

International mobility of researchers: policies, trends and impacts⁵¹

Ana Delicado

Institute of Social Sciences (ICS), Lisbon

Modern science is the main source of knowledge. It has become a productive force comparable to the industrial complex in terms of size of the labour force, public and private investment. According to Stehr (1994: 9), “contemporary society may be described as a knowledge society based on the penetration of all its spheres of life by scientific knowledge”, and science is the cornerstone of knowledge societies.

Thus, the development of a strong and internationalised scientific system is one of the conditions for building a knowledge society. Contemporary science is highly internationalised, and national science and technology (S&T) systems cannot function in isolation. The trends identified by Crawford et al. (1993) regarding the transnationalisation of scientific practice have but accrued in recent years:

...there reigns an internationalist ethos among scientists (...) scientific communication and exchange networks that cut across national boundaries and shape the everyday perception (...) of what scientific work is all about. There does indeed exist a world-wide system of journals, organisations, conferences and personal and institutional networks. (...) Transnational co-authorships (...) are growing.

(Crawford et al. 1993: 2-4)

The mobility of scientists plays no small part in achieving internationalisation. According to Gibbons et al. (1997), mobility is one of the dimensions of the “Mode 2” production of science, the predominant form of the currently organised scientific activity (characterised, in broad terms, by being transdisciplinary, problem-driven, focused on application, heterogeneous, socially accountable and reflexive):

⁵¹ This work is based on a recently finished post-doctoral research project funded by the Portuguese Foundation for Science and Technology (FCT) and hosted by the Institute of Social Sciences of the University of Lisbon.

Mobility is an essential precondition for the cross-fertilisation of scientific ideas and know-how. Scientists moving between different sites of knowledge production exchange ideas and know-how and learn about new techniques, devices and principles. Numerous instances of scientific creativity, of sudden insights and the opening up of novel pathways towards solutions can be traced to encounters between scientists brought together from different sites. The more mobility a science system permits or even encourages, the more potential instances of this kind can be expected.

(Gibbons et al. 1997: 38)

The Portuguese S&T system has grown at an unprecedented rate in the past decades, both in terms of human and material resources as well as outputs (Heitor & Bravo, 2010). This development has been accompanied by an increased internationalisation (measured, for instance, in publications in international journals⁵² and collaborations in international projects). It is argued here that the mobility of Portuguese researchers has played a significant role in achieving this level of internationalisation.

Hence, this chapter focuses on the policies put in place by national and supra-national actors regarding mobility, on the outbound and inbound flows of researchers, and on the impacts this phenomenon is having over Portuguese science. Although scientific mobility can be defined in various ways, according to its length in time (ranging from a few days to several decades), to its actors (students, researchers, faculty) or to its points of origin and destination (mobility between sectors, between regions of a country, between countries), this chapter focuses on mid- to long-term international mobility at PhD and post-PhD level.

Mobility policies: national and supra-national actors

Even though governments still play the major role in defining national S&T policies, including measures to promote (or restrict) scientific mobility, contemporary science is also shaped by the recommendations and actions of both supra-national bodies and non-governmental organisations.

Since the freedom of movement is one of the core principles of the European Union (EU), the international mobility of researchers has

⁵² See Table 7 in this chapter and also GPEARl (2010), Godinho (2007).

been actively promoted in the past few decades. Although programmes such as the Marie Curie Fellowships (created under the Fourth Framework Programme in 1994) were already in place, this issue gained momentum in 2001, with the publication of the ERA Mobility Strategy, which put forward the notion that international mobility enhances professional development in individual careers but also generates networks through which knowledge is circulated, fostering the production of science:

Mobility, a well-known and effective way of training skilled workers and disseminating knowledge, is a core element in research development (...) Mobility, however, is not an end in itself, but an instrument by which research results can be optimised. It creates European added value by: (...) fostering research collaboration internationally, with different regions and between the academic and business worlds (networking); enhancing the transfer of knowledge and technology between the different actors of the European research and innovation system (...) making the research work more efficient by pooling together competence and experience, providing better dissemination of research results.

(EC 2001: 4-5)

A few years later, in 2005, the European Commission issued a recommendation constituting the European Charter of Researchers and the Code of Conduct for the recruitment of researchers, in which mobility was included in the general principles and requirements applicable to employers and funders:

Employers and/or funders must recognise the value of geographical, intersectoral, inter- and trans-disciplinary and virtual mobility as well as mobility between the public and private sector as an important means of enhancing scientific knowledge and professional development at any stage of a researcher's career. Consequently, they should build such options into the specific career development strategy and fully value and acknowledge any mobility experience within their career progression/appraisal system.

(EC 2005: 19)

– as well as in the criteria to be considered in evaluation systems and career progression and in the recruitment of researchers:

Any mobility experience, e.g. a stay in another country/region or in another research setting (public or private) or a change from one discipline

or sector to another, whether as part of the initial research training or at a later stage of the research career, or virtual mobility experience, should be considered as a valuable contribution to the professional development of a researcher.

(EC 2005: 26)

However, in Portugal only two organisations undersigned these EU documents: a minor independent research centre in social sciences (Numena) and the association of grant holders.

Besides issuing policy documents, the EU has also put in place mechanisms to stimulate intra-European scientific mobility, such as the aforementioned Marie Curie Actions and the Euraxess Portal. The former funds different types of fellowships, the majority of which supporting transnational mobility⁵³, and also supports national or regional programmes to foster mobility (COFUND) and research institutes involved in mobility agreements (IRSES – International Research Staff Exchange Schemes). The Euraxess portal (formerly known as ERA Careers) provides mobile researchers with relevant information and services, such as a listing of research jobs and funding opportunities, a network of centres that provide information and assistance in relocation, and a networking tool for researchers working outside Europe.

Additionally, the EU has also commissioned several large-scale research projects on this issue, such as the evaluation of the Marie Curie Fellowships (Ackers 2001; Van de Sande et al. 2005), the Integrated Information System on European Researchers (IISER) project, carried out by the Institute of Prospective Technological Studies⁵⁴, or the ongoing Mobility and Career Paths of Researchers in Europe (MORE) project.⁵⁵

Despite the strong influence European policies usually have in Portugal, there is barely any mention of international scientific mobility in official documents. Nevertheless, in practice, the Portuguese government has been a strong supporter of mobility through advanced training grants abroad. Policies for training researchers abroad have been in place since the 1960s, through grants awarded by the Junta Nacional de

⁵³ IEF – Intra-European Fellowships for Career Development, IIF – International Incoming Fellowships, IOF – International Outgoing Fellowships for Career Development, ERG – European Reintegration Grants, IRG – International Reintegration Grants, ITN – Initial Training Networks.

⁵⁴ See <http://ipts.jrc.ec.europa.eu/activities/research-and-innovation/iiser.cfm>.

⁵⁵ See <http://www.researchersmobility.eu>.

Investigação Científica e Tecnológica (JNICT) and mostly supported by NATO funding; law reform in the 1970s by Veiga Simão allowed the recognition of foreign diplomas (Gago 1996: 437; Ruivo 1995: 179, 229).

In this period these fellowships were aimed exclusively at university and research institutes' personnel, and were justified by the paucity of PhD training in Portugal (Ruivo 1995: 179-180). However, since the late 1980s JNICT [replaced in 1996 by the Foundation for Science and Technology (FCT), a subsidiary of the Ministry of Science] started holding yearly calls for fellowships that were open to all graduates and these have been granted mainly to young researchers with no institutional affiliation, aiming to increase the pool of qualified human resources for science (Ruivo 1995: 270-271; Horta 2010: 71).

These programmes were (and still are) largely financed by the European Social Fund. Doctoral and post-doctoral fellowships can be awarded to researchers enrolled in foreign institutions, and this has been the main source of support for outbound mobility in Portugal. However, whereas the first regulations in 1996 made no distinction in the length of post-doctoral fellowships at home and abroad (three years), the current regulation stipulates that fellowships "abroad will be only awarded under exceptional circumstances, the maximum length of the grant being one year for individuals who obtained their doctoral degree in Portugal and six months for those who obtained their degree abroad" (FCT n.d., a). As will be shown below, FCT has been granting a growing number of mixed fellowships, which can signify a shift towards promoting "tethered mobility", with more assurances of return.

FCT also awards other kinds of grants aimed at fostering the international mobility of Portuguese researchers as well: grants for internships in international science and technology organisations, as well as sabbatical leave grants (for holders of doctoral degrees on sabbatical leave for the purpose of carrying out research at foreign universities).

There have been no specific return policies but the growth of the scientific system (in the 70s and 80s with the creation of peripheral universities and polytechnics, in the 90s with the rise in funding for scientific activities) and some recent government initiatives have clearly benefited expatriate researchers aiming to come back. On the one hand, FCT regulations for post-doctoral grants state that "the evaluation of post-doctoral grants favors the mobility of doctoral degree holders who have been granted their degree abroad and wish to pursue post-doctoral work

in Portugal” (FCT n.d., a). On the other hand, in 2007 the government launched the *Compromisso com a Ciência* (Commitment to Science) Programme, with the purpose of hiring 1,000 researchers through 5-year contracts. Though expatriate researchers were not explicitly favoured in the evaluation criteria, the fact that these positions had to be advertised in the ERA Careers website encouraged more applications from abroad. Moreover, although host institutions carried out the recruitment procedures, they were constrained by FCT regulations and had to be validated by FCT, in a strategy clearly aimed at improving transparency and thwarting inbreeding (see below).

However, there is anecdotal evidence that the bureaucratic procedures took so long that a few of the selected researchers chose to accept jobs elsewhere, that some already left their positions (attracted by better offers) and that there is some discontentment about the absence of means for carrying out research (unlike the ERC Starting Independent Grants, there is no research funding allocated to these positions, researchers must seek competitive funding from FCT or other sources).

According to a publication of FCT (2009), 41% of all researchers hired under this programme are foreign nationals and 12% are Portuguese researchers who had obtained their PhD abroad.⁵⁶ A survey of *Ciência-2008* researchers, carried out by a research centre, CIES-ISCTE, and commissioned by the FCT, has yet to yield results. More recently, in 2010, the FCT launched the Welcome Programme II (co-funded by the Marie Curie Action) aimed at post-doctoral European researchers that have been working outside the EU for at least three years. This Programme funds three-year contracts at Portuguese institutions (including business companies) in all scientific fields.

But the promotion of scientific mobility does not fall exclusively on governmental organisations. Private non-profit foundations have also played a role in fostering the training of Portuguese researchers abroad. The Gulbenkian Foundation started supporting fellowships abroad in the late 50s (see Ruivo 1995: 163; Tostões et al. 2006; Horta 2010: 73). Currently it still awards grants for long-term post-graduate studies in renowned foreign institutions, for short-term stays and periods abroad within doctoral programmes in Portuguese institutions. The Luso-

⁵⁶ However, some of these foreigners had already done their PhD in Portugal. From among the Portuguese with a foreign PhD, some were already in Portugal working as postdocs, that is, they were not necessarily attracted back by these positions.

American Foundation for Development (FLAD) and the Fulbright Programme also award several types of mobility fellowships with the United States as host country, such as R&D grants for research abroad for periods of three to 12 months as well as grants for doctoral studies.

In recent years, several mixed PhD programmes, in which students spend part of their postgraduate education at a Portuguese institution and another period at a foreign university, have been created. This is more common in the natural and health sciences, and it is fostered by agreements between higher education institutions but also by specifically designed programmes. The first of these programmes started in the early 1990s, at the Gulbenkian Institute of Science, in life sciences: the students spend the first year at the Institute and in other Portuguese research centres (attending classes delivered by national and foreign experts and acquiring laboratory experience) and afterwards choose a host institution and a supervisor, either at home (less frequently) or abroad (the majority) to complete their PhDs.

Since then, two other doctoral programmes have been created at the Gulbenkian Institute, in Computational Biology and in Neuroscience, Brain and Behavioural Systems. Other Portuguese institutions also followed suit: the University of Porto with the Graduate Programme in Areas of Basic and Applied Biology; and the Centre for Neuroscience and Cell Biology at the University of Coimbra with the Programme in Experimental Biology and Biomedicine. Since 2005, agreements between the Portuguese government and American universities have also promoted the creation of collaboration programmes (Heitor & Bravo 2010: 229; Horta 2010: 76), which include joint master and doctoral degrees: with MIT in engineering and the health sciences; with Carnegie Mellon University in information and communication technologies; with the University of Texas at Austin in digital media, advanced computing and mathematics.

Finally, regarding the attraction of foreign researchers to the Portuguese S&T system, there have been no targeted policies, other than designing regulations that enforce the international nature of recruitment procedures for research positions: fellowship calls are open also to foreign nationals wishing to study or work in Portuguese institutions (doctoral, post-doctoral and invited scientist grants), legislation passed in 1999 has made all vacancies in the research career open to external candidates (vacancies in the academic career suffered similar changes in

2009) and all job opportunities have to be advertised in English in the ERA careers website. The above mentioned agreements with American universities also purportedly aimed “to foster the recruitment of international academic staff” (Horta 2010: 76).

Mobility trends: more circulation than exodus

Although there is a severe lack of reliable statistical data on the international mobility of researchers in Europe, some indicators can be used as proxy: the intra-European flows of doctoral candidates (Mogu  rou & Di Pietrogiacomo 2008) and the Marie Curie Fellowship scheme (Van de Sande et al. 2005: 16).

Table 1. Mobility trends in selected EU countries

	Doctoral candidates*		Marie Curie fellows**		
	% foreign (EU) in this country	% studying abroad (EU) among this nationality	outgoing fellows	incoming fellows	incoming as % of mobility ⁵⁷
Portugal	1	12	173	69	29
Italy	2	9	1646	732	31
Spain	4	2	1897	866	31
Poland	1	3	536	35	6
Sweden	7	2	254	383	60
France	7	3	1496	2040	58
UK	13	0	620	3334	84

Source: *Mogu  rou & Di Pietrogiacomo 2008: 78, 83. **Van de Sande et al. 2005: 16, 69.

Portugal has been mostly a sending country for scientific mobility (Table 1): outgoing doctoral students and Marie Curie Fellows far outnumber the inflow from other EU countries. A similar trend can be seen for Italy (see also Morano-Foadi 2006) and for Spain (but only in the case of Marie Curie fellows, since Spain does have a fairly high proportion of foreign doctoral candidates, mainly Portuguese), as well as in Eastern

⁵⁷ This indicator shows the weight of incoming fellows in the total number of mobile researchers going in and out of the country. For instance: $173+69=242$, $69/242=29\%$ (Portugal).

European countries, for instance Poland. The top receiving country is the United Kingdom (a well-known fact from previous studies – Mahroum 2000; Casey et al. 2001; Baruch et al. 2007; Millard 2005), with very low levels of outgoing mobility. It is followed at a distance by France and Sweden, with slightly higher levels of outbound flows.

Although there is no accurate figure regarding how many Portuguese scientists have left the country (temporarily or permanently) in the past few decades, PhD and post-doctoral fellowships for studying or working abroad granted by FCT give us some clues on outbound trends (Table 2). Between 1994 and 2008, 3,815 PhD and 691 postdoctoral fellowships for studying abroad and 3,046 PhD and 973 post-doctoral mixed fellowships (divided into periods spent at a foreign and a national institution) were granted.

Table 2. Fellowships granted by the Foundation for Science and Technology

Type	Year of award	Abroad		Mixed	
		number	% (of all)	number	% (of all)
Doctoral	1994-1998	1,428	41.2	382	11.0
	1999-2003	1,188	31.2	808	21.2
	2004-2008	1,199	14.9	1,856	23.0
	Total	3,815	24.8	3,046	19.8
Post-doctoral	1994-1998	152	29.5	60	11.6
	1999-2003	233	16.8	227	16.4
	2004-2008	306	10.9	686	24.5
	Total	691	14.7	973	20.7

Source: (FCT n.d., b).

In this 15-year period some changes also became apparent. Even though there has been little change in absolute figures, the share of doctoral grants for studying abroad plummeted from 40% in the 1990s to 15% in the past five years, which is a reflection of the substantive growth of post-graduate education in Portugal in the last one and a half decades.⁵⁸

⁵⁸ This growth can be explained by several factors: the increase in qualifications of the higher education personnel, now more able to teach at Master's and doctorate level; the perception by universities that post-graduate courses are an important source of income (fees are far higher than in undergraduate education); the availability of grants to support students; changes in the labour market that have re-

Conversely, the number of mixed grants increased both in absolute and relative terms in the same period. A similar trend can be seen in post-doctoral grants, affected also by changes in regulations (see above).

These figures do not wholly represent outward mobility trends, since there are other organisations (national and international, as well as foreign institutions) that grant fellowships for studying abroad⁵⁹ and because researchers and academics can also leave the country without explicit financial support (by applying to jobs abroad, for instance).

In June 2007, the author carried out an online survey of a sample of Portuguese researchers abroad. For this purpose, 803 researchers were identified through several sources (an online database, newspaper articles, membership lists of associations, university websites, internet search) and contacted by email. The questionnaire contained both closed and open-ended questions. 521 answers were received, which amounts to 65% of the original sample.⁶⁰

In addition, in 2008 the author carried out 32 interviews with Portuguese researchers who had PhD degrees from foreign institutions and are currently working in science in Portugal. The interview partners were chosen from a database with 3,008 cases. This sample, though non-representative, was stratified according to gender, career situation, scientific area, type and region of current host institution, year and country where the PhD was awarded. The extended quotations that will appear throughout the following parts of this chapter stem from these interviews.

According to the data collected through the author's survey⁶¹, Portuguese researchers working abroad are distributed throughout the world

sulted in the fact that the first university degree is no longer a guarantee of employment, pushing graduates into further training.

⁵⁹ For instance, in 2001-08 the Gulbenkian Foundation awarded 554 fellowships for post-graduate studies abroad. The Fulbright Programme has awarded grants to 1,300 Portuguese students and researchers since 1960.

⁶⁰ The actual response rate is lower, since the researchers were asked to forward the email to other people in the same circumstances and the survey was publicised by several associations of researchers. 62% of the respondents were doctoral students and 38% senior researchers (with a PhD); 78% of senior researchers worked in universities, 14% in public research centres and 3% in business companies; 52% of the respondents were women; 45% were under 30 years of age, 31% between 30 and 34 years old, 13% between 35 and 39 years old and 11% over 40 years of age.

⁶¹ For more a detailed analysis of the survey results, see Delicado (2008).

unevenly, following the patterns usual for scientific mobility, such as from the periphery to the centre (see Mahroum 2000b). Although sampling procedures may have introduced some distortion, the survey has shown that 64% of Portuguese expatriate researchers are located in the EU countries (see Table 3), mainly in the UK (29%).

Table 3. Host countries of Portuguese expatriate researchers (%)

European Union	64.8
United Kingdom	28.8
France	7.9
Netherlands	6.5
Germany	6.1
Spain	4.4
Other EU	11.1
Europe (non-EU)	4.8
Switzerland	4.6
United States	26.9
Rest of the world	3.5

Source: Author's survey of Portuguese researchers abroad.

Most mobile researchers strive to reach high-profile institutions (Millard 2005; Mahroum 2000a; Gill 2005: 330; Van de Sande et al. 2005: 15), whose prestige is transferred to its alumni or personnel: the choice of a PhD host institution is often determinant for the development of a career in research (Casey et al. 2001: 29; Mahroum 2000a: 56). Very slight variations by scientific discipline were found: the weight of the UK is higher in the social sciences and humanities (maybe due to the importance of language in research methods) and there is a higher proportion of natural scientists in other EU countries.⁶²

According to the same survey, the majority was in the early stages of their career (PhD students) but one third of the respondents were already senior researchers (PhD holders), most of them already with tenure or on a fixed term contract (Table 4). Tenured researchers tend to be older than researchers in temporary positions, although a fraction of

⁶² In most questions of this survey, few differences between natural and social sciences were found. This may be due to a fairly balanced policy towards scientific disciplines.

older researchers are still in temporary contracts or even post-doctoral fellowships. Most of these senior researchers are working in universities and devote themselves mainly to research.

Table 4. Situation of Portuguese expatriate researchers (%)

Career position	PhD students	61.6
	Senior researchers (PhD holders)	38.4
Career situation of senior researchers	Tenure	38.5
	Fixed-term contract	37.5
	Post-doctoral fellows	14.5
	Visiting professors/researchers	8.5
Host institution of senior researchers	University	77.8
	Public research centre	13.6
	Private non-profit research centre	8.6
	Business company	3.0
	Hospital	2.0
Activities of senior researchers	Mainly research	63.3
	Research and teaching	18.6
	Research, teaching and administration	14.6
	Research and other activities	2.0
	Mainly teaching	1.5

Source: Author's survey of Portuguese researchers abroad.

Most of these senior expatriate researchers obtained their PhD abroad, especially those on tenure (84%) or on fixed-term contract (79%). However, half of the post-doctoral fellows had obtained their PhDs in Portugal, so this could be their opportunity for enriching their CVs with a work experience abroad. It can also be hypothesised that it is easier for those who already studied abroad to build a career in a foreign country. Numerous studies have shown that studying abroad is often the first step in a more permanent migration (Alarcon 1999: 1390; Baruch et al. 2007: 100; Jalowiecki & Gorzelak 2004: 300; Millard 2005: 353; Avveduto 2001: 238; Tremblay 2002: 42; Rizvi 2005: 179; Diaz-Briquet & Cheney 2002: 11; Mahroum 2000a: 24). "Study abroad offers possible social and cultural integration, and provides the educational credits (recognised

abroad) that make integration less difficult” (Ferro 2004: 383). And in fact, only 13.7% of senior researchers stated that it was quite or very difficult to find a scientific job and only 7.6% affirmed that discrimination at work or in daily life had posed difficulties for them.

According to several previous studies (Baruch et al 2007: 106; Casey et al 2001: 19, 44-46; Thorn & Holm-Nielsen 2006: 1), the (negative) perception of the scientific labour market at home (in terms of job opportunities, salaries and rewards, career progression, bureaucratic hurdles) often works as a barrier to return. Hence, when asked to compare their host and home countries, the vast majority of expatriate researchers consider that employment and work conditions are more favourable abroad (Table 5).

Table 5. Comparison between conditions in the host and home country

	better abroad (%)	better in Portugal (%)	about same (%)	don't know (%)
Research resources	92.9	0.9	3.6	2.6
Scientific employment	89.7	1.1	4.5	4.7
Transparency in recruitment procedures	68.9	0.4	16.1	14.6
Career progression	70.9	2.2	8.9	17.9
Work/family balance	27.4	35.3	24.8	12.4

Source: Author's survey of Portuguese researchers abroad.

The only issue in which Portugal seems more attractive is work and family balance. As a result, almost two thirds of the senior researchers surveyed had no intention of returning to Portugal in the medium run (Table 6), stating mainly work- and employment-related reasons. As far as PhD students are concerned, they are slightly more optimistic regarding the conditions in Portugal and the majority intends to return home.

Table 6. Expatriate researchers' intention of returning home

	Yes (%)	No (%)	
PhD students	56	44	
Senior researchers	38	62	
Reasons (%):			
Family	80.5	Lack of work opportunities	65.1
Wish to contribute to the Portuguese S&T system	73.9	Difficulty in performing quality research	58.2
Wish to contribute to the country's development	69.9	Wish to prolong work experience abroad	56.0
Quality of life in Portugal	62.4	More difficult career progression	51.7

Source: Author's survey of Portuguese researchers abroad.

Open answers to these questions only stressed how negatively perceived career opportunities in the home country are:

It is difficult to find a position in a company where the doctoral degree won't represent an obstacle (over-skilled) or would be valued intellectually or economically.

(PhD student, health sciences, UK)

To be treated as a student even after the PhD, lack of welfare and other basic rights.

(PhD student, natural sciences, France)

Lack of clarity in recruitment procedures by Portuguese institutions.

(Senior researcher, health sciences, France)

Some expatriate researchers even had firsthand experience on the difficulties of initiating or resuming a scientific career in Portugal:

In the past two years only one tenure position opened in my area and I applied for it. Unfortunately, I didn't get that position, despite the fact that the successful candidate had a much inferior scientific curriculum. In the meantime, I was offered a tenured position in one of the best UK universities in my area.

(Senior researcher, natural sciences, UK)

The only time I tried to apply for a job vacancy in Portugal was a professorship in chemistry at the University X. I was immediately excluded despite my professional experience at the time (senior research scientist at Pirelli Labs), my publications and my patents. After a lot of struggle I managed to obtain a copy of the job selection minutes and I realised I had been excluded due to my degree classification (15 points) and obviously the successful candidate was the first in ranking. The lack of transparency is too obvious.

(Senior researcher, exact sciences, Canada)

I have been trying to return for the past 6 years and I've failed every time. I came to learn and I have learnt and now I want to go home. But I can't. The reasons vary slightly but always revolve around preconceived notions about those who have been abroad – presumed arrogance, they are too young and ambitious, etc. There is a lot of talk about how we don't know how things are in Portugal, how we want to return and rock the boat, of us being offered positions below those we have here, of preferring internal candidates, already inside the university.

(Senior researcher, social sciences, Netherlands)

Inbreeding and hostility towards researchers trained abroad has also been reported in other European countries with rigid and traditional academic structures, which still rely heavily on informal relationships between senior and junior scientists, such as Spain, Italy and France (Ackers 2001: 72; Casey et al. 2001: 35; Morano-Foadi 2006: 213; Gill 2005: 327-328; Millard 2005: 352; Avveduto 2001: 239). In Portuguese universities, inbreeding rates are estimated to lie between 91% (Soler 1001) and 80% (Heitor & Horta 2004).

As for return flows, there is no solid administrative data but between 1970 and 2007, Portuguese universities have recognised 4,004 PhDs obtained in foreign institutions (until recently a necessary step for applying for a position in academia in Portugal). However, not all of these PhD holders are Portuguese nationals nor are they necessarily still working in Portugal; also positions in research institutions do not require the recognition of the diploma. Additionally, a survey carried out in 2006 in Portugal registered that 29% of Portuguese doctorate holders (3,200) had obtained their PhD abroad (MCTES n.d., a).

By crossing two databases (PhD abroad and faculty of Portuguese higher education institutions) and filling in information gaps through different procedures (web searches), it was possible to identify 3,789 Portuguese researchers with PhD obtained abroad (between 1970 and

2006), of whom close to 80% are currently active in the Portuguese scientific system. Among the remaining 20%, 3.5% returned or remained abroad, 9% are retired or deceased, 1.6% work in areas other than research and there are 6.5% whose situation is unknown.

This means that there is a quite considerable rate of return of Portuguese researchers who obtained a PhD abroad. And most seem to reintegrate fairly easily into the Portuguese S&T system.⁶³ But in fact, many of the returnee researchers had previous contracts with Portuguese institutions (mainly as university lecturers, but also polytechnic lecturers and researchers in state laboratories) before leaving the country and their absence was supported by government grants for studying abroad. Thus their return was practically assured:

When I went to France I was already an employee of the University and I remained an employee. So coming back instead of staying in France was never an issue. To me, I was there as long as I was in training; staying in France was never an option.

(Senior research at a university, natural sciences)

I had a job here. It never crossed my mind [staying]. Since the Portuguese government paid for my training I had the moral duty of returning. It never crossed my mind, staying. I hadn't had an offer, but even if I have had. It never crossed my mind, staying.

(Full professor at a public university, natural sciences)

Higher education, especially public universities, was the largest sector in terms of human resources in R&D in Portugal.⁶⁴ So it comes as no surprise that it also absorbs the largest portion of returnee researchers: 73% of scientists trained abroad between 1970 and 2006 work in public universities. However, breaking down this value by time segments shows changes over time, evidencing a decrease in the universities capacity for absorbing mobile researchers: in the 1970s, 86.5% of foreign doctorate holders obtained (or returned to) positions in public universities; this value has been decreasing steadily and between 2000 and 2006, only 61.2% of new returnee PhDs entered public universities. And although the most prestigious public universities (larger, older, located in the main three cities of the country) still absorb the majority of returnees,

⁶³ For more a detailed analysis of return experiences, see Delicado (2010).

⁶⁴ According to the 2008 R&D survey, it represented 49% of the R&D personnel and 56% of the researchers (GPEARI 2009).

the weight of peripheral universities has been increasing (from 13.7% in the 1970s to 38% in the 2000s).

Symmetrically, a growing number of foreign trained researchers has been integrated in less prestigious (and less research intensive) institutions, such as private universities (22.8% in the last decade) and polytechnics (13.2%). State laboratories have also received an increased influx of PhDs, especially in the 1990s (4.8%). Nevertheless, this trend does not necessarily apply only to returnee researchers. “Home-grown” PhDs, whose numbers have been increasing at a much faster pace (in the 1970s, they represented 38% of all PhD obtained; between 2000 and 2006 this value reached 84.3%), may also face difficulties in finding a position in the more prestigious institutions of the scientific system.⁶⁵

It is also important to assess what kind of positions returnee researchers are able to obtain. In public universities, 40.7% of full professors have been trained abroad but this value decreases as we go down the stages of the faculty career: 27.6% of associate professors, 17.7% of assistant professors (non-tenure) and 14.9% of instructors (a position usually reserved for non-doctorate holders). Although this distribution is certainly affected by the recent growth in PhDs obtained in Portugal, it also seems to indicate that returnee academics tend to be more successful in reaching the top echelons of the career:

When I came back to my department I had the support of the head of the scientific council of the department who made everything available to me (...), he provided everything I needed to do research. At the time, the Foundation for Science [and Technology] had research programmes

⁶⁵ Although prestige is a symbolic attribute extremely difficult to gauge, the commonly held perception that the Portuguese scientific system is hierarchically structured, with the more ancient public universities of Lisbon, Coimbra and Porto on top, followed by peripheral (and more recent) universities, then by public polytechnics and private universities can be based on more measurable indicators, such as the presence in international rankings (only Lisbon and Porto are included in the top 500 of the *Academic Ranking of World Universities* compiled by Jiaotong University, Shanghai; only the New University of Lisbon and Coimbra in the *QS World University Rankings*; only Porto, Coimbra and the Technical University of Lisbon in the 2010 *Performance Ranking of Scientific Papers for World Universities*), the qualification levels of their personnel, the number of research units funded by the Foundation for Science and Technology, the number of publications in peer-reviewed journals (see also Horta (2010) on the Portuguese higher education system).

for young PhDs, lines of funding for people who had received their PhDs less than three or four or five years, which is a really good thing (...) and I won my first project, then applied again and won again and I've been winning ever since.

(Full professor, public university, natural sciences, UK PhD)

However, this is not always the case with the academics interviewed:

Here everything is very rigid, there is no opportunity, either big or small, no career progression. After my PhD I've been always an assistant professor, I applied once for associate professor, there were 15 other candidates, I wasn't chosen of course, I was approved in terms of merit on all categories, but the vacancy was filled by someone from outside the school.

(Assistant professor, public university, exact sciences, UK PhD)

On the other hand, in recent years, a growing number of young researchers have left the country without a "safety net", supported only by government fellowships. And although some do manage, on returning, to obtain a position fairly easily –

It was by chance than I heard about this position here in the Department, it was through a website for disseminating information about competitions, called ERA Careers, I came across this advert because I was looking for several solutions, I heard about it. I sent my CV and a little later I was called and, having this opportunity, I decided to come back.

(Assistant professor, public university, engineering sciences, German PhD)

– others face many difficulties, including spells of unemployment:

When I came back they told me "we have nothing for you to do, go away because there is no business, no project on mycorrhizas, at the moment we don't need you". And I did nothing for a whole year, I was unemployed, and after becoming a bit desperate, because it's not easy to find a job with a PhD, I decided to accept a job earning the minimum wage but at least it had something to do with what I liked, I was setting up a mushroom factory, through some people I met when I was doing the PhD. And that helped get my spirits up, because I was becoming a bit desperate. I didn't do it for the salary but for what I was doing, to let some air in my head. At the same time, the department got a new project on mycorrhizas and they remembered that they needed me (...) That was three years after my PhD. They called me and asked me if I wanted to take part in the project, they needed an expert, and they asked if I

wanted to apply to a post-doctoral fellowship.

(Senior researcher, state laboratory, natural sciences, French PhD)

Postdoctoral fellowships are a fairly recent solution for the integration in the scientific system of young highly trained researchers. Introduced by the Portuguese government in the 1990s, the number of fellowships has grown significantly in the past few years: while between 1994 and 2000, 940 of these fellowships were awarded, between 2001 and 2008 their number increased to 3756. Although some are granted to researchers abroad (see above), the majority (64%) funds researchers in Portuguese institutions. These fellowships are not aimed exclusively at expatriate researchers wishing to return home, but they are favoured in the evaluation. However, data on the distribution of these fellowships by country of PhD is not publicly available.

Although the competitions for fellowships are open to all (there are yearly calls in which candidates submit a research project), it does help if expatriate researchers willing to return have some contacts at home, since these projects need to be backed by a potential host institution and supervisor. Expatriate researchers that have kept in touch with peers established in the home country (colleagues or senior scientists, such as former professors, supervisors or project coordinators) have a higher chance of receiving privileged information on job opportunities, of being personally known or recommended to potential recruiters, of being regarded with less suspicion than other candidates coming from abroad (Casey et al. 2001: 36; Morano-Foadi 2006: 215; Gill 2005: 327).

I applied to a FCT fellowship, I was in touch here with professor X, who always told me that if I wanted to come back she would support me, she wrote me a letter of recommendation and told me to name the Institute as host institution.

(Postdoctoral fellow, university research centre, exact sciences, UK PhD)

Although providing a reasonable salary and the opportunity to carry out full-time research (whereas university positions usually entail a fairly heavy teaching load), post-doctoral fellowships also have downsides: a limited duration (three to six years), scarce social welfare entitlements, ill-defined links with the host institution.

For all the fellows interviewed, this was a “necessary evil”, while waiting for better career opportunities:

Employment opportunities really don't exist (...) the situation abroad has nothing to do with it [situation in Portugal], the wages can be bad, the benefits can be bad, but we are employees, we have a contract, we pay taxes. Here we are like students, we have no workers' rights, we are not entitled to unemployment benefits (...) I'm not asking for a job for life, that doesn't happen abroad either, the contracts last three or four years, but there are more opportunities, after the duration of that contract you have other opportunities, you apply and eventually get it. Here you have a fellowship and after the fellowship maybe a "Ciencia-2008" position, there is no market.

(Postdoctoral fellow, university research centre, natural sciences, UK PhD)

The most desired positions are, as expected, in academia. The private sector not only does not absorb many PhDs (business companies in Portugal have low levels of investment and performance in R&D)⁶⁶ but is also considered less attractive:

When I finished my degree I had the possibility of working in civil engineering companies, but the head of the department here asked me if I was interested in coming here with a grant and I thought... It's not that you can't learn in a company or be learning all the time, but I think some things motivated me to accept and from then on I did other things. I think it would be a different life, could have been better or worse. But then someone talked to me, then I decided to come here and try and then there was this possibility of doing the PhD and I kept going.

(Researcher on a 5-year contract, state laboratory, engineering sciences, UK PhD)

As regards positions in universities, not only have the openings been scarce in recent years (due to a fairly closed system, in which most academic jobs are "for life" and there is little transition between sectors and between institutions, as well as to a decrease in the number of students and the Bologna reform) but also, much like their expatriate peers (as seen above), some returnee researchers complain of not having been treated fairly in job competitions:

I tried and I wrote, I sent my CV, I explained what I was interested in, the areas I had studied and what I would be interested in doing (...) to a se-

⁶⁶ According to the 2008 R&D survey, the business sector accounted for 50% of expenditure but just 31% of the R&D personnel and 26% of the researchers in the Portuguese S&T system (GPEAR 2009).

ries of architectural schools (...) I never received any answer, nothing, zero, not even a letter saying “we are grateful for your interest but there are no positions available, so we are sorry”.

(Civil servant, local administration, social sciences, US PhD)

In the beginning I tried two universities. I won't go into details, because you can guess... (...) I was applying to a position in artificial intelligence, my supervisor was the most famous researcher in the world in artificial intelligence (...) I have over 50 scientific papers published, which is more than many full professors here, after my PhD, I have an award for the best paper and I was nominated for another award. I know that in this specific case there were three positions, I know I was entitled to one of them. I didn't get it because anyone who has been abroad and returns to Portugal has to face the inbreeding. I'm convinced that who wants to go abroad for a PhD has less probabilities of getting a position here than someone who stays and does his PhD here with someone with whom he has been working for a long time and makes promises... It shouldn't be like this, staying or going shouldn't give an advantage, it should be based on skill.

(Senior manager, private company, engineering sciences, US PhD)

Finally, to a much smaller extent, Portugal is also a host country for foreign researchers. According to the 2006 survey of doctorate holders in Portugal, only 3.2% (423) were foreign nationals. Considering higher education staff in 2007, the absolute figure rises to 1,177, though the relative weight is similar, 3.3% (MCTES n.d., a). According to Horta (2009: 399), it is not salary differentials that explain the low attractiveness of Portuguese universities to international academic staff, but rather the “overly bureaucratic recruitment processes, underlined by the low attractiveness of the Portuguese universities in terms of reputation and constrained by the scarcity of available resources to develop scholarly work”.

Nonetheless, in the past decade and a half a significant number of FCT fellowships have been awarded to foreign citizens: 1,113 doctoral grants (7% of the total) and 1,539 post-doctoral grants (33% of the total) (FCT n.d., b). Additionally, 41% of the doctorate holders hired under the *Commitment to Science* Programme are also foreigners (MCTES n.d., b). Fellowships and temporary contracts are aimed at younger researchers (that also face difficulties in their home countries) and entail much less bureaucracy; furthermore, the funding allocated to the S&T system in the past few years (for research projects and training personnel) also

made it more enticing.

Mobility impacts: from tacit knowledge to measurable indicators

The return of expatriate scientists, after a period studying or working abroad, to the home country usually has obvious and direct results in terms of knowledge flows: the accrued knowledge that returnee researchers bring with them in terms of innovative theories, methodologies, techniques, research problems.

Though scientific information formally circulates through publication in peer reviewed journals and presentations at scientific conferences, tacit knowledge can only be obtained in face-to-face relationships, through actual physical presence in laboratories and research centres, by attending internal meetings, seminars, informal chat (Langberd & Gravesen 2001; Nerdum & Sarpebakken 2006: 217; Van de Sande et al 2005: 40). Return mobility allows for tacit knowledge to be transmitted to other scientists in the home country.

Scientific mobility brings about the circulation of knowledge and ideas which, in turn, and when applied locally, requires some sort of transformation. This transformation of knowledge is often to adapt “external” knowledge to local specifications. In doing so, it engenders a change in the hosting site’s reservoir of knowledge and affects its knowledge profile in the long run.

(Mahroum 2000a: 121)

Mobile scientists are thus “cultural bees” (Todisco et al. 2003: 122) that pollinate the institutions in which they work. Keimar (1997) describes how the return to Argentina of a group of scientists was crucial for the development of a particular research area; and Gaillard & Gaillard (1997: 219, 213) mention similar studies regarding India and Korea. The impact of return mobility permeates throughout the whole S&T system: “People not only transfer knowledge and skills locally, they also contribute towards changing the culture of the system through their experiences in a different environment and contribute to overcoming the barriers faced by researchers on the periphery” (Pereira 2002: 457).

Mobility also has measurable impacts: researchers who have spent time abroad are more prone to publish in international journals, to collaborate with colleagues from other countries, to join transnational projects (see, for instance, Jonkers & Tijssen 2008; Barjak & Robinson 2007;

Cañibano et al. 2008). The recent changes in the Portuguese scientific system can be attributed partially to the role played by returnee researchers. Several top institutions were created or are currently headed by scientists who obtained their PhDs abroad.⁶⁷ Many of the Gulbenkian fellows went on to occupy prominent positions in academia (see Tostões et al. 2006). According to Horta (2010: 73), training and mobility policies “led to an increased internationalisation, qualification and rejuvenation of the academic staff in Portuguese universities. This permitted not only the build-up of a distributed research capacity in the higher education system but also reinforced the knowledge capability of long-time national prominent universities”.

The quantitative and qualitative leap of research in Portugal, measured for instance in the growth of international publications, increasingly in co-authorship with researchers from other countries (see Table 7), can also be partially attributed to the influx of human resources trained abroad (Gago 1996: 438; Pereira 2002: 453; Horta 2010: 72).

Table 7. Portuguese scientific production: publications in co-authorship with institutions in other countries

	1981-84	1985-89	1990-94	1995-99	2000-04	2005-09
Publications	1,665	3,418	6,399	13,064	23,881	42,246
Publications in co-authorship	509	1,115	2,570	5,852	11,437	20,126
% co-authorship	30.6	32.6	40.2	44.8	47.9	47.6

Source: Thomson Reuters, *National Citation Report for Portugal*, 1981-2008; OCES 2003; GPEARI 2010: 31.

Even taking into consideration solely the last decade, the growth rate of international publications has been far higher than that of other southern European countries (Table 8).

⁶⁷ For example, ITQB-UNL (António Xavier), IGC (António Coutinho), IBMC (Alexandre Quitanilha), CNC (Arsélio Pato de Carvalho), INESC (José Tribolet).

Table 8. Number of publications per million inhabitants in selected countries

	2000	2009	Growth rate (%)
Portugal	265	703	165
Italy	491	758	54
Spain	512	832	63
France	695	869	25
UK	1,146	1,311	14
Sweden	1,494	1,831	23

Source: Thomson Reuters; Web of Science; GPEARI 2010: 6,8.

But quantitative indicators do not suffice to show the changes in Portuguese science brought about by international mobility. The interviews carried out do show that returnee researchers have played a significant role in transforming the way science is produced and disseminated in Portugal. Firstly, they bring with them valuable knowledge:

Here the science that was being done was quite descriptive, sort of how many birds there are in the Berlengas islands and that it, whereas in England they tested hypothesis (...) The question was, for instance, which percentage of energy a consumer wastes in reproduction and searching for food, and that consumer can be a bird in the Berlengas islands or a grasshopper in Figueira da Foz or a wolf in Trás-os-Montes. And that was very different: to test a hypothesis.

(Full professor, public university, natural sciences, UK PhD)

it's obvious that the contact with researchers from other countries and having been abroad allowed me access to some techniques, some perspectives that possibly I wouldn't have acquired here, perhaps.

(Assistant professor, public university, exact sciences, UK PhD)

However, the question is whether that knowledge has been applied and disseminated in the home country. In most cases, the researchers interviewed went on to have fruitful academic careers. But a few, burdened down by teaching and administrative duties or impaired by a less than welcoming environment in the home institution, gave up on research and concentrated on lecturing. And others, not previously affiliated to any institution, may have left the scientific system altogether.

Perhaps more important than the knowledge that returnee researchers acquired is the network of contacts with researchers and institutions

in the former host country or throughout the world that they may have formed (Ackers 2005: 312; Gill 2005: 319; Mahroum 2000a: 9; Thron & Holm-Nielsen 2006; Van de Sande et al. 2005: 25-28). Since mobile researchers are pulled towards clusters or centres of excellence (Millard 2005), they usually choose host institutions which already have a high level of cultural diversity, in terms of faculty and students nationalities (Mahroum 2000b: 517).

We had Americans, we had French, we had Germans, we had Italians, Canadians, Australians, we had a large team of engineers with similar interests, we were young, this gave me a very large multicultural experience and that was a very enriching experience.

(Professor, polytechnic institute, engineering sciences, Belgian PhD)

This network of contacts can be later activated for the constitution of work teams or the preparation of joint projects:

In these institutions there is a workgroup environment, (...) contacts with the surrounding community are easier, there is always in the group someone who knows someone who can act as reference for an introduction, someone in another country or another workgroup, so it's much easier to build networks than here.

(Assistant professor, public university, engineering sciences, German PhD)

– for the dissemination of tacit or not yet published information:

Going abroad is very enriching to exchange notes with colleagues, to see what our colleagues are doing, why they are doing it. To give an example, we have a project approved for funding by the Foundation of Science and Technology regarding climate change (...) In one of these trips abroad, I sat down at the café table with one of my colleagues – many times it's just as important to sit at the café table as it is to go to the laboratory or to conferences, at the café table we talk about things that have nothing to do with science but we also talk a lot about science - (...) and this colleague is doing something similar and (...) he is a year ahead of us and he gave me some tips on how to approach EDP to ask (...) them to warm the river water (...) he gave me some tips on the kind of experiments we can do (...) and he also got some ideas for some extra experiments.

(Full professor, public university, natural sciences, UK PhD)

– for promoting students or faculty exchanges:

I said to a colleague of mine who is in Germany or Switzerland or Canada “come to Portugal for a week and I’ll pay for your trip and the hotel and the food and you can teach that new technique you’re describing”. And he comes to Portugal and teaches that new technique to my master degree students, in the same week someone comes from Canada, someone from Germany, someone from Spain. And in two weeks my students are exposed to people who are experts in that field of science (...) All these experiences are possible only through contacts. I think that if I hadn’t gone to Sheffield, my first contact abroad, I would hardly have started this internationalisation process.

(Full professor, public university, natural sciences, UK PhD)

– for publication in co-authorship:

one of the good things I brought from Florence were the good friends I made there and that I still keep in my email list because they are scattered around the world but I still contact them frequently (...) in the humble articles I publish, there is always the name of some of my former colleagues at the department because I have this habit of, before sending anything to a journal, to ask three or four of them to read it and criticise it.

(Assistant professor, public university, social sciences, Italian PhD)

However, this requires that the returnee researchers maintain some form of contact with former colleagues or professors. And according to the interviews, this is not always the case. Connections can be lost over time or due to the volatility of professional paths in research (international, intersectoral or internal mobility, changes in research interests) or to institutional change.

My contacts are almost reduced to zero. One of the places I used to go to was the group of my former PhD supervisor, but he retired (...) I also used to go to Swansea (...) there was a gentleman with whom I collaborated, who was younger than me, but they were going to shut down the department (I don’t know if they did it already) and he was thinking of early retirement.

(Assistant professor, public university, exact sciences, UK PhD)

Academics that become less involved in research also tend to lose touch with former colleagues

[Contacts with the host institution in the US] were gradually lost (...) Not even informally, because I haven’t been there for a while and sending an

email wishing a merry Christmas is not really my style.

(Assistant professor, public university, natural sciences, US PhD)

On the other hand, international connections can be formed through other means (attending conferences, taking part in meetings and events, writing emails) and with people without previous face-to-face contact.

After all these years and since I changed my subject a bit (...) I had to establish contact with new teams, who had nothing to do with the [former host institution in France] team, not even the subject. Currently I'm working on forest disease so I ended up making contacts with other specialised laboratories and I have privileged contacts with some laboratories in South Africa, with teams that are currently more advanced, and Australia.

(Senior researcher, state laboratory, natural sciences, French PhD)

Nevertheless, working or studying abroad may have fostered the inclination and the aptitudes for international collaboration, as well as the development of other needed skills, such as the use of the English language:

The effortlessness of working in English – for me, that has opened many doors in terms of international collaboration.

(Researcher on a 5-year contract, university research centre, exact sciences, Irish PhD)

This, in turn, has also increased the ability of transferring knowledge abroad, namely thorough the publication in international journals

It has the advantage of the English language, of learning a little more, which then is important for studying, for writing articles and for publishing (...) to be knowledgeable in English is very useful, it's much easier to read and write, especially for publishing in foreign journals.

(Researcher on a 5-year contract, state laboratory, engineering sciences, UK PhD)

As regards participation in international associations, most (but not all) of the returnee researchers interviewed claim to be members, but that is not necessarily a consequence of having had an experience of international mobility.

I became a member when I came to Portugal, after starting my professional activity. (...) It serves several purposes, it serves the purpose of be-

longing to a club of people who are interested in the same subjects and that exchange information among them, it serves the purpose of gaining access to journals, to research projects, to scientific meetings where issues of interest are discussed. In this sense, it is useful for circulating ideas and opportunities, for being aware of opportunities.

(Researcher, non-profit research centre, health sciences,
Swedish PhD)

But not only returnee researchers have an impact on the Portuguese S&T system. Expatriate researchers can also help internationalise and develop Portuguese science. According to the survey mentioned above on Portuguese researchers abroad, the majority of them maintain contacts with the Portuguese S&T system.⁶⁸ Informal contacts with professors or colleagues were by far the most frequent (85%), followed by other types of practice that signify accompanying Portuguese science “at a distance”: reading scientific papers published in Portugal or by Portuguese authors (56%), attending scientific conferences in Portugal (50%). Less frequent is the active participation in research and educational activities in Portugal: writing in co-authorship with Portuguese scientists (30%), taking part in joint research projects (27%), teaching (21%), doing fieldwork in Portugal (15%).

Senior researchers also carry out other activities, such as promoting student or researcher exchanges (30%), taking part in advisory or evaluation boards of journals, research centres or funding bodies (17%), participating in thesis committees (16%), and co-supervising graduate students in Portugal (15%). Their familiarity with the language and the scientific system is an advantage, alongside their independence from Portuguese institutions: in recent years, the Portuguese government has in some cases resorted to expatriate scientists to perform international evaluations of research centres⁶⁹ and to act as mediators in the agreements with North American universities (see above)⁷⁰.

These senior researchers are usually well integrated in the host country, both professionally and personally, and are hardly susceptible to be

⁶⁸ For more detailed analysis of this issue see Delicado (2009).

⁶⁹ See, for instance, the evaluation of research units in 2007: 7 out of the 23 disciplinary panels had expatriate Portuguese researchers as members (FCT n.d., c).

⁷⁰ José Moura, professor at Carnegie Mellon University and director of the Information and Communication Technologies Institute (ICTI), now manages the CMU-Portugal Programme.

enticed back into the Portuguese scientific system. However, their skills and professional connections can be harnessed in favour of the home country, as partners in transnational research projects, as external advisors and reviewers, as nodal points in networks for circulating knowledge, technology and people (students, visiting researchers), thus constituting “diaspora networks” (Brown 2000; Meyer & Brown 1999; Ferro 2004: 388; Meyer et al. 2001: 353; Meyer & Wattiaux 2006; Mahroum et al. 2006: 29). These allow “the exploitation not only of embodied knowledge, but also their wide socio-professional networks, as well as the associated human, material and cognitive resources” (Meyer et al. 2001: 352).

Concluding remarks

This chapter has sought to demonstrate that the scientific mobility of Portuguese researchers has played a significant role in the growth and internationalisation of the national S&T system and, in turn, in the path towards transforming Portugal into a knowledge society.

Although dealt with separately in subsequent sections of this chapter, policy, trends and impacts are closely intertwined. Government measures fostered the outbound mobility of academics, but in turn also responded to the challenges and constraints created by the migration flows, namely by facilitating the return of expatriates in order to prevent “brain drain”. The impact of mobility over the S&T system has had consequences also over mobility flows: a growing number of aspiring scientists no longer need to exit the country in search of quality advanced training but, if they wish to do so, senior expatriate and returnee researchers can act as “bridges” to prestigious institutions abroad.

Returnee researchers play an important role in the circulation of scientific knowledge not only between home and former host countries, but also with other institutions and peers throughout the world. Mobility seems to stimulate the propensity for international communication and collaboration. However, maintaining links abroad requires an ongoing effort, since over time connections can be lost. This strongly depends on the conditions returnee scientists encounter at home for pursuing scientific activities. Academics no longer active in research have little use for and few contributions to give to the exchange of knowledge. Therefore it is still crucial to continue promoting policies that fos-

ter both mobility and the development and smooth functioning of the science system at home.

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