we find much weaker levels of feminisation. Nearly 89% of supervisors in the population are male. These figures support the often-cited "scissors" phenomenon whereby the representation of women in science careers decreases with seniority. Since supervisors are normally group leaders or persons in a senior position, the low proportion of female supervisors is not unexpected.

There were low representations of minority groups, 3.2% reported coming from an ethnic minority in their country. Just under 2% of respondents reported a medical condition or disability.

SUMMARY

- The Marie Curie scheme gives support to motivated and skilled scientists for going to high-quality host institutions, research groups and supervisors.
- The funding structure of the scheme is very attractive both for fellows and for host institutions.
- Supervisors tend to be satisfied with the performance of the Marie Curie fellows in their research group.
- The Marie Curie fellowship is considered as a prestigious fellowship and having obtained one is perceived by many fellows to act as a career boost.

Section 2.1
Aspects of impact

The factors shaping the impact of the Marie Curie fellowship are highly interrelated, and may work to different effects on different individuals. Before discussing specific elements of impact in more detail, this introductory section provides a general overview of the relative importance of factors for fellows and supervisors.

The questionnaires invited Marie Curie fellows and supervisors to rate, on a scale of 1 (not important) to 5 (very important), the importance of a series of key factors for working effectively in their field. They were then asked to rate how far the Marie Curie fellowship made a significant impact on these same factors. (see figure 2.1.1).

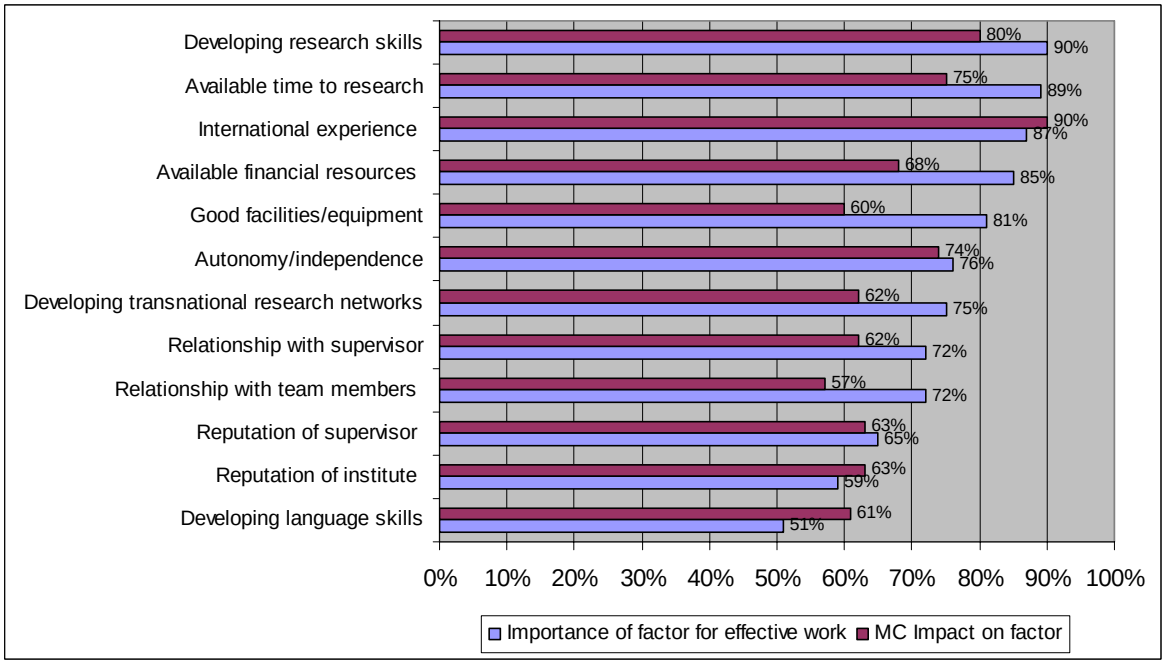
The three factors **fellows** most frequently rated as being 'rather' or 'very important' in relation to their own research field were:

- international experience;
- the development of research skills;
- having available time to do research.

When asked to rate these same factors again, according to the **relative impact of the Marie Curie fellowship on their career**, the same three factors emerged as the most highly rated in importance of impact (see figure 2.1.1). This leads us to conclude that generally the Marie Curie fellowships are giving researchers the opportunity to gain experience in areas that they themselves regard as most important for working in their discipline.

The Marie Curie fellowships are giving researchers the opportunity to gain experience in areas that they themselves regard as most important for working in their discipline.

Figure 2.1.1: Relative importance of factors rated as 'important' to working effectively in research and the impact of the Marie Curie fellowship on these factors - *fellows* opinions



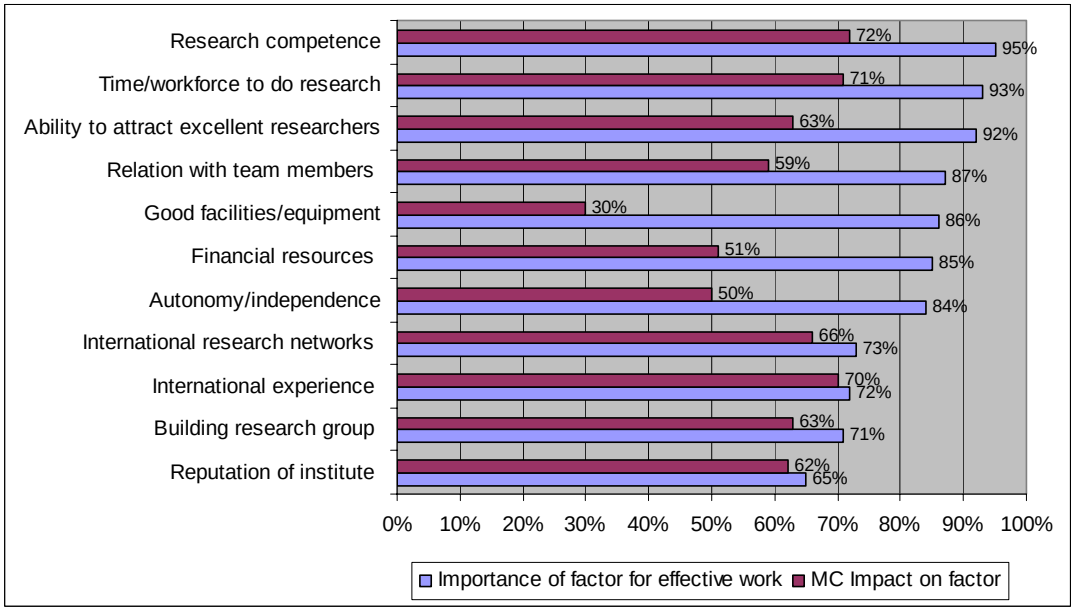
Source: IMPAFEL fellows questionnaire

In response to the open-ended question: '*What do you consider to be the main impacts of the Marie Curie fellowship scheme*?' respondents normally gave a mixture of answers. In the open-ended questions mobility remains the most frequently cited impact but the importance of networking also features very strongly. Access to well resourced and high-quality host institutions was also frequently mentioned.

The three factors **supervisors** most frequently rated as 'rather' or 'very important' in relation to working effectively in their research field were (figure 2.1.2):

- research competence;
- time/workforce to do research;
- ability to attract excellent researchers.

Figure 2.1.2: Relative importance of factors rated as 'important' to working effectively in research and the impact of the Marie Curie fellowship on these factors - *supervisors* opinions



Source: IMPAFEL supervisors questionnaire

In terms of impact, supervisors indicated that the strongest impacts were on 'research competence' and on 'time to research' or workforce. Although supervisors did not rate international experience within the top three factors most important to working effectively in their field, they did rate it as one of the largest impacts of the scheme.
Generally, supervisors thought that financial resources, good facilities and equipment, and autonomy were all important factors for the functioning of their research group. However, these were the factors that they rated the Marie Curie scheme as having a weaker impact on.

Supervisors mainly appreciate the additional, high-quality, labour force that hosting Marie Curie fellows provides.

Supervisors, also, were asked the open ended question, '*What do you consider to be the main impacts of the Marie Curie scheme on your research group?'*. The most common response related to positive impact on the 'research capabilities of the group'. The fellows contributed to the group with techniques, skills, competences. The fellows also represented 'extra hands' to take on new and original work which lead in some cases to expansion. Again, the impact of the scheme on contact-building came through strongly in the open-ended question, as supervisors highlighted the impact on networking between individuals, groups and institutions. Attracting excellent researchers and international mobility were both commonly volunteered as main impacts of the scheme by supervisors.

The following sections explain in-depth how these issues 'impact' on careers and scientific outputs.

SUMMARY POINTS

- The three factors fellows most frequently rated as being 'rather' or 'very important' in relation to their research field were: international experience, the development of research skills and having available time to do research
- Fellows identified the same factors they regarded as most important for working effectively in their field as those that received most impact from their Marie Curie fellowship
- Supervisors indicated that the strongest impacts of hosting Marie Curie Fellows for their research group were on: 'research competence' and 'time/workforce to do research'. Although supervisors did not rate international experience within the top three factors most important to working effectively in their field, they did rate it as one of the largest impacts of the scheme.
- Supervisors especially appreciated the additional, high-quality scientific labour force that Marie Curie fellows represent.

Section 2.2
European Mobility

A distinguishing feature of the Marie Curie Scheme is the requirement for the fellow to move country. The return grant scheme also provides support to those scientists wishing to make a subsequent international move and return to their 'home' country.
This section considers the importance that fellows and supervisors attached to international mobility and the impact the scheme is having in this respect. It focuses on two dimensions of impact. Firstly, the impact of this on the geography of flows and the distribution of scientists and, secondly, on whether the scheme stimulates mobility itself, by encouraging more scientists to move both during the fellowship and afterwards. The section concludes with a discussion of the impact Marie Curie mobility has on balanced growth in Europe.

2.2.1 The geography of flows

The 4th Framework Programme restricted eligibility to participate to the 15 EU Member States. The 5th Framework programme subsequently extended eligibility to scientists from Associated States or Candidate Countries. Their participation was restricted, however, in the sense that a person from a Candidate or Associated State could go to a Member State, but not to another Candidate country or Associated State. Furthermore, some countries became associated in the course of FP5. Therefore, Associated and (then) Candidate countries are represented to a fairly modest extent.

Analysis of the total population of funded fellows shows a level of clustering of *host institutions* in certain European countries. More information can be found in table 5 in annex 2 and in annex 4.
The UK was the most popular destination for both post-graduate and post-doctoral fellows (28%), followed by France (17% of fellows), Germany (12%), the Netherlands (9%), Spain (6%) and Italy (6%).

Analysis by fellow's *nationality*, indicates an over-representation of certain nationality groups. Southern Europe exports a significant proportion of fellows.
Spanish fellows are the most highly represented group contributing over 16% of fellows. Italians form the second largest group with 14% of fellows, followed by Germans and French with 13% each.[19]

A comparison of flows into and out of participating countries shows a high level of imbalance with key "sending" or "receiving" countries emerging. Data have been related to the scientific work force, in order to account for the factor of size of the population, and return grants were excluded from the analysis. [20]

As figure 2.2.1 shows, the country with the highest **net inflow** in relative terms is the UK. This is followed by Denmark, the Netherlands, Norway, Belgium, Sweden, France and Switzerland. These are the only countries with a net positive gain, in relative terms (i.e. against S/T work force).

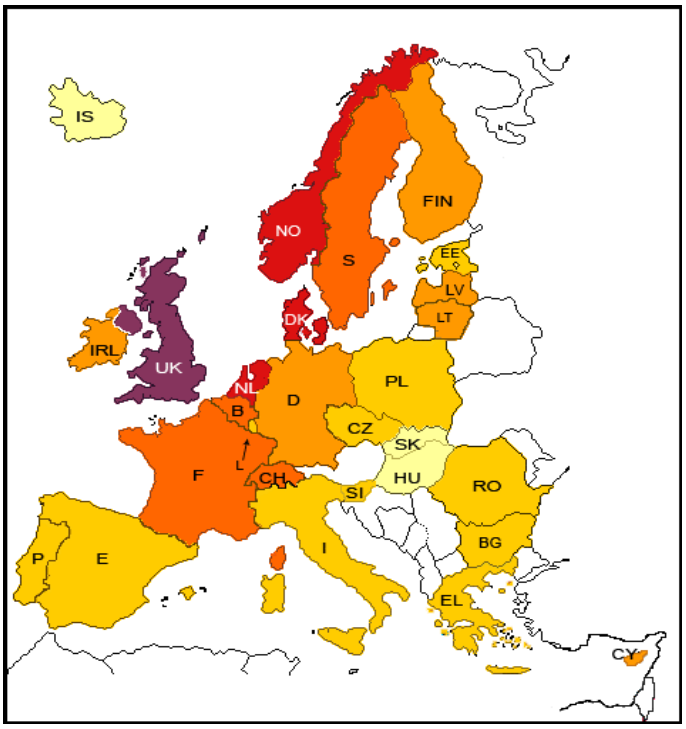
The other countries all sent abroad more Marie Curie fellows than they receive as a host country.

The countries with the largest **net outflow** as a "sending" country were the Slovak Republic, Iceland and Hungary.
These figures taken from the Commission database give an overall picture of the distribution of fellows. These trends to a large extent appear to reflect the wider distribution of scientific resources and opportunities (see below).

[19] The numbers of each nationality group and their preferences for certain host countries are shown in table 3 in Annex 2 and in the country maps in Annex 4.
[20] For further details see Annex 4.

Figure 2.2.1: Net flows (incoming Marie Curie fellows minus outgoing Marie Curie fellows - return grants excluded) in proportion to people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland 2002[21]

	(nr. of fellows)	*fellows on S/T work force*	
Slovak Republic	-119	-0,056%	
Iceland	-12	-0,052%	
Hungary	-241	-0,050%	< -0,050
Greece	-290	-0,049%	
Romania	-378	-0,048%	
Italy	-914	-0,041%	
Spain	-1031	-0,037%	
Czech Republic	-174	-0,037%	
Bulgaria	-169	-0,035%	
Slovenia	-34	-0,033%	
Poland	-499	-0,032%	
Luxembourg	-10	-0,029%	
Estonia	-30	-0,029%	
Portugal	-104	-0,025%	< -0,025
Latvia	-15	-0,012%	
Lithuania	-38	-0,011%	
Cyprus	-6	-0,010%	
Finland	-44	-0,008%	
Ireland	-5	-0,002%	
Germany	-74	-0,001%	
Switzerland	32	0,005%	
France	544	0,012%	
Sweden	129	0,014%	
Belgium	132	0,015%	> 0
Norway	152	0,029%	
Netherlands	414	0,030%	
Denmark	231	0,041%	
United Kingdom	2714	0,061%	> 0,050



2.2.2 Fellowship location decisions

The reasons for this degree of imbalance are complex, reflecting both 'push' and 'pull' factors. 65% (917) 'category 30' respondents and 70% (804) post-graduate researchers thought that mobility makes it easier to progress in their home country on return. Slightly more 'category 30' researchers thought it became harder to progress at home (12% compared to 8% of 'category 20' fellows). There was no difference between men and women in how they thought mobility impacted on return moves.

[21] Data "employed in S&T" year 2002. Source: Eurostat "Human resouces in R&D in Europe-Part2" 2003-figure 4.11 Employment distribution of 25-64 years olds, **in thousands** and proportion of people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland 2002, pag.70. The referece category is "researchers with third level education and working in S&T occupation (HRSTC)". Data on S&T employees not available for Austria, Israel, Malta, Lithuania.

[22] For further details see Annex 4.

Some fellows reported that experience abroad can be used as leverage to improve opportunities on return. It was felt to be a 'requisite' by many. Yet, on the other hand, supervisors and fellows in certain countries spoke of the danger of staying abroad too long and losing connections, since it might impair employment opportunities upon return. This seems closely linked to the prevalent recruitment practice in countries. Return grants were sometimes perceived to alleviate this phenomenon.

As to push factors, for those people embarking on science careers in countries with limited doctoral and post-doctoral (or equivalent) positions, mobility is less an 'option' and more a requisite in careers. For researchers in these countries, the Marie Curie scheme provided an important avenue for a research career.
For 27% (791) of respondents, lack of opportunities in their home country was a reason why they applied for a Marie Curie fellowship. In fact, 8% (213) respondents stated this was their **main** reason for applying. Over 30% of all fellows from Southern Europe (Italy, Spain, Portugal, Greece, Cyprus and Malta - countries which supply the most researchers to the scheme) said that lack of opportunity in their home country lead to applications for the Marie Curie fellowship.

As to pull factors, the questionnaire invited fellows to explain their choice of location. Most replies included a combination of professional and personal factors. The most commonly cited factors influencing location decisions are summarized below.

- The **prestige of the institute** and reputation of the supervisor within the field, and therefore the skills that could be acquired by working with that supervisor, had an important influence on location decisions.
- Many scientists were heavily influenced in the choice of host institution by their **connections and networks** which typically serve to 'channel' mobility.

'It was the single best institution in Europe to cover a wide range of aspects of my field of interest, with the additional benefit of a lot of visiting scholars passing through.' [F08026S-F]

- **Centres of excellence** or research clusters were a clear attraction to fellows both because of the level of expertise and resources concentrated in specialist centres but also because of the greater range of employment opportunities for scientists and their partners in research intense clusters.
- The ability for **partners and children** to accompany fellows, or for fellows to be able to visit family and friends in the home country both cheaply and easily, were very important factors, as was the availability of work positions for partners.
- Destinations were influenced by **language** considerations, and familiarity with a language often impacted on destinations. In many cases scientists were attracted to regions in order to improve their language skills (particularly in English). In other cases their lack of language skills, or those of their partner, restricted their choice of destinations.

'I wanted to stay in Europe… because the distances… were "human". I mean when you are going to the USA it is to far away to come back to your home country for professional or personal needs. [F03196F-M]

- For many respondents the scheme offered them the opportunity to **return to or remain in Europe**.
- Although the scheme, through its generous allowances, reduces the effects that salary usually play in migration decisions, many fellows referred to the **relative costs of living and housing**, in particular in some regions which shaped their choice of host institute.
- Particularly in the case of host fellowships, fellows were availing themselves of a **pre-existing opportunity**, and therefore exercised a lesser degree of free choice in their location decision.

Many of the factors shaping the location decisions of Marie Curie fellows determine not only the fellowship itself but also their post-fellowship mobility.

Post fellowship flows

As outlined in section 2.3, the science community actively recruits through networks, often favouring people who are 'tried and tested' for employment. These processes shape post-fellowship locations. Focusing on the locations of former fellows now working in research positions, the effect of this is evident: 34% of 'category 20' fellows and 29% of 'category 30' fellows were working for an institution at which they had previously been studying or working (table 2.2.2). Substantial proportions of fellows remained working in the host country, the majority of these within the host institute.

A slightly higher proportion of 'category 30' fellows had returned to the home country to work in another institution. Former 'category 20' fellows were more likely to have gone on to work in a new country and institution.

Table 2.2.2: location of employment of former fellows at time of answering questionnaire (2004)

Place of work at time of answering questionnaire	'Category 20'	'Category 30'
At same institute as prior to Marie Curie (in the home, host or another country)	34%	29%
In Marie Curie host institute	13%	22%
Different institute in the host country	9%	8%
Different institute in the home country	22%	28%
Different institute in another country	21%	14%
Totals	*384*	*886*

Source: IMPAFEL fellows' questionnaire

The previous section has considered the geography of flows within the Marie Curie programme. The following section moves on to consider the impact of the scheme on the overall volume of mobility, on the propensity to move, and on the propensity to return to the home country.

2.2.3 Does the Marie Curie fellowship generate international experience?

Marie Curie fellows and supervisors attached great importance to international mobility and the experience associated with it. Although respondents, in common with many policy-makers, often conflate geographic mobility with international experience, in practice the two dimensions need to be disaggregated. The Marie Curie scheme *requires* fellows to make an international move. As such it necessarily promotes mobility and exposes scientists to the experiences of living in another country. The extent to which this provides access to an international scientific environment is not so clear cut and depends on the specific situation in the host institution. Where the mobility is a means of accessing an international research group then the two may go together. In other situations, however, a move may imply leaving a more international environment to work in a more homogenous group. This is likely to happen in the case of certain industrial locations and in some countries where the national research system is less international in composition.

- 79% (2304) respondents indicated that gaining international experience was a key *motivation for applying* for the Marie Curie Fellowship. Nearly a quarter (688) reported it to be the *most significant* reason for applying.
- Overwhelmingly, the Marie Curie fellows thought that mobility/international experience was important to their *career progression*, with over 90% ranking it as either 'rather' or 'very important'. Female fellows were slightly more likely to rate mobility as 'very' important to career progression than men (67% compared to 57%).
- In addition to this, 95% (2489) of fellows rated mobility as either rather or very important to *European scientific excellence*.

The impact on the propensity to move

What was the impact of the scheme on scientific mobility? Would fellows have been as mobile in the absence of the Marie Curie fellowship?
The majority of respondents believed that the scheme had a very positive impact on their personal mobility. As figure 12 in annex 2 shows, a large number of fellows, especially 'category 20' and 'category 40' fellows reported that they would not have gone abroad without the fellowship.
'Category 30' fellows were more likely to think they would have gone abroad anyway without the Marie Curie fellowship, and thus ascribed less impact to the Marie Curie fellowship in this respect. This might reflect the relatively greater alternative opportunities for mobility at this career stage.

Recipients of Marie Curie fellowships were already a very mobile population. 62% of all respondents had lived abroad for more than 3 months at some time prior to the fellowship.
Out of 2754 respondents, 27% were living in a country different to that of their nationality *immediately prior* to their MC fellowship. Of this group, however, 69% were living in a country different to that of their Marie Curie fellowship[23]. The fellowship thus encouraged the majority of these scientists to make a subsequent international move.

The fellowship was the *first mobility experience* for nearly half of all 'category 20' fellows. Over two thirds of 'category 30' fellows had already been mobile prior to the fellowship. Unsurprisingly, more senior researchers 'category 40' were most likely to have been mobile already (table 2.2.3).

Table 2.2.3: Mobility prior to the Marie Curie fellowship, by level

Level of Marie Curie fellowship	Marie Curie is the first mobility experience	Mobile for 3 months or more prior to Marie Curie	Totals by level of experience
'Category 20'	48%	52%	1217
'Category 30'	30%	70%	1469
'Category 40'	16%	84%	56
All respondents %	38%	62%	2746

Source: IMPAFEL fellows' questionnaire

The fellows' assessment of how important the Marie Curie fellowship has been in promoting their mobility is also influenced by whether respondents had already been mobile. Fellows for whom Marie Curie was the first mobility experience rated it as more important to their personal mobility (69%) than fellows who had already been abroad (55%). As 'category 30' fellows were generally more mobile prior to the Marie Curie fellowship than 'category 20' fellows it stands to reason that they would generally place less emphasis on the importance of the scheme in generating their mobility[24]. Tables 13 to 16 in annex 2 show how previous mobility was linked to several other characteristics of the fellows.

2.2.4 Return moves

There is concern that mobility may cause researchers' to become 'locked out' of their home country or 'locked into' the host country (JRC, 2001: 6). Alan Gamlen stresses that physical returns themselves do not constitute successful reintegration, '…*return per se cannot automatically be considered a positive thing. … Even when migrants are occupationally successful, there is no guarantee that benefits to the individual returnee will spill over to the home society*.' (Gamlen, 2005:16).

Findings on the return moves of former fellows showed that the proportion of fellows who returned to the home country increases over time; 30% of fellows who had finished their fellowship within

[23] 126 were living outside of Europe. The largest hosts being the US (85) and Canada (18). The remainder were living elsewhere in Europe including the associated countries; the largest hosts being the UK (88), Germany (45), Switzerland (37). According to eligibility criteria, fellows may not have lived in the host country for more than 12 months before the fellowship.
[24] There were no strong gender differences: 54% of female post-graduate fellows had been mobile prior to MC compared to 51% of men. For 'category 30' fellows, the figure was around 70% for both male and females. At 'category 40' level, male researchers were more likely to have been mobile than their female counterparts (87% compared to 77%).

the last six months had returned to their home country, compared to 56% of fellows who had completed the fellowship over four years ago.
When invited to comment on their plans in relation to return, only 3 % (22) of current fellows thought they would 'definitely not' return to their home country to work. The majority 47% (331) thought it was 'possible' and a further 34% (240) said they would 'certainly' return.
Overall 11% (200) of former fellows thought they would '*definitely not'* return to their 'home' country. The proportion of fellows who are resolute about not returning also increases over time as careers and personal situations begin to stabilize (table 2.2.6).

Table 2.2.4: Former fellows' plans to return to the home country by time since fellowship

	Return to home country following the Marie Curie fellowship					
Length of time since fellowship ended	already have	certainly	possibly	definitely not	don't know	Totals
0-6 months	30%	17%	40%	3%	9%	179
7-12 months	43%	14%	31%	2%	10%	367
13-24 months	46%	11%	28%	4%	10%	505
25-48 months	49%	12%	24%	5%	10%	407
49+ months	56%	3%	21%	9%	12%	313

Source: IMPAFEL fellows' questionnaire

Of course, return moves following the fellowship do not necessarily imply an intention to remain. In practice a proportion of returnees will make further out-going moves.

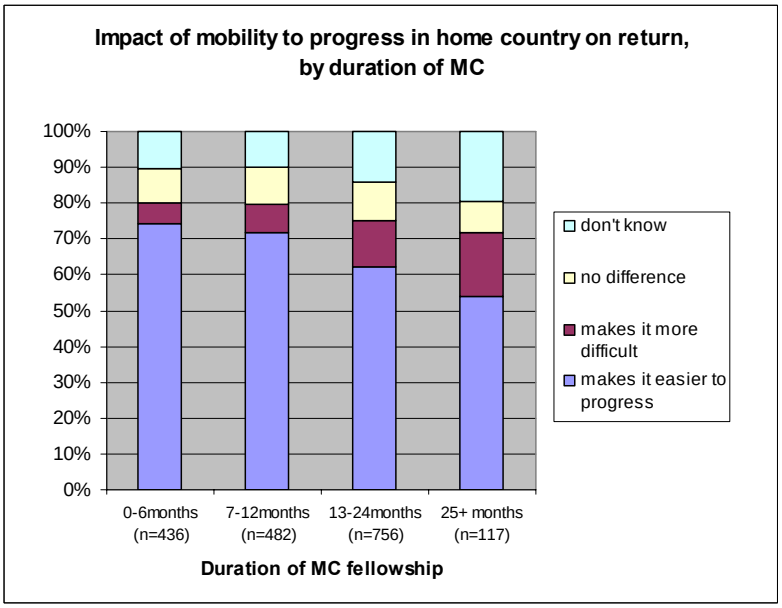
Without considering the interval since the end of the fellowship, 46% (872) of all former fellows had returned to their home country after the fellowship. Return rates increased with the level of the fellowship: 40% of former 'category 20' fellows had returned compared to 50% 'category 30' fellows and 74% 'category 40' fellows.
There is no evident relationship between rates of return and gender, but parental status does impact on return; 56% (276) of fellows with children had returned compared to only 42% (544) of fellows without children. The proportion that returned was the same for both mothers and fathers.

Looking at return moves by nationality (although nationality may not always correspond with which country fellows viewed as 'home'), roughly half of respondents from the largest sending countries had returned; 58% (153) of Spanish fellows; 44% (108) Italians, 46% (120) Germans and 48% (121) French had made a return. The lowest rates of return can be seen amongst respondents from South East Europe and the UK and Ireland - although in real terms the numbers are low in these categories (table 17 in annex 2).

Length of fellowship and re-integration

The majority of respondents believed that mobility supported their career progression on return. However, there was evidence to suggest a link between the length of the fellowship (and the period spent out of their home country) and re-integration. The longer the fellowship, the greater the proportion of fellows who thought mobility posed difficulties for return (see figure 2.2.8 below).

Figure 2.2.5: Impact of mobility on capacity to progress in home country on return, by duration of Marie Curie fellowship



Source: IMPAFEL fellows' questionnaire

The Marie Curie return fellowships

The Marie Curie return grant scheme is only open to researchers coming from one of the designated 'Less Favoured Regions'. As such, they were a relatively modest phenomenon in the 4th and 5th Framework Programme.

If we look at the total population, there were 307 Marie Curie return grants (3%). These were mostly concentrated in a few countries, in which a significant part of the national territory is classified as 'Less Favoured Region'. In Greece, 38% (94) of all incoming fellows were Marie Curie return grant holders. In Spain, 23% (160) of the inflow of Marie Curie fellows was due to a return grant. In other words, when reading the figures of incoming researchers for these countries, it must be remembered that these comprise an important share of returning nationals, rather than foreigners coming for a fellowship in that country (e.g. Spanish researchers coming back to Spain after having been abroad with a Marie Curie fellowship.)

On the whole, Marie Curie return grants were not a major route for fellows to return to their home country. However, respondents were generally positive about return schemes as an aid to re-integration in the home country.

The study shows that the percentage of researchers who returned to their home country after the Marie Curie fellowship is much higher amongst the fellows in the population who held a Marie Curie return grant, compared to researchers who did not have a return grant. 86% of researchers who received a return grant are working in their country of origin after the grant (60% works at the same organisation as they worked before the fellowship and 26% at a different organisation).

Future mobility plans

67% of former fellows (1301) thought they might make another international move in the next 5 years; 18% (356) said they definitely would move again and 14% (273) were not considering moving again. The pattern was similar for current fellows but with only 7% (48) not considering future mobility. Fellows from Eastern Europe and the Baltic countries were most likely to be planning another international move in the next five years (table 2.2.6):

Table 2.2.6: Plans for international mobility by European nationality group

	intention to move country in next 5 years	

Fellows nationality by European region[25]	Definitely not	Possibly	Definitely will	Totals
Nordic Countries	11%	72%	16%	116
Central Europe	15%	67%	18%	338
Western central Europe	18%	66%	16%	334
UK / Ireland	14%	68%	18%	114
Southern Europe	16%	67%	17%	642
Central Eastern Europe	6%	70%	24%	230
South East Europe	8%	72%	20%	107
Baltic countries	12%	53%	35%	17

The final section considers the significance of the degree of imbalance identified above in terms of both the impact of the scheme on individual scientists and on the distribution of scientific resources throughout the European Research Area.

2.2.5 The impact of the scheme on regional equality and 'balanced growth'

The Marie Curie programme objectives refer to the importance of, 'promoting scientific and technological cohesion of the Community, particularly with respect to its less favoured regions'[26].
The Marie Curie fellowships play an important role in enabling scientists to access resources. Mobility is the logical corollary of 'clustering' and the redistribution of human capital to support the research infrastructures. A recent Communication refers directly to this imperative of encouraging labour mobility in response to, '*skills mismatches [which] are often a major cause of imbalances in the supply and demand for labour across sectors and regions.'* (COM/2002)

The findings suggest that the Marie Curie scheme has a significant impact both in encouraging new episodes of mobility and in reinforcing existing contacts. It is also clear that flows of scientists are highly imbalanced in a geographical sense.
When considering the 'unevenness' of migration flows within the scheme we need to take account of different perspectives. A clear policy tension exists between, on the one hand, the perspective of the individual scientists and the issue of equality of opportunity and, on the other, the distributional or collective consequences of this for the regions and countries concerned. In the pursuit of the latter we need to ensure that we do not undermine the former.
From the perspective of individual equity and justice, the scheme would appear to play an important role in supporting a broad equality of access and opportunity for scientists on the basis of individual merit and excellence. This was particularly clear in relation to the opportunities it generated for scientists from Southern and Eastern Europe.

Interestingly, the scheme was not only seen as important in terms of opening up opportunities for scientific research to people in less research intensive countries (effectively encouraging emigration from those regions) but also as a means of attracting researchers into the same regions who would otherwise be deterred by the levels of remuneration.

Whilst the net flows of qualified researchers away from less favoured regions may be at odds with commitment of the 'European Research Area' concept to balanced growth, on the other hand, the Marie Curie fellowships specifically allow for less favoured regions to regain 'home' researchers with increased competences through return grants, and to attract foreign talent through the Marie Curie development host. In this regard, the scheme evidently provides important and perhaps unique incentives for researchers from resource-rich regions to re-locate to less developed regions. This is a critical dimension of impact which will contribute in important ways to the internationalisation of science in those areas.

[25] Key to country groupings provided in Annex 1: 'Geographic areas'.
[26] The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers reflect these concerns: ''The development of a consistent career and mobility policy for researchers to and from the EU should be considered with regard to the situation in developing countries and regions within and outside Europe, so that building capacities within the EU does not occur at the expense of less developed countries or regions'. (para 13)

The data on return outlined in this section are complex but interesting. Overall nearly half of fellows had returned to their 'home' country post-fellowship. The proportions increase with seniority from 40% for early stage through 50% for post-docs and 74% for experienced researchers. It is important to take care in interpreting these figures, however, as they may indicate either a greater net loss of early and post-doc researchers or a phase in their life-course and career trajectory – in other words they may yet return. Lower rates of return were identified for South East European countries, but the relatively low participation of these countries under FP4 and 5 suggest caution in interpreting this data. Further analysis of FP6 would be far more useful in this respect. We have also noted the relationship between length of stay and return.

The second dimension of the brain drain debate concerns the impact of the scheme in limiting the scale of external brain drain *away from* the European Research Area. In that context it is relevant to consider whether the scheme shapes the geography of scientific migration reducing potential losses of human capital through external 'brain drain.' More specifically, whether it helps to attract, nurture and retain scientific expertise within the boundaries of the European Union.
Quite a number of respondents referred to the impact of the scheme in terms of retaining scientists within the European Union and, in particular, preventing 'brain drain' to the US.
Whilst supervisors tended to talk in general terms about the impact on retention of scientists within the EU, fellows often referred to their own personal experience and the extent to which the scheme actually enabled them to remain in Europe.

The vast majority of former fellows who responded to the questionnaire were living in Europe and predominantly within the EU-15 (Table 2.2.7) [27]. These findings suggest high levels of retention of fellows in Europe.

High retention rates in the EU
90% of former Marie Curie fellows who responded to the questionnaire were still living in the enlarged EU.

Table 2.2.7: Location of former Marie Curie Fellows

Fellows current country of residence	Category 20	Category 30	Category 40	Total %
EU-15	74%	86%	55%	80%
New EU Members (EU10)	18%	6%	40%	9%
EU Associated countries	3%	4%	2%	3%
US	4%	3%	4%	3%
Other world	1%	2%	4%	5%
Total %	100%	100%	100%	100%
Totals	936	1025	53	2014

Source: IMPAFEL fellows' questionnaire

SUMMARY POINTS

- The fellowship was the first mobility experience for nearly half of all 'category 20' fellows. Over two thirds of 'category 30' fellows had already been mobile prior to the fellowship.
- 79% of respondents indicated that gaining international experience was a motivation for applying for the Marie Curie fellowship.
- Over 90% of fellows rated mobility/international experience as 'rather' or 'very' important to career progression in their field.
- Few fellows thought they would have gone abroad anyway without the Marie Curie fellowship.
- There was evidence of retention of researchers in Europe - Over 90% of former Marie Curie fellows who responded to the questionnaire were still living in the EU.

[27] The sample may be biased due to the greater difficulty of locating and soliciting responses from fellows who had since moved away from Europe.

- Return rates to the home country increased over time - 30% of fellows who had finished their fellowship within the last six months had returned to their home country. 56% of fellows who had finished their fellowships over four years ago had returned.
- Although flows between countries were imbalanced, this did not mean the scheme was exacerbating 'brain drain'. In fact, in order to support individual equity it must remain open to scientists throughout Europe, which may mean that scientists in countries with fewer national opportunities are more drawn to it. However, there were signs that institutions in less-favoured regions also stood to benefit from the scheme as it provided a means to attract researchers from overseas. Furthermore, there was evidence that countries that supplied many fellows also had fellows returning to work in science positions.
- Former fellows were open to further international moves: most respondents would consider another move in the next five years.

Section 2.3
Networking

This section considers the impact of the Marie Curie scheme on the volume and quality of scientific connections or 'networking.' The international nature of science and the importance of knowledge transfer to scientific development quite rightly places an emphasis on the development and stimulation of contacts. Scientific networking supports the development of two key dimensions of knowledge transfer.

Firstly, it constitutes an essential conduit for the diffusion of scientific ideas and knowledge and, as such, support investment in human capital. Put simply, it enables scientists to learn new techniques and share ideas; to find out who is doing what in their field, supporting effective and efficient scientific collaboration. In this context, a powerful and generally positive relationship exists between the investment in human capital (scientific knowledge) and social capital (personal networks). This form of networking is a 'normal' and desirable feature of science and one which the scheme actively promotes.

Secondly, networking plays a key role in shaping the allocation of scarce scientific resources (such as information about employment resources or funding opportunities). Networks, and the social capital they represent, form the basis of the exchange of information about people, potential research opportunities and positions. As such, they provide a means by which supervisors and fellows can 'talent spot', enabling them to efficiently locate the 'brightest and best' people to work with.

This section considers the importance of networking in science and the impact of the Marie Curie fellowship scheme in this respect.

2.3.1 The importance of networks to Marie Curie fellows and supervisors

The majority of fellows (58%) rated networks, in general, as 'very important' to their career development with a further 33% stating that contacts were 'rather important'. The questionnaire furthermore invited fellows to consider the importance of **transnational** networks. Whilst just over 36% of all respondents regarded transnational networks as 'very important', some disciplinary diversity emerged. Social and human scientists, economists and environment and geoscientists in our sample showed higher figures (over 44%) and mathematicians, lower (25%). Female fellows were more likely than their male counterparts to rate transnational networks as 'very important' (44%) compared to 32% of male respondents.

Having established the importance of international networks to career progression, fellows were asked to comment on the *impact* their fellowship had made on their networks. The results suggest a *high impact*. Table 2.3.1 shows a marked correlation between those respondents who felt that transnational networks were 'very important' and those who rated the impact of the Marie Curie fellowship as very important.

Table 2.3.1: The importance attached to networks by the impact of the scheme - fellows

***Importance** of networks to working effectively in field*	***Impact** of Marie Curie fellowship on developing transnational networks*					
	No impact	Slight impact	Moderate impact	Rather significant impact	Very significant impact	
Not important	56%	23%	4%	6%	10%	100%
Slightly important	22%	41%	25%	11%	1%	100%
Moderately important	8%	20%	43%	23%	7%	100%
Rather important	4%	7%	23%	47%	**19%**	100%
Very important	2%	3%	11%	24%	**59%**	100%
Total %	*6%*	*10%*	*22%*	*32%*	*30%*	*100%*
Total	*168*	*279*	*623*	*897*	*855*	*2822*

Source: IMPAFEL fellows' questionnaire

Female fellows were more likely to rate the impact of Marie Curie on developing transnational networks as 'very important'.

Table 2.3.2: Perception of the impact of the scheme on developing transnational networks, by gender

	***Impact** of Marie Curie Fellowship on developing transnational networks*						
Fellows' gender	No impact	Slight impact	Moderate impact	Rather significant impact	Very significant impact	Total %	Total
Females	6%	9%	21%	31%	***34%***	*100%*	*1092*
Males	6%	11%	23%	32%	*28%*	*100%*	*1741*
Total	6%	10%	22%	32%	30%	100%	2833

Source: IMPAFEL fellows' questionnaire

2.3.2 Does the Marie Curie scheme stimulate new networks?

Does the Marie Curie scheme largely work through strengthening *existing* connections or does it generate *new* forms of connections? The findings indicate an important impact in both respects.

Prior institutional links

Around a third of post-graduate fellows, 41% of post-doctoral fellows and 73% of 'cat. 40' researchers reported having a prior link with their host institution. On average, post-doctoral fellows at university hosts (46%) were most likely to have prior links to their Marie Curie host, and fellows in industrial hosts the least (8%). Fellows who visited a Marie Curie host fellowship site were much less likely (27%) to have prior contacts than individual fellows (49%). Therefore, the host fellowships can be said to have a greater impact in creating new links, whereas the individual fellowships have a greater impact in consolidating existing links.

Table 2.3.3: Prior links with host institute by host type and level of fellowship

Total: 2874 (cat. 40&R not shown)	**% Prior links with host institute**					
	Host fellowships		**Individual fellowships**		**All fellowships**	
Host type	**Cat. 20**	**Cat. 30**	**Cat. 20** (FP4)	**Cat. 30**	**Cat. 20**	**Cat. 30**
University	31%	9%	59%	48%	35%	46%
Public or Private Research Centre	34%	19%	65%	43%	39%	41%
Large industries or SME	16%	6%	50%	25%	19%	8%
Private NGO, International or other	(N=4) 13%	(N=0)	(N=3)	40%	21%	37%
Average all host type	**31%**	**10%**	**61%**	**46%**	**35%**	**41%**
Totals	*1083*	*231*	*173*	*1309*	*1262*	*1547*

Source: IMPAFEL fellows' questionnaire

The importance of prior links also varied by discipline and nationality group. Social and human scientists, for example, had the fewest institutional links to the host at early stage and the most at post-doctoral stage. British and Irish fellows reported fewer prior links. Fellows from Eastern Europe and the Baltic countries were least likely to have a link with the host institution at early stage, although this was not the case for post-doctoral fellows from these regions (table 2.3.4). On the basis of these findings one might conclude that the scheme has the greatest impact on the development of networks of 'category 20' scientists from these regions.

Table 2.3.4: Prior links with host institute by European nationality group and level of fellowship

	% Prior links with host	
Nationality of fellows by European region	**Early Stage**	**Post-Doctoral**
Nordic	43%	41%
Central Europe	41%	45%
Western Central Europe	41%	35%
UK/Ireland	29%	31%
Southern Europe	37%	44%

Central Eastern Europe	28%	48%
South East Europe	**22%**	42%
Baltic	**26%**	43%
Average	*35%*	*41%*
Totals	431	620

Source: IMPAFEL fellows questionnaire

Networks, connections and fellowship initiation

The interviews suggest that supervisors use networks in two key respects as a means of identifying 'suitable' fellows. Firstly, they may meet potential fellows at conferences and research visits and, secondly, they use their contacts with other supervisors to enquire about potential recruits. Supervisors argued that recruitment through networks and on the basis of an 'expert' and trusted judgement of a colleague is often more efficient.

Whilst these forms of recruitment may be viewed as efficient and effective, they nevertheless lie in some tension with developments at European level designed to support more open and transparent recruitment. It is important to remember that we are not talking about the kinds of systems based on patronage that persist in some national systems. The Marie Curie fellowships are allocated on the basis of individual competition and objective peer review. The question more concerns the nature of the initial 'coming together' to forge the application than the decision as such.

It is clear from the findings that the Marie Curie scheme not only supports the development of new networks but also operates via existing connections (which may be based on a brief or indirect acquaintance or more consolidated) which play an important role in shaping application behaviour.

Access to international networks

Section 2.1 evidenced the importance that fellows attached to international experience. It is clear that many fellows felt that the experience of working in a research group in another country gave them access to an 'international environment' of contacts. Many respondents explained this by emphasising the reputation of the institute or research group that the Marie Curie scheme allowed them to be part of, aligning this reputation with a commensurate 'international culture', that connected them with other individuals, research groups and institutes of the same high stature. For many fellows the scheme provided access both to networks *within the research group*, and to some it also gave access to the institution's networks with other *institutions*.

Supervisors, also, in some cases referred to the contribution that fellows made to their research group's international networks.

Establishing personal networks

As was said in section 2.1, fellows attached much importance to the independence and autonomy that the scheme offered them. Mobility was viewed by many fellows as a critical opportunity to develop their own networks as a personal resource[28].

The scheme was particularly important in supporting the networking of scientists from Eastern European countries, many of whom had fewer prior contacts than Western Europeans. In these situations, international mobility is not only a resource in itself but also a means by which to access the kinds of 'critical international mass' associated with many of the Marie Curie host institutions.

'*The resources made availalble for travel allowed me to quickly create and maintain an extensive network of contacts. Many of the contacts I created in the period of the fellowship (1996-1998) I still maintain.' F04275NL-M*

The level of financial support, coupled with the autonomy and time made available to fellows under the scheme, enables fellows to activate networks established through the host research group (through visits and exchanges) and also to identify and establish new connections through attendance at conferences, workshops and summer schools. In this respect, the mobility of fellows operates at a number of inter-related 'layers.' Firstly, at the level of the international

[28] The importance of these personal networks was also emphasised in a recent survey of foreign PhD students and researchers in Finland (Puustinen-Hopper, 2005).

move itself and secondly, through on-going mobility during the fellowship which stimulates new international contacts both within and outside of the host country.

2.3.3. Importance of networks

Fellows and supervisors both referred to the role of the scheme in fostering an environment in which scientists can bring together their specific backgrounds and learn from each other. These 'backgrounds' do not just refer to the traditions of different disciplines but also to sub-disciplines, research techniques and skills that may be specifically associated with particular countries. The language used by respondents underlines the importance attached to collaborative working which supports the active transfer of knowledge and skills at many levels.

> I've started working more in a team way which I've really gained a huge amount from. Also, because it's multidisciplinary. Because I'm a social scientist. My team are psychiatrists, psychologists and statisticians. I hadn't worked that way before. *[F07178UK-F]*

The value of connections to research groups

The objectives of the Marie Curie scheme, as detailed in the Council Decision adopting the programme [29] include, 'helping to create a European Research Area through ... promoting transnational cooperation between research teams, including interdisciplinary approaches, particularly through networking around a common research project.' The Communication 'Towards a European Research Area' (COM (2000) 6 final) also specifically identifies the importance of 'the networking of specialist centres to research performance and optimal use of resources'. At present, it contends, many world class centres of excellence are 'not always sufficiently known outside the frontiers of the country'.

Supervisors often describe their collaborations as existing along 'research group' and 'institutional' lines, whereas the fellows would be more likely to refer to other individuals, or the 'one-on-one' nature of collaboration. Indeed, 52% of supervisors stated that the fellowships supported 'significant new forms of institutional collaboration.' In the course of the interviews, supervisors referred to the value of such forms of collaboration in terms of developing longer term institutional links, attracting good researchers, accessing research facilities and co-authorship.

The continued impact of networks

Whilst it is interesting to consider the impact of the scheme on connections during the fellowship, it is of particular importance from the point of view of longer term impact and the potential multiplier effect of this to consider the tenacity of these connections over time. A small collaboration might begin between two doctoral candidates exchanging ideas in the lab, and could eventually grow into a strong and long-lasting collaboration between two group leaders, based in different countries, who consolidate their relationship through partnership on research projects, publications and conferences. Both fellows and supervisors were confident that this was a major impact of the scheme, and that its repercussions would be felt for a long time to come. Data from the questionnaire suggests that networks established during the fellowship are often maintained over long periods. Indeed, some 86% of former fellows said that they had maintained professional links with research contacts in their host country. The interview data supports these findings on the tenacity and diffusion of networks.

A 'knowledge community'?

Over 50% of fellows were based in host institutions alongside other Marie Curie fellows (63% of post-graduate fellows and 40% of post-docs). About half of these had retained contacts with other Marie Curie fellows after the fellowship. This creates a powerful environment for networking with other fellows.

[29] Council Decision of 25 January 1999 adopting a specific programme for research, technological development and demonstration on improving the human research potential and the socioeconomic knowledge base (1998 to 2002) 1999/173/EC

Over 70% of fellows reported that their stay abroad resulted in the development of networks that were influential to their subsequent career progression. Around 30% of early stage fellows and 40% of post-docs felt that the contacts they had established during their fellowship had played a role in securing their current position.

Many fellows and supervisors referred, in the interviews, to the impact of the Marie Curie programme on the fostering of a *European scientific identity* and the wider impact of this on European integration. To the extent that the scheme is having an impact in this important respect, it is doing so through the encouragement of specifically *European* networks. The results suggest that the networks developed as a result of the scheme have a distinctly European flavour. These networks are highly influential in shaping location decisions and retaining scientists within the EU.

SUMMARY POINTS

- Networking plays a **very important role** in fellows' career development and in the promoting the visibility and effectiveness of research groups.
- The Marie Curie scheme clearly has a **very significant impact** on scientific networking of both fellows and research groups. This was particularly the case for female fellows.
- In many cases, the scheme effectively **supported existing** relationships and connections. This was especially true for experienced (73%) and post-doc fellowships (41%) and less so for early stage fellows (34%). To that extent the scheme operates through and substantiates prior networks.
- Although the majority of applications were initiated by fellows, the findings of **fellowship initiation** suggest that prior links play an important role in the process leading up to an application for a Marie Curie grant, particularly at more senior level and particularly in the university sector.
- Working through existing connections at the application stage was seen, by supervisors, to be an **efficient and effective** approach to research collaboration.
- The scheme plays a key role in developing **new** contacts and relationships. This was particularly true for early stage fellows, for fellows in industrial hosts, for certain disciplines (such as social and economic sciences) and for some nationality groups (such as Eastern Europeans).
- Networks were seen as important to the development of **international connections**; supporting conferencing and publication opportunities and **inter-disciplinarity** and, from the perspective of supervisors, **institutional** links.
- The research provides evidence of the long term **sustainability** of networks generated during the Marie Curie fellowship: 86% of former fellows are still in contact with their supervisor.
- Over 70% of fellows reported that their stay abroad resulted in the development of connections that were **influential to their subsequent career progression**.
- Where fellows had been working alongside other Marie Curie fellows over half **retained their links** with these scientists.
- The findings suggest a strong impact on the development of specifically **European networks** which, in turn, play a role in supporting European science and retaining scientists in the EU.

Section 2.4
Research Outputs

This section focuses on the tangible outputs of the Marie Curie fellows' activity during the fellowship. This includes mainly publications, but also conference papers, patents and awards.

Publications are an objectively measurable and universally recognised output of most research activities in the public sphere.
Nevertheless, many researchers themselves acknowledge that it is not an ideal means of assessing research excellence. There are significant limitations, and biases related to the use of **publication and citation counts** as a means of assessing research excellence. They have been accused of containing inherent biases towards the natural and exact sciences, towards 'basic' as opposed to 'applied' research, towards English language publications and towards established, "traditional", research fields. It has also been said that publication-based assessment methods contain a gender bias (studies found that women publish less, but more substantial papers), and that citation counts can be manipulated by researchers citing their colleagues' works as often as possible (a form of merit by association). Many approaches also privilege quantity over quality. As one of the Marie Curie supervisors put it, the risk is that the issue becomes one of being 'industrious perhaps, or typing fast', rather than gauging research excellence and originality.

A particular challenge facing the research team, in addition to the general issues outlined above, concerned the ability to distinguish the impact of the Marie Curie scheme on a fellows' publications from other causal factors specific to that case. A further challenge concerned the definition of an appropriate time frame for this analysis as publication of research results often takes place some time after the completion of a project.[31]
For these reasons, and considering the resource constraints of this impact assessment, the research team has not attempted an extensive bibliometric approach. In order to try to understand the impact of the scheme on publications, the research strategy included a series of general questions regarding the fellows' publications both in the questionnaires and interviews.

2.4.1 Publications and duration of fellowship

Length of fellowship is not an indicator in its own right but rather determines what can be achieved within the fellowship. The following section considers whether a relationship exists between duration and other key dimensions of impact.

A recent study[32] found that 'migrant' scientists who had moved without family members and often had more limited social networks in their new host country, committed a significant amount of time to research, often working during after-hours, which were used to concentrate on publications.[33]
It is perhaps not surprising, in this context, that the majority of Marie Curie fellows (64%) were satisfied with duration of their fellowship and had succeeded in publishing either during or after the end of the grant.

In order to account for differences not only in the *duration* of the fellowship, but also in the *time interval* which passed since the end of the fellowship, the respondents were asked to indicate their **average annual publication rate** before, during and after the fellowship, rather than providing

[30] Please refer to bibliography.
[31] It is therefore important not to underestimate the longer term impact of the scheme. On the other hand, as time progresses the influence of other factors such as networking, follow-up training etc. further complicate causation.
[32] The use of working time and the gender implications of this is discussed at length in 'Legislating for Equality? Working Hours and Career Progression in Science' in Ackers, H.L. (2005) ed. (forthcoming) *Gender, Mobility and Career progression in the European Union: A Case Study of Science Careers*, Camberley: Edward Elgar. A short fact sheet based on this research is available from www.law.leeds.ac.uk/cslpe
[33] This clearly had an impact on progression rates of scientists who were unable to commit this amount of time to paid work and in particular people with partners and children.

absolute figures. This provided a tool for comparing publications across the vast heterogeneity of the fellowship population under assessment, independently of the duration of the fellowship and the time interval since the end of the fellowship.[34]

As could be expected, the statistics show a correlation between the length of the fellowship and the number of (either single authored or co-authored) publications which the fellows were able to produce as a result of their activities at the host institution. As a general trend, the longer the fellowship, the higher the annual publication rate which was reported during the fellowship.
For fellowships of up to 6 months, 43% (1776) of fellows did not produce a publication during the fellowship. This is probably also related to the fact these were in large part (94%) post-graduate 'category 20' fellows in a Training Site. Seeing that the aim of the stays in a Training Site was to provide integral training to a PhD which the fellows was undertaking in the country of origin, it can be expected that the work at the Training Site contributed to the PhD thesis.

In fellowships which lasted between 6 and 12 months, 23% did not publish during the fellowship period. In this group, 65% are 'category 20' fellows (60% in a Training Site, 5% other types of early stage fellowship).

For fellowships of one year or more (where 'category 30' post-doctoral fellows are represented for 92%), more than 90% of fellows published one or more articles or papers.

90% of fellowships of one year or more produced publications.

The same pattern is perceived when 1897 respondents made a self-assessment of the impact made by the Marie Curie fellowship on their publications output. Amongst those whose fellowships lasted six months or less, 28% said that it had had little or no impact, while 48% believed it had a significant impact. As the duration of the fellowship increases, the percentage which reports little or no impact goes down (down to 9% in the group who had a more than two years' duration), and the percentage of fellows who assess the impact of the fellowship as 'significant' goes up (up to 63% of those with a grant of more than two years).

The longer the fellowship, the more publications.

The qualitative data showed that in certain fields, fellows required periods of more than two years to yield results. Examples included cell biology, neuroscience, plant science, and, in general, areas where experiments require equipment to be built before the tests can be run and experiments involving equipment shared by many researchers (implying restrictions on user time).
The constraints in the time period at their disposal were also especially mentioned by researchers who had decided to move to a new research area.

The use of fellowship funding to enable researchers to complete and publish work effectively represents an important impact of the scheme.
Some of the fellows interviewed who had not managed to secure follow-up funding from other sources which would allow them to stay at the host institute after the end of the fellowship spent time concluding their research – access to equipment permitting - and writing publications in their own time, either during a temporary period of unemployment while looking for another position, or in combination with research activities connected to a new position they had secured.

Quote from Danish fellow, male molecular biologist
'Giving people an extra year would probably be good. (…) I would probably make it an evaluation, and people have to prove (…) that they are good enough to be given the extra year.' [F05277DK-M]

A solution to this situation proposed by respondents was to provide more funding for the extension of fellowships in appropriate cases.

Respondents who commented on this aspect of the scheme generally preferred this option to an overall increase in duration,

[34] For a small number of disciplines, such as pure mathematics, where people may often publish papers that are substantially longer than the average scientific article, but less than once a year, this may on hindsight have been less adequate.

which fellows thought might encourage people to embark on more ambitious and long-term projects.
On the other hand, using Marie Curie fellowship funds in this way, i.e. providing longer fellowships to fewer people, necessarily reduces their impact in terms of generating new research partnerships and mobility episodes.

On the contrary, other people proposed considerations in favour of a fixed duration. The fact of having to programme one's work and respect deadlines is part of the necessary professional skills of a researcher.

2.4.2 Publication and gender

A difference could be noted between the publication rates of male and female Marie Curie fellows. There tended to be a significantly higher proportion of fellows who did not publish amongst females as compared to males. According to the data gathered, the male fellows tend to have a higher publication rate throughout, i.e. both before, during and after the fellowship.

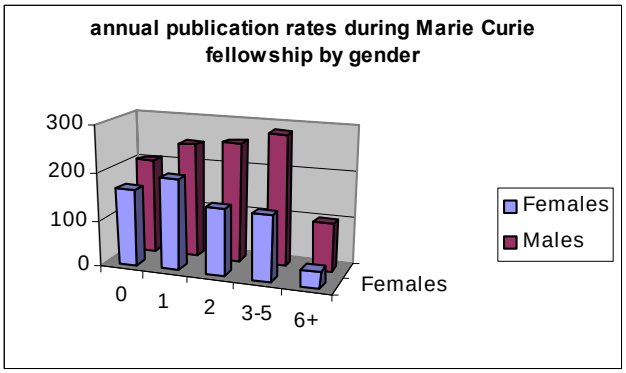
This may, again, be partly linked to the level of experience. Amongst females we find 50% 'category 20' researchers and 48% 'category 30' ones. Amongst males are 40% 'category 20' fellows and 57% 'category 30' ones[35]. This factor alone, however does not explain the finding.

The phenomenon was observed across all disciplines, except engineering, where women had a slightly higher number of average annual publications during and after the fellowship, and social sciences, where women had a marginally higher rate before the fellowship (but got surpassed by their male counterparts during and after the grant) (please see table 22 in Annex 2 for details).

Table & figure 2.4.1: annual publication rates during Marie Curie fellowship by gender

Total 1776	*nr. of annual publications*				
	0	1	2	3-5	6+
Male	19%	23%	23%	26%	10%
Female	24%	29%	21%	21%	5%
All	*21%*	*25%*	*23%*	*24%*	*8%*

Source: IMPAFEL fellows questionnaire



When asked to make a self-assessment of the impact of the fellowship on their publications, a greater proportion of females (24%) stated that there was *little or no* effect, compared to 17% of males.
A lower proportion of females (49%) answered that the Marie Curie fellowship had a *significant* impact, than males (58%).

These findings may be linked to several specific characteristics of the sample.
Firstly, on average, female fellows' grants in the sample of respondents were on average slightly shorter (16 months) than those of their male counterparts (17.3 months) reducing the time available for publication.

Secondly, females were relatively overrepresented in host fellowship schemes (43% as opposed to 35.2% males), which fellows tended to rate as having a lesser impact on publications. In fact, 48% of fellows in host fellowships rated the impact on publications as significant, compared to 60% of those with an individual fellowship. This is probably related to the issue of independence. The greater independence deriving from having an individual fellowship gives fellows more opportunity to publish.

[35] The remainder are 'category 40'

Also, the majority of host fellowships are Training Sites - which have a maximum duration of 12 months and an average duration of 6.7 months - and Industry Host fellowships, where the publication rate may be slightly lower anyway. So women are more present in fellowship types which by their nature may lead to fewer publications.
Finally, the average annual publication rate is closely linked to the age of the fellow, as would be expected. This is confirmed by the questionnaire findings. The number of average annual publications rises with the age of the respondents, both for males and for females. The females, however, start at a lower level and, except for the group of researchers over age 40, do not catch up.

Table 2.4.2: Average annual publications before, during and after the fellowship, by current age (2004) and gender

nr. of **average annual publications**	<29 years' old		30-34 years' old		35-39 years' old		40+ years' old	
	Female (N=153)	Male (N=189)	Female (N=281)	Male (N=425)	Female (N=166)	Male (N=306)	Female (N=27)	Male (N=71)
before Marie Curie	1,15	*1,23*	2,02	*2,26*	2,7	*3,21*	2,76	*3,02*
during Marie Curie	0,97	*1,23*	1,82	*2,38*	2,63	*3,21*	3,03	*3,33*
after Marie Curie	1,67	*2,11*	2,25	*2,89*	3,15	*4,51*	4,59	*4,5*

Source: IMPAFEL fellows questionnaire

In the sample of 2750 fellow respondents, the percentage of women tends to diminish with age. In the group of fellows aged under 29, we find 43.5% women and 56.5% men. The group which is currently over 40 years' of age is composed of 30% women and 70% men. In fact, the average age of female respondents is 32.4, whereas male respondents were on average 33.3 years' old. This also brings down the average annual publication rate for females.

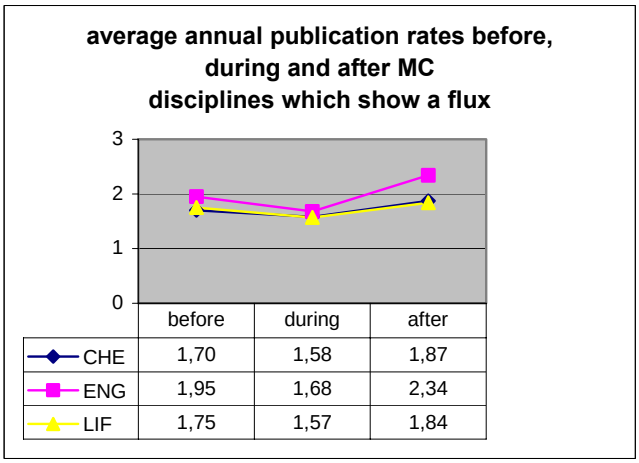
2.4.3 Publications and discipline

Another factor which influences the publications outcome of the Marie Curie fellows is related to their field. Whilst acknowledging that considerable differences may exist within specific subfields in any give discipline, the study has analysed the average annual publication rate of the Marie Curie fellows by macro-discipline.

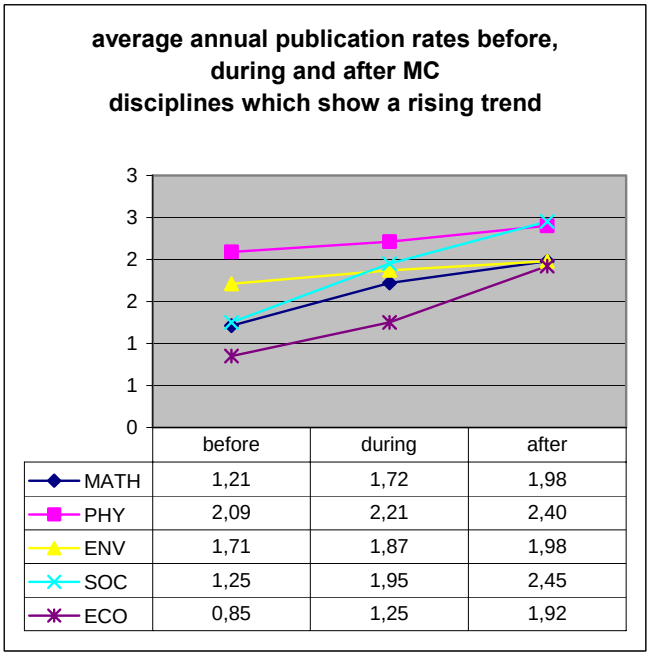
These data show that, in all cases, the average number of annual publications is higher after the fellowship than before the fellowship. Most disciplines show a progressive increase in the publication rate, in the sense that the rate during the fellowship is higher than before the fellowship, and after the fellowship it is higher still. This holds true for physics, mathematics/information technologies, environment/ geo-sciences, social sciences and economic sciences.

For the disciplines of chemistry, engineering and life sciences, however, the data show that the publication rate during the fellowship suffered a decline with respect to the periods before and after. This result is confirmed even when we exclude fellows in industrial sites (who might be more present in these disciplines than in others and who might be expected to publish less).
This phenomenon could be related to the relationship between discipline and duration of fellowship (discussed in Section 1.2) which suggested that researchers in some disciplines needed longer periods to produce outcomes.

Figure 2.4.3: Average annual publication rates by discipline – disciplines showing flux against disciplines showing increase



Source: IMPAFEL fellows' questionnaire



2.4.4 Publications and host type

Some differences can be seen in the number of average annual publications during the Marie Curie fellowship if we distinguish between type of host institution. As table 2.4.4 shows, amongst fellows who carried out their fellowship in an industrial host, there is a higher recurrence of those who reported having achieved no publication, and they are less likely to have high annual average publication rates.

Table 2.4.4: average annual publications by type of host institution – all types of fellowship

Nr. of publications ➔	0		1		2		3-5		6		Total	
University	179	*15.9%*	189	*16.7%*	240	*21.3%*	377	*33.4%*	144	*12.8%*	1129	*100%*
Public/private research institute	72	*15.7%*	98	*21.3%*	95	*20.7%*	139	*30.2%*	56	*12.2%*	460	*100%*
Industry	26	*43.3%*	13	*21.7%*	7	*11.7%*	8	*13.3%*	6	*10.0%*	60	*100%*
Other	11	*22.0%*	12	*24.0%*	8	*16.0%*	14	*28.0%*	5	*10.0%*	50	*100%*
Total	**288**		**312**		**350**		**538**		**211**		**1699**	

Source: IMPAFEL fellow questionnaire

However, these data are hard to interpret since they comprise all types of fellowship (Training sites, individual fellowships, more experienced fellows etc.) and all types of duration of fellowship. In order to compare like with like, a similar analysis has been done using average ('mean') annual publication rates only for individual fellows at experienced level[36]. In the table below these have been compared with the mean annual publications for the entire sample. The mean annual publication figure is highest in university, and lowest in industry.

Table 2.4.5: average annual publications by type of host institution and type of fellowship

Mean annual publications	University	Public/private research institute	Industry	Other
Individual 'category 30' fellows only	3.05	2.59	1.20	2.21
Entire sample	2.36	2.13	1.63	2.04

[36] Total respondents 858, equal to 46% of the sample. This includes so-called 'B30' fellows of FP4 and 'cat. 30' fellows of FP5.

Source: IMPAFEL fellow questionnaire

What these same data show is that, contrary to popular belief, Marie Curie fellows in industry are publishing! If we take only former fellows who carried out the Marie Curie fellowship in a company, 68% of 71 respondents had at least one publication, and 21% even had more than three annually, though on the whole the annual average was lower than for respondents who went to a university or research centre.

A small number of fellows reported being disappointed at not having been able to publish during their stay in the Marie Curie host company due to confidentiality restrictions, but most researchers who chose to carry out their fellowship in an industrial setting were aware that such restrictions might apply. In fact, many of them professed an interest in gaining experience in industry and reaching research results that could be used for real applications, rather than pursuing the more abstract exercise of publishing.

One industrial supervisor said that she tried to enable her fellows to publish once the confidential information had been secured by a patent. However, patenting can occur after the results have been obtained and is not an instantaneous process. Therefore, the interval between obtaining the results, securing a patent and subsequently publishing is considerable, and the timing did not always allow this to happen during the fellowship. For this reason the issue of timing and duration of fellowship may have a specific impact in the case of industrial hosts.

2.4.5 Processes shaping publication impact

Information from the interviews conducted with the Marie Curie fellows provides a diversified picture of factors operating to different effects on the impact on publications.

On the one hand, some fellows report that the Marie Curie fellowship gave a boost to their publications through the independence in conducting their research which the fellowship gave them. The fellowship also allowed them to dedicate their time exclusively to research. Furthermore, by moving to a different laboratory, some fellows report that their networking capacity is increased, allowing them to publish with different research groups throughout Europe.

On the other hand, the scheme may actually dampen publication rates, at least in the short term, of those researchers who do not succeed in obtaining publishable results within the time frame of the Marie Curie fellowship. One example of this is the case of scientists wishing to change field or try new approaches, who require more time to reach results (see 2.4.1)
In these circumstances fellows may not produce the volume of publications, at least in the short term, as they would have done if they had continued previous research lines and techniques with which they are more familiar. This may apply for all fellows who start to learn new research aspects, but especially for those individual fellowship projects which were truly a new idea of the Marie Curie fellow, rather than an activity decided together with the supervisor to fit in with ongoing activities.

On the one hand, Marie Curie fellows creating original, novel approaches can be considered as having a positive impact on European science and scientific production in general. On the other hand, such original research will take more time to lead to publishable results, and this may initially cause a negative flux in the researcher's publications, if measured strictly during or shortly after the Marie Curie fellowship.

In any case, the data show that the negative flux in number of publications - for the disciplines in which it occurs - is only temporary. After the fellowship the rates rise again, and are higher than before. In fact, many respondents indicated in the space for free comments of the questionnaire that some of the publications they classified under 'after the fellowship' in fact were related to the Marie Curie project.

Besides the time required to write up a paper after the research project was concluded, a further aspect to consider is that in scientific publishing, the times between submitting a paper and its actual publication are long. Interviewees estimated that in most peer-reviewed journals, it takes between six months and a year, and if the paper does not get accepted at the first attempt, it may take even longer.
This factor may also have influenced the answers provided by the respondents concerning their annual publication rates during the fellowship.

Moreover, notwithstanding the apparent phenomenon of a temporary decrease in publications for some fellows, the respondents were almost unanimous in acknowledging the training benefit of the Marie Curie fellowship, which they felt to be beneficial to their career as a scientist, independent of the tangible output as measured in, for example, publications.

2.4.6 Co-authorship between fellows and supervisors

Co-authorship is an interesting phenomenon as it reflects a range of potential impacts. At one level it reflects effective mentoring and supervision and provides evidence that appropriate recognition is given to the less senior members of the research team. It is also indicative of the existence and effect of networks (section 2.3).

It was very common for supervisors and fellows to have joint authorship of publications relating to the work under the Marie Curie fellowship. 87% of supervisors reported that they co-authored articles with their fellows and 66% presented joint conference papers.
13% of supervisors had one co-authored publication jointly with the fellow, and 13% had two. More than a quarter (27%) had between three and five co-authored publications with their fellows and 19% had more than six, with peaks of up to 30 publications or more.[37]

As might be expected, the data showed a link between the number of co-authored publications and the supervisor's evaluation of how productive the supervision time had been spent. Less than 2% of supervisors who had joint articles with their fellow(s) thought the time spent supervising had not been very productive, as opposed to less than 9% of those who did not co-author with their fellows. More than 87% of supervisors who did publish together with their fellows rated the time dedicated to supervision as productive, whereas for supervisors who did not have joint authorship, this appreciation was about 15% lower.

As mentioned also in sections 2.5 and 2.4.10, many supervisors believed that the presence of the Marie Curie fellow had contributed to the development of new research ideas and projects, and that the combined effect of the fellows' – often slightly different – competences with the knowledge of the group lead to fruitful new developments.

2.4.7 Patents and commercial output

Marie Curie fellowships tend to be carried out mainly in an academic setting and to be more oriented towards basic research than towards applied research. Only 8% (197) of fellows who took part in the survey said that the results were or were expected to be commercialised in any way. There is a slight, but less than could be expected, difference between private and public host organisations in this respect. Fellows who spent their fellowship in a company report that the results of their work were commercialised in 24% of cases, which is a further indicator that their work is still fairly exploratory.

Fellows in engineering (in any type of host organisation) make the most recurrent mention of results being commercialised (20%), whereas in mathematics/IT and in economic sciences this phenomenon represents less than 4% of all fellows' research results under the fellowship.[38]

[37] If, in order to eliminate the cumulative effect of several fellows' work with one supervisor, we consider only supervisors who had one fellow only, these figures vary slightly by one or two points.
[38] 10% of respondents said they weren't sure.

Only 7% of former fellows (126) said that the research project result in a patent. In total, 43 patents are held by fellows and 83 by the host institutions of former fellows.
Twenty-four out of 1859 respondents (1%) say the results lead to the creation of a new commercial enterprise.

If we look at the subgroup of 43 fellows who deposited a patent based on the results of the Marie Curie fellowship, five of them reported that this lead to the creation of a new commercial enterprise. One of these five persons reported to be involved personally in this enterprise (as co-patent holder). Another person, whose results were patented by the Marie Curie host organisation rather than by himself, reported to have launched a start-up company which he is currently still running.

Similar questions were put to the group of *current* Marie Curie fellows inviting them to comment on their expectations of how the results of the fellowship would be employed.
Only 29 respondents (4%) expected the results to be patented by themselves, and the same percentage (4%) expected that they would lead to the creation of a new enterprise.[39] Eighty-six respondents to the current fellows' questionnaire (12%) expected a patent to be filed by the host institute.
These percentages are double or more than double than the ones reported by the former fellows. Whether this is related to the fact that these figures reflect expectations of future events, rather than confirmed facts, or to the fact that a mentality change has occurred over the years can only be concluded if the same group of fellows is contacted again after the end of their fellowship.

According to answers provided by the 1262 supervisor respondents, patenting by the host seems to be most recurrent in the field of chemistry: 15% (23) of supervisors in chemistry report that the results of the work of the fellows led to a patent owned by the host, followed by 8% (40) of supervisors in life sciences, 5% (6) of those in engineering and physics (9), and 2% (2) in maths and IT.
On the other hand, commercialisation of results was reported by 19% (21) of supervisor respondents working in the field of engineering, followed by 10% (15) of those in chemistry, 5-6% of supervisors in life sciences, maths/IT and physics.
Thirty-four out of 1255 supervisors (3%) reported that they were aware of a spin-off or start-up enterprise having been created based on the results of the Marie Curie fellows' work.

2.4.8 Conference participation and papers

In addition to publications, the respondents were also asked about conference participation and the papers, talks and posters that they presented there. In total, the 2179 respondents who provided information took part in 8318 conferences (on average 3.8 conferences per respondent), and presented a total of 7058 papers or presentations.

As to location, 44% (3640) of these conferences took place in the **host** country, and the respondents contributed to these conferences with 2436 papers or presentations.
Furthermore, 14% (1146) of conferences in which the fellows participated took place in their **home** country, and through 1049 papers and presentations these fellows had the opportunity to consolidate or renew contacts in the home country. The remainder of 43% (3532) of conferences in which the Marie Curie respondents participated took place in a country which was neither the host country nor the home country. The respondents indicated that they contributed to these meetings with 3573 papers and/or presentations.

The highest incidence of co-authoring between fellow and supervisor on conference papers can be seen in relation to conferences or publications in the host country and the countries of origin of the fellows.

[39] These are not generally the same persons; only 4 fellows who expect to file a patent also expect to create a new commercial enterprise, whereas 12 do not know yet.

There was a less clear link concerning co-authoring in other European countries or world-wide. This seems to be indicative of the significant networking effect operated by the Marie Curie fellowship between the contact network of the supervisor in the host country and the contact network of the fellow in the home country (see also section 3.2).

Less than half the fellows (45%) whose fellowship lasted less than 6 months (94% of whom were 'category 20' post-graduate researchers) participated in a conference.
In the group of fellows whose grant lasted between 7 and 12 months, 72% answered that they have at least one conference participation. For fellowships of more than one year (13-24 months) 87% participated in one or more conferences.
Social scientists and economists were more likely to have presented papers at conferences than engineers and mathematicians.

2.4.9 Awards

The fellows were asked to provide information on any awards they might have received during their careers.

362 fellows in the group of 2918 respondents (12%) have received one or more awards at one time during their career, for a total of 506 awards (104 fellows had received two awards, and 40 of them even three or more). 200 of these awards, so almost 40%, were related to their activities under the Marie Curie fellowship. This corresponds to 7% of all fellows.
The majority (30%) of the awards related to the Marie Curie fellowship were issued by various bodies after a selection procedure. They are very diverse in nature[40], and therefore must be treated with caution as an indicator of output.
17% referred to invited lectureships or invitations as 'visiting researcher', and 12% were awards in the form of fellowships or research grants. A further 10% were for 'best paper or poster' and 6% for 'best oral presentation', related to conference participation; 9% were related to the PhD thesis; 6% were travel awards and 10% were not specified.

2.4.10 Enhancing research capability

When the supervisors were asked to comment on the impact of the Marie Curie fellows' research activities on the group, a rather positive picture emerged. 43% (551) said that the scheme had led to the creation of new technologies, indicating the innovative character of the research performed. This was particularly common amongst supervisors in engineering (67%), chemistry (53%) and life sciences (49%). According to 76% of supervisors, knowledge transfer between organisations had occurred as a result of the Marie Curie scheme.

Many of the supervisors from industry, especially, explained how the fellows' work allowed the company to explore less applied, less short-term research activities, for which normally company management would not have allocated personnel-time. They mentioned the strategic advantage provided by the research activities of the Marie Curie fellows, who could act as 'technology scouts'.

The interview data show that the host institutions usually benefited from the fellows being there because of their knowledge, previous experience, techniques and skills. It also provides another way of thinking and different aspects and views, which can be of high benefit for a research project and for other members in the group.
Quite often the mixture of the fellows research background and the competences in the host group lead to completely new research lines. Often, such projects continued at the host group even after the fellow left.
Supervisors also spoke of the benefits of having a 'free' person in the group whose time is less constrained by other commitments and who can, by virtue of this, conduct more exploratory research.

[40] Awards included e.g. the *ISTH Young Investigator Award*, *Joseph de la Vega Prize*, *Marcinkiewicz Prize*, etc.

In some situations, even a single post-doc fellowship could make a significant difference to the capabilities of the host group. This was noticeably the case in relation to some industrial placements and also in the case of less research intensive countries and small sub-disciplines.

SUMMARY POINTS

- 90% of fellowships of one year or more produced publications.
- Female Marie Curie fellows had a consistently lower number of average annual publications.
- In all disciplines, the average publication rate was higher after the fellowship than before. In the disciplines of chemistry, engineering and life sciences, the number of average annual publications diminished slightly during the Marie Curie fellowship.
- In certain subfields there seems to some difficulty in getting results published during the maximum duration allowed by the fellowship, but this effect is annulled after.
- Marie Curie fellows in an industrial host published slightly less than their counterparts in public research, but nevertheless 68% had at least one publication during the fellowship.
- 48% of fellows in host fellowships rated the impact on publications as significant, compared to 60% of those with an individual fellowship.
- 87% of supervisors co-authored with their fellows.
- Patenting is a very limited phenomenon amongst the Marie Curie fellows and supervisors.
- For fellowships of 7-12 months, 72% of fellows participated in at least one conference. For fellowships of 13-24 months, 87% participated in one or more conferences.
- 7% of fellows had received some form of award or recognition for their work under the Marie Curie fellowship.
- The majority of supervisors gave positive comments about the input of the fellows on the research output in general, and by consequence on the publications output, due to the combination of the complementary skills of the fellow and the host group.

Section 2.5
Supervision and training

The Marie Curie fellowships have quite a significant impact on the skills and competences of the fellows. The chance to learn new research skills was the second most recurrent motivation (indicated by 67% of fellow respondents) for applying for a Marie Curie fellowship, and it was also one the areas where the Marie Curie fellowship had the most impact (after 'international experience'). This finding was further confirmed by the fellows and supervisors who were interviewed.
Since, obviously, the training benefit of the Marie Curie fellowship was mostly intangible, it is not easy to quantify such impacts. In this chapter certain recurring themes, or facets of this impact will be singled out, based on statements made by fellows and supervisors in the interviews, and on the answers to the open-ended questions in the questionnaires. This information will be integrated with some aggregated data about fellows' assessment of the supervision they received during the fellowship.

Transfer of knowledge
Knowledge gets transferred in many different ways within the Marie Curie fellowships, and also afterwards as a continuing consequence.
Clearly, a main goal of the fellowship is for the fellow to acquire knowledge from his or her supervisor. In many cases, there are more actors involved in this process than just the fellow and the supervisor. Usually, the supervisor is member or head of a research group, and as such the fellow will interact also with the other group members and learn from them.

Besides this obvious transfer of knowledge from the group to the fellows, many supervisors reported that an *exchange* of knowledge occurred rather than unilateral transfer: the group had also benefited from specific knowledge brought in by the fellow, or new research lines started by the fellow which were continued after the end of the fellowship.
In other cases, fellows dedicated a portion of their time to tutoring students or more junior researchers in the lab, in that way contributing with their previous skills to the comprehensive knowledge of the group. In the case of Marie Curie Development Host fellowships, these last two aspects even were the specific aim of the scheme.

Exchange of knowledge
Fellows not only acquired skills and competences, but also transferred knowledge back to the host group.

Interviewees furthermore reported having transferred specific knowledge gained during the Marie Curie fellowship to their new place of employment elsewhere in Europe.

2.5.1 Transfer of knowledge: research training

This first part of the chapter will concentrate on knowledge acquisition by the fellow during the Marie Curie fellowship. A first distinction is that between formal training and informal training. A second distinction is that between scientific and 'complementary' skills.

As to formal training, fellows hosted by a university were often encouraged to participate in courses run by the faculty, if language restrictions permitted this. Other examples often cited were fellows who had been sent to follow specific courses, such as for example in statistical techniques. Conference participation, which is treated in section 2.4, can also be counted under this heading.

The most impact, however, seems to derive from informal training: exposure to a new research environment and a role model function of the supervisor. That is why international mobility is in itself a factor generating new knowledge, which cannot be substituted by a virtual exchange of

knowledge. It is necessary to create a situation where the researcher is placed at some distance to his or her past experience. Spending at least a few months in a new working environment seems to be an effective pathway to cross-fertilisation between different research environments.

Differentiation of skills

One of the evaluation criteria of the individual Marie Curie fellowships of FP5 concerned the impact and benefit of the training for the candidate[41]. Therefore, grant applications which succeeded in demonstrating an element of 'additionality' of the training or differentiation of competences with respect to past experience had a higher possibility of being funded. In the host fellowships, also, the fellows are likely to come from slightly different fields, and therefore need to adapt to a new area during their stay at the Marie Curie host organisation.

The data from the open-ended questions and the interviews confirmed that in this respect, the Marie Curie fellowship generated an important training impact.

A further training impact of the Marie Curie fellowship is constituted by the fact that it provides fellows the chance to access highly specialised equipment or infrastructures, which they might not otherwise have had the opportunity to use. Also the chance to work with specialists in the field was mentioned by some fellows as having a significant impact on their career.

Scientific maturity

Being fully integrated in the host group and working in proximity with the supervisor also produced the effect for many fellows of what could best be described as 'growing up as a scientist'. Some mentioned the opportunity to put theory to practice, some the fact of gaining more confidence and independence. Fellows often expressed appreciation of the fact that they had gained experience of new 'concepts' of science, different methodologies, approaches and so on. Some supervisors noticed a positive change in their fellows during the time the fellow spent at the host institution.

a UK supervisor: *'that person is now a relatively independent researcher. So it's about not only an ability to think as a researcher, but also to develop research skills and learn techniques.' [S5907UK]*

Complementary skills

Besides scientific skills and knowledge, an important impact of the Marie Curie fellowship is also achieved in the transfer of 'complementary' skills, such as publishing, public speaking, management and team working, proposal writing, research ethics, issues dealing with intellectual property rights (IPR), and, of course, proficiency in a foreign language.

Of the many knowledge exchanges that take place in the fellows' collaborations, the data indicates both that the opportunity to learn another language is important to the career development of the fellow, and also that the Marie Curie scheme has a significant impact on the fellows' ability to learn new language skills. Just over half the fellows identified 'developing language skills' as important' (51%) for working effectively in science. Approximately two thirds (61%) said that the Marie Curie scheme had a significant impact on their ability to develop language skills.

In the quantitative survey, fellows were not specifically asked about complementary skills, but this issue emerged strongly in the interviews. When the interviewers asked fellows to describe the training impact they felt had occurred, improved language skills was a frequently recurrent theme, as well as publishing and public speaking.

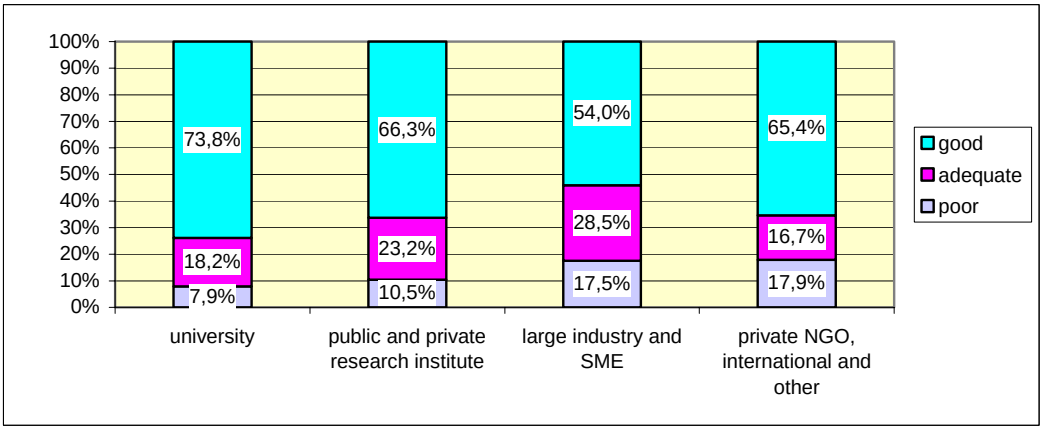
2.5.2 Quality of supervision

Fellows were asked to assess the quality of the supervision they received: 70% of 2601 respondents felt the supervision to be good (the two highest ranks on a scale of 5), 20% adequate

[41] COUNCIL DECISION of technological development and demonstration on adopting a specific programme for research, "Improving the human research potential and the socio-economic knowledge base (1998 to 2002) "*The selection criteria will include the research experience and the aptitude of the candidate, the impact and benefit of the training for the candidate, the research quality of the hosting research group, the ability of the host to meet the specific research training needs of the candidate, and the scientific and technological quality and relevance of the project.*".

and 10% poor. As figure 2.5.1 below shows, satisfaction levels were generally higher in universities and lower in industrial hosts.

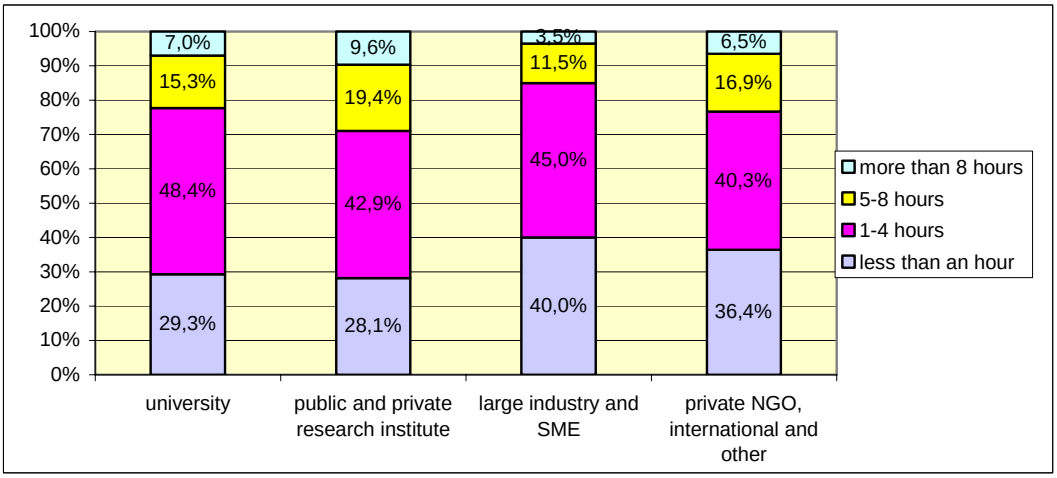
Figure 2.5.1: Fellows' opinion about the quality of supervision by type of host
University: N=1613, research institute: N=697, industry: N=200, other: N=78



Source: IMPAFEL fellows questionnaire

This finding relates to data provided by fellows about the time spent discussing their research with their supervisors.
Almost half of the fellows indicated that on average they spent between one and four hours a week discussing their project with their supervisor. Thirty percent indicated they spent less than one hour a week and 16% spent between 5 and 8 hours a week in close contact with the supervisor.
More than three-quarters (76%) of the 2601 fellows who responded said that they had as much contact with their supervisor as needed.
Notwithstanding the general satisfaction, as figure 2.5.2 shows, in industrial hosts and 'other' host organisations the average time dedicated to supervision time was lower.

Figure 2.5.2: Time fellows spent with supervisor by type of host
University: N=1616, research institute: N=697, industry N= 200, other N= 77

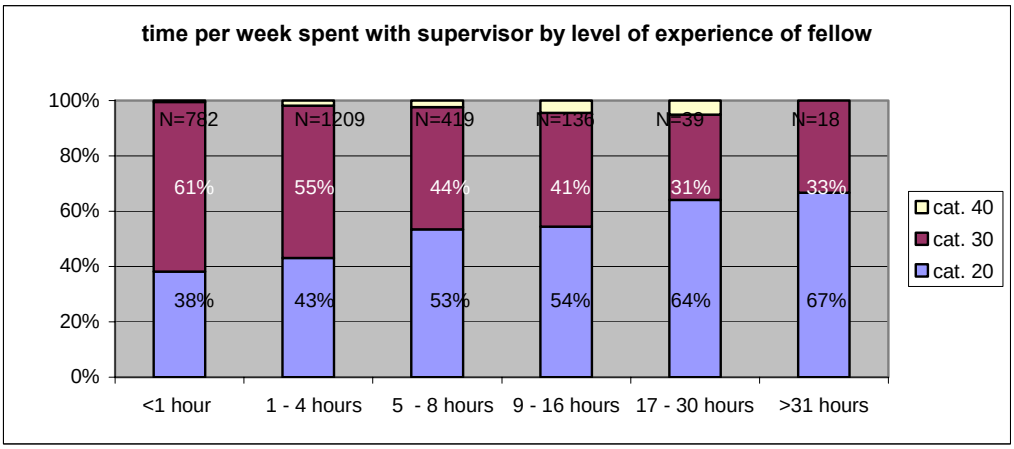


Source: IMPAFEL fellows questionnaire

Time spent with the supervisor was furthermore related to the level of experience. As can be expected, 'category 20' fellows spent on average more time with their supervisors. Fellows of both levels thought the time spent with the supervisor was sufficient in 75% of cases, 15% thought it should have been more, and the remaining were not sure.

As to satisfaction with supervision, 74% of 'category 20' fellows and 67% of 'category 30' fellows thought it was good[42].

Figure 2.5.3: time per week spent with supervisor by level of experience of fellow



Source: IMPAFEL fellows' questionnaire

Transfer of knowledge to further generations of researchers

The questionnaire answers indicate a high level of involvement (52%) of former fellows in the supervision and tutoring of the next generation of researchers. If 'category 20' fellowships are excluded, the figure rises to 68% for post-docs (964) and 87% for experienced researchers (46) who are now acting as tutor or supervisor to younger researchers.

If the effect of time past since completion of the fellowship is considered, the incidence of supervision rises to 78% of all respondents who finished over four years previously.

Transfers of knowledge occur not only over space but also at a temporal level and, as such, play a critical role in the training and encouragement of the next generation of researchers.

SUMMARY

- 70% of fellows report a good level of satisfaction with the supervision received. Both the time spent with the supervisor and the satisfaction of fellows with their supervision were higher in universities and lowest in industries.
- Post-graduate fellows received on average more supervision time than post-doctoral and senior researchers, but satisfaction was roughly the same for all levels of experience.
- The qualitative data show a positive impact of the Marie Curie fellowship on acquisition of skills and professional growth.

[42] Pearson Chi Square test value 0.019, therefore the data cannot be extended to the entire population but are valid only for this sample. Further data for 'Cat. 20': 18% adequate, 8% poor. 'Cat. 30': 22% adequate, 11% poor.

Section 2.6
Intersectoral Exchange

This chapter will explore the flows between academia and industry, and the extent of collaboration between the two which occurs during or as a result of the Marie Curie fellowships.

The Marie Curie fellowships can be carried out at any institution legally established in a European member state or Associated state[43] which has adequate research training facilities. As shown in the population profile (section 1.3), the majority of Marie Curie fellowships were carried out in a university setting with only 8% of fellows based in large enterprises or SMEs. These were 35% 'category 20' fellows, 64% 'category 30' and 1% 'category 40'. These fellowships were for 90% in a host fellowship, and 10% were individual fellows.

The 214 fellow respondents in industry were representative of the composition of the population. As indicated in the table of scientific disciplines below, the lion's share goes to companies in the life sciences.

Table 2.6.1: fellows in industrial host sites, by discipline

	Chemistry	*Engineering*	*Physics*	*Mathematics/ IT*	*Life sciences*	*Environment/ geosciences*	*total*
%	20%	25%	7%	4%	41 %	4%	100%
total	41	53	14	8	85	8	209*

Source: IMPAFEL fellows' questionnaire * 5 respondents did not indicate the discipline

This chapter seeks to determine fellows' experiences of working in different sectors both before, during and after the fellowship period, and to gauge the level of inter-sectoral mobility.

2.6.1 Comparison before and after the Marie Curie fellowship

The findings presented below consider the experiences of a sub-group of 1200 fellows who provided complete information concerning the sector in which they worked **before**, **during** and **after** the fellowship.

Before the fellowship, 91% of the respondents had worked in a university or a research centre. After the fellowship, 90% worked in the same sector. These are not necessarily the same persons.

Table 2.6.2 below shows that 989 persons were in a university/research centre both before and after the fellowship, and that 952 of them also carried out the fellowship in a university or research centre, remaining active in the same sector throughout. As few as 13 researchers who were in a university or research centre both before and after had carried out the Marie Curie fellowship in an industry.

If we look at the 78 former fellows who are employed in industry after the fellowship, we see that 62 of them were engaged in a university or research centre before the Marie Curie fellowship. In this group, slightly more than half carried out the Marie Curie fellowship in a university or research centre. Therefore presumably the decision to move to industry developed during or after the fellowship.

The other half of this group (who were in university/research centre before and are currently employed in industry) carried out the Marie Curie fellowship in an industrial environment. In other words, of those that moved to an industrial fellowship after coming from university or a research institute, half remained in industry afterwards (though not necessarily the same as where they carried out the fellowship).

[43] By the rules of FP4 and FP5. Under the 6th Framework Programme, the Marie Curie fellowships may also be carried out in "third" countries.

Please see section 2.6.3 for a summary of the reasons for changing between sectors, as emerged from the qualitative component of the study.

Table 2.6.2: Employment sector before and after the Marie Curie fellowship

(absolute numbers)		**After** Marie Curie fellowship					Total
		academia (incl. research centres)	industry	other	industry-academia combination[44]	other intersectoral combination[2]	
Before Marie Curie fellowship	academia (incl. research centres)	989	62	30	5	9	1.095
	industry	18	12	3	0	1	34
	other	22	0	4	0	4	30
	industry-academia combination[2]	11	4	2	3	0	20
	other intersectoral combination[2]	13	0	3	0	5	21
Total		1.053	78	42	8	19	1.200

Source: IMPAFEL fellows' questionnaire

2.6.2 Comparison during and after the Marie Curie fellowship

If we compare the sector of the Marie Curie host institute during the fellowship with the sector of current employment of 1827 Marie Curie fellow respondents, we find that 89% of all those who undertook the Marie Curie fellowship in a university have found current employment in that same sector or in a research institute; 4.5% have switched over to an industrial employer; 3.5% are employed in a still different sector, and 2.6% have collaborations with more than one sector. Similar percentages apply for Marie Curie fellows hosted in a research centre.

Out of the 74 fellows who carried out a Marie Curie fellowship in an industrial environment[45], 65% are now employed in that same sector, whereas 28% have returned to a university or research centre.

Retention in industry
More than half the fellows who carried out the Marie Curie fellowship in industry (after coming from university or a research institute) remained in industry afterwards.

In fact, the data indicate a stronger than average tendency for employers in the industry sector to offer follow-up contracts after the Marie Curie fellowship. Whereas, on average, 21% of Marie Curie fellows whose grants have finished[46] are still working at the host institute where they undertook the Marie Curie fellowship, for researchers who carried out the Marie Curie fellowship in an industrial setting, as many as 39% continued working there. A similar trend can be noted for the contract type. On average, 44% of former Marie Curie fellows currently have a permanent contract, but this is so for 63% of fellows who had an industrial Marie Curie host.

Retention in industry
Industry is more likely to offer follow-up contracts to Marie Curie fellows than public host organisations. Industry is also more likely to offer permanent contracts.

Table 2.6.3: Marie Curie host organisation sector and current employment sector

Marie Curie host type →	University	Public/ private research	Indus- try (incl.	Private non profit, international and other	Total by current employment

[44] The question allowed for multiple answers, wherefore some fellows indicated two or three different sectors, meaning that they had worked or were working for more than one type of organisation.
[45] in this chapter, a Marie Curie fellowship in an "industrial environment" or "industrial setting" refers both to individual fellowships carried out at an industry and to fellows in a "Marie Curie industry host fellowship".
[46] These figures exclude Training Site fellows, who are presumed to return to their home universities to finish the PhD anyway.

Current employment type ↓		institute	SME)		
Academia (incl. research centres)	1063	469	21	39	*1592*
Industry (incl. SME)	53	20	48	1	*122*
Other	42	14	3	12	*71*
Combination of industry and academia	11	3	2	0	*16*
Other intersectoral combination	20	5	0	1	*26*
Total by Marie Curie host type	*1189*	*511*	*74*	*53*	**1827**

Source: IMPAFEL fellows' questionnaire

If we analyse the data according to scientific discipline, we see that there is a link between discipline and the sector of work. Out of the 1802 respondents who answered this question, researchers who most frequently found employment in academia or in a research centre after the fellowship were the ones in economic sciences (94%) and mathematics and IT (93%). Fellows most likely to end up working in an industrial environment were those in chemistry (14.5%) and physics (10.5%), followed by life sciences (7%).

All in all, the flows of Marie Curie fellows between industry and the public/academic sector are fairly limited.

2.6.3 Factors shaping inter-sectoral moves and exchange

The interview data appear to indicate three main reasons for taking up a position in industry, in general, and two additional ones for taking up a Marie Curie fellowship in industry, in particular.

A number of persons said that they preferred industry because of the **work environment**: the working methods are more structured, there is more team spirit, and the research is target-oriented and "useful for society".
A second reason for taking up a career in industry was related to a more stable **contract position**, more attractive salary and the possibility of a faster and more transparent career progression.
For both types of motivation mentioned above, data from the interviews seem to indicate that the decision factors for moving to industry are linked to character traits or views on career, rather than to any specific impact of the Marie Curie fellowships.

A third group of people, who could be called '**reluctant movers**', mentioned a move to industry as a last option due to their inability to find adequate funding to sustain themselves and their research projects financially on the long term within the university sector or other purely research-based organisations.

It is indicative of the distance between the public and the private sector that many of the young researchers who took part in the survey appeared to nourish inflated impressions concerning the availability of jobs in industry. A large majority of the (ex) Marie Curie fellows interviewed who were without a permanent position mentioned that they would ideally like to find a job in academia or in public research, and if this were not possible, they would 'accept' a job in industry. (Ex) Marie Curie fellows who did have industry experience, however, had a different, probably more realistic, view on the chances of finding a good position as a researcher in an industry.

One of the reasons sometimes mentioned for preferring a Marie Curie fellowship in industry was that it gave them 'a foot in the door' to gain access to a company. With the possible exception of biotechnology, especially for more experienced researchers (post-doc level or equivalent), it may not be that easy to find a research position in a company. The interviews showed that companies often prefer younger, less specialised people. Many positions within a company may not be in research but in management or in marketing.

Besides it not being that easy to access a company, certain industries may not be present in all countries, wherefore a country move would be necessary.
The industry as 'safety net' in a research career may therefore be a false hope.

When discussing the **reasons for taking up a fellowship in industry** in the first place, besides the above reasons in favour of work in industry in general, fellows mentioned the opportunity provided by the Marie Curie fellowship to explore what it is like to work in industry. Furthermore, some fellows mentioned the chance to do so without too high a cost to their career. Since the experience in industry would be related to a 'prestigious' Marie Curie 'fellowship', it would not 'look bad' on these researchers' CVs in case they should decide to pursue an academic career after the fellowship.

Fellows who expressed a **preference for the academic sector**, on the other hand, attached a great deal of value to academic freedom, getting recognition for individual effort and sharing knowledge, either through teaching or through publications and congresses.

2.6.4 Inter-sectoral collaboration

The findings presented above have provided some indication of the relatively limited volume of inter-sectoral mobility. This is, however, only one indicator of knowledge transfer and co-operation. The following section considers whether the Marie Curie fellowships stimulate other forms of industry-academia collaboration.
It is interesting to consider the importance that fellows attach to the 'idea' of inter-sectoral collaboration. 60% of Marie Curie fellows and 63% of supervisors rated collaboration between academia and industry as important.
However, if we look at actual collaborations which occurred in the frame of the Marie Curie fellowship, an overwhelming 82% of fellows had experienced no collaboration at all. Only 18% of Marie Curie fellows working in a university, a research centre, or another non-industrial organisation answered that their work involved collaboration with industry (9% with SMEs and 9% with large industry). This finding confirms earlier conclusions that the Marie Curie fellowships are predominantly carried out in a purely academic setting.

60% of fellows think industry-academia is important but only 18% of fellows gained such experience during the fellowship.

If we look at a subgroup of 2557 respondents for which complete information is available, we see that fellows based in research centres experience a higher incidence (25%) of collaboration with industry than in universities (15%).

Some disciplinary differences emerge in how fellows rated industry-academia collaboration: in chemistry and engineering sciences 80% thought it was important, opposed to 27% in social and human sciences.
Marie Curie fellows in the field of engineering were also most likely to be involved in industry-academia collaboration during the fellowship (52%), followed by chemistry (28%) and life sciences (24%). Collaboration with industry was least frequent in the areas of mathematics and IT (13%), social and human sciences (10%) and economics (2%).

That industry-academia collaboration does occur to a greater extent is shown by the fact that 66% of supervisors answer that they or their research group are involved in any direct collaboration with industrial or commercial partners.

The information gathered from the interviews with supervisors showed, however, that even if the organisation was engaged in some form of collaboration with other types of organisations, most supervisors did not encourage the fellows' involvement in this interaction. A number of supervisors explained this phenomenon by the particular position of the fellows within the host organisation: for efficient collaboration, contacts with the other sector are

Even if supervisors had intersectoral collaborations, they did not involve their fellows in those activities.

best maintained by persons who know their own organisation well, and are authorised to make a certain level of commitment. This is not normally the case of a temporary researcher from another country, who may or may not have a good command of the local language.

Some good examples did occur, of course, of Marie Curie fellows who were involved in significant and fruitful collaboration between the two sectors. Apparently, the decisive influence was with the supervisors, who needed to make a conscious effort to engage the fellows in their ongoing collaborations. Some supervisors whom we asked this question simply had not considered involving fellows in such collaboration as relevant to their training. This indicates an untapped potential for training in an environment of intersectoral collaboration.

SUMMARY POINTS

- 88% of Marie Curie fellows carried out their fellowship in a university or a public research centre. Most fellowships in industry were host fellowships.
- Though there is a certain pull factor for fellows who carried out the fellowship at an industrial host institution, the net move away from academia to industry after the fellowship is a limited phenomenon.
- Out of 74 fellow respondents who carried out a Marie Curie fellowship in an industrial environment, 65% are now employed in that same sector.
- On average, 21% of Marie Curie fellows whose grants have finished are still working at the host institute where they undertook the Marie Curie fellowship. For researchers who carried out the Marie Curie fellowship in an industrial setting, this figure rises to 39%.
- On average, 44% of former Marie Curie fellows currently have a permanent contract, but this is so for 63% of fellows who had an industrial Marie Curie host.
- The choice for one sector or the other seems to be influenced by factors other than the Marie Curie fellowship, except for a small percentage of researchers who are offered permanent contracts by the Marie Curie host company (see above).
- The fact whether a fellow was involved in industry-academia collaboration often depended on the supervisor.

Section 2.7
Post-fellowship Career Trajectories

In order to understand the impact of the Marie Curie scheme, it is important to consider post-fellowship trajectories to ascertain if fellows remained in science research or moved into other types of work. ***Retention*** of fellows in research is one marker of impact. Tied into this issue are the ***employment conditions*** of former fellows in terms of their contracts and pay.

The Marie Curie is training the next generation of European Researchers
The objectives of the Marie Curie fellowship scheme work towards, '*stimulating training-through research of young researchers, especially those in the early stages of their professional career (EC., 1999)'* in an effort to redress some problematic issues in the EU including, '*a relative shortage of researchers;…and a general tendency towards an ageing workforce' (EC., 1999)*.

From: **Council Decision (1999)** adopting a specific programme for research, technological development and demonstration, Improving the human research potential and the socio-economic knowledge base (1998 to 2002), 1999/173/EC

A note about method is pertinent first. Although there was a good overall response to the questionnaire (which roughly mirrors the characteristics of the larger population) it is likely that former fellows who had left research altogether were less easy to trace and/or were less inclined to respond to the questionnaire. Therefore this section is likely to be positively skewed towards the group of fellows who are still active in research and who have maintained their contacts with the host. Nevertheless, it still contains important information about what researchers have gone on to do after Marie Curie.

2.7.1 Career following the fellowship

Former fellows were asked to report what they were currently doing.

Overall, 43% of 914 respondents who had 'category 20' fellowships were working in paid research jobs and were no longer studying. A further 48% were still studying (sometimes in combination with paid employment) at the time of the questionnaire (table 3.6.1). Looking at the pattern over time, there is evidence that 'category 20' fellows continue into research careers - 89% (67) of respondents who completed their category 20 fellowship over four years ago were working in research.

The vast majority of former Marie Curie Fellows who took part in the survey had continued in research careers

91% of former 'category 20' researchers were working in research and/or studying

90% of former 'category 30' fellows were employed in research positions at the time of the survey

Overall 90% of 993 respondents who had been 'category 30' fellows were now in paid research posts (table 3.6.1). Continuity in employment was apparent for most category 30 fellows; 87% (47) of respondents who had finished their post-doctoral fellowship within the last 6 months were now in a paid research position.

Table 2.7.1: Former fellows' occupation at the time of answering the questionnaire (2004)

Former fellows' current occupation (2004)	**Cat. 20**	**Cat 30.**
Paid Science/Research Work	43%	90%
Unpaid Science/Research Work	2%	1%
Studying only including PhD	23%	0%
Working AND studying in science research	25%	2%
Working in another area	4%	4%
Unemployed	1%	2%
Other	2%	1%
Total %	100%	100%
Total	914	993

Source: IMPAFEL fellows questionnaire

None of the 112 recipients of a Marie Curie return grant who answered the questionnaire were unemployed (compared to 2% in the group of fellows of all categories who did not have a return grant).

Interruption of the Fellowship
In 13% of cases (288), the fellowship was interrupted prematurely. In most cases this was because the fellow concerned had secured a new position, in 29% of these cases a permanent position (table 21 in Annex 2). Mostly, interruption to the fellowship occurred towards the end of the fellowship. A reason sometimes given for breaking off the fellowship prematurely was related to the difficulty in planning the stay abroad adequately. In some cases the contract started later than foreseen, or the end date interfered with the start of the academic season.

Alternatives to a research career
4% of 'category 20' fellows and 'category 30' fellows were working in 'other' occupations, for example, as medical practitioners, engineers, consultants, journalists, school teachers or translators. Often, these roles still contained an aspect of science, for instance, issuing patents. Skills and knowledge gained from the fellowship was therefore not 'lost' but fed back into European science in a less direct way. However, there is likely to be a group of former fellows that have changed career completely that were not picked up by the survey[48].

2.7.2. Type of work former fellows engaged in after the fellowship

The type of work in which respondents are engaged is influenced by their sector, institution and field. There are different expectations according to national practice. For instance, in the UK academic contracts will often specify teaching and research as joint contractual roles. In other countries, like Bulgaria, there is more of a dichotomy and research is likely to be carried out exclusively in the Academy of Sciences. In practice, respondents carried out a varied portfolio of tasks under umbrella terms like 'teaching'.

On the whole, 91% of 1574 former fellows respondents indicated that they were active in science, research and/or teaching before the fellowship, as opposed to 88% after the fellowship.

Of all the respondents currently working in an academia or a research centre, 94% are engaged doing solely science, research or teaching. Unsurprisingly, among the respondents employed in industry or in other non-academic sectors, the recurrence of people with tasks in business/commercial aspects, administration or management was much higher, both as their sole occupation and in combination with research/teaching (recurrences between 18 and 44%, as opposed to 6% or less for academia and research centres).

The interview data seem to point out that the (partial) move from pure science to other types of activities such as management, administration or commercial activities are dictated, as with the sector of employment, by the possibility to progress professionally and/or financially, or by necessity in the sense that some people reported that in pure science they found it too difficult to find an adequately paid position.
Furthermore, as a researcher progresses in his or her career, seniority and a higher level of responsibility also bring with it more management and fund-raising tasks.

Work sector
There is a trend for fellows to continue to work in the same sector as their Marie Curie host type after the fellowship (table 2.7.2). Respondents were allowed to indicate when they worked in more

[48] Fellows who left science were less likely to have completed the questionnaire – to capture this within this type of study would require a longitudinal analysis of careers - periodically following a cohort from graduation onwards to capture their employment trajectories. This would also help to capture the extent and duration of unemployment and unpaid work and the impact it has on retention in science.

than one work sector so they can be counted more than once e.g. they could work in university and industry simultaneously. The majority of fellowships were held in universities.

There was low turnover between sectors - three quarters of respondents who had been in a university host currently worked in a university. Nearly half respondents now working in public or private research centres also did their fellowship in that type of host. Nearly half the fellows who now worked in industry had been at a university host, but 36% had been in industrial hosts. Fellows working in Non-Governmental Organisations or international organisations were most likely to have done their fellowship in a university or a public private research centre – but there was evidence of some retention in the sector

Table 2.7.2: Fellows' current work sector by type of Marie Curie host

Host Type ↓	**Current work sector (more than one sector allowed) ↓**			
	University	**Public / private research centre**	**Large Industry / SME**	**NGO / international Organisation / Other**
University	76%	46%	48%	64%
Public / private research centre	19%	48%	16%	20%
Large Industry / SME	1%	2%	36%	3%
NGO / International Organisation / Other	2%	4%	1%	13%
Total percentage	100%	100%	100%	100%
Total respondents	*1147*	*575*	*141*	*97*

Source: IMPAFEL fellows questionnaire

2.7.3 Location of work

Respondents who previously held 'category 20' fellowships were most likely to be found working at an institution they had been at prior to the Marie Curie Fellowship. The only exception to this was category 20 industrial fellows who were most likely to be in the home country but working at a different institution (although the real numbers were smaller in this category). This is likely to be tied to qualifications: many fellows returned to complete their studies after the fellowship.

Table 2.7.3: 'Category 20' fellows' current place of work

Cat. 20 Marie Curie fellows only	**Current place of work↓**						
Host type ↓	At an institution worked at prior to the MC fellowship	At the Marie Curie host institute	A different institution in home country	A different institution in the host country	A different institution in another country	Total %	Total
University	54%	10%	18%	6%	13%	100%	542
Public / private research centre	47%	18%	16%	8%	12%	100%	203
Large Industry / SME	12%	24%	41%	6%	18%	100%	17
NGO /International Organisation / Other	53%	12%	12%	0%	24%	100%	17
All host types average percentage	*51%*	*12%*	*17%*	*6%*	*13%*	*100%*	*779*

Source: IMPAFEL fellows questionnaire

Former 'category 30' fellows who had been to a university or public/ private research centre for their fellowship were equally likely to be working at an institution they had previously been at, or another institution in the home country. Fellows who had been in NGO's or international organisations were most likely to have returned to a new institution in their home country. 'Category 30' fellows who had been at industrial hosts were most likely to be still working at the institute where they carried out their fellowship.

Table 2.7.4: 'Category 30' fellows' current place of work

Cat. 30 Marie Curie fellows only	**Current place of work↓**						
Host type ↓	At an institution worked at prior to the Marie Curie fellowship	At the Marie Curie host institute	A different institution in home country	A different institution in the host country	A different institution in another country	Total %	Total
University	29%	19%	29%	9%	14%	100%	585
Public / private research centre	30%	22%	30%	7%	12%	100%	291
Large Industry / SME	8%	47%	18%	8%	18%	100%	49
NGO /International Organisation / Other	21%	21%	32%	12%	15%	100%	34
All host types average %	*28%*	*21%*	*29%*	*8%*	*14%*	*100%*	*959*

Source: IMPAFEL fellows questionnaire

2.7.4 Post-fellowship employment terms for researchers

This section looks at the contractual status of the group of former fellows (396 at 'category 20' level; 891 at 'category 30' level) who reported being in paid employment at the time of answering the questionnaire. There was also a group which was in paid employment and studying at the same time, but this is not included in the analysis.
'Category 30' fellows were more likely than 'category 20' fellows to hold contracts of three years or more or even permanent contracts (table 3.6.6). This fits with the typical career path in research careers, where it is common to have shorter contracts in early career.

Table 2.7.5: Current contract duration of former fellows in paid work

Current contract (Duration)	**'Cat. 20'**	**'Cat. 30'**
<12 months	23%	12%
13-36 months	39%	25%
=>37 months	11%	20%
Permanent	27%	43%
Totals	396	887

Source: IMPAFEL fellows questionnaire

The relationship between level of employment, speed of progression and contractual status is complex. It is also relative to the employment culture of the country and work sector. In the absence of a 'control' group it is not possible to gauge whether Marie Curie fellows are more likely to secure longer contracts than other researchers. However, it is possible to see a pattern of contractual length increasing with experience.

In the first year after the fellowship, 'category 20' fellows are most likely to be on a short-term contract of a year or less (table 3.6.7). Between two and four years after the fellowship, most 'category 20' fellows have contracts that last between a year and three years. After four years, 42% of early stage fellows were in permanent research positions.

Four years after the fellowship, 42% of 'category 20' respondents and 63% of 'category 30' respondents were in permanent research positions.

Table 2.7.6: Former 'category 20' fellows' current contract type by length of time since fellowship

Category 20 fellows		Current contract length				Total 357
		<12 months	13-36 months	>37 months	permanent	
Length of time since Marie Curie fellowship	0-6 months	45%	35%	5%	15%	20
	7-12 months	42%	38%	6%	15%	55

	13-24 months	26%	46%	12%	16%	81
	25-48 months	19%	41%	8%	32%	134
	49+ months	8%	34%	16%	42%	67

Source: IMPAFEL fellows questionnaire

Fellows with a 'category 30' grant who were working in research were most likely to have a contract lasting between one and three years during the first year following the Marie Curie grant (table 3.6.8). When a year had passed since the fellowship, respondents in this group were most likely to have a permanent position in science. After four years, 63% of former 'category 30' fellows had a permanent position. It is not possible to show precisely how far this relates to having a Marie Curie fellowship.

Table 2.7.7: Former 'category 30' fellows' current contract type by length of time since fellowship

Category 30 fellows		Current contract length				Total 836
		<12 months	13-36 months	>37 months	permanent	
Length of time since Marie Curie fellowship	0-6 months	28%	37%	8%	26%	46
	7-12 months	24%	30%	19%	28%	162
	13-24 months	14%	34%	17%	35%	212
	25-48 months	8%	22%	24%	46%	196
	49+ months	4%	12%	21%	63%	220

Source: IMPAFEL fellows questionnaire

Remuneration after the fellowship by type of host

Most respondents were working in universities or public research centres after the fellowship[49]. These are also the workplaces where fellows were least likely to report 'very good' wages. Fellows in large industry and international organisations reported the most satisfaction with the adequacy of their wages.

Table 2.7.8: Fellows' perceived sufficiency of wages in current job by institutional sector

Former fellows current workplace	insufficient	not quite sufficient	adequate	good	very good	Total 1579
University	14%	24%	34%	25%	4%	942
Public research	15%	26%	33%	22%	5%	447
Private research	15%	8%	38%	25%	15%	48
Large Industry	3%	13%	30%	37%	17%	60
SME	7%	23%	34%	27%	9%	44
NGO or non-profit	14%	7%	57%	14%	7%	14
International Organisation	4%	8%	17%	33%	38%	24

SUMMARY POINTS

- Post-fellowship employment trajectories provide evidence of ongoing retention in science careers and a gradual progression into longer employment contracts over time.
- Most fellowships were in university hosts and the majority of former fellows now worked in universities. However, there is a trend that fellows continue to work in the same sector as their Marie Curie host after the fellowship.
- After the fellowship respondents were most likely to go back to an institution they had formerly been at, remain working in the host institution, or return to the 'home' country but work in a different institution.

[49] Multiple responses were allowed so fellows could be working in more than one workplace type.

- 90% (891) of respondents who had completed a ‘category 30’ fellowship were in paid research posts at the time of answering the questionnaire.
- 89% (67) of respondents who completed their ‘category 20’ fellowship over four years ago were now working in science and research. This shows recipients of fellowships early in their careers have continued into research careers.
- 63% of former ‘category 30’ fellows who had finished Marie Curie over four years ago now had a permanent position.

Section 3
Conclusions and recommendations

3.1 Conclusions

The impact assessment has analysed almost 12.000 Marie Curie fellowships funded under the 4th and 5th Framework Programmes for Research and Technological Development (1994-2002). Participation was possible for the 15 Member States, and in the course of the 5th Framework also Associated States became eligible to participate. As a mobility programme, 12 different types of fellowship allowed for research training and knowledge transfer in a different European country, for periods between three months and three years, at post-graduate, post-doctoral or senior researcher level.

Prestige of the Marie Curie fellowship

The Marie Curie fellowship scheme has established a strong reputation amongst both researchers and host organisations. It is regarded as highly effective in terms of identifying, selecting and rewarding excellence at European level. The objective and transparent evaluation criteria and procedures are widely recognised, and a key part of its reputation.

In this respect, the Marie Curie fellowship scheme stands out as an example of good practice, with the potential to stimulate policy change within participating countries.

The level and quality of the funding associated with the scheme, including individual remuneration as well as support for research costs and travel is sufficiently high to act as a magnet to both quality researchers and institutions. This ability to bring together, through mobility, high quality human resources and infrastructures promotes effective research capability and training. In addition to the quality of investments, the scheme is generally associated with objective and transparent evaluation procedures.

The prestige of the fellowship, in turn, has a significant impact on the career progression of Marie Curie fellows, and was amongst the main reasons for applying for one.

High quality training and supervision

The Marie Curie scheme is centrally focused on providing high quality research training. The study found strong evidence of the quality of training and supervision, especially in the university sector, where almost two-thirds of fellowships took place. The value of training lies not only in access to formal courses but, perhaps more importantly, to informal training and mentoring. Fellows identified an important impact in relation to the development of research and complementary skills associated with a different working environment. These helped to build the confidence and adaptability of fellows. Language and, in particular, the opportunity to develop their ability to publish in English also emerged as one of the motivations for applying for the fellowship and was felt to have a significant career impact.

Two-way knowledge exchange

The nature of knowledge transfer and training under the Marie Curie fellowship scheme is both multidirectional and inter-generational. Transfers of knowledge under the scheme flow both from supervisor/research group to fellow and from fellow to supervisor/research group. This is especially true at post-doc level, where fellows brought new knowledge and insights to their supervisors and host institutions. In smaller hosts and industrial hosts, the presence in the group of even one or a few fellows can make a significant impact in this respect. Many former fellows are now actively engaged in supervision and training of the new generation of researchers, including Marie Curie fellows.

Mobility flows

Marie Curie fellows and supervisors shared an overwhelming belief in the importance of mobility to their career progression and to European science. The fellows considered the Marie Curie

fellowship scheme to have a significant impact in stimulating mobility: many of them would not have gone abroad had it not been for the fellowship.
The Marie Curie scheme enhances the geographical mobility of researchers in two key respects. Firstly, it encourages many young researchers to make their first international move. This is particularly important during the early stages of a research career ('category 20') and for some nationality groups (Southern and Eastern European countries) and disciplines (social and human sciences).
Secondly, the scheme augments the on-going mobility of what is an already very mobile population, particularly in the natural sciences. The majority of fellows, especially at post-doc level and above, had already made at least one international move prior to their fellowship. Also after the Marie Curie fellowship, many former fellows reportied continued high levels of mobility, especially at post-graduate or doctoral level. Slightly more than half returned to the home country within four years after the fellowship.
In geographical terms, the flows of scientists within the scheme are quite uneven, with certain countries readily identifiable as 'sending' countries and others as 'receiving' countries. It is important to remember that in the case of sending countries, the benefit lies with the individuals who move and gain new competences, most of whom have intentions of returning to the home country at some stage, whereas in the case of receiving countries there is both an investment in training and a probable return at institutional level in terms of access to a pool of highly skilled researchers.

Operating through stimulation of existing networks and development of new connections
One of the ways in which international experience enhances career progression and research capability lies in its relationship to scientific networking. Scientific networking is critical to the transfer of knowledge both in a scientific sense but also in terms of accessing employment opportunities.
The Marie Curie scheme operates through stimulation of existing connections, adding value to these, as well as through the development of new connections.
Researchers with an individual fellowship more often used the fellowship in order to build on and intensify existing contacts (for example based on short previous meetings or visits), whereas the host fellowships more often lead to entirely new contacts.

Mobility provides fellows with access to the scientific networks associated with established and prestigious supervisors and institutions. Furthermore, the support for on-going conference and research travel enables fellows to build their own personal networks. In many cases, these involve other Marie Curie fellows. Fellows referred to the specific value of the connections generated during the Marie Curie fellowship in terms of their international and inter-disciplinary quality. The networks generated during the fellowships are typically sustained and developed over time and after the fellowships. In some cases, they form the basis of new funding applications strengthening research links over time and space.

Provision of maximum time for research
Perhaps less associated with mobility as such and more with the quality of funding, a particular value of the Marie Curie scheme lay in its contribution to research time. Especially at post-doc level, the fellowships underwrite valuable research time, enabling scientists to focus 100% on their own research without other obligations and pressures. This enables fellows to work effectively, increasing their research productivity and placing them at a significant competitive advantage.
The issue of time is also linked to the exercise of autonomy and independence, enabling fellows, notably at post-doc level, to play a bigger role in the development of their careers. To some extent, this reflects the specific qualities of personal research fellowships over and above the more prevalent post-doc positions funded by research grants, which require scientists to work under the close direction of grant holders and to the specific remit of the award.

In general, fellows and supervisors considered the duration of fellowships to be more or less appropriate although some fellows found that they needed longer fellowships in order to complete

their projects and improve their publication rates. It could be argued that fellows need to plan their work more effectively and allow time for themselves to write within the fellowship period. Many fellows said they used the entire time to make best use of the resources and infrastructure so that they could complete analysis and write up their work in the period following the fellowship. Some discipline-specific constraints emerged suggesting that research outputs take longer to produce in some fields than others.

Multidisciplinarity and experience with different research cultures

The combination of the factors described above enabled fellows and their host groups to take more risks and develop innovative approaches, often including inter-disciplinary aspects or exploring new fields. For the fellows, this contributed to reaching scientific maturity and becoming independent researchers. As to the host groups, it enabled them to undertake more strategic, long-term research.

Some fellows in industrial hosts were more constrained in this respect, having to fit their projects to company strategy to a greater extent than might be the case in public host institutions. The host companies valued the benefit of being able to explore longer term aspects through the fellows' activities, which could lead to a strategic competitive advantage.

Commitment to gender equality and representation

During FP4 and FP5, 40% of Marie Curie fellowships were awarded to women, which met with the European Commission target for female participation in FP5. Importantly, fellows did not perceive gender bias in the selection and administration of the scheme. Researchers with children participated in the scheme and parents were more likely to have returned to their home country following the fellowship. It is important that fellows are able to plan the timing of their fellowship adequately in advance and with sufficient precision (reliable 'time to contract'). This was particularly evident for those people who needed to schedule the fellowship around other personal commitments such as a job for the partner or school for the children.

A more active industrial engagement in all aspects of the Marie Curie scheme needed

The overwhelming majority of fellowships are carried out in a university or public research environment, especially at post-graduate level ('Category 20').

Career paths and progression systems in the public and private sectors are quite different and significant barriers persist limiting inter-sectoral circulation. The level of inter-sectoral knowledge transfer remains small within the scheme. The scheme provides researchers so inclined with an important opportunity to access industrial hosts - opportunities which they may otherwise regard as too risky (in terms of their ability to return to the university sector afterwards), which do not exist in their home countries, or which are hard to gain access to. The extent of intersectoral collaboration is greater in certain fields (chemistry, engineering and life sciences) than others. There is some evidence that supervisors are not involving fellows as much as they perhaps could in their ongoing inter-sectoral collaborations, which means a potential for intersectoral training is left untapped.

Research productivity

The findings provide evidence of a population actively engaged in publishing and the presentation of papers at conferences, both in host, home and third countries. The precise impact of the Marie Curie fellowship on publication rates is difficult to disentangle from many other concurring factors. Unsurprisingly, longer fellowships are associated with higher levels of publication, but to some extent this reflects the amount of time it takes to complete work and get it published which is field-specific. Publication rates are not a strong indicator for early career category 20 fellowships, as the period may be focused more on training and many will not have time to publish in the time frame of shorter fellowships.

Linked to the issue of publication is the issue of co-authorship. Co-authorship is not only an indicator of research productivity but also of collaboration and connections. The majority of Marie Curie supervisors had been involved in co-authorship and joint presentation of papers with their fellows. In some cases this extended beyond the fellowship period suggesting the sustainability of the connections developed during the fellowship.

There is a limited incidence of commercialisation of results, perhaps related to the relatively low share of industries participating, though a fair proportion of the activities under the fellowship did lead to new technologies and knowledge transfer.

Developing research careers in Europe

In concrete terms, the Marie Curie fellowship scheme provides the resources, opportunities and incentives that enabled many fellows to remain within research. Without the scheme, some fellows said they would have left scientific research because of the lack of employment and training opportunities in their home country or the pitifully low level of resources associated with these. The assignees of a Marie Curie fellowship are clearly strongly committed to continue pursuing a career in science, though in some cases or in some countries circumstances may be adverse.

Findings in terms of post-fellowship employment indicate a significant impact. A high proportion of fellows remained in science and progressed into permanent positions. This was especially true of industrial hosts which were associated with higher rates of post-fellowship follow-up contracs, a greater prevalence of permanent contracts and higher levels of remuneration.

Overcoming fragmentation in Europe

The Marie Curie scheme clearly plays a strategic role in 'matching' high quality human capital and resources in support of European science.

Many fellows expressed a particular appreciation for the Marie Curie fellowship in that it had been instrumental in keeping them in Europe or allowing them to return to Europe, as opposed to regions which exercise a strong pull factor, such as the USA. Many European scientists exhibit a strong commitment to Europe and to European science, which the actual situation in some areas of Europe not always allows them to exploit. The Marie Curie fellowships are a positive example in this respect. Many also thought that the Marie Curie fellowship contributed to creating a sense of European scientific identity.

For many supervisors, the issue of research time was closely linked to research capability and the additional, high-quality and not 'pre-assigned' human resources that the fellows represented. The Marie Curie scheme has an impact on research capability in many contexts.

Whilst key receiving regions invest a considerable amount in the training of fellows, they also benefit from the financial contribution to the host institution, from the fellows' work during the fellowship (especially at post doc level) and from the opportunities to retain them.

Just as the scheme channels resources into more prestigious institutions, it also, by virtue of application behaviour, represents a specific investment in fellows from less research intense regions (Southern and Eastern Europe). Many of these fellows return to the home country after the fellowship, providing highly trained capital for the benefit of these regions.

On the other hand, the Marie Curie fellowship contributes to the development of less research intensive regions through specific types of fellowship aimed at attracting excellent researchers to these areas. Importantly, the level of remuneration of the Marie Curie fellowship allows researchers from countries with higher levels of research investment to move to areas which could normally not have offered attractive levels of remuneration.

3.2 Recommendations

The Marie Curie fellowships should be continued following the same guiding principles of selection based on excellence and with a *free choice of research subject*. The fact that *evaluation is carried out at European level* is an important intrinsic value of the Marie Curie fellowships, which should be continued.

The principle of non-discrimination in terms of nationality and *avoidance of quotas* in this respect is an important component of objective assessment under the scheme and should be retained.

The levels of *remuneration* and support for research were critical to the facilitate mobility and support researcher autonomy under the prevailing circumstances and should be maintained at comparable levels for the types of fellowship assessed.

Overall, evidence suggests that the current duration of fellowships is working effectively and should be retained. Applicants should be encouraged to allow time in their proposals for writing-up and, especially where fellows are moving into new and inter-disciplinary fields, they should be encouraged to design viable projects capable of delivering outcomes within the fellowship period.

The level of *inter-sectoral collaboration* within the scheme is not high. To a large extent, this reflects the situation in research and, in particular, the difficulties of 'circulation' given the highly divergent performance criteria and employment conditions. A more active industrial engagement is to be encouraged, where relevant and possible.
The impact of the Marie Curie fellowship in creating awareness and skills related to intersectoral collaboration could be improved by encouraging supervisors to engage their fellows in ongoing industry-academia collaborations to a greater extent, if relevant and when possible.

The *system of tracking fellows* (and supervisors) should be streamlined and enhanced to improve the ability to locate fellows and avoid duplication and questionnaire fatigue amongst fellows/supervisors.

The data concerning the fellows and supervisors population were contained in separate data bases which were not compatible and not complete. For certain groups, data on gender, age or start date of fellowship were missing and extensive work was needed before the population could be analysed in its entirety. If further impact assessments are to be undertaken in the future, it is recommended to collect and store data on fellowships contracts in a single comprehensive data base, and acquire full contact and personal details also for fellows in host fellowships.

The impact assessment should be taken forward to encompass *FP6.* This would enable it to capture the impact of the scheme on the geography of scientific mobility both in terms of flows within an enlarged EU and also flows between the EU and other regions.

Any follow-up study should be guided by the experiences of this impact assessment building on its strengths and the investment it represents. The team would propose some modifications to the research instruments effectively *streamlining* the approach and reducing the length of the questionnaires.

This first impact assessment has focused considerable effort on tracing former fellows. It has also drawn attention to the importance of understanding the longer term impact of the scheme especially in terms of employment trajectories and research outputs. Any follow-up study could usefully build on the current database and responses effectively tracking a cohort of fellows over time. This would allow a more reliable assessment of the proportion of former fellows who continue a career in science and who remain in Europe.

The tender specifically called for an impact assessment, not a programme evaluation, meaning that the remit strictly related to the effects of the fellowship rather than to the way in which the programme is operated. However, there is a certain overlap between the two, and data volunteered by respondents often referred to the latter type of approach. *Combining* both aspects of evaluation would lead to economy of scale, help to avoid questionnaire fatigue and provide insight into which aspect of programme administration are critically related to impact.

Issues of balanced growth and access to the Marie Curie fellowship are also related to the *evaluation procedure*. The impact of the fellowship could be measured more fully if also non successful applicants could be contacted. This would have the benefit of assessing the impact of the selection mechanism.

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Annex 1: Definitions and notes

Associated State - In the 8 year period covered by the impact assessment, more and more countries became associated to the RTD Framework Programme. By the end of the FP5, associated countries comprised all new EU Member States, Bulgaria and Romania, as well as Iceland, Norway, Liechtenstein and Israel. An association of Switzerland to FP5 was not ratified in time, but due to a special arrangement it was possible for Swiss researchers to take part in Marie Curie actions abroad – though not for European researchers to go to Switzerland.

Bottom-up approach - This principle applies to the programmes 'Training and Mobility of Researchers' of the 4th and 'Improving Human Potential' of the 5th Framework Programme, which funded the majority of Marie Curie fellowships. Besides that, other programmes of the Framework Programme - aimed at funding transnational research projects in targeted research areas - also allotted parts of their budget to fund Marie Curie fellowships. These had the same name and followed the same criteria and procedures as the general ones, but only funded fellowships on topics covered by these programmes.

FP4 – 4th Framework Programme of Research and Technological Development of the European Community (1994-1998)

FP5 – 5th Framework Programme of Research and Technological Development of the European Community (1998-2002)

Under FP4 and FP5 the following types of Marie Curie fellowship were provided.

		Type of Marie Curie fellowship or grant	Cate-gory code	Category definition	Maximum duration (months)
FP4 ('94-'98)	Individual	Individual	B20	Doctoral researchers	36
			B30	Postdoctoral or >4 years research experience	24
			BRT	Return grant to go to a LFR* after a 2 years Marie Curie Fellowship	12
			B40	Established researchers with >8 years postgraduate experience in LFR*	12
FP5 ('98-'02)	Individual	Individual	30	Postdoctoral or >4 years research experience	24
			R	Return fellowship to go to LFR* after a 2 years Marie Curie Fellowship	12
			40	Experienced researchers with >10 years postdoctoral experience or >14 postgraduate to go to LFR* or to do Industry-Academia exchange.	12
	Hosts	Training sites	PhD20	Doctoral researchers	12
		Industry hosts	IND20	Doctoral researchers in industry	36
			IND30	Postdoctoral or >4 years research experience	24
		Development hosts	DEV30	Postdoctoral or >4 years research experience to go to a LFR*	24

LFR = Less Favoured Regions of the Community

Geographic areas

GROUP NAME	COUNTRIES
-**Nordic Countries:**	Finland, Sweden, Denmark, Norway, Iceland
-**Central Europe:**	Germany, Austria, Switzerland
-**Western Central Europe:**	France, Belgium, the Netherlands, Luxemburg
-British and Irish	UK, Ireland
-**South Europe:**	Italy, Spain, Portugal, Greece, Cyprus, Malta
-**Central Eastern Europe:**	Czech Republic, Slovakia, Slovenia, Hungary, Poland
-**Southeast Europe**:	Romania, Bulgaria,
-**Baltic Countries:**	Estonia, Latvia, Lithuania
-**Near East:**	Israel, Turkey, Syria, Lebanon
-**East Asia:**	Japan, South Korea
-North America:	US, Canada
-**Latin and South America:**	Argentinia, Chile
-Russian, Ukrainian, Belarussian	Russia
-**Africa:**	Morocco, Tunisia
-**Oceania and Australia:**	Australia, New Zealand

N.B. only countries which were relevant (as host country or as country of origin of fellows) to the population of Marie Curie fellows (FP4-FP5) are mentioned.

Home and host country - The term **'home'** or **'sending'** country is used to describe the country in which the fellow has spent most of their life and, usually, the place where they were educated at least to undergraduate level. This usually, but not always, corresponds to their nationality. The term **'host'** or **'receiving'** country is used to describe the site of the Marie Curie fellowship.

IMPAFEL – The acronym IMPAFEL was coined to indicate the impact assessment of the Marie Curie fellowships and used in the tender specifications. It has been used in the report to indicate the impact assessment in brief.

Intersectoral -

Less favoured regions - The list of 'Less Favoured Regions' has been updated during the 8 year period covered by this impact assessment. They are the regions defined as 'Objective 1', where development is lagging behind. The nomenclature is "regionalised", meaning that it applies to designated NUTS level II areas in the Nomenclature of Territorial Units for Statistics developed by Eurostat. Of these geographical areas, only those with a per capita gross domestic product (GDP) lower than 75% of the Community average are eligible under Objective 1. Further criteria for the definition of 'Objective 1' regions also apply (please consult http://europa.eu.int under the heading 'regional policy'.)

Mobility – the 'mobility criterion' for eligibility for a Marie Curie fellowship entails that applicants may not carry out the fellowship in their country of nationality, nor in the country in which they were already living recently, meaning that they may not have carried out their normal activity in the country of the host institute for more than 12 months in the two years preceding their application.

Percentages – due to rounding to one or zero decimal point, the total of a column may be slightly less or more than 100%. In these cases, the total has nevertheless been indicated as 100%.

ANNEX 2: ADDITIONAL TABLES AND FIGURES

Table 1: Type of Marie Curie fellowship by total population and response rate

		Population		Replies	
FP4		N.	%	N.	%
B 20	Individual post graduate fellowship	1125	*9,5%*	181	*6,%2*
B 30	Individual post doctoral fellowship (or >4 yrs research experience)	2413	*20,4%*	354	*12,1%*
B 40	Individual fellowship >10 years post-graduate research experience	108	*0,9%*	16	*0,5%*
BRT	Marie Curie return grant (Less Favoured Regions)	195[50]	*1,7%*	3	*0,1%*
FP5				N.	%
30	Individual post doctoral fellowship (or >4 yrs research experience)	2484	*21,0%*	983	*33,7%*
40	Individual fellowship >10 years post-graduate research experience	114	*1,0%*	44	*1,5%*
DEV 30	Host fellowship for post doctoral researchers (transfer of knowledge to Less Favoured Regions)	272	*2,3%*	71	*2,4%*
IND 20	Host fellowship in industry: post graduate researchers	288	*2,4%*	75	*2,6%*
IND 30	Host fellowship in industry: post doctoral researchers	586	*5,0%*	160	*5,5%*
PhD 20	Host fellowship: researchers enrolled in a PhD course in country of origin	4105	*34,8%*	1031	*35,3%*
R	Marie Curie return grant (Less Favoured Regions)	112	*0,9%*	N.A.[51]	-
Total		11802[52]	*100%*	2918	*100%*

Table 2: Supervisors' opinion about the quality of Marie Curie fellows compared to other fellows

	more than 2 *current* postgraduate Marie Curie fellows	*%*	**more than 2 *current* postdoctoral Marie Curie fellows**	*%*	**more than 2 *past* postgraduate Marie Curie fellows**	*%*	**more than 2 *past* postdoctoral Marie Curie fellows**	*%*
no other fellows	2	*5%*	1	*6%*	3	*3%*	2	*2%*
uncertain	0	*0%*	0	*0%*	6	*5%*	6	*7%*
MARIE CURIE generally higher standard	12	*31%*	5	*26%*	35	*31%*	38	*43%*
MARIE CURIE generally no different	24	*61%*	13	*68%*	64	*58%*	41	*47%*
MARIE CURIE generally poorer standard	1	*3%*	0	*0%*	3	*3%*	1	*1%*
total	**39**	***100***	**19**	***100***	**111**	***100***	**88**	***100***

[50] Researchers were contacted about the outgoing grant, therefore this table does not include replies linked to the return grant, though people with a return grant are included in the other types of grant. The only exception is for a group of 7 persons whose outgoing grant took place during the 3rd Framework Programme (so before the reference period for this study). The three replies refer to these cases.
[51] See previous footnote.
[52] The data refer to 11.802 fellowships, but these include 630 cases of more than fellowship held by the same person (including return grants) and – as far as known to the research team - 5 deceased persons. The number of physical persons who currently make up the population is 11.167.

Table 3: Duration of Marie Curie fellowship types and preferred durations

	Allowed maximum duration	**Average** duration (population)	Average **ideal** duration (**supervisor** respondents)	Average **ideal** duration (**fellow** respondents)
Category 20 (post graduate level)	months	months	months	months
Individual post graduate fellowship – FP4	36	25	32	33
Host fellowship in industry: post graduate researchers - FP5	24/ 36*	23	30.5	28
Host fellowship 'Training Site': researchers enrolled in a PhD course in country of origin - FP5	12	7	15	12
Category 30 (post doctoral level or equivalent)				
Individual post doctoral fellowship (or >4 yrs research experience) – FP4	24	21	27.5	30
Individual post doctoral fellowship (or >4 yrs research experience) - FP5	24	22	27.4	29
Host fellowship in industry: post doctoral researchers – FP5	24	21	25.8	29
Host fellowship for post doctoral researchers (transfer of knowledge to Less Favoured Regions) - FP5	24	19	26.8	30
Category 40 (senior researcher)				
Individual fellowship >10 years post-graduate research experience – FP4	12	8	24	17
Individual fellowship >10 years post-graduate research experience – FP5	12	10	16.6	17
Return grant				
Marie Curie return grant (Less Favoured Regions) –FP4	12	12 standard	22	24**
Marie Curie return grant (Less Favoured Regions) –FP5	12	12 standard	22.6	30**
TOTAL AVERAGE DURATION		**16**		
* 36 if fellow undertook a PhD during stay at industry			** (only 2 answers)	

Source: EC rules for Marie Curie fellowships of FP4 and FP5 and IMPAFEL fellows questionnaire

Table 4: Family situation during the fellowship by duration of fellowship and gender

Duration of Marie Curie fellowship (in months)	Partner remained in the home country		Partner joined the Marie Curie fellow in the host country		Partner lived in the host country already		(Other options not shown) *	*Total*		
	M	F	M	F	M	F		*M*	*F*	
1-6	72%	74%	10%	8%	5%	10%		*228*	*175*	*100%*
7-12	51%	59%	30%	10%	12%	18%		*259*	*216*	*100%*
13-24	26%	30%	45%	27%	18%	29%		*677*	*371*	*100%*
25+	13%*	13%*	33%	13%*	28%	50%		*46*	*30*	*100%*
Total (N)	*488*	*373*	*418*	*140*	*178*	*180*		*1210*	*792*	

Source: IMPAFEL fellows questionnaire * numbers of <5 per category

Table 5: Preferred destination by nationality[53]

Nationality group	1st most recurrent destination	2nd most recurrent destination	3rd most recurrent destination
Spain (*N=1897*)	UK (29.4%)	France (19.7%)	Germany (12.9%)
Italy (*N=1646*)	UK (30.1%)	France (23.2%)	Germany (12.6%)
Germany (*N=1526*)	UK (32.8%)	France (22.0%)	The Netherlands (9.0%)
France (*N=1496*)	UK (37.1%)	Germany (13.2%)	The Netherlands (9.9%)
Greece (*N=626*)	UK (28.4%)	France (13.1%)	Germany (12.1%)
UK (*N=620*)	France (25.2%)	the Netherlands (14.4%)	Germany (11.5%)
Poland (*N=536*)	UK (24.8%)	Germany (21.1%)	France (14.6%)
Netherlands (*N=414*)	UK (33.3%)	France (17.2%)	Germany (16.9%)
Romania (*N=378*)	France (22.2%)	UK (19.1%)	Germany (14.0%)
Belgium *(N=336*)	France (30.4%)	UK (25.9%)	The Netherlands (12.8%)
Sweden (*N=254*)	UK (37.4%)	France (14.6%)	Germany (8.7%)
Hungary (*N=243*)	Germany (23.5%)	UK (16.9%)	The Netherlands (14.4%)
Ireland *(N=231*)	UK (34.2%)	Germany (10.8%)	France (9.5%)
Czech Republic (*N=216*)	UK (24.6%)	Germany (20.8%)	France (15.3%)
Portugal (*N=173*)	UK (19.7%)	France (20.8%)	The Netherlands (13.3%)
Bulgaria (*N=170*)	Germany (24.1 %)	UK (18.8%)	France (11.2%)
Finland (*N=170*)	UK (30.0%)	Germany (16.5%)	Denmark (8.8%)
Austria (*N=159*)	UK (27.0%)	Germany (22.0%)	France (19.1%)
Denmark (*N=138*)	UK (28.3%)	France (18.1%)	The Netherlands (11.6%)
Slovakia (*N=119*)	UK (21.9%)	France (15.8%)	Austria and Germany (15.1% each)
Israel (*N=97*)	UK (30.9%	France (25.8%	Germany (10.3%)
Norway (*N=71*)	UK (25.6%	France (22.5%)	The Netherlands (15.5%)
Slovenia (*N=52*)	Germany (30.8%)	UK (17.3%)	The Netherlands (15.4%)
Lithuania (*N=39*)	UK (23.1%)	Germany (18.0%)	France and Denmark (12.8% each)
Estonia (*N=30*)	UK (26.7%)	Germany (16.7%)	The Netherlands (13.4%)
Latvia *(N=18*)	Germany (N=6)	Denmark (N=3)	Austria and Spain (N=2 each)
Iceland *(N=12*)	France, Italy, the Netherlands, Sweden, UK (2 each)		
Luxembourg (*N=11*)	UK (N=5)	France (N=3)	Austria, Italy, Norway (1 each)
Cyprus (*N=9*)	UK (N=3)	Germany and The Netherlands (N=2)	France and Germany (1 each)
Switzerland (*N=5*)	Germany (N=2)	Greece, Italy and Spain (1 each)	
Malta (*N=4*)	The Netherlands (N=2)	France and UK (1 each)	
Other countries[54] (*N=78*)	UK (28.2%)	France (19.2%)	Germany (10.3%)

Source: Marie Curie EC database

[53] N=11802 minus 28 persons whose nationality was not retrievable from the database.

[54] Researchers holding other nationalities were eligible to participate if they had been living in Europe for at least 5 years. Number of persons per nationality: Argentina-3, Brasil-5, Canada-3, China-4, Ecuador-2, India-2, Japan-2, Kenya-2 , South Korea-2, Lebanon-2, Morocco-12 , Mexico-6, Nigeria-1, Pakistan-1, Russia-10, Singapore-2, Senegal-1, Syria-3 , Tunisia-2, Turkey-5, United States of America-4, Uruguay-1, Venezuela-2 , Vietnam-1.

Tab 6: comparison by *supervisors* of other fellowship schemes with Marie Curie

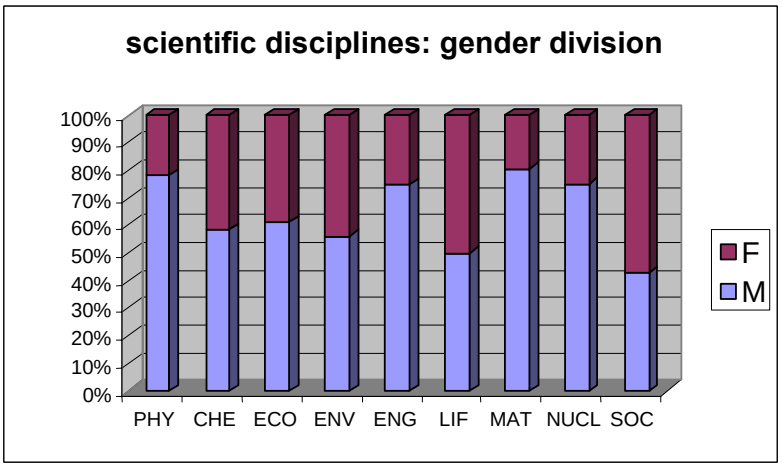
OTHER FELLOWSHIPS	STIPEND			TRAVEL			RESEARCH FUND			PRESTIGE		
	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better
A. von HUMBOLDT (N.22)	4,3%	56,5%	39,1%	22,7%	45,5%	31,8%	9,1%	36,4%	54,5%	45,5%	45,5%	9,1%
EMBO (N.53)	15,1%	43,4%	41,5%	9,4%	47,2%	43,4%	13,5%	23,1%	63,5%	61,8%	30,9%	7,3%
HUMAN FRONTIERS – ESF (N.18)	50%	33,3%	16,7%	27,8%	61,1%	11,1%	38,9%	33,3%	27,8%	72,2%	22,2%	5,6%
INTERNATIONAL – USA (N.5)	40%	40%	20%	20%	60%	20%		40%	60%	40%	60%	
NATO (N.5)	20%		80%		40%	60%	33,3%	33,3%	33,3%	16,7%	50%	33,3%
WELLCOME (N.27)	60,7%	25%	14,3%	44,4%	44,4%	11,1%	59,3%	22,2%	18,5%	29,6%	66,7%	3,7%
NATIONAL – AUSTRIA (N.11)		18,2%	81,8%		36,4%	63,6%	20%	40%	40%		54,5%	45,5%
NATIONAL – BELGIUM (N.9)	11,1%	33,3%	55,6%	11,1%	22,2%	66,7%	25%		75%	22,2%	55,6%	22,2%
NATIONAL – DENMARK (N.3)		100%		66,7%		33,3%	33,3%	66,7%		33,3%	33,3%	33,3%
NATIONAL – FINLAND (N.4)	50%		50%	25%	25%	50%	25%	50%	25%		100%	
NATIONAL – FRANCE (N.57)	10,5%	15,8%	73,7%	8,8%	19,3%	71,9%	12,3%	28,1%	59,6%	8,9%	48,2%	42,9%
NATIONAL – GERMANY (N.42)	14%	18,6%	67,4%	16,7%	21,4%	61,9%	19,5%	39%	41,5%	17,5%	52,5%	30%
NATIONAL – GREECE (N.2)	50%		50%	50%		50%	50%		50%	50%		50%
NATIONAL – IRELAND (N.15)	7,1%	28,6%	64,3%	6,7%	20%	73,3%	13,3%	20%	66,7%	6,7%	33,3%	60%
NATIONAL – ITALY (N.31)	3,2%	9,7%	87,1%	6,5%	29%	64,5%	10%	33,3%	56,7%	9,7%	32,3%	58,1%
NATIONAL – NETHERLAND (N.16)		43,8%	56,3%	12,5%	43,8%	43,8%	31,3%	31,3%	37,5%	25%	68,8%	6,3%
NATIONAL – NORWAY (N.8)	62,5%	37,5%		12,5%	25%	62,5%	42,9%	28,6%	28,6%		87,5%	12,5%
NATIONAL – PORTUGAL (N.4)	25%		75%	25%	25%	50%	25%	25%	50%	25%		75%
NATIONAL – SPAIN (N.29)	6,9%	10,3%	82,8%	6,9%	17,2%	75,9%	14,3%	25%	60,7%	17,2%	34,5%	48,3%
NATIONAL – SWEDEN (N.6)	33,3%	16,7%	50%	16,7%	50%	33,3%	20%	20%	60%		50%	50%
NATIONAL – SWITZERLAND (N.2)		50%	50%		50%	50%	100%				100%	
NATIONAL – UK (N.166)	22%	33,5%	44,5%	28,3%	24,1%	47,6%	46,7%	29,1%	24,2%	34,3%	53,3%	12,4%
NATIONAL – NOT SPECIFIED (N.134)	10,4%	23,9%	65,7%	10,4%	27,6%	61,9%	13,6%	34,8%	51,5%	11,6%	43,4%	45%
VARIOUS (N.113)	23,4%	30,6%	45,9%	22,1%	31,9%	46%	22,3%	39,3%	38,4%	23,9%	43,4%	32,7%
ALL FELLOWSHIPS (1392 supevisors)	**18,7%**	**28,8%**	**52,5%**	**19%**	**30,4%**	**50,6%**	**25,5%**	**32,3%**	**42,2%**	**25,3%**	**46,5%**	**28,2%**

Source: IMPAFEL supervisors' questionnaire

Tab 6 (cont.): Comparison by *supervisors* of other fellowship schemes with Marie Curie

OTHER FELLOWSHIPS	DEST. CHOICE			DURATION			ADMINISTRATION			AVAILABILITY		
	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better	Marie Curie is worse	No diffe-rent	Marie Curie is better
A. HUMBOLDT (N.22)	15,8%	78,9%	5,3%	4,5%	54,5%	40,9%	45,5%	50%	4,5%	22,7%	31,8%	45,5%
EMBO (N.53)	23,5%	74,5%	2%	7,5%	81,1%	11,3%	70,6%	19,6%	9,8%	7,4%	42,6%	50%
HUMAN FRONTIERS – ESF (N.18)	47,1%	52,9%		50%	44,4%	5,6%	61,1%	38,9%		16,7%	27,8%	55,6%
INTERNATIONAL – USA (N.5)	25%	75%		40%	60%		40%	40%	20%	20%	20%	60%
NATO (N.5)	33,3%	50%	16,7%	16,7%	83,3%		33,3%	66,7%		16,7%	50%	33,3%
WELLCOME (N.27)	19,2%	69,2%	11,5%	51,9%	44,4%	3,7%	14,8%	74,1%	11,1%	32%	28%	40%
NATIONAL – AUSTRIA (N.11)		40%	60%	63,6%	36,4%		45,5%	54,5%		36,4%	45,5%	18,2%
NATIONAL – BELGIUM (N.9)	12,5%	62,5%	25%	66,7%	11,1%	22,2%	55,6%	44,4%		33,3%	55,6%	11,1%
NATIONAL – DENMARK (N.3)	33,3%	66,7%			100%			66,7%	33,3%	33,3%		66,7%
NATIONAL – FINLAND (N.4)	25%	50%	25%	25%	50%	25%	25%	75%		33,3%	66,7%	
NATIONAL – FRANCE (N.57)	12,5%	56,3%	31,3%	26,3%	31,6%	42,1%	36,4%	50,9%	12,7%	38,2%	36,4%	25,5%
NATIONAL – GERMANY (N.42)	17,5%	65%	17,5%	39%	48,8%	12,2%	33,3%	54,8%	11,9%	17,1%	53,7%	29,3%
NATIONAL – GREECE (N.2)	50%		50%		50%	50%		50%	50%	50%		50%
NATIONAL – IRELAND (N.15)	7,1%	42,9%	50%	21,4%	78,6%		35,7%	57,1%	7,1%	14,3%	50%	35,7%
NATIONAL – ITALY (N.31)		70%	30%	34,5%	51,7%	13,8%	40%	40%	20%	53,3%	33,3%	13,3%
NATIONAL – NETHERLAND (N.16)	12,5%	50%	37,5%	53,3%	33,3%	13,3%	37,5%	43,8%	18,8%	12,5%	37,5%	50%
NATIONAL – NORWAY (N.8)	37,5%	37,5%	25%	87,5%	12,5%		12,5%	87,5%		12,5%	25%	62,5%
NATIONAL – PORTUGAL (N.4)		75%	25%	50%	25%	25%	25%	50%	25%	50%	25%	25%
NATIONAL – SPAIN (N.29)	13,8%	65,5%	20,7%	55,2%	37,9%	6,9%	37,9%	51,7%	10,3%	44,8%	37,9%	17,2%
NATIONAL – SWEDEN (N.6)	16,7%	66,7%	16,7%		66,7%	33,3%	66,7%	33,3%		66,7%		33,3%
NATIONAL – SWITZERLAND (N.2)	50%	50%		50%	50%		50%	50%			100%	
NATIONAL – UK (N.166)	18%	57,1%	24,8%	55,4%	32,5%	12%	30,9%	54,9%	14,2%	20,7%	35,4%	43,9
NATIONAL – NOT SPECIFIED (N.134)	11,3%	68,5%	20,2%	35,9%	45,8%	18,3%	27,5%	64,1%	8,4%	38,3%	32,8%	28,9%
VARIOUS (N.113)	21,2%	54,8%	24%	32,1%	50%	17,9%	41,4%	49,1%	9,8%	26,5%	48,7%	24,8%
ALL FELLOWSHIPS (1392 supervisors)	**16,6%**	**61,9%**	**21,5%**	**37,5%**	**46,1%**	**16,4%**	**35,6%**	**53,4%**	**11%**	**27,3%**	**39,7%**	**33%**

Table 7: Male-female ratios in the Marie Curie scheme by scientific discipline



Source: Marie Curie EC Database

Table 8: Frequency of reference to different dimensions of impact in the former fellows open-ended question '*What do you consider to be the main impacts of the Marie Curie Fellowship Scheme*?'[55]

Mobility	*515*
Networks	*430*
Skills/Training	*223*
Career Progression	*220*
Access to excellent hosts/centres	*173*
Autonomy/Independence	*109*
Prestige of the Scheme	*73*
Salaries (personal income)	*70*
Ability to do good research	*64*
Research Field	*60*
Language skills	*56*
Time to focus on research	*52*
Resources for research	*52*
Publications	*26*
Links with Industry	*18*

The responses to this question are interesting. Firstly, they differ slightly to the responses to the pre-set answers (above). In the open-ended questions mobility remains the most frequently cited impact but the importance of networks also features very strongly. Access to well resourced and high-quality host institutions is also high on the list.

Source: IMPAFEL fellows' questionnaire

Table 9: Frequency of reference to different dimensions of impact in the supervisors' open-ended question 'What do you consider to be the main impacts of the Marie Curie Scheme on your research group'.[56]

Research Capabilities of Group	*333*
Networks/collaboration	*257*
Access to excellent researchers	*236*
Mobility	*218*
Social environment of group	*192*
Skills/training of MC fellow	*161*
Building a research group	*112*
Knowledge transfer	*78*
Financial resources	*68*
European science/research discipline	*36*
Publications	*21*
Career Progression of fellows	*17*
Time to do research	*5*

[55] In most cases fellows mentioned more than one issue as an impact - thus the count corresponds to the number of times an issue was raised rather than the number of fellows who answered the question

[56] Like fellows, the majority of supervisors mentioned more than one issue as an impact - thus the count corresponds to the number of times an issue was raised rather than the number of supervisors who answered the question

Source: IMPAFEL supervisors' questionnaire

Figure 10: time spent with supervisor per week, by discipline

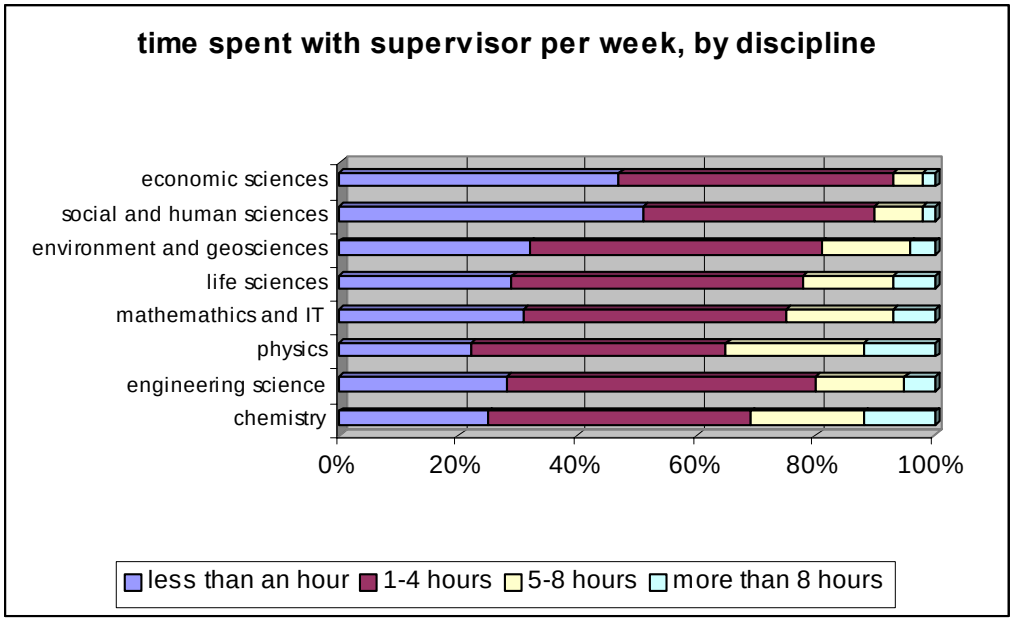
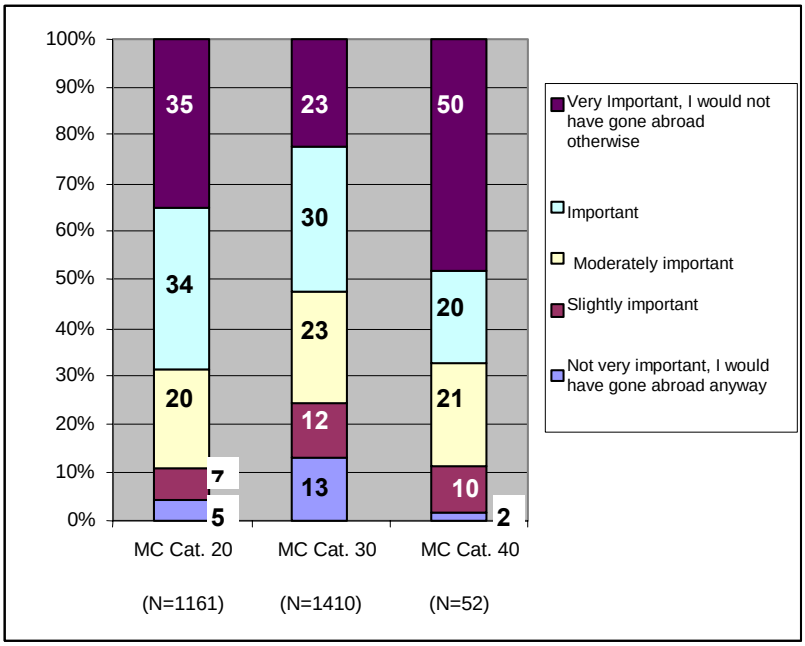


Table 11: Fellows' most significant *single* reason for applying to scheme, by level of fellowship

Main Reason for Applying for MC	Cat. 20	Cat. 30	Cat. 40	Return	Average all types
International experience	24%	24%	18%		24%
New research skills	18%	11%	10%		21%
Opportunity for good science	12%	12%	15%	N=1	12%
Work with specific supervisor	8%	5%	12%	N=2	7%
To specialise in certain area	7%	3%	(N=3) 5%		5%
Lack of opportunity home country	7%	7%	(N=3) 5%	N=1	7%
Speed up career development	4%	6%	0%		5%
Recommended by supervisor	4%	3%	0%		4%
High reputation of institute	4%	3%	(N=1) 2%		3%
Other	2%	2%	17%		2%
Gain industry experience	2%	4%	(N=3) 5%		3%
Attractive salary	2%	2%	(N=1) 2%		2%
To change to a new field	1%	2%	(N=1) 2%		2%
Prestigious fellowship	1%	8%	(N=1) 2%	N=1	5%
Learn/ improve other language	1%	1%	0%		1%
Family or personal reasons	1%	2%	(N=2) 3%		2%
Applying for many fellowships	0%	2%	0%		1%
No reply	2%	2%	(N=2) 3%		2%
Total %	100%	100%	100%		100%
Total	***1286***	***1567***	***60***	***5***	***2918***

Source: IMPAFEL fellows questionnaire

Figure 12: The importance of Marie Curie in stimulating mobility



Source: IMPAFEL questionnaire

Table 13: Prior mobility experience by European nationality group and level of fellowship

Fellows nationality by European geographic region	Cat. 20	Number	Cat. 30	Number
Nordic	61%	48	84%	68
Central Europe	66%	92	69%	155
Western Central Europe	42%	65	57%	225
UK/Ireland	46%	23	68%	77
Southern Europe	54%	223	77%	357
Central Eastern Europe	46%	99	68%	84
South East Europe	49%	61	88%	36
Baltic	42%	8	71%	5
Totals	51%	619	69%	1007

Source: IMPAFEL fellows' questionnaire

Table 14: Percentage of fellows who had been mobile prior to the Marie Curie fellowship, by host type and level of fellowship

	% Mobile prior to Marie Curie	
Host Type of Marie Curie fellowship	**Category 20**	**Category 30**
University	52%	70%
Public or Private Research Centre	48%	68%
Large industries or SME	71%	66%
Private NGO, International or other	52%	80%
Total	*632*	*1016*

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Table 15: Prior mobility experience by scientific panel

	% Mobile prior to Marie Curie	
Discipline	**Category 20**	**Category 30**
Chemistry	41%	66%
Life science	48%	68%
Engineering	56%	70%
Environment and Geo-sciences	60%	70%
Physics	45%	71%
Maths / IT	56%	73%
Economics	67%	77%
Social and Human Science	64%	84%
Totals	*xxx*	*xxx*

Source: IMPAFEL fellows questionnaire

Table 16: Percentage of fellows who had already returned by host type and fellowship stage

	Category 20		Category 30	
Host Type of Marie Curie fellowship	%	totals	%	totals
University	41%	257	50%	290
Public or Private Research Centre	40%	89	55%	156
Large industries or SME	43%	9	26%	13
Private NGO, International or other	24%	4	38%	13

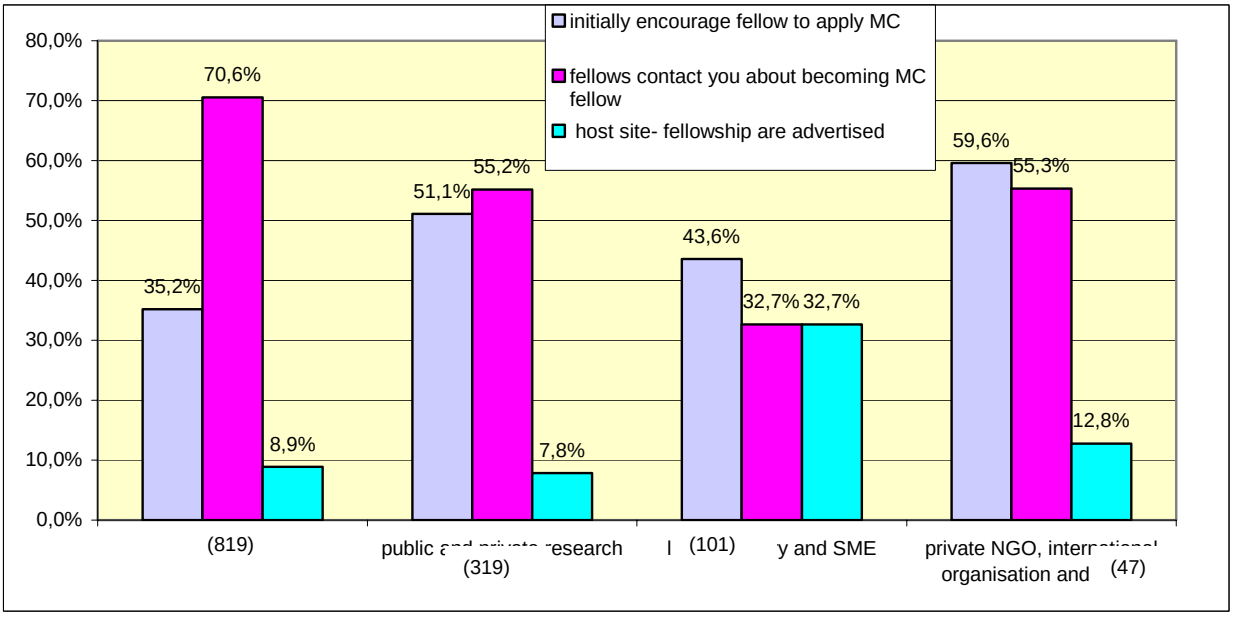
Source: IMPAFEL fellows' questionnaire.

Table 17 : Return Rates of Former Fellows by nationality grouping and fellowship stage

	Cat. 20		Cat. 30	
Host Region	Return Rates (%)	Number	Return Rates (%)	Number
Nordic	48%	30	55%	31
Central Europe	48%	55	41%	67
Western Central Europe	36%	40	52%	135
UK/Ireland	32%	12	30%	21
Southern Europe	41%	126	57%	169
Central Eastern Europe	40%	60	55%	36
South East Europe	32%	25	27%	7
Baltic	50%	6	60%	3

Source: IMPAFEL fellows' questionnaire

Figure 18: Fellowship initiation by host type



Source : IMPAFEL supervisors' questionnaire.

Table 19: fellow's age at signature of MC contract

FP5 individual only	Men	Women
up to 29	43,1%	51,6%
30-34	46,0%	41,2%
35-39	6,1%	5,5%
40+	4,7%	1,7%
N=2707	100%	100%

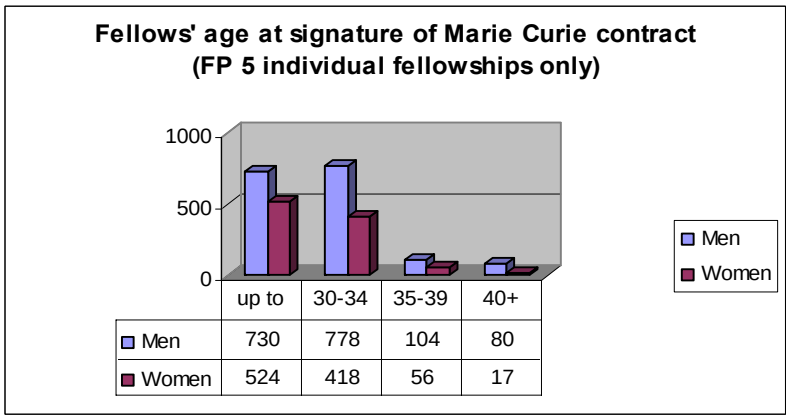


Table 20: fellow's current age (2004)

FP4-FP5 individual only	Men	Women
up to 29	1,4%	1,9%
30-34	31,4%	39,2%
35-39	46,5%	46,5%
40+	20,8%	12,4%
TOT N=6559	4171	2388

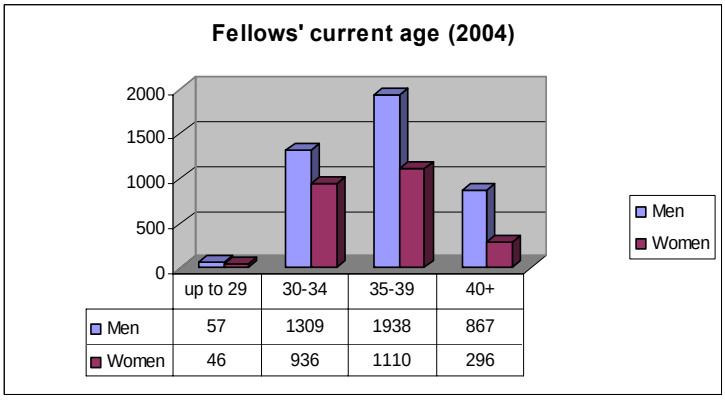


Table 21: reasons provided for interrupting the fellowship prematurely

Total	**260**	
Got other job*	103	39.6%
Got permanent job*	74	28.5%
Personal/family reasons (including to follow the partner in a move to another country)	19	7.3%
Other fellowship/grant	15	5.8%
Marie Curie started late and timing did not coincide with needs of fellow	10	3.8%
Pregnancy/maternity/paternity	8	3.1%
Project finished earlier than foreseen	7	3.0%
Left slightly early for holiday	6	2.3%
Research disappointing	4	1.5%
Needs related to PhD in home country	3	1.2%
Health problems	3	1.2%
other	8	3.1%
No reply (not counted in totals)	*28*	

Table 22: average annual publication rates by gender, before, during and after the Marie Curie fellowship – all disciplines

Fellow gender	**Average annual publications before Marie Curie fellowship**	**Average annual publication rate during Marie Curie fellowship**	**Average annual publication rate after Marie Curie fellowship**	**Total respondents**
Female	2,02	1,88	2,47	661
Male	2,41	2,48	3,38	1047

Table 22a: average annual publication rates by gender, before, during and after the Marie Curie fellowship – chemistry only

Fellow gender	**Average annual publications before Marie Curie fellowship**	**Average annual publication rate during Marie Curie fellowship**	**Average annual publication rate after Marie Curie fellowship**	**Total respondents**
Female	1,92	1,76	2,33	101
Male	2,57	1,99	2,89	142

Table 22b: average annual publication rates by gender, before, during and after the Marie Curie fellowship – engineering only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	2,21	2,13	3,34	32
Male	2,80	2,06	3,16	95

Table 22c: average annual publication rates by gender, before, during and after the Marie Curie fellowship – physics only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	2,27	2,36	3,19	67
Male	3,10	3,43	4,24	210

Table 22d: average annual publication rates by gender, before, during and after the Marie Curie fellowship – mathematics/IT only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	1,12	1,84	1,60	25
Male	1,45	2,31	2,90	112

Table 22e: average annual publication rates by gender, before, during and after the Marie Curie fellowship – life sciences only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	2,32	1,60	2,09	239
Male	2,49	2,25	3,31	297

Table 22f: average annual publication rates by gender, before, during and after the Marie Curie fellowship – environment/geosciences only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	2,15	2,15	2,15	73
Male	2,53	2,96	3,34	68

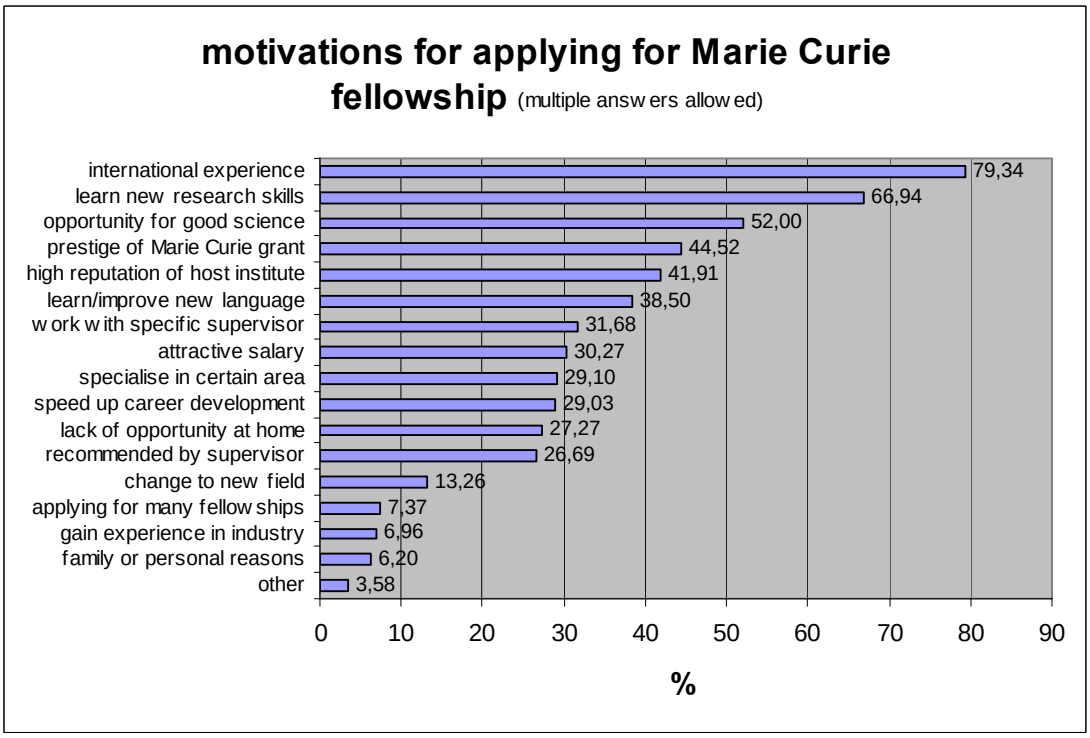
Table 22g: average annual publication rates by gender, before, during and after the Marie Curie fellowship – social sciences only

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	1,54	2,58	3,80	65
Male	1,49	2,83	3,98	47

Table 22h: average annual publication rates by gender, before, during and after the Marie Curie fellowship – *economics only*

Fellow gender	Average annual publications before Marie Curie fellowship	Average annual publication rate during Marie Curie fellowship	Average annual publication rate after Marie Curie fellowship	Total respondents
Female	0,87	1,49	2,31	48
Male	1,00	1,57	2,83	59

Figure 23: motivations for applying for a Marie Curie fellowship



ANNEX 3: STATISTICAL VALIDITY TABLES

In addition to the considerations on the representativity of the sample in section 1.1, this annex provides further information on the statistical reliabilityof the findings.
With 50% of contacted persons and 25% of the fellows population who answered, this can be considered a 'large sample'. The statistical validity depends on the size of the sample or subsample considered, and the percentage of respondents which provided a certain answer.
When referring to the entire sample of fellows, the error margin is given below. For smaller subgroups, please see table 1 below.

Dimension of the sample (reference closest to 2918)	*(Percentage of the sample)*	**5% or 95%**	**10% or 90%**	**15% o 85%**	**20% or 80%**	**25% or 75%**	**30% or 70%**	**35% or 65%**	**40% or 60%**	**45% or 55%**	**50%**
2925	*(100,24%)*	0,35%	0,65%	0,77%	0,86%	0,93%	0,99%	1,03%	1,06%	1,07%	1,08%

For example, if a certain characteristic occurs in a measure of 20%, and it is measured in the entire sample of fellows (containing 2918 respondents), the probability of an error occurring when transferring the percentage of the sample to that of the population is 0.86%. This means that the true value of this estimate is comprised in the interval (18.28%;21.72%).

The interval is calculated simply by adding and detracting from the estimate, double the probability of error, expressed as a percentage.
In this example: $20\% - 2 \times 0{,}86\% = 18{,}28\%$ and $20\% + 2 \times 0{,}86\% = 21{,}72\%$.

Table 1: Error margin when transferring the value for the sample to the population.

Dimension of the sample	*(Percentage of the sample)*	**5% or 95%**	**10% or 90%**	**15% or 85%**	**20% or 80%**	**25% or 75%**	**30% or 70%**	**35% or 65%**	**40% or 60%**	**45% or 55%**	**50%**
25	*0,86*	4,35	6,01	7,15	8,01	8,67	9,18	9,55	9,81	9,96	10,01
50	*1,71*	3,08	4,25	5,06	5,67	6,14	6,50	6,76	6,94	7,05	7,09
75	*2,57*	2,51	3,48	4,14	4,63	5,02	5,31	5,53	5,68	5,76	5,79
100	*3,43*	2,17	3,01	3,59	4,02	4,35	4,60	4,79	4,92	5,00	5,02
125	*4,28*	1,94	2,70	3,21	3,60	3,90	4,12	4,29	4,41	4,48	4,50
150	*5,14*	1,77	2,47	2,94	3,29	3,56	3,77	3,92	4,03	4,09	4,11
175	*6,00*	1,63	2,29	2,72	3,05	3,30	3,49	3,63	3,73	3,79	3,81
200	*6,85*	1,53	2,14	2,55	2,85	3,09	3,27	3,40	3,50	3,55	3,57
225	*7,71*	1,44	2,02	2,41	2,69	2,92	3,09	3,21	3,30	3,35	3,37
250	*8,57*	1,36	1,92	2,28	2,56	2,77	2,93	3,05	3,13	3,18	3,20
275	*9,42*	1,30	1,83	2,18	2,44	2,64	2,80	2,91	2,99	3,04	3,05
300	*10,28*	1,24	1,76	2,09	2,34	2,53	2,68	2,79	2,87	2,91	2,93
325	*11,14*	1,19	1,69	2,01	2,25	2,44	2,58	2,69	2,76	2,80	2,82
350	*11,99*	1,15	1,63	1,94	2,17	2,35	2,49	2,59	2,66	2,70	2,72
375	*12,85*	1,11	1,58	1,88	2,10	2,28	2,41	2,51	2,57	2,61	2,63
400	*13,71*	1,07	1,53	1,82	2,04	2,21	2,33	2,43	2,50	2,53	2,55
425	*14,56*	1,04	1,48	1,77	1,98	2,14	2,27	2,36	2,42	2,46	2,47
450	*15,42*	1,01	1,44	1,72	1,93	2,08	2,21	2,30	2,36	2,39	2,41
475	*16,28*	0,98	1,41	1,67	1,88	2,03	2,15	2,24	2,30	2,33	2,35

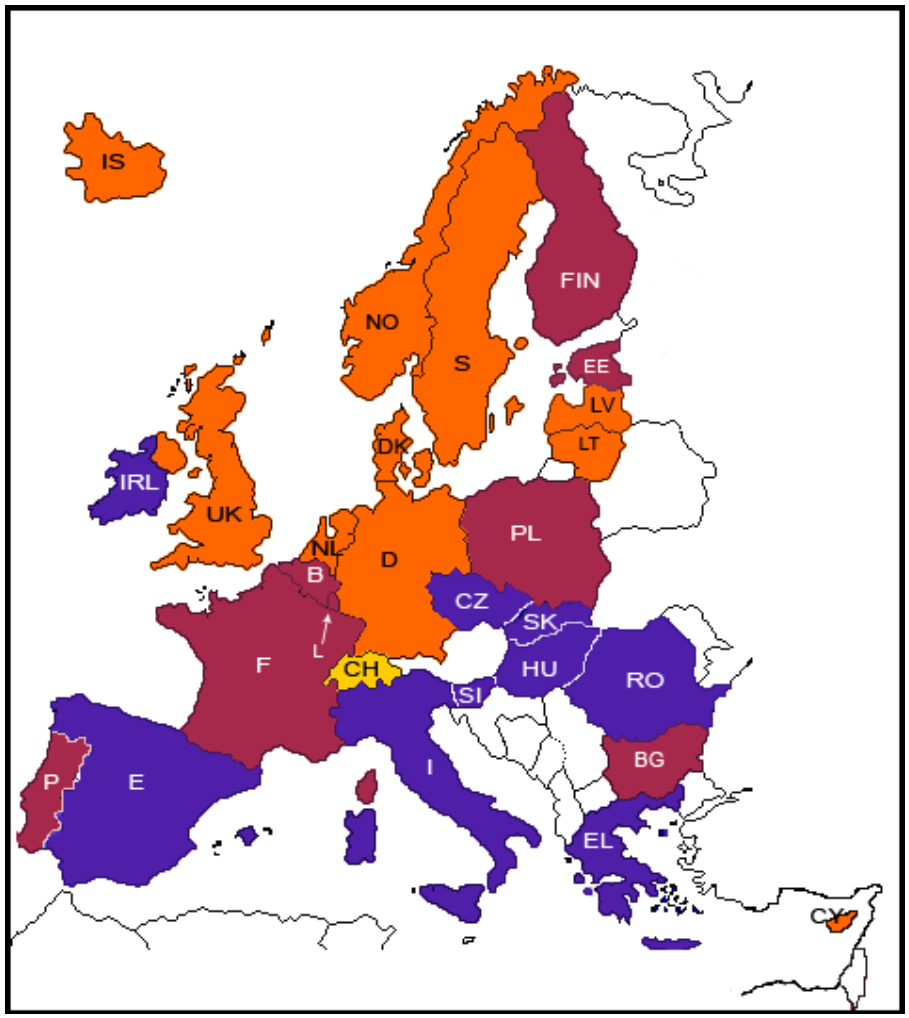
Dimension of the sample	*(Percentage of the sample)*	5% or 95%	10% or 90%	15% or 85%	20% or 80%	25% or 75%	30% or 70%	35% or 65%	40% or 60%	45% or 55%	50%
500	*17,14*	0,95	1,37	1,63	1,83	1,98	2,10	2,18	2,24	2,28	2,29
525	*17,99*	0,93	1,34	1,60	1,79	1,94	2,05	2,13	2,19	2,22	2,24
550	*18,85*	0,91	1,31	1,56	1,75	1,89	2,00	2,09	2,14	2,18	2,19
575	*19,71*	0,88	1,29	1,53	1,71	1,85	1,96	2,04	2,10	2,13	2,14
600	*20,56*	0,87	1,26	1,50	1,68	1,82	1,92	2,00	2,06	2,09	2,10
625	*21,42*	0,85	1,24	1,47	1,65	1,78	1,89	1,96	2,02	2,05	2,06
650	*22,28*	0,83	1,21	1,44	1,62	1,75	1,85	1,93	1,98	2,01	2,02
675	*23,13*	0,81	1,19	1,42	1,59	1,72	1,82	1,89	1,95	1,98	1,99
700	*23,99*	0,80	1,17	1,39	1,56	1,69	1,79	1,86	1,91	1,94	1,95
725	*24,85*	0,78	1,15	1,37	1,54	1,66	1,76	1,83	1,88	1,91	1,92
750	*25,70*	0,77	1,13	1,35	1,51	1,64	1,73	1,80	1,85	1,88	1,89
775	*26,56*	0,75	1,12	1,33	1,49	1,61	1,71	1,78	1,83	1,85	1,86
800	*27,42*	0,74	1,10	1,31	1,47	1,59	1,68	1,75	1,80	1,83	1,84
825	*28,27*	0,73	1,09	1,29	1,45	1,57	1,66	1,73	1,77	1,80	1,81
850	*29,13*	0,72	1,07	1,27	1,43	1,55	1,64	1,70	1,75	1,78	1,79
875	*29,99*	0,71	1,06	1,26	1,41	1,53	1,61	1,68	1,73	1,75	1,76
900	*30,84*	0,70	1,04	1,24	1,39	1,51	1,59	1,66	1,70	1,73	1,74
925	*31,70*	0,69	1,03	1,23	1,37	1,49	1,57	1,64	1,68	1,71	1,72
950	*32,56*	0,68	1,02	1,21	1,36	1,47	1,56	1,62	1,66	1,69	1,70
975	*33,41*	0,67	1,01	1,20	1,34	1,45	1,54	1,60	1,64	1,67	1,68
1000	*34,27*	0,66	0,99	1,18	1,33	1,44	1,52	1,58	1,62	1,65	1,66
1025	*35,13*	0,65	0,98	1,17	1,31	1,42	1,50	1,56	1,61	1,63	1,64
1050	*35,98*	0,64	0,97	1,16	1,30	1,40	1,49	1,55	1,59	1,61	1,62
1075	*36,84*	0,63	0,96	1,15	1,28	1,39	1,47	1,53	1,57	1,60	1,61
1100	*37,70*	0,62	0,95	1,13	1,27	1,38	1,46	1,52	1,56	1,58	1,59
1125	*38,55*	0,62	0,94	1,12	1,26	1,36	1,44	1,50	1,54	1,57	1,57
1150	*39,41*	0,61	0,93	1,11	1,25	1,35	1,43	1,49	1,53	1,55	1,56
1175	*40,27*	0,60	0,93	1,10	1,23	1,34	1,41	1,47	1,51	1,54	1,54
1200	*41,12*	0,59	0,92	1,09	1,22	1,32	1,40	1,46	1,50	1,52	1,53
1225	*41,98*	0,59	0,91	1,08	1,21	1,31	1,39	1,45	1,48	1,51	1,52
1250	*42,84*	0,58	0,90	1,07	1,20	1,30	1,38	1,43	1,47	1,49	1,50
1275	*43,69*	0,57	0,89	1,06	1,19	1,29	1,36	1,42	1,46	1,48	1,49
1300	*44,55*	0,57	0,89	1,05	1,18	1,28	1,35	1,41	1,45	1,47	1,48
1325	*45,41*	0,56	0,88	1,05	1,17	1,27	1,34	1,40	1,43	1,46	1,46
1350	*46,26*	0,56	0,87	1,04	1,16	1,26	1,33	1,39	1,42	1,45	1,45
1375	*47,12*	0,55	0,86	1,03	1,15	1,25	1,32	1,38	1,41	1,43	1,44
1400	*47,98*	0,54	0,86	1,02	1,14	1,24	1,31	1,36	1,40	1,42	1,43
1425	*48,83*	0,54	0,85	1,01	1,14	1,23	1,30	1,35	1,39	1,41	1,42
1450	*49,69*	0,53	0,85	1,01	1,13	1,22	1,29	1,34	1,38	1,40	1,41
1475	*50,55*	0,53	0,84	1,00	1,12	1,21	1,28	1,33	1,37	1,39	1,40
1500	*51,41*	0,52	0,83	0,99	1,11	1,20	1,27	1,33	1,36	1,38	1,39
1525	*52,26*	0,52	0,83	0,99	1,10	1,19	1,26	1,32	1,35	1,37	1,38
1550	*53,12*	0,51	0,82	0,98	1,10	1,19	1,26	1,31	1,34	1,36	1,37
1575	*53,98*	0,51	0,82	0,97	1,09	1,18	1,25	1,30	1,33	1,35	1,36

Dimension of the sample	*(Percentage of the sample)*	5% or 95%	10% or 90%	15% or 85%	20% or 80%	25% or 75%	30% or 70%	35% or 65%	40% or 60%	45% or 55%	50%
1600	*54,83*	0,50	0,81	0,97	1,08	1,17	1,24	1,29	1,32	1,35	1,35
1625	*55,69*	0,50	0,81	0,96	1,07	1,16	1,23	1,28	1,32	1,34	1,34
1650	*56,55*	0,49	0,80	0,95	1,07	1,16	1,22	1,27	1,31	1,33	1,34
1675	*57,40*	0,49	0,80	0,95	1,06	1,15	1,22	1,27	1,30	1,32	1,33
1700	*58,26*	0,49	0,79	0,94	1,06	1,14	1,21	1,26	1,29	1,31	1,32
1725	*59,12*	0,48	0,79	0,94	1,05	1,14	1,20	1,25	1,28	1,30	1,31
1750	*59,97*	0,48	0,78	0,93	1,04	1,13	1,19	1,24	1,28	1,30	1,30
1775	*60,83*	0,47	0,78	0,93	1,04	1,12	1,19	1,24	1,27	1,29	1,30
1800	*61,69*	0,47	0,77	0,92	1,03	1,12	1,18	1,23	1,26	1,28	1,29
1825	*62,54*	0,47	0,77	0,92	1,03	1,11	1,17	1,22	1,26	1,28	1,28
1850	*63,40*	0,46	0,76	0,91	1,02	1,10	1,17	1,22	1,25	1,27	1,27
1875	*64,26*	0,46	0,76	0,91	1,01	1,10	1,16	1,21	1,24	1,26	1,27
1900	*65,11*	0,45	0,76	0,90	1,01	1,09	1,16	1,20	1,24	1,25	1,26
1925	*65,97*	0,45	0,75	0,90	1,00	1,09	1,15	1,20	1,23	1,25	1,25
1950	*66,83*	0,45	0,75	0,89	1,00	1,08	1,14	1,19	1,22	1,24	1,25
1975	*67,68*	0,44	0,75	0,89	0,99	1,08	1,14	1,18	1,22	1,24	1,24
2000	*68,54*	0,44	0,74	0,88	0,99	1,07	1,13	1,18	1,21	1,23	1,24
2025	*69,40*	0,44	0,74	0,88	0,98	1,07	1,13	1,17	1,21	1,22	1,23
2050	*70,25*	0,43	0,73	0,87	0,98	1,06	1,12	1,17	1,20	1,22	1,22
2075	*71,11*	0,43	0,73	0,87	0,97	1,06	1,12	1,16	1,19	1,21	1,22
2100	*71,97*	0,43	0,73	0,87	0,97	1,05	1,11	1,16	1,19	1,21	1,21
2125	*72,82*	0,42	0,72	0,86	0,97	1,05	1,11	1,15	1,18	1,20	1,21
2150	*73,68*	0,42	0,72	0,86	0,96	1,04	1,10	1,15	1,18	1,20	1,20
2175	*74,54*	0,42	0,72	0,85	0,96	1,04	1,10	1,14	1,17	1,19	1,20
2200	*75,39*	0,42	0,72	0,85	0,95	1,03	1,09	1,14	1,17	1,19	1,19
2225	*76,25*	0,41	0,71	0,85	0,95	1,03	1,09	1,13	1,16	1,18	1,19
2250	*77,11*	0,41	0,71	0,84	0,95	1,02	1,08	1,13	1,16	1,18	1,18
2275	*77,96*	0,41	0,71	0,84	0,94	1,02	1,08	1,12	1,15	1,17	1,18
2300	*78,82*	0,40	0,70	0,84	0,94	1,02	1,07	1,12	1,15	1,17	1,17
2325	*79,68*	0,40	0,70	0,83	0,93	1,01	1,07	1,11	1,14	1,16	1,17
2350	*80,53*	0,40	0,70	0,83	0,93	1,01	1,07	1,11	1,14	1,16	1,16
2375	*81,39*	0,40	0,70	0,83	0,93	1,00	1,06	1,11	1,14	1,15	1,16
2400	*82,25*	0,39	0,69	0,82	0,92	1,00	1,06	1,10	1,13	1,15	1,15
2425	*83,10*	0,39	0,69	0,82	0,92	1,00	1,05	1,10	1,13	1,14	1,15
2450	*83,96*	0,39	0,69	0,82	0,92	0,99	1,05	1,09	1,12	1,14	1,15
2475	*84,82*	0,39	0,68	0,82	0,91	0,99	1,05	1,09	1,12	1,14	1,14
2500	*85,68*	0,38	0,68	0,81	0,91	0,99	1,04	1,09	1,11	1,13	1,14
2525	*86,53*	0,38	0,68	0,81	0,91	0,98	1,04	1,08	1,11	1,13	1,13
2550	*87,39*	0,38	0,68	0,81	0,90	0,98	1,04	1,08	1,11	1,12	1,13
2575	*88,25*	0,38	0,68	0,80	0,90	0,97	1,03	1,07	1,10	1,12	1,13
2600	*89,10*	0,37	0,67	0,80	0,90	0,97	1,03	1,07	1,10	1,12	1,12

Dimension of the sample	*(Percentage of the sample)*	5% or 95%	10% or 90%	15% or 85%	20% or 80%	25% or 75%	30% or 70%	35% or 65%	40% or 60%	45% or 55%	50%
2625	*89,96*	0,37	0,67	0,80	0,89	0,97	1,03	1,07	1,10	1,11	1,12
2650	*90,82*	0,37	0,67	0,80	0,89	0,97	1,02	1,06	1,09	1,11	1,11
2675	*91,67*	0,37	0,67	0,79	0,89	0,96	1,02	1,06	1,09	1,11	1,11
2700	*92,53*	0,36	0,66	0,79	0,89	0,96	1,02	1,06	1,09	1,10	1,11
2725	*93,39*	0,36	0,66	0,79	0,88	0,96	1,01	1,05	1,08	1,10	1,10
2750	*94,24*	0,36	0,66	0,79	0,88	0,95	1,01	1,05	1,08	1,10	1,10
2775	*95,10*	0,36	0,66	0,78	0,88	0,95	1,01	1,05	1,08	1,09	1,10
2800	*95,96*	0,36	0,66	0,78	0,88	0,95	1,00	1,04	1,07	1,09	1,09
2825	*96,81*	0,35	0,65	0,78	0,87	0,94	1,00	1,04	1,07	1,09	1,09
2850	*97,67*	0,35	0,65	0,78	0,87	0,94	1,00	1,04	1,07	1,08	1,09
2875	*98,53*	0,35	0,65	0,77	0,87	0,94	0,99	1,03	1,06	1,08	1,08
2900	*99,38*	0,35	0,65	0,77	0,87	0,94	0,99	1,03	1,06	1,08	1,08
2925	*100,24*	0,35	0,65	0,77	0,86	0,93	0,99	1,03	1,06	1,07	1,08

Figure 7.1: Percentage of yearly average outgoing Marie Curie fellows on total employed in S&T related to year 2002 (return grant excluded)

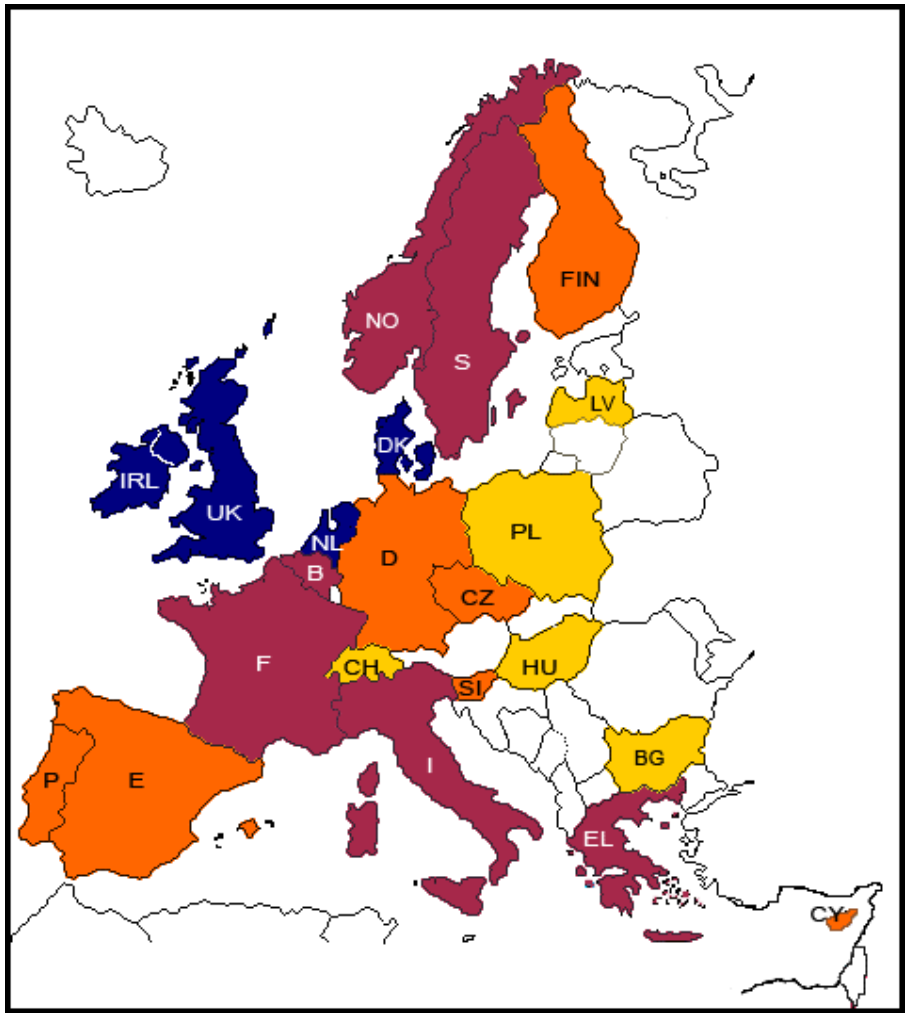
NATIONALITY	TOTAL N	GROUP
Switzerland	0,0002%	<0,0009
Iceland	0,0022%	
United Kingdom	0,0022%	
Norway	0,0027%	
Lithuania	0,0028%	
Latvia	0,0036%	0,0010-0,0049
Cyprus	0,0037%	
Germany	0,0040%	
Netherlands	0,0042%	
Denmark	0,0043%	
Sweden	0,0048%	
France	0,0054%	
Finland	0,0056%	
Belgium	0,0061%	
Luxembourg	0,0066%	0,0050-0,0099
Estonia	0,0071%	
Portugal	0,0077%	
Poland	0,0085%	
Bulgaria	0,0088%	
Spain	0,0099%	
Italy	0,0107%	
Czech Republic	0,0114%	
Romania	0,0119%	
Slovenia	0,0126%	>0,0100
Ireland	0,0124%	
Hungary	0,0127%	
Slovak Republic	0,0141%	
Greece	0,0132%	



*FP5 MC(n/4): Only MC fellows data related to FP5 were considered (excl. fellows who had a different host Country than the ones listed). The total number for each host country has been divided by 4 (duration of FP5 in years) to compare with people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland, 2002.
**Data "employed in S&T" year 2002.
Source: Eurostat "Human resouces in R&D in Europe-Part2" 2003-figure 4.11 Employment distribution of 25-64 years olds, in thousands and proportion of people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland 2002, pag.70. The referece category is "researchers with third level education and working in S&T occupation (HRSTC)".
Data on S&T employees not available for Austria, Israel, Malta, Lithuania.

Tab. 7.2: Percentage of yearly average incoming Marie Curie fellows on total employed in S&T related to year 2002

HOST COUNTRY	FP5 MC(n/4)*/employed (2002)**	GROUP
Bulgaria	0,0001%	
Hungary	0,0001%	
Poland	0,0006%	<0,0009
Switzerland	0,0007%	
Latvia	0,0008%	
Cyprus	0,0012%	
Czech Republic	0,0022%	
Portugal	0,0022%	0,0010-0,0049
Spain	0,0042%	
Slovenia	0,0044%	
Germany	0,0046%	
Finland	0,0047%	
Italy	0,0058%	
Greece	0,0061%	
Sweden	0,0072%	0,0050-0,0099
France	0,0076%	
Norway	0,0085%	
Belgium	0,0088%	
United Kingdom	0,0116%	
Denmark	0,0125%	>0,0100
Ireland	0,0126%	
Netherlands	0,0144%	



*FP5 MC(n/4): Only MC fellows data related to FP5 were considered (excl. fellows who had a different host Country than the ones listed). The total number for each host country has been divided by 4 (duration of FP5 in years) to compare with people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland, 2002.
**Data "employed in S&T" year 2002.
Source: Eurostat "Human resouces in R&D in Europe-Part2" 2003-figure 4.11 Employment distribution of 25-64 years olds, in thousands and proportion of people working in S&T EU-15, Candidate Countries, Iceland, Norway and Switzerland 2002, pag.70. The referece category is "researchers with third level education and working in S&T occupation (HRSTC)".
Data on S&T employees not available for Austria, Israel, Malta, Lithuania.

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