Funding of young researchers in life sciences

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Abstract

This paper presents the results obtained by the NetReAct project on the financing of doctoral and postdoctoral researchers in life sciences (NetReAct doctoral students 2005; NetReAct post-docs 2005).

The NetReAct project was commissioned by JRC-IPTS. It studied the correlation between the “mobility of brains”, i.e. the mobility of researchers between research teams, and the “mobility of ideas”, i.e. the co-authorship of scientific papers, and highlights specific co-operation and networking patterns. One of the innovative features of this project is that the basic unit of analysis is the research team or group, rather than a university as a whole.

Through internet research an overall population of 7 732 research teams in life sciences in 10 European countries (The Czech Republic, France, Germany, Hungary, Italy, Norway, Portugal, Spain, Sweden, and the UK) was identified. Data on doctoral and post-doc researchers was collected through a survey addressed to the heads of the 1 773 research teams in the sample. Questions addressing the funding structure of the team and the salaries of the non-permanent scientific staff members are of particular relevance for this paper.

The most notable results include:

1. **Public sources other than university budgets** are the main sources for doctoral and post-doc researchers in all countries except Czech Republic, Italy and Hungary, 54% in

both cases on average. There is near complete reliance on these sources for doctoral researchers in Portugal (85%) and overwhelming reliance for post-docs in Norway and Portugal (75%).

2. An average of 30% of doctoral researchers and 24% of post-docs are funded through **university budgets**. This source of funding is dominant in the Czech Republic, Italy and Hungary for both doctoral and post-doc researchers.
3. Industry funding, self-funding (by the doctoral and post-doc researchers) and other sources are generally of low importance: 4-7% for doctoral researchers and 4-11% for post-docs.
4. Significant **industry funding** for doctoral and post-docs researchers is only found in France for around 10% of each group. In Hungary and UK somewhat more than 5% of post-docs are funded in their research by industry.
5. **Industry funding** for doctoral and post-docs researchers, is significant, 10-15%, only in teams above 50 members.
6. **Self-funding** is particularly high in the Czech Republic for doctoral researchers (17%) and in France (25%) and UK (16%) for post-docs. This may be an indication of greater difficulty for obtaining funding from other sources, in particular public sources.
7. **Other funding sources** concern around 10-11% of doctoral researchers in France, the UK, and Germany and post-docs in Italy, France and in the UK.
8. The UK and France exhibit the most even **spread of funding** to doctoral and post-doc researchers across the different possible sources.
9. Overall, it is interesting to note that **results are broadly similar for doctoral and post-docs researchers**, though in the category “self-funded” values were conspicuously lower in the former group.
10. For doctoral students **funding periods** are usually longer than three years, short-term funding of less than one year is negligible and less than two uncommon. For post-docs, periods between two and three years are most common and many are longer, however, short funding periods of less than one year are also quite common.

This paper is extracted from a larger report devoted to the specific topic of “Research in University: Changes and Challenges in Funding and Governance” which synthesises the relevant results of both CHINC and NetReAct. It is available on request.

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1 Introduction

This paper presents the results obtained by the NetReAct project on the financing of doctoral and postdoctoral researchers in life-science research teams within a sample of 10 European countries (NetReAct doctoral students 2005; NetReAct post-docs 2005). This is for various reasons a particularly relevant issue for European research. Adequate salaries, both in level and duration, are valuable argument to attract and retain capable young researchers. Certain stability in staffing is certainly important for ensuring the continuity in research activities and thus their productivity.

Moreover, the levels and modes of financing may impact on the research subjects and other characteristics of the research being performed, for instance whether or not the results are openly disseminated at conferences and in scientific papers.

2 The NetReAct project

2.1 Overview and objectives of the project

The NetReAct project, "The role of Networking in Research Activities", was commissioned by the Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre (NetReAct final 2006, http://www.netreact-eu.org/index.htm). A consortium of researchers from 10 countries participated in the study[1], which combined both quantitative and qualitative methods in an effort to identify systematic and comparable evidences.

It aimed at capturing, describing and analysing the strategies, patterns, dynamics and impact of networking in research activities in the life sciences in the sampled countries.

The objectives are to shed light on current collaboration and networking behaviours of European research teams, in particular in respect to the "mobility of brains", i.e. the mobility of researchers between research teams, and the "mobility of ideas", i.e. the co-authorship of scientific papers and to highlight specific patterns. In doing so it was necessary to:

- Assess the dynamics of universities' networking activities in respect of other universities, of public and private research bodies;
- Measure the capacity of universities and their laboratories to attract doctoral and post-doctoral researchers from other geographical areas;
- Refine methods (e.g., questionnaire-based surveys, bibliometrics analyses, webometrics analyses) which could be subsequently use study similar issues.

In the course of this project, data on doctoral and post-doc researchers (e.g. age, gender, main discipline, country of origin and last degree, and sources and duration of funding) was collected through a survey addressed to the heads of 1 773 research teams. Questions

[1] The following institutions participated in the NetReAct project:
- empirica Gesellschaft für Kommunikations- und Technologieforschung mbH, Germany
- University of Applied Sciences Solothurn Northwestern Switzerland
- University of Wolverhampton, UK
- Katholieke Universiteit Leuven, Belgium

addressing the funding structure of the team and of the non-permanent scientific staff members are of particular relevance for this paper.

2.2 Geographical coverage

The sample of ten countries was selected as "representative" of the 33 countries involved in the European Framework Programme. It consisted of the three "key players" in research (Germany, France and the United Kingdom), three Mediterranean countries (Italy, Portugal, and Spain), two Scandinavian countries (Norway and Sweden) and two new member states (The Czech Republic and Hungary).

2.3 Collecting information at team level

Research and networking strategies are mostly determined at the level of the individual research team or laboratory. Whereas in CHINC[2] the basic level of analysis is the university as a whole, one of the innovative features of the NetReAct project is that the basic unit of analysis is the **research team or group**. This is understood as a group of people, scientists and non-scientists, working in the same location over a substantial period of time to produce new scientific knowledge. This group of people can be part of one or more larger organisations (university, department, school etc.), but at least some of its members are employed by a university. Also, the team is recognised from the outside as a separate entity.

2.4 Methodology and sampling

The following methodology was developed:

1. Through the International Handbook of Universities (International Association of Universities 2003) and internet research, an overall population of 7 732 research teams in life sciences in a sample of 10 European countries was identified.
2. A stratified, random sampling was used to draw a sample of 1 773 teams. The stratification variable was the number of hyperlinks pointing to the team internet homepage according to Google. This indicator was chosen as a readily available proxy indicator for the research performance of the team, as previous research had shown that for academic organisations the number of hyperlinks is related to research performance (Thelwall & Harries 2003).
3. Within this sample, the names and email addresses of the team leaders, the total scientific and non-scientific staff (77.5% of the teams), the doctoral (53.8%) and post-doctoral researchers (39.3%) were identified through internet research.
4. A questionnaire was sent to the team leaders in the sample (either attached to a personalised email or as a personalised link to an online questionnaire). It contained questions on the team, its structure and team members (especially doctoral and post-doc researchers) and its collaboration activities. The questionnaire was completed by 811 respondents leading to 468 usable questionnaires (26.4% of the sample, see Table 1).
5. The representativeness of the responses for the sample was checked using the number of in-links and the size of the team (according to the team website). The only divergence from representativeness detected was that the Italian teams that responded tended to

[2] "Changes in University Incomes: Their Impact on University-Based Research and Innovation" (CHINC final 2006)

have fewer hyperlinks (suggesting worse research performance) than the Italian teams which did not respond.

Table 1: NetReAct dataset of life sciences research teams by country

Country	Research population	Sample	Usable questionnaires				
			Number	In % of sample	Average number of inlinks	Average team size	% of female heads
Czech Republic	173	119	30	25.2	1.6	12.8	23.3
France	1 384	225	56	24.9	4.4	16.8	12.5
Germany	1 447	271	60	22.1	9.5	16.6	20.0
Hungary	214	108	34	31.5	5.8	22.3	17.6
Italy	952	186	52	28.0	1.5	8.8	21.2
Norway	199	122	37	30.3	7.8	11.0	18.9
Portugal	229	123	44	35.8	11.4	12.6	50.0
Spain	896	164	37	22.6	1.9	14.8	8.1
Sweden	650	148	41	27.7	7.3	12.3	26.8
United Kingdom	1 588	307	77	25.1	8.7	13.1	13.0
Total	**7 732**	**1 773**	**468**	**26.4%**	**6.4**	**14.3**	**20.5%**

Source: NetReAct

2.5 Methodological limitations

The following limitations of the NetReAct methodology in respect of the use of results in this context should be mentioned:

- The NetReAct project was designed primarily to investigate research mobility and collaboration rather than to provide material on the financing of doctoral and post-doc researchers. Data on financing were gathered only to deal with alternative hypotheses for apparent impacts of research collaboration on team productivity.
- Though it is a large and growing field, life sciences are not representative of the whole scientific landscape.
- The focus of NetReAct was on doctoral and post-doc researchers. No information was obtained on the funding of more senior research personnel.
- As the focus was put on causal links between team composition, collaboration and research output, no specific investigation was carried out on the causal links between the financing of researchers and research activity.

3 Financing of young researchers in life sciences

This section presents the results obtained by the NetReAct project on the financing of doctoral and postdoctoral researchers in life-science research teams within the 10 sampled countries (NetReAct doctoral students 2005; NetReAct post-docs 2005). The NetReAct survey gathered the following characteristics for up to five doctoral researchers and five post-docs per team:

- age,
- gender,
- main discipline of doctoral research,
- country of origin and last degree (master or equivalent for the doctoral researchers and doctorate for the post-docs),
- source and duration of funding.

In addition, characteristics of the research team they belonged to were requested from the team leaders, including:

- country of location,
- main discipline of research,
- maturity (time since foundation),
- size (total staff members).

3.1 Young researchers in life sciences

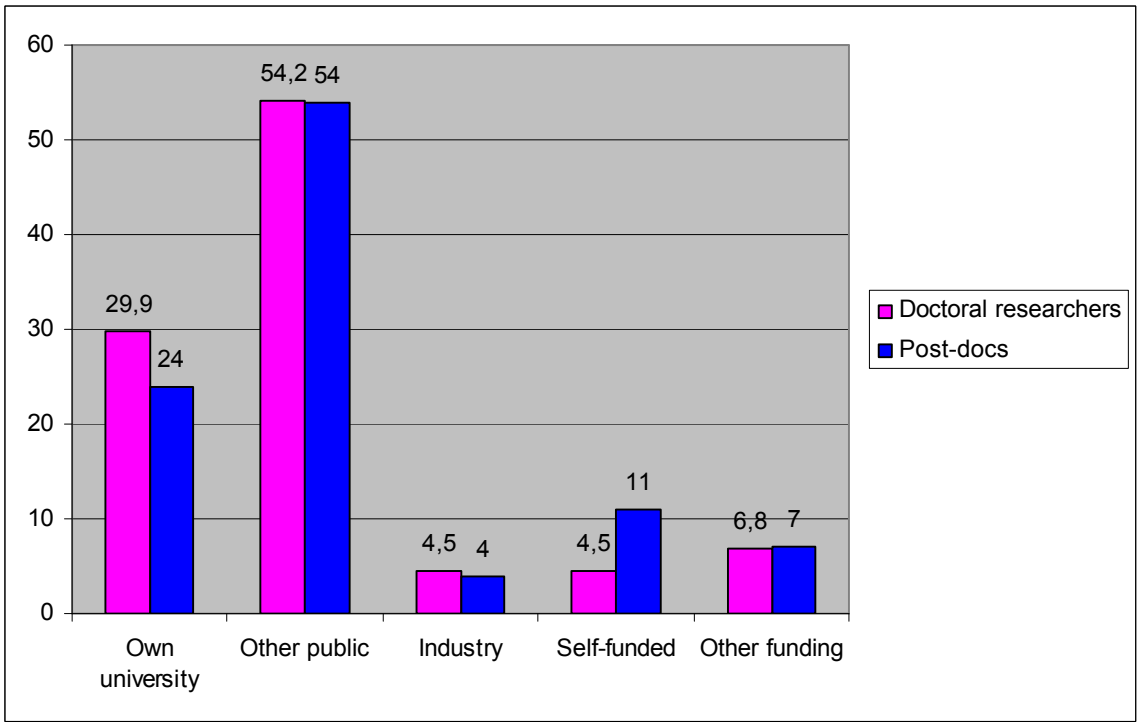
The following picture of doctoral and post-docs researchers in life sciences in Europe emerges:

1. The average age of **doctoral researchers** in life sciences is **27.4 years**. They are somewhat older on average in the Nordic countries and lower in the UK.
2. **Post-docs** in life sciences are on average **32.2 years old**. Average age is higher in Spain and Germany and lower in the UK and the Czech Republic.
3. A slight majority of **doctoral researchers** are **female**: 820 out of 1,553 (53%). In Portuguese and Italian research teams more than 60% of the doctoral researchers are female, whereas in British teams there are more males than females.
4. An equally slight majority of **post-docs** are **male**: 431 out of 809 (53%). In Spanish and British research teams around 60% of the post-docs are male, whereas in Italian teams there are significantly more females than males.
5. More than 75% of **doctoral researchers** are in their country of origin, nearly 80% in the country in which they graduated, whereas 9% come from another EU country and 14% from the rest of the world. Foreign research students are most numerous in the UK and Sweden (coming from all over the world), and in Germany (mostly coming from European countries outside the EU).
6. 57% of **post-docs** are employed in their country of origin, and also around 60% in the same country in which they earned their doctorate whereas 20% come from another EU country and 22% from the rest of the world. Foreign post-docs are more numerous in Sweden, France and the UK (mostly coming from other EU countries).
7. More than **half of all post-docs in life sciences already have experience working abroad**. In Portugal, Hungary and Spain, the share of post-docs with foreign work experience is particularly high, whereas fewer post-docs in UK teams have had such experience.

3.2 Funding sources

➔ The dominance of **public funding** for doctoral and post-doc researchers in Europe is clearly visible in the following statistics showing the share of the various funding sources.

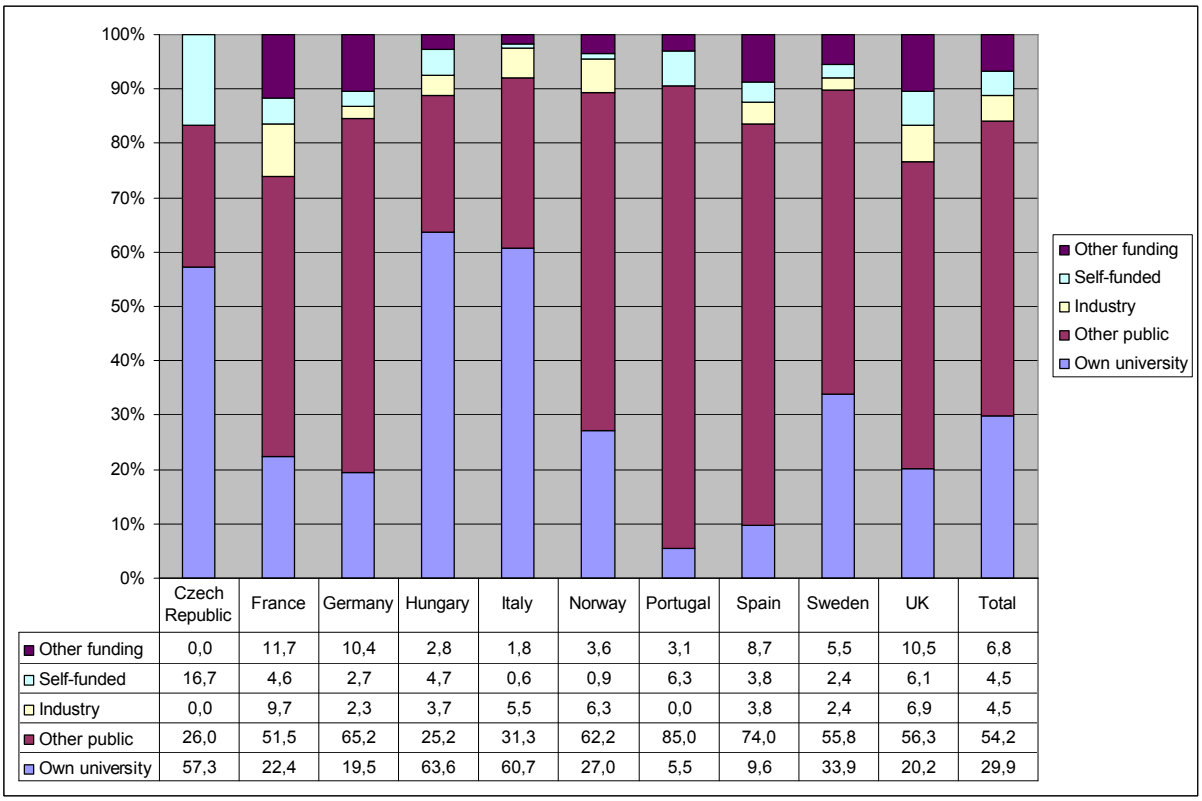
Figure 1: Percentages of **doctoral researchers** and **post-docs** by their source of funding



Source: IPTS from NetReAct

As can be seen in the following two figures, funding structures differ notably across countries.

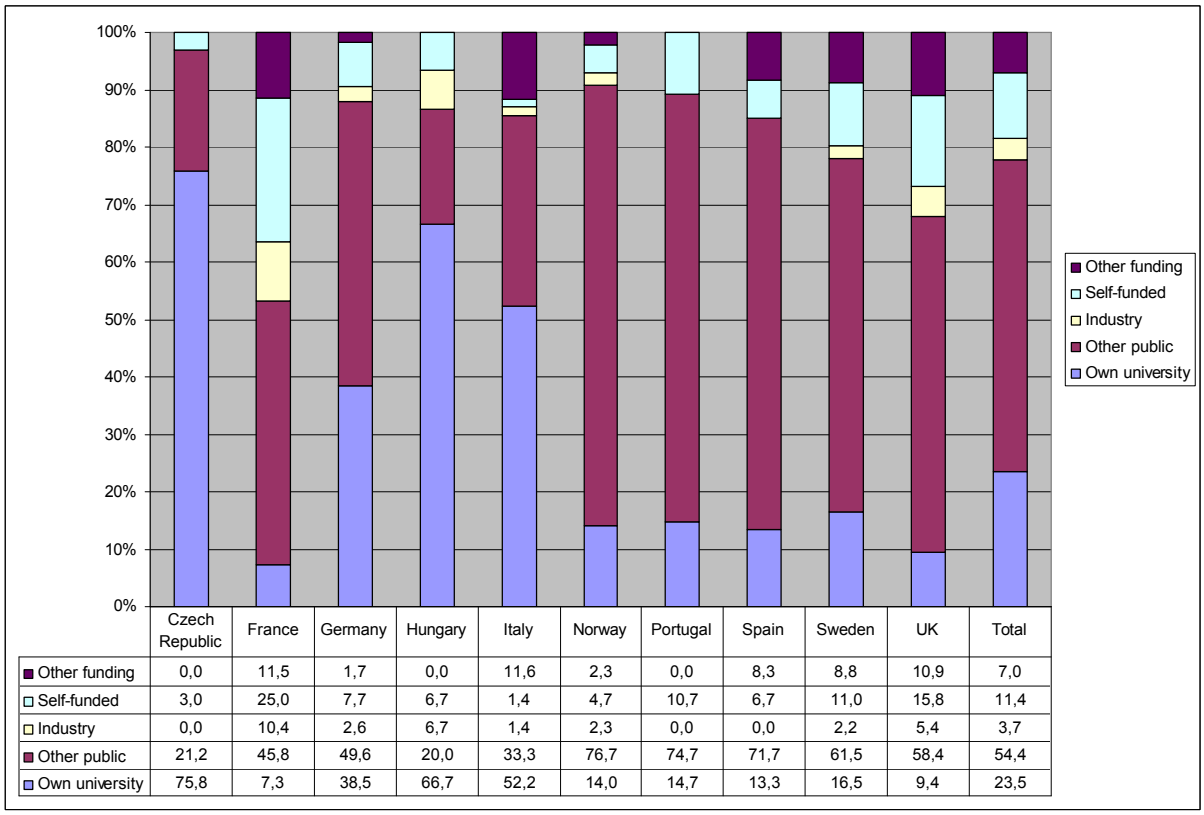
Figure 2: Percentages of **doctoral researchers** by their source of funding and team country



	Czech Republic	France	Germany	Hungary	Italy	Norway	Portugal	Spain	Sweden	UK	Total
Other funding	0,0	11,7	10,4	2,8	1,8	3,6	3,1	8,7	5,5	10,5	6,8
Self-funded	16,7	4,6	2,7	4,7	0,6	0,9	6,3	3,8	2,4	6,1	4,5
Industry	0,0	9,7	2,3	3,7	5,5	6,3	0,0	3,8	2,4	6,9	4,5
Other public	26,0	51,5	65,2	25,2	31,3	62,2	85,0	74,0	55,8	56,3	54,2
Own university	57,3	22,4	19,5	63,6	60,7	27,0	5,5	9,6	33,9	20,2	29,9

Source: IPTS from NetReAct

Figure 3: Percentages of **post-docs** by their source of funding and team country



	Czech Republic	France	Germany	Hungary	Italy	Norway	Portugal	Spain	Sweden	UK	Total
Other funding	0,0	11,5	1,7	0,0	11,6	2,3	0,0	8,3	8,8	10,9	7,0
Self-funded	3,0	25,0	7,7	6,7	1,4	4,7	10,7	6,7	11,0	15,8	11,4
Industry	0,0	10,4	2,6	6,7	1,4	2,3	0,0	0,0	2,2	5,4	3,7
Other public	21,2	45,8	49,6	20,0	33,3	76,7	74,7	71,7	61,5	58,4	54,4
Own university	75,8	7,3	38,5	66,7	52,2	14,0	14,7	13,3	16,5	9,4	23,5

Source: IPTS from NetReAct

The most notable results include:

1. **Public sources other than university budgets** are the main sources for doctoral and post-doc researchers in all countries except Czech Republic, Italy and Hungary, 54% in both cases on average. There is near complete reliance on these sources for doctoral researchers in Portugal (85%) and overwhelming reliance for post-docs in Norway and Portugal (75%).
2. An average of 30% of doctoral researchers and 24% of post-docs are funded through **university budgets**. This source of funding is dominant in the Czech Republic, Italy and Hungary for both doctoral and post-doc researchers.
3. Industry funding, self-funding (by the doctoral and post-doc researchers) and other sources are generally of low importance: 4-7% for doctoral researchers and 4-11% for post-docs.
4. Significant **industry funding** for doctoral and post-doc researchers is only found in France for around 10% of each group. In Hungary and UK somewhat more than 5% of post-docs are funded in their research by industry.
5. **Self-funding** is particularly high in the Czech Republic for doctoral researchers (17%) and in France (25%) and UK (16%) for post-docs. This may be an indication of greater difficulty for obtaining funding from other sources, in particular public sources.
6. **Other funding sources** concern around 10-11% of doctoral researchers in France, the UK, and Germany and post-docs in Italy, France and in the UK.
7. The UK and France exhibit the most even **spread of funding** to doctoral and post-doc researchers across the different possible sources.

8. Overall, it is interesting to note that **results are broadly similar for doctoral and post-doc researchers**, though in the category "self-funded" values were conspicuously lower in the former group.

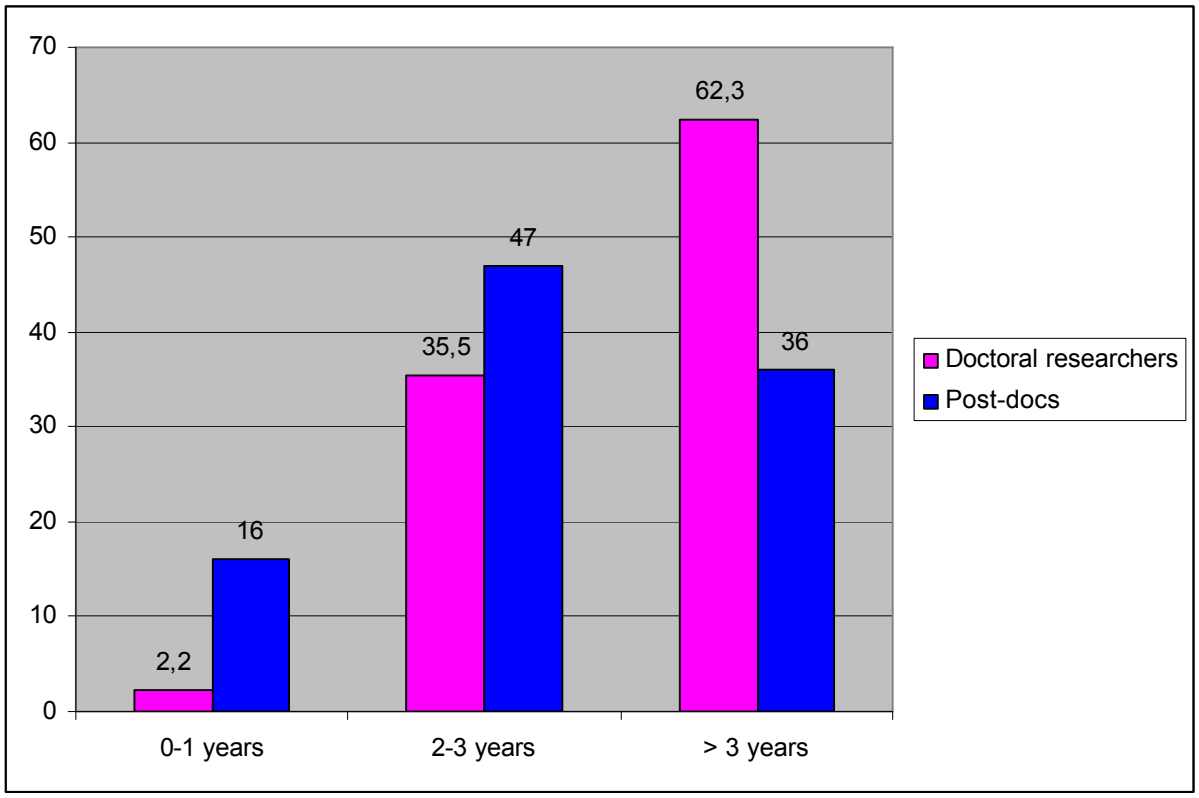
The high level of university funding for young researchers in Czech Republic, Italy and Hungary raises the issue of whether this is a real difference in terms of decision structures of funding allocations. This would only be the case if universities in these countries had room to manoeuvre in their allocation of budgets. On the contrary, if they are merely bound to distribute pre-allocated government funding, then there would be no difference in substance to countries where there is less funding from university and more from other public sources.

The lowest share of "self-funding" for doctoral researchers may show the reluctance of graduate students to engage in doctoral research without secured funding. On the contrary some doctoral graduates may decide to stay in research for a certain time even without external funding hoping that they will eventually get one.

3.3 Funding durations

➔ The **low occurrence of very short periods of funding** for doctoral and post-doc researchers in Europe is clearly visible in the following statistics showing the percentages of each receiving funding for durations of 0-1, 2-3 or more than 3 years.

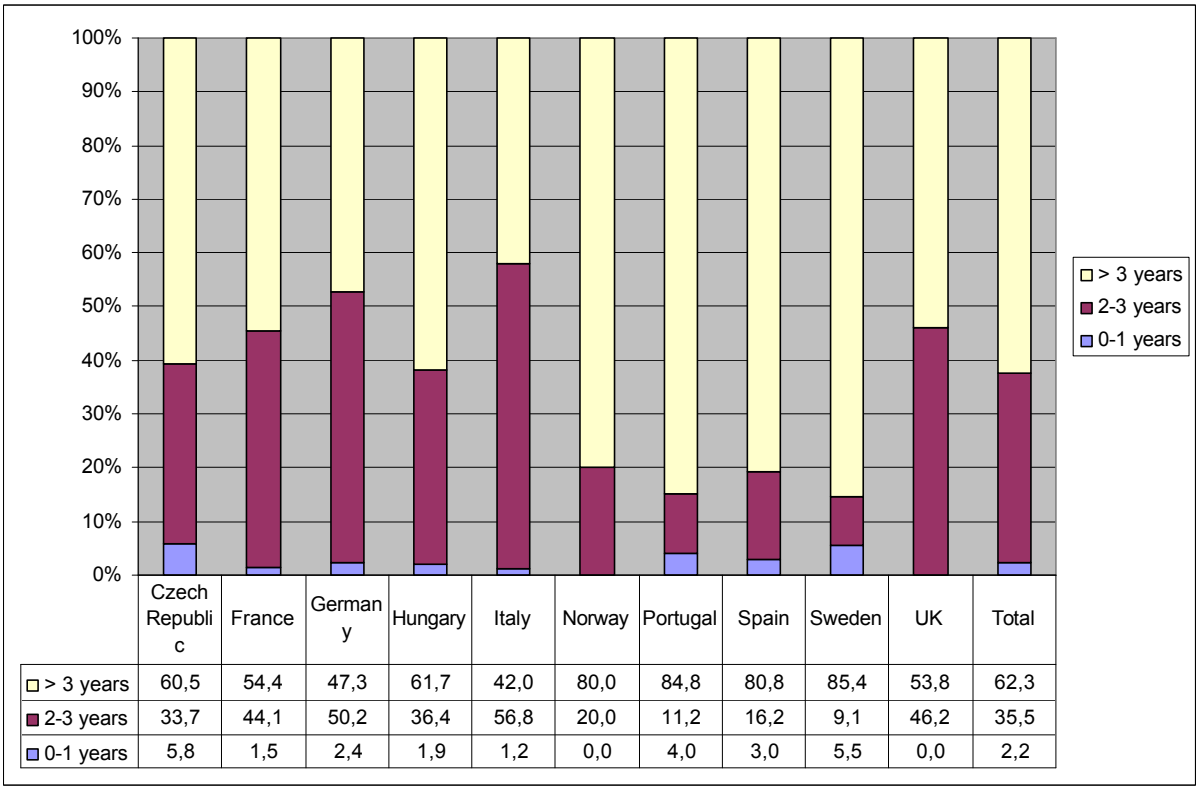
Figure 4: Percentages of **doctoral researchers** and **post-docs** by their duration of funding



Source: IPTS from NetReAct

The breakdowns by country are shown in the following figures:

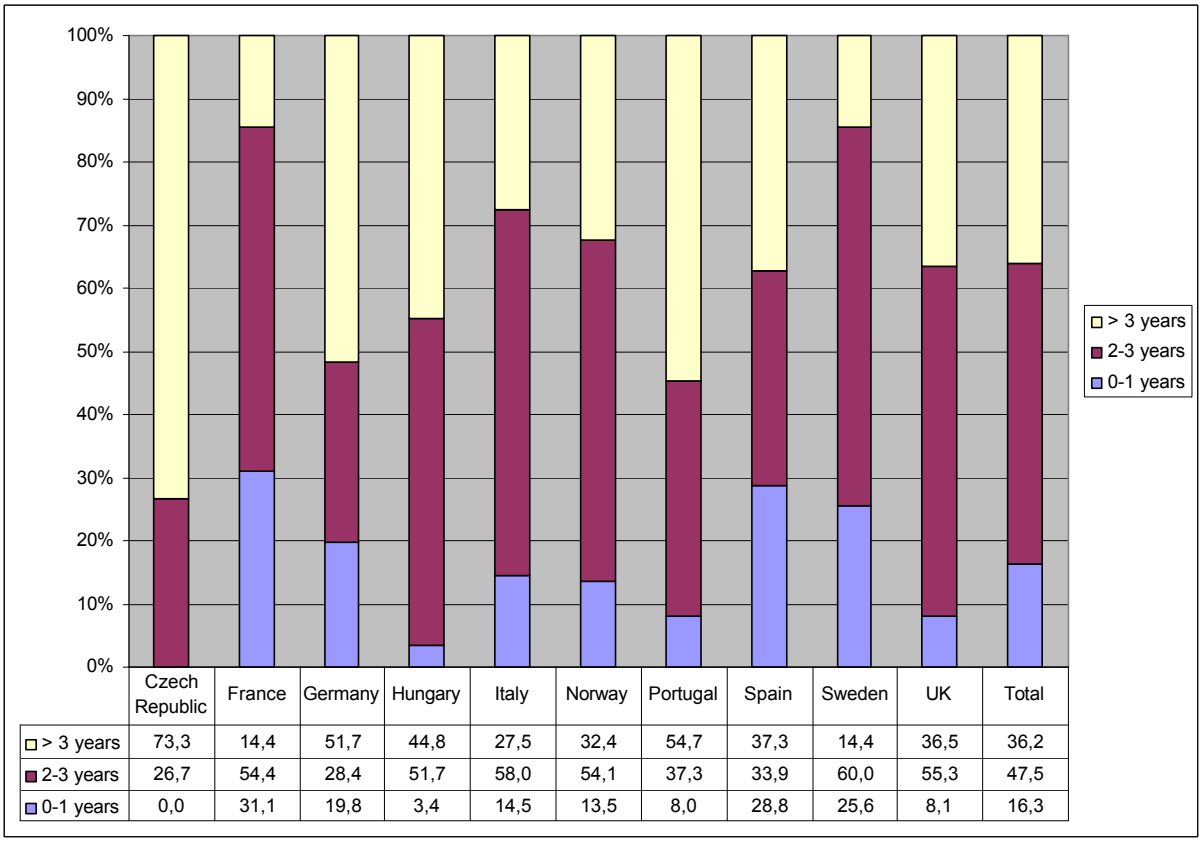
Figure 5: Percentages of **doctoral researchers** by their duration of funding and team country



	Czech Republic	France	Germany	Hungary	Italy	Norway	Portugal	Spain	Sweden	UK	Total
> 3 years	60,5	54,4	47,3	61,7	42,0	80,0	84,8	80,8	85,4	53,8	62,3
2-3 years	33,7	44,1	50,2	36,4	56,8	20,0	11,2	16,2	9,1	46,2	35,5
0-1 years	5,8	1,5	2,4	1,9	1,2	0,0	4,0	3,0	5,5	0,0	2,2

Source: IPTS from NetReAct

Figure 6: Percentages of **post-docs** by their duration of funding and team country



	Czech Republic	France	Germany	Hungary	Italy	Norway	Portugal	Spain	Sweden	UK	Total
> 3 years	73,3	14,4	51,7	44,8	27,5	32,4	54,7	37,3	14,4	36,5	36,2
2-3 years	26,7	54,4	28,4	51,7	58,0	54,1	37,3	33,9	60,0	55,3	47,5
0-1 years	0,0	31,1	19,8	3,4	14,5	13,5	8,0	28,8	25,6	8,1	16,3

Source: IPTS from NetReAct

For doctoral researchers the most prevalent duration of funding is **longer than three years**. Except in Germany (47%), most of them fall in this category. Short-term funding of less than one year is negligible in all countries, though proportions of over 5% are found in Sweden and Czech Republic. Funding periods of 2-3 years are more common in the larger countries: Italy, Germany, UK and France have proportions between 45-55% compared to the average of 35%.

For post-docs, funding periods are generally shorter and the most prevalent category is **between two and three years** are the most common. Here, the shortest category of funding period - one year or less - is quite common, particularly in France, Spain, and Sweden where over a quarter of post-docs are funded for periods under one year. Funding periods longer than 3 years are particularly common in Czech Republic (73% of post-docs), and in Germany and Portugal (more than 50%).

Overall, these relatively long durations of funding imply significant stability in research team staffing.

3.4 Correlation with the age and size of the teams

The repartitions of the different funding sources depending on the **age of the team** for doctoral and post-doc researchers are the following.

Table 2: Percentages of **doctoral researchers** by their source of funding and **age of the team**

Age of the team	Source of funding of doctoral researchers					All doctoral researchers (N)
	Own university	Other public	Industry	Self-funded	Other funding	
up to 5 years	37.1	50.9	3.6	4.9%	3.6%	224
6-10 years	30.6	52.3	3.8	2.9%	10.5%	421
11-15 years	33.1	53.1	4.4	5.0%	4.4%	360
16-25 years	22.8	61.4	3.7	5.5%	6.6%	347
more than 25 years	25.4	53.7	9.7	4.5%	6.7%	134
Unknown	28.1	54.4	5.3	8.8%	3.5%	57
Total	**29.8**	**54.5**	**4.5**	**4.6%**	**6.6%**	**1,543**

Source: NetReAct

Table 3: Percentages of **post-docs** by their source of funding and **age of the team**

Age of the team	Source of funding of the post-docs					All post-docs (N)
	Own university	Other public	Industry	Self-funded	Other funding	
up to 5 years	28.8	49.0	0.0	16.3	5.8	104
6-10 years	26.8	51.2	3.8	9.4	8.9	213
11-15 years	17.9	57.7	4.0	13.9	6.5	201
16-25 years	22.4	57.3	3.1	8.9	8.3	192
more than 25 years	21.1	59.2	9.2	9.2	1.3	76
Unknown	37.5	62.5	0.0	0.0	0.0	16
Total	**23.4**	**55.0**	**3.6**	**11.1**	**6.9**	**802**

Source: NetReAct

For both doctoral and post-doc researchers, **university funding** is more important for **younger teams**. However, **older teams** perform better in both cases in obtaining funding from other public sources or industry. It does make sense because older teams should on average be better known outside of their university.

The repartitions of the different funding sources depending on the **size of the team** for doctoral and post-doc researchers are the following.

Table 4: Percentages of **doctoral researchers** by their source of funding and **size of the team**

Total staff of the team	Source of funding of doctoral researchers					All doctoral researchers (N)
	Own university	Other public	Industry	Self-funded	Other funding	
less than 10	31.9	52.4	4.3	2.9	8.6	489
10 to 19	30.9	54.7	3.1	5.6	5.7	647
20 to 29	18.4	60.4	7.1	8.5	5.7	212
30 to 49	29.6	57.6	4.0	1.6	7.2	125
50 or more	42.9	39.3	10.7	1.2	6.0	84
Total	**30.1**	**54.1**	**4.5**	**4.6**	**6.7**	**1,557**

Source: NetReAct

Table 5: Percentages of **post-docs** by their source of funding and **size of the team**

Total staff of the team	Source of funding of the post-docs					All post-docs (N)
	Own university	Other public	Industry	Self-funded	Other funding	
less than 10	15.1	60.4	3.6	13.3	7.6	225
10 to 19	24.6	56.0	1.5	11.1	6.8	325
20 to 29	28.8	54.2	5.1	5.1	6.8	118
30 to 49	31.7	46.3	2.4	13.4	6.1	82
50 or more	32.1	32.1	14.3	12.5	8.9	56
Total	**23.8**	**54.3**	**3.6**	**11.2**	**7.1**	**806**

Source: NetReAct

In this case, results differ slightly between doctoral and post-doc researchers:

- ➔ For doctoral researchers, own **university funding** is more common in either **small** (less than 20) or **large** (more than 50) teams and the **other public sources** in **medium-size** team (20 to 50);
- ➔ However, for post-docs own **university funding increases** with the size of the team whereas **other public sources decreases** with the size of the team.
- ➔ In both cases, **industry funding** is significant, 10-15%, only in large teams above 50 members. This corroborates the result with the size of the teams. Large teams benefit from a better visibility.

4 Further information

This paper has been extracted from a larger report devoted to the specific topic of “Research in University: Changes and Challenges in Funding and Governance”. This report synthesises the relevant results of both CHINC (“Changes in University Incomes: Their Impact on University-Based Research and Innovation”) and NetReAct. In this case, the financing of young researchers is considered as a specific instance of supporting research in University.

The CHINC project investigated on a sample of 117 HEIs in eleven European countries the changes in income patterns and the impact of these changes on research and innovation activities. Bearing in mind the methodological limitations, such as the limited size of the sample and the lack of data in some of the large countries, CHINC provided meaningful results which are questioning some currently prevalent perceptions on the state of European Higher Education and Research (HE&R), namely:

- ➔ **Total income for most (95%) institutions in the sample increased** between 1995 and 2003 (of 3% per year on average).
- ➔ In most cases, funding grew faster than student enrolments. However, **the universities which have grown a lot have been penalised** due to the lack of elasticity versus the number of students.
- ➔ **Changes in funding composition are evident but limited**. Many institutions witnessed an increase in the share of grants and contracts and some a decrease in the share of general government allocations. The share of tuition fees has not increased significantly, their level differing highly between countries.
- ➔ Data is too scarce to determine unequivocally whether private funding is becoming a key funding source. It seems that **private funding is becoming significant for a minority of institutions only**.
- ➔ The prevailing model seems to be a funding structure where general government allocation accounts for 60-80% of total income, with the remainder coming from other sources, largely public grants and contracts. The UK case is exceptional in the European context in that government funding is not the major source of institution income.

On the basis of the interviews with leading HEI officials carried out in the CHINC project and of the academic literature, ongoing changes in research governance are discussed:

- ➔ Universities primarily operate under national agendas. European research and even more education are still **fragmented across national borders** and will remain so for the foreseeable future. However, early trends point towards convergence across Europe in the percentages of government allocations towards 60-80%.
- ➔ There is some evidence based on doctoral enrolments and numbers of academic staff that **research capacity of most HEIs has increased**.
- ➔ European HEIs are in a **profound transformation phase** and have undertaken dramatic external and internal reorganisations in order to **"profile" themselves more distinctly**. They are also fighting to increase their **autonomy** from the centralised systems.
- ➔ As far as the specialisation of institutions is concerned, mixed signals are observed. On the one hand, HEIs are aiming at **enhancing their focus** and **increasing their mass** through the rationalisation of their research activities but on the other the **research capacity** seems to be **more widely spread across the institutions**.
- ➔ It is claimed that the "marketisation" and diversification of research as well as the increasing reliance on competitive funding may be progressively replacing the traditionally-centralised funding model for university research in Continental Europe. This is raising many concerns. However, CHINC results tend to show that HEIs are very **careful to preserve or even increase research quality**. A growth in both **interdisciplinary and applied research** is observed.
- ➔ In the global competitive environment, the **profession of researcher is becoming much more challenging**. At the same time HEIs are becoming more aware of the **importance of human resources**.

This draft report is available on request.

5 Future related activities

The results obtained through the NetReAct survey demonstrates the feasibility of accessing critical information on the mobility of doctoral and post-doc researchers in Universities by surveying their team leaders, at least in life sciences. On this basis, DG JRC IPTS has recently commissioned two additional surveys specifically dedicated to the career and mobility of researchers. They will also address issues related to their incomes.

In both cases, the sample will consist of 10 European countries chosen to reflect the diversity of the 33 countries participating in the European Framework Programme (see § 2.2): the three “key players” in research (Germany, France and the United Kingdom), three Mediterranean countries (Italy, Portugal, and Spain), two Scandinavian countries (Norway and Sweden) and two new member states (Czech Republic and Hungary).

These surveys will be carried out within the first half of 2007.

5.1 Survey of doctoral and post-doctoral researchers in social sciences and engineering

5.1.1 Overview

This survey will follow the “same” methodological approach as NetReAct but on different fields, social sciences and engineering instead of life sciences. The subjects of the survey are doctoral and postdoctoral researchers in these two fields. Similarly to NetReAct, the population surveyed are team leaders in universities.

5.1.2 Methodology

Schematically the methodology will be the following:

1. Identifying the overall population of research teams in social sciences and engineering through the International Handbook of Universities (International Association of Universities 2003) and internet research;
2. Drawing a sample of at least 1 000 teams in each field with a minimum of 75 teams in the “small” countries (in terms of research systems) (CZ, HU, NO, PT), 125 for the “medium-sized” countries (ES, IT, SE), and 200 teams for the “large” countries (DE, FR, UK);
3. Collecting from the web the names and email addresses of the team leaders, the total scientific and non-scientific staff and the doctoral and post-doctoral researchers.
4. Sending the questionnaire to the sampled team leaders;
5. Checking the representativeness of the responses.

Certainly this methodology tested in NetReAct will be adapted to account for the specificities of these two fields.

5.1.3 Information needed

Information is sought along the following three related axes:

➔ Research teams, overall personnel structure and resources, recruiting strategies and procedures;

➔ Doctoral and post-doctoral researchers within the team:

- Personal and education characteristics,
- Sources of funding,
- International mobility (into, within and outside EU-25) (of those who are in and those who have recently left the team),
- Employment characteristics (of those who have recently left the team) and in particular sectoral mobility (from pubic to private sector),
- Time from doctoral graduation to a permanent position in R&D.

➔ Career path and mobility experiences of the team leader.

The last point is important in itself and also for involving the team leaders into the issues at stake thereby further motivating them to reply.

5.2 Survey of life scientists in public & private sectors

5.2.1 Overview

In this case, the field is the same as in NetReAct but extended to the private sector. However, the subjects of the survey are different. We are interested in the "mid-career" scientists. The scope has to be defined carefully. As the target population will be found in bibliometric or patent databases, one may at this stage speak equally of "senior", "experienced" or "productive" researchers.

Moreover, the quantitative information collected on careers and mobility of doctoral and post-doctoral researchers in NetReAct will be supplemented with more qualitative information.

5.2.2 Methodology

A pilot survey will be designed and carried out so as to capture the career dynamics of researchers by on their main turning points. It is important to emphasise that contrarily to the previous survey, individual researchers will be questioned (and not team leaders).

Schematically the methodology will be the following:

1. Identifying researchers in the public and private sectors mainly from bibliometric and patent analysis;
2. Collecting email addresses from the web (when not included in ISI and EPO databases);
3. Sending the questionnaire;
4. Checking the representativeness of the responses.

5.2.3 Information needed

The information to be collected through this survey includes:

➔ Personal and educational characteristics:

- Personal characteristics: gender, nationality/citizenship, marital status, number of dependants,
- Education background: particularly doctoral education (e.g., date of award, duration, location, funding);

➔ Career and mobility:

- Time from graduation to first permanent employment in R&D,
- Evolution of career (e.g., number and nature of positions in and out of R&D, percentage of time devoted to research/teaching/management),
- Sectoral mobility,
- International mobility (e.g., past, present and future experiences abroad, expectations, reasons for moving);

➔ Job satisfaction:

- Reasons for choosing a R&D career (e.g., creativity, independence, job security, contribution to society),
- Satisfaction with their job and related characteristics (e.g., working conditions, position, responsibilities, recognition, location, commitment to R&D, salary and benefits),
- Satisfaction with their career prospects (e.g., opportunities for advancement).

6 References

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