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of Doctorate Recipients
in OECD Countries

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**AVAILABILITY AND CHARACTERISTICS OF SURVEYS ON THE DESTINATION OF
DOCTORATE RECIPIENTS IN OECD COUNTRIES
(STI WORKING PAPER 2003/9)**

Statistical Analysis of Science, Technology and Industry

Isabelle Recotillet

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AVAILABILITY AND CHARACTERISTICS OF SURVEYS ON THE DESTINATION OF DOCTORATE RECIPIENTS IN OECD COUNTRIES

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Abstract

As far as we know, there is no study that identifies databases relating to the destination of doctorate recipients, including at international level. Young scientists unquestionably play an important role in research and innovation. Consequently, it is necessary to develop statistical sources to find out about the destinations of doctorate recipients. Such information is extremely valuable to the authorities for framing research and innovation policies.

This study has two objectives: first, to review existing statistical sources in the OECD countries, and to discuss their comparability. All told, 21 countries replied to the questionnaire on the existence of such databases, representing 25 data sources available for analysis. The analysis focused on the main aspects of the labour market for young researchers: the existence of queues for academic posts with, correlatively, post-doctoral training, relations between public research systems and industrial research, and, lastly, international flows of intellectual resources. By and the large, the diversity of methods of data collection hinders international comparability, and calls into question the accuracy of the description of career paths. Longitudinal data sources provide the most significant information, making it possible better to understand the way the labour market works for doctorate recipients. Because these data have a temporal dimension, they can help to address concerns about the destination of doctorate recipients. They make it possible to describe the queuing that exists for academic posts and to measure the effect of post-doctorates on careers, to measure the impact of transfers between the academic world and industry on the employment of young researchers and, lastly, to circumscribe more precisely the effect of international mobility.

Nonetheless, comparison of these data sources remains difficult if only because in the data bases surveyed, the observation periods differ and the questionnaires are sometimes not very comparable. To improve international comparisons of the professional destinations of young researchers, the efforts of those producing the data need to be co-ordinated. Compiling a core of common questions would be a step forward. The study concludes by proposing a number of improvements to existing methods of data collection which would maket it possible to fill, at least partially, the gaps identified in the data sources available.

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Introduction

Human resources in science and technology include a particular category of population which produces and circulates knowledge: recent doctorate recipients. Doctorate recipients produce knowledge during their doctoral training, in the form of scientific articles, industrial cooperation, patents, etc., and circulate it mainly after they have been awarded their doctorate, through professional mobility, industrial cooperation, the production of scientific outputs, post-doctoral training programmes in other laboratories, etc. Because of the role played by doctorate recipients in research and innovation, statistical resources need to be applied to finding out about their destinations, a matter of vital interest to the public authorities as regards the management of research and innovation policy (Auriol, 2002a).

The shortage of scientists in certain fields and the unattractiveness of academic careers raise a question mark over the future of public research systems. It is therefore essential to know and understand how recent doctorate recipients embark on their careers, especially as they tend to be attracted by private-sector R&D jobs in fields like medicine and engineering. In response to these structural changes on increasingly knowledge-based job markets, wholesale reforms of the higher education system in general, and of doctoral courses in particular, have been carried out or are in progress, with the political goal of producing young scientists who can have careers as researchers or engineers in the private sector or academic careers in public research systems (Auriol, 2002a; Verdier, 2001).

The marked tendency in industrialised countries for doctorate recipients to move into the private sector (in certain scientific disciplines such as engineering sciences) poses the problem for public research systems of recruiting new staff for public research organisations, against the background of a greying scientific population.

At a time when research and innovation policies seek to encourage exchanges between science and industry, the question of the skills of recent doctorate recipients needs to be addressed. Are doctorate recipients trained with that in mind? This path is echoed in the links established between research, innovation and higher education policies (Ezkovitz and Leydesdorf, 2000).

Through the economic and statistical analyses conducted in the various OECD countries, three issues may be identified relating to the labour market for young scientists. In order to analyse them, national statistical sources need to be harmonised so as to meet the needs of international comparison. The three issues are:

- The existence of a queue for entry-level academic positions (France, Belgium, United States, Germany, etc.) and the possibility of professional down-grading that might result.
- Transfers between academic science and industry.
- The international circulation of intellectual resources.

A rigorous definition of research and development activities is needed in order to measure the difficulties experienced by doctorate recipients entering the labour market. The subject has been much studied and the work on the Canberra Manual is regarded as a reference in the field. However, difficulties remain with regard to the classification of certain professions (Auriol, 2002a and 2002b; see also Quebec's work on the feasibility of adapting the ISQ 2002 method) and, as we shall see in this report, the question of professions and nomenclatures continues to prove contentious when seeking to advance the comparability of data sources. It is in recent doctorate recipients' first occupations, and not just their very first, that the labour market transmits the image of its own workings. The findings have different origins but the same

consequences: doctorate recipients switch between several occupations before settling into stable employment. Statistical sources must encompass initial professional experience, a point that we believe should be underlined.

The development of industrial cooperation between science and industry is a central concern of research policy (Laredo and Mustar, 2001; Verdier, 2001; Lanciano and Nohara, 2002, etc.). Are internationally available statistical sources capable of perceiving these transformations and quantifying them in different countries? Can the participation of doctorate recipients in scientific production be measured, in terms of articles, patents, spin-offs, etc.? How does this participation tie in with their future on the labour market?

International mobility is at the centre of much economic and political debate. From a standpoint of “who trains for who”, each country worries about a possible brain drain to other countries. On this vital issue where research and innovation are concerned, studies seem to point to an international circulation of intellectual resources (Auriol, 2002a) rather than any real brain drain (OECD, 2001). Again, the question arises of how surveys of doctorate recipients can address this concern through their survey methodology and the formulation of their questionnaire.

This report sets out to review existing statistical resources relating to the destination of recent doctorate recipients, thanks to the commitment and active participation of the members of the Working Party of NESTI (National Experts on Science and Technology Indicators, OECD), who have completed a questionnaire on the state of statistical sources in their country (Annex 1). The situation that prompted the research was the lack of expertise relating to existing data among doctorate recipients. The importance of being able to compare statistical data on this issue is self-evident. We shall see in this report how difficult it is to apply a comparative approach, and how necessary it is to achieve coordination. Should surveys be coordinated at international level in order to answer the questions raised in the three areas listed above? We shall advance arguments in support of that idea in the final section of the report.

Before that, we shall describe the choices made with regard to data collection (Section 1) which are considered in detail in Annex 2. A summary of the statistical sources made available to us is given in Section 2, comparability is discussed in Section 3, and various options for adjusting existing surveys are considered in Section 4.

1. Collection of information from surveys of doctorate recipients

As far as we know, there is no study that identifies databases relating to the destinations of doctorate recipients, including at international level. Consequently, the first step was to find out whether such databases exist in other countries and subsequently to assess the degree of comparability between them. For that purpose, each national delegate in the NESTI Working Party was sent a questionnaire designed to elicit the desired information (the questionnaire may be found in Annex 1).

Each statistical survey has its own specific features, apart from the methodology used. The questions put (or not put) reflect what the authorities commissioning the survey wish to find out. As regards specifically labour market matters, the mere fact of asking a type of question that has to be answered in a certain way highlights the difficulties that individuals may encounter on these markets. For example, questions that focus on job insecurity mean that answers along those lines are expected even before any information has been collected. Consequently, asking survey managers about the information contained in the questionnaires is in itself a rich source of information that can be explored in order to gain an understanding of the labour market of the country in question. Of course, this information is further enhanced when matched against the results of the surveys, and we shall try to establish the link between the two in Section 3.

The same rationale may be applied to the construction of the questionnaire (Annex 1) which is the principal source of our information. It is because we suspected that labour markets for doctorate holders had their own peculiar structures that we sought to discover the general conditions of doctoral study and the modalities, especially time-related, of access to employment. The survey methodology is in itself enlightening in this regard, as we have already emphasised in an article on the comparison of surveys of doctorate recipients (Recotillet, 2002).

The choice of the point in time in the early career of doctorate recipients when the survey is carried out gives a clear indication as to the organisation of national labour markets. Choosing to seek the information in the year following award of the doctorate, for example, implicitly supposes that the transition period between study and work has come to an end. As well as the observation period, the type of data and survey (snapshot or longitudinal, census or administrative data) partly determine the precision of the information on the destination of recent doctorate recipients that may be collected. Snapshot data in particular do not necessarily reflect the types of mobility that recent doctorate recipients may experience immediately after completing their thesis (jobs on research contracts, for example, before gaining access to more stable employment). Clearly, the question of tenure is important here. On the French labour market, for example, competitive selection for academic positions is an important structural factor influencing entry into working life. The American system is also instructive from this standpoint, since a sometimes extended professional career is required before obtaining a tenured position and the current trend is towards recruiting professors for temporary positions (NSF, 2002). The recruitment difficulties experienced by UK academic institutions in certain fields, and the anticipated difficulties over the next ten years, raise the question of the career prospects of young scientists. The possibility for computer scientists and engineering researchers to earn high salaries in the private sector is one of the factors that make it difficult to recruit academic staff (Thewlis, 2001).

Broadly speaking, the comparison of national data is made difficult when the only available information concerns the point of arrival, *i.e.* the doctorate recipient's professional situation at the time of the survey. As a result, comparing the modalities of access to that professional situation becomes an awkward, if not downright impossible exercise. The existence of post-doctoral training is a striking example. Although it is frequent in many countries, research on the subject is sporadic: do the survey data include information about post-doctoral training (description, location, in another country, in a research organisation or private company, etc.)? Two questions have been included in the questionnaire, designed to elicit information about post-doctoral training, how it is defined, and where it is carried out (abroad or not).

It is for that reason in particular that we considered questions about employment to be crucial. Consequently, questions about past employment and employment at the time of interview were asked for. They were based on standard criteria for measuring the quality of employment: occupation (details about the nomenclature used), type of contract, duration (or length of service, for a current occupation), salary, sector (and nomenclature used), and location (abroad or not).

The first step in being able to compare doctorate recipients' access to employment is to understand the conditions in which doctoral research is performed, in particular through the funding on offer. Career outlines being to emerge according to the type of funding for doctoral research. Doctorate recipients who have obtained funding from private sector companies (as is the case with CIFRE¹ scholarships in France or the Non-Federal Support system in the United States) are more likely to go into private research than seek an academic career. More broadly, as of post-graduate level, it is one of the forms of hybridisation between research and industry that begins to emerge. For institutions that use research to fund courses, a statistical survey of the destination of their beneficiaries is of immediate interest in terms of evaluating the expense incurred and the overall effectiveness of this type of training. Therefore, we considered that the existence

1. CIFRE: *Convention industrielle pour la formation et la recherche en entreprise.*

of funding for doctoral research and the type of funding was an important point to cover in surveys of doctorate recipients.

Twenty of the 30 OECD countries replied to the questionnaire, plus one non-member country that is an observer. Respondents were able to submit several responses if there were several national surveys that included questions on recent doctorate recipients. Conversely, in some countries there were no surveys that provided information on the destination of doctorate recipients.

The respondent countries were:

Australia, Belgium, Canada, Denmark, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Japan, Mexico, the Netherlands, Norway, Portugal, the Slovak Republic, Sweden, Switzerland, the United Kingdom, the United States.

Altogether, this report explores 25 surveys from which it is possible to gain a picture of the entry of doctorate recipients into the labour market.

2. Surveys of doctorate recipients in 16 OECD countries: tables summarising their main features

This section describes the various surveys of destinations of doctorate recipients we identified. The comparative aspect will be dealt with in the following section, although some points of comparison can already be established.

General characteristics of statistical surveys of doctorate recipients

Tables 1 to 5 contain summary information describing the surveys of doctorate recipients carried out in the OECD countries that responded to the survey (summary of Annex 2).

Of the countries that filled out the questionnaire, a minority has no surveys of doctorate recipients (Netherlands, Iceland², Mexico and Slovakia) and a similar number has only administrative data mainly derived from census (Denmark, Finland, Japan, Norway, and Sweden), although Denmark and Sweden carry out other types of graduate survey. In Denmark, a specific survey of doctorate recipients is carried out, but it relates only to doctorate recipients in the life and natural sciences. In Sweden, the *Entrance to the Labour Market* survey carried out by Statistics Sweden provides information on the entry into the labour market of graduates in a given year, but the information on their professional situation is crude in relation to other surveys in other countries. The same applies to the data assembled by NIFU (Norway) from a register of administrative data: covering the population of doctorate recipients with a job in a university or research institute (public or private), it is relatively uninformative about their professional situation. Finland also has data from administrative registers but we do not have enough details to include them in the analysis. A specific survey of doctorate recipients is also being conducted by the Finnish Academy but the findings will be available only later.

A larger proportion of surveys are snapshots, and there are considerable variations in the information they collect. Snapshot surveys are carried out in Australia (household surveys: SETIT, SEW; graduate survey: GDS), Portugal (*Professional Situation of ex-PhD Grant Holders Survey*), the United Kingdom (*First Destination Survey*), United States (SED), Sweden (*Entrance to the Labour Market*), Ireland (*First Destination of Award Recipients in Higher Education*) and Israel (*Recipients of Degrees from*

2. Iceland is a special case, given its demography, and post-graduates often do their doctorate in other countries.

Universities). The first element likely to differentiate snapshot surveys is the time that elapses between award of the doctorate and conduct of the survey. The gathering of information about professional situation is the second element, to which we will return in greater detail.

In the Australian population surveys, SETIT and SEW, the date of award of the diploma (in this case the doctorate) is not requested (see Table 3). Consequently, it is not possible to identify the cohorts of recent doctorate recipients entering the labour market, though age is a way of partly getting round that problem. The Portuguese survey, carried out in December 2001, questioned those awarded doctorates in 2000-2001, and therefore measures entry into working life a few months after award of the doctorate. The same applies to the UK's *First Destination Survey*, which questions doctorate recipients from a given year in January of the following year. Ireland's *First Destination of Award Recipients in Higher Education* survey is similar in structure to the UK's FDS. In the US SESTAT system (Scientists and Engineers Statistical Data System, steered by the National Scientific Foundation), one of the three surveys, the *Survey of Earned Doctorates* (SED), is a government steering tool that measures the number of doctorate recipients each year and is used to feed the enquiry base of another survey, the *Survey of Doctorate Recipients* (SDR), a longitudinal survey that tracks doctorate recipients on the labour market for two years after award of their doctorate. Thus, the SED aims to measure the flow of doctorates delivered and not the labour-market effectiveness of the training. In the same spirit, the Israeli government conducts an annual survey of doctorate recipients but does not collect information about their destination.

There are numerous longitudinal surveys, mostly retrospective though sometimes panel-based (Canada, for example). They are: *Employment of PhDs of the University of Roma* (Italy), *PhDs in Natural Science* (Denmark), *Enquête sur les études doctorales, Enquête enseignement supérieur 1997 et 1999, Enquête Génération 98* (France), *National Graduates Survey* (Canada), *Enquête auprès des docteurs diplômés* (Belgium), *Opportunities of Doctorate Recipients on the Labour Market* (Hungary), *Survey of Doctorate Recipients* (United States), *Brain Drain - Brain Gain* (Germany), *Enquête auprès des nouveaux diplômés* (Switzerland). Most of these surveys provide information about the professional situation of doctorate recipients two to three years after they received their doctorate. However, the Danish survey covers the recipients of natural science doctorates between 1990 and 1999 (questioned in 2000), the Belgian survey covers doctorate recipients in 1987, 1991 and 1995 (questioned in 2000), and the Hungarian survey covers doctorate recipients between 1990 and 2001. The data therefore span different lengths of time spent on the labour market, since several cohorts of labour market entrants are questioned. The Canadian survey differs from the others because an initial survey is carried out two years after receipt of the doctorate and a second round three years later (ie, five years after receipt of the doctorate). Somewhat similarly, the Swiss survey questions doctorate recipients one year and four years after they receive their doctorates. For the other surveys, the observation period varies between two and three years: *Employment of PhDs of the University of Roma* (3 years), *Enquête sur les études doctorales* (two years), *Enquête enseignement supérieur 1997 et 1999, Enquête Génération 98* (three years), *Survey on Doctoral Recipients* (two years), *Brain Drain - Brain Gain* (three years).

Overall, many surveys seem to give a very full description of the professional situation of doctorate recipients. However, differences appear from one survey to another, especially the closer one looks at international professional mobility (last column of Table 1). It is possible from Table 1 to identify those surveys which collect rich data on the professional situation of doctorate recipients (description of current occupation and previous occupation or occupations) and those which collect little data (only the occupation at the time of interview) or none at all. Two surveys make no measurement at all of doctorate recipients' first employment: Israel's *Recipients of Degrees from Universities* and the administrative data taken from Sweden's Register of Education. As a result, they were eliminated from the comparability analysis (Section 3).

Of the 25 data sources included in the analysis, two do not contain questions on the labour market, nine produce scant data on the professional situation after award of the doctorate and the other fourteen are constructed so as to establish a link between doctorates and their suitability for the labour market.

Administrative data sources (Denmark, *Integrated Database on the Labour Market*; Norway, *Doctoral Degree Register*; Japan, *Basic Survey on Schools*) are among those that provide the least comprehensive description of the labour market for doctorate recipients. However, administrative data turn out to be a useful source of information for measuring the stock of human resources in science and technology (HRST), not least because single identification numbers in the Nordic countries make it possible to centralise information (Ekeland, 2001). In contrast, this is not the most suitable type of data source if the aim is to compare doctoral training with its results on the labour market.

Longitudinal surveys, whether panel or retrospective, are without exception the data sources that provide the most information about the situation of doctorate recipients on the labour market. This is of course related to the very structure of the data. In fact, we can already assert that longitudinal data sources are a highly appropriate tool for the conduct of research and innovation policies and for steering higher education flows. We shall come back to this point in greater detail in Section 3, in which we shall try to make comparisons between the various surveys available to us. However, differences remain as to the type of information collected and details concerning the professional mobility of doctorate recipients (see Table 4 and Table 5).

Cross-sectional surveys give an equally non-diversified picture, since six of the seven cross-sectional data sources describe doctorate recipients' most recent professional situation. For example, although the Australian population surveys, SETIT and SEW, include questions on past employment, they give only the profession and salary; and while the *Graduate Destination Survey* provides more details, in particular on post-doctoral training (abroad or not), it gives only a brief description of the occupation held at the time of interview (length of service, profession, salary). The intention of the British, Irish and Israeli surveys, for example, is clearly to measure the flow of doctorate recipients rather than to consider their destination. Consequently, these data sources are limited with regard to analysis of the issues we described in the introduction, namely measuring the queue for access to certain occupations, relations between academic and industrial activities, and the international circulation of intellectual resources.

However, certain snapshot data sources, by describing the position held at the time of interview, question doctorate recipients who have moved from one country to another. Given that that is so, how do existing data sources deal with the question of the circulation of intellectual resources? Our argument is based on two types of information: the scope of the survey (does it include foreign doctorate recipients or not) and the description of the occupation when a recent doctorate recipient has moved from one country to another. The German *Brain Drain – Brain Gain* survey (2002) represents a significant step forward in the search for the determining factors and effects of the international mobility of highly qualified persons. The survey covers three types of population: German graduates working in foreign countries, foreign graduates employed in German universities and research institutes, and foreign staff employed in German companies, all having an educational level at least equal to ISCED 5. This data source therefore makes it possible to measure mobility between German research organisations (public and private) and those in other countries. The population covered differs significantly from the type of population frequently covered by the other identified data sources (doctorate recipients from a given year). In contrast, the surveys carried out by CEREQ³ (France) exclude foreign graduates from the scope of the sample. It is not possible from this data to measure the resulting circulation of intellectual resources, in the sense of a return to the country of origin (or a move to another country), *i.e.* the “brain gain” effect. Likewise, it was not until recently that CEREQ questioned doctorate recipients residing in a foreign country at the time of the survey and those who had

3. Higher education surveys, Génération 98.

been employed in another country but had returned to France by the time of the survey, thus giving an initial measurement of the brain drain^{4,5}. NSF surveys in the United States exclude doctorate recipients employed abroad, since the SDR survey extends to all doctorate recipients who have been awarded a doctorate by an American institution and are on American territory when the questionnaires are sent out.

Some snapshot surveys produce information about the place of employment after receipt of the doctorate (abroad or not, with country code in some cases). That being said, the closer the survey date is to the doctorate award date, the more the brain-drain rate that can be calculated from the information will be biased by the existence of numerous post-doctoral training programmes in foreign countries. It may be supposed that a substantial proportion of doctorate recipients who have done post-doctoral work in a foreign country will seek subsequently to return to their country of origin⁶. From this standpoint, longitudinal surveys may help to circumvent the problem. Moreover, four of the longitudinal surveys – *Génération 98* (France), *Brain Drain - Brain Gain* (Germany), *Professional Situation of Ex-PhD Grant Holders* (Portugal) and *Enquête auprès des nouveaux diplômés* (Switzerland) describe past occupations and current position including those held in a foreign country. The other longitudinal surveys include employment in a foreign country only if it is the position held at the time of survey. They are no different from snapshot surveys on this point, except that the lapse of time between receipt of the doctorate and the survey is longer, and that consequently the calculation of a brain-drain rate is on a more secure foundation.

Apart from the data mentioned earlier, administrative or census data sources do not appear to provide the right statistical framework for measuring international mobility. None of the administrative sources in Denmark (IDA), Norway (*Doctoral Degree Register*), Japan (*Basic Survey on Schools*) or Sweden (*Swedish Register of Education*) collect information on the geographical location of the occupation (in a foreign country or not).

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4. Nevertheless, questioning doctorate recipients in foreign countries is no easy matter; the fact that they are more difficult to locate inevitably introduces a sample bias. Lack of manpower is another factor that curbs analysis of such mobility.
 5. Results on this topic may be found in Béret, Giret et Recotillet (2002).
 6. By extrapolation, we may take for example the rate of return to country of origin after the doctorate. The NSF (2002a) found that most foreign doctorate recipients trained in the UK returned to their country of origin after completing their doctorate (source: FDS Survey), whereas for France the rates are much lower, around 20% for natural sciences and 28% for engineering sciences (source: Ministère de l'Education Nationale).

Table 1. Surveys of doctorate recipients in OECD countries and Israel: summary of main characteristics

Country	Name of survey	Type of survey	Population covered	Date of most recent available survey round	Collection of information on professional situation after completing doctorate ⁷	Collection of information on professional situation abroad
Australia	SETIT	Snapshot	Persons aged 15 to 64 living in private accommodation	2001	▼ ⁸	≡
	SEW	Snapshot	Persons aged 15 to 64 living in private accommodation	2002	▼	≡
	GDS	Snapshot	University graduates in the previous 12 months	2001	▼	Post-doctoral training and employment abroad
Belgium	Enquête auprès des docteurs diplômés	Longitudinal retrospective	Doctorate recipients in 1987, 1991 and 1995	2000	▲	≡
Canada	National Graduates Survey	Longitudinal retrospective, panel at 2 and 5 years	Doctorate recipients questioned 2 and 5 years after diploma award	2000	▲	Current employment abroad
Denmark	IDA	Administrative data	Pop. 15 to 64 years	2000	▼	≡
	PhDs in Natural Science	Longitudinal retrospective	Doctorate recipients between 1990 and 1999	2000	▲	Current employment abroad
Finland	Statistics Finland Register	-	-	-	-	-
France	Enquête sur les études doctorales	Longitudinal since 2002	Doctorate recipients in 1999-2000	2002	▲	Post-doctoral training and employment abroad
	S97	Longitudinal retrospective	Doctorate recipients in 1994	Carried out in 1997	▲	≡
	S99	Longitudinal retrospective	Doctorate recipients in 1996	Carried out in 1999	▲	Current employment abroad
	G98	Longitudinal retrospective	Doctorate recipients finishing their studies with or without a diploma in 1998	Carried out in 2001	▲	Description of all occupations, including those abroad, in 1998 and 2001

7. ▼ some information on professional situation is collected / ▲ wealth of information on professional situation after doctorate / ≡ no information on professional situation is collected

8. From the information available to us, we were not able to evaluate the possibility of identifying doctoral diplomas in the data. Moreover, the date of (final) diploma award is not requested.

Country	Name of survey	Type of survey	Population covered	Date of most recent available survey round	Collection of information on professional situation after completing doctorate ⁷	Collection of information on professional situation abroad
Germany	Brain Drain – Brain Gain Survey on International Job Careers	Longitudinal retrospective	- German graduates (ISCED 5 or more) employed abroad - foreign graduates (ISCED 5 or more) employed in universities or research institutes in Germany - foreign graduates (ISCED 5 or more) employed in companies in Germany	2002	▲	▲ (description of past and current employment abroad)
Hungary	Opportunities of Doctorate Recipients on the Labour Market	Longitudinal retrospective	Doctorate recipients between 1990 and 2002	2002	▲	▲
Iceland	No survey of doctorate recipients					
Ireland	First Destination of Award Recipients in Higher Education	Snapshot	Award recipients in higher education in the year in question	2001	▼	▼ (current employment abroad)
Israel	Recipients of Degrees from Universities	-	Doctorate recipients from a given year	-	▬	▬
Italy	Employment of PhDs of the University of Roma	Longitudinal retrospective	Doctorate recipients of 3 years standing (1995)	Carried out in 1998	▲	▬
Japan	Basic Survey on Schools	Census data	Universities offering doctorates	2002	▼	▬
Mexico	No survey of doctorate recipients					
Netherlands	No survey of doctorate recipients					
Norway	Doctoral Degree Register	Administrative data	Doctorate recipients employed at a university or in a research institute (public or private)	2001	▼	▬

Country	Name of survey	Type of survey	Population covered	Date of most recent available survey round	Collection of information on professional situation after completing doctorate ⁷	Collection of information on professional situation abroad
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	Snapshot	Doctorate recipients funded by the Ministry of Science and Higher Education	2001	▲	▲ (past and current employment abroad)
Slovakia	No survey of doctorate recipients					
Sweden	Swedish Register of Education	Administrative data	Swedish population aged 16 to 74	-	▬	▬
	The Entrance to the Labour Market	Snapshot	University graduates in 1998-1999	2000	▼	▬
Switzerland	Enquête auprès des nouveaux diplômés	Longitudinal (panel)	Recent graduates from higher education institutes (universities and specialist institutes)	2001	▲	Description of all employment including in foreign countries
United Kingdom	First Destination Survey	Snapshot	Doctorate recipients from a given year	2002	▼	▼ (current employment abroad)
United States	SED	Snapshot	Doctorate recipients in the 12 months to June of the survey year	2001	▲	▬
	SDR	Longitudinal	Doctorate recipients aged under 76	2001	▲	▬

Information collected on individual characteristics and thesis conditions

Broadly speaking, all the identified data sources provide the same information on individual characteristics, age, title of diploma and discipline (Table 2). In contrast, the classifications for the field of study are generally national; for the purposes of international comparison, concordance tables would have been drawn up between these classifications and CITE (which distinguishes 21 main fields of study in addition to educational levels). Five of these fields of study (natural sciences, engineering and technology, medical sciences, agricultural sciences, social sciences) fall within the scope of core coverage and two (humanities and other fields) within that of extended coverage. For comparison purposes, it would be necessary to check, in each domestic classification, that the core coverage corresponds to the Canberra Manual recommendation, or at least that the information is sufficient to select doctorate recipients according to these regroupings of fields of study.

Information about nationality is not systematically sought in the surveys, a point that we made earlier, this being probably due to the scope of the data (13 data sources out of 25 ask for information about nationality). Likewise, information about the country of birth is sought in only 12 data sources out of 25. Beyond that, the question posed is that of measuring international mobility and the choice of criteria. For

example, if international mobility were to be defined according to the nationality of survey respondents, the existing data sources do not seem well-suited to validating this criterion.

The conclusions that may be drawn from summary tables of the surveys (Table 3) based on examination of information gathered on the general conditions of the thesis are as follows:

- Scant information on the duration and funding of doctoral research.
- Little information collected on post-doctoral training, especially abroad.

In fact, the first conclusion should be put in context, because for the most part it is only surveys not designed to analyse the labour market for recent doctorate recipients that lack information on the funding of doctoral research. There are four exceptions: the data for France (G98, CEREQ⁹), Hungary (*Opportunities of Doctorate Recipients on the Labour Market*), Israel (*Recipients of Degrees from Universities*) and Ireland (*First Destination of Award Recipients in Higher Education*). The inclusion of Irish case is due merely to the fact that it is not possible, in principle, to identify doctorate recipients in the survey since the information is aggregated at Higher Degree level, including both Masters and PhDs.¹⁰

At least two reasons may be advanced to support the collection of information on the conditions of research. The first concerns public decision-takers above all, since the evaluation of publicly funded training courses funded is in itself an objective for measuring the efficiency of the training. Second, some research using French data has shown the impact of the conditions of research on the quality of doctorate recipients' entry into working life (Robin and Cahuzac, 2001). More specifically, cooperation between the spheres of academic research and industry is likely to engender recruitment in the private sector (Perret, 2002) and encourage innovation in industry (Cohen and Levinthal, 1989; Beltramo, Paul and Perret, 2001), or quite simply the valorisation of research through patents, for example. In addition, many countries' research and innovation policies tend to amplify hybridisation between higher education, research and industry (Laredo and Mustar, 2001 and 2002).

One of the changes attributable to the organisation of research is the spread of post-doctoral programmes (Marie Curie scholarships in Europe, etc.). Situated between doctoral research and employment, they are often ill-defined and cover a variety of professional situations. In our survey of statistical data on the destination of doctorate recipients, we have sought to find out, first, whether the statistical surveys included post-doctoral training in the description of early careers and, if so, what definition was used. In fact, no very precise definition is really given with regard to post-doctorates. Moreover, the description of post-doctoral training is often brief in the extreme, reduced to a simple: "post-doctoral training: yes/no".

However, the majority of surveys specifically of doctorate recipients (or at least of higher education award holders in which doctorate recipients are identified) include a question on post-doctoral training (12 data sources out of 25 in all, or out of 21 if we include only surveys of doctorate recipients). Some of them have restrictions, like the Portuguese survey, which only counts post-doctoral programmes that receive a certain form of public funding, or are more detailed, like the French survey of doctoral studies which asks about the length of the post-doctoral programme. Several surveys do not ask doctorate

9. The other two CEREQ surveys used to collect much more detailed information on the conditions of doctoral research, including the place where research was done (university, firm, home, etc.) and cooperation with private companies during the doctorate, in addition to funding.

10. It is not hard to imagine that if doctorates cannot be identified, specific questions about doctorates cannot be asked. This deserves consideration, in particular with a view to options for improving the comparability of statistical data at international level.

recipients about post-doctoral work. They are: *Génération 98* (France), *First Destination of Award Recipients in Higher Education* (Ireland), *Employment of PhDs of the University of Roma* (Italy), *Doctoral Degree Register*¹¹ (Norway), *Enquête auprès des docteurs diplômés* (Belgium), *First Destination Survey* (United Kingdom), *The Entrance to the Labour Market* (Sweden). There is clearly a lack of information on this particular aspect of researchers' careers in the light of the data collected on post-doctorates.

This remark is all the more true with regard to post-doctoral training abroad. Although it is a central concern of research policy, especially in Europe where there is a real fear that the best brains will head for the United States as soon as they finish their doctorate, statistical surveys are ill-equipped to provide evidence to inform the debate. Only eight of the identified surveys included a question about post-doctoral work abroad, asking for information on the destination country.

11. As the *Doctoral Degree Register* covers doctorate recipients employed in universities and research institutes (public or private), the post-doctoral situation is not relevant.

Table 2. Surveys of doctorate recipients in 16 OECD countries and Israel: summary of the main variables in the different questionnaires

Country	Name of survey	Age	Nationality	Country of birth	Title of diploma	Field of study
Australia	SETIT	✓	-	✓	✓	✓
	SEW	✓	-	✓	✓	✓
	GDS	✓	✓	✓	✓	✓
Belgium	Enquête auprès des docteurs diplômés	✓	-	-	✓	✓
Canada	NGS	✓	-	-	✓	✓
Denmark	IDA	✓	✓	✓	-	✓
	PhDs in Natural Science	✓	✓	-	✓	✓
France	Enquête sur les études doctorales	✓	✓	-	✓	✓
	S97	✓	-	✓	✓ ¹²	✓
	S99	✓	-	✓	✓	✓
	G98	✓	✓	✓	✓	✓
Germany	Brain Drain – Brain Gain Survey on International Job Careers	✓	✓	✓	✓	✓
Hungary	Opportunities of Doctorate Recipients on the Labour Market	✓	✓	-	✓	✓
Ireland	First Destination of Award Recipients in Higher Education	-	-	-	✓	✓
Israel	Recipients of Degrees from Universities	✓	-	✓	✓	✓
Italy	Employment of PhDs of the University of Roma	✓	-	-	✓	✓
Japan	Basic Survey on Schools	✓	-	-	✓	✓
Norway	Doctoral Degree Register	✓	✓	-	✓	✓
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	✓	✓	-	✓	✓
Sweden	Swedish Register of Education	✓	✓	✓	✓	✓
	The Entrance to the Labour Market	✓	✓	-	✓	✓
Switzerland	Enquête auprès des nouveaux diplômés	✓	✓	✓	✓	✓
United Kingdom	First Destination Survey	✓	-	-	✓	✓
United States	SDR	✓	✓	✓	✓	✓
	SED	✓	✓	✓	✓	✓

12. For France, for all the surveys S97, S99 and G98, it is known whether the doctorate recipient had previously graduated from an engineering school. Consequently, the sample includes a certain number of “PhD engineers”.

Table 3. **Surveys of doctorate recipients in 16 OECD countries and Israel: summary of the main variables in the different questionnaires (cont.)**

Country	Name of survey	Doctorate completion date	Time to complete doctorate	Funding of doctorate	Post-doctoral training	Post-doctoral training abroad
Australia	SETIT	-	-	-	-	-
	SEW	-	-	-	-	-
	GDS	-	-	✓	✓	✓
Belgium	Enquête auprès des docteurs diplômés	✓	✓	✓	-	-
Canada	National Graduates Survey	✓	-	✓	✓	✓
Denmark	IDA	✓	-	-	-	-
	PhDs in Natural Science	✓	-	✓	✓	✓
France	Enquête sur les études doctorales	✓	✓	✓	✓ (length)	✓ (country)
	S97	✓	✓	✓	✓	-
	S99	✓	✓	✓	✓	-
	G98	✓	-	-	-	-
Germany	Brain Drain – Brain Gain Survey on International Job Careers	✓	-	✓	✓	✓
Hungary	Opportunities of Doctorate Recipients on the Labour Market	✓	-	-	✓	✓
Ireland	First Destination of Award Recipients in Higher Education	✓	-	-	-	-
Israel	Recipients of Degrees from Universities	✓	-	-	-	-
Italy	Employment of PhDs of the University of Roma	✓	-	✓	-	-
Japan	Basic Survey on Schools	✓	-	-	-	-
Norway	Doctoral Degree Register	✓ (in principle)	-	✓	-	-
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	✓	-	✓	✓ (with restriction)	✓ (with restriction)
Sweden	Swedish Register of Education The Entrance to the Labour Market	✓	-	-	-	-
Switzerland	Enquête auprès des nouveaux diplômés	✓	???	-	✓	✓
United Kingdom	First Destination Survey	✓	-	✓	-	-
United States	SDR	✓	-	-	✓	-
	SED	-	-	✓	✓	-

Information collected on the destination of doctorate recipients

Leaving aside the type of survey (register of administrative data, longitudinal survey, snapshot), the points on which data sources differ most from each other is in the collection of information on employment after completing the doctorate. It is not easy to identify doctorate recipients' first job as such, since depending on the questionnaire and the method, the first job might well be the current one. In fact, in the majority of cases, although it was said that information about past employment was given, it was not said whether that information was provided as of the first job. Because of these limitations, Table 4 has a different structure, since only a handful of surveys (Denmark, France, Australia, Germany, Hungary, United States, Switzerland) provide precise information about the first job (occupation, status, duration, salary, abroad or not, job satisfaction).

Another type of information requested relating to doctorate recipients' early careers concerns professional mobility, represented by the variable "number of jobs held". Eight data sources out of

25 include this information: Denmark (the two surveys, *IDA* and *PhDs in Natural Science*), France (CEREQ surveys), United States (SDR), United Kingdom (*First Destination Survey*) and Switzerland (*Enquête auprès des nouveaux diplômés*). There is thus a lack of information on the number of jobs held after award of the doctorate, even though we feel that this indicator could measure the difficulty (or lack of it) of gaining access to stable employment.

Lastly, we propose to look at the synthesis given in Table 5, which contains a summary of the variables describing current employment.

The first information sought is occupation at the time of the survey. While discounting time-related aspects that could well make comparison difficult, occupation is nonetheless an item of information that features in almost all data sources with the exception of the administrative data sources of Norway, Israel and Sweden (*Swedish Register of Higher Education*). However, the mere fact of providing information about current employment does not solve the problem of comparison, mainly due to the use of classifications. We shall return to this point in Section 3.

In the order given in Table 5, information about status (type of contract) is provided much less often than information about occupation. The French *Etudes Doctorales* survey does not ask about type of contract even though a certain insecurity of employment is a central issue in France (Béret, Giret and Recotillet, 2002). The Australian surveys do not collect information about employment status either, nor do the British or Irish surveys (the structure of the latter being very close to the British FDS survey).

Duration of employment does not feature any more prominently than type of contract but concerns slightly different data sources. Australia's GDS survey does not cover type of contract but does include duration, as does the British *First Destination Survey*, whereas the Belgian survey of several cohorts of doctorate recipients and the Swedish survey (*Entry to the Labour Market*) provide information about type of contract but not about duration.

Only five data sources out of 25 provide information about salary. The surveys in Norway, Japan, Portugal, Italy and the United Kingdom¹³ do not provide information about the salary levels of doctorate recipients, to say nothing of those countries whose statistical sources do not describe the destination of recent doctorate recipients at all.

The question of international mobility returns here in the form of information about employment abroad. Denmark (*PhDs in Natural Science*), France (*Enquête sur les études doctorales, Génération 98*), Canada (*National Graduate Survey*), Australia (*Graduate Destination Survey*), Germany (*Brain Drain - Brain Gain*), Portugal (*Professional situation of ex-PhD Grant Holders Survey*), Hungary (*Opportunities of Doctorate Recipients on the Labour Market*), United Kingdom (*First Destination Survey*), Ireland (*First Destination of Award Recipients in Higher Education*) and Switzerland (*Enquête auprès des nouveaux diplômés*) request information about moves to other countries. The relatively large number of data sources which seek to find out whether doctorate recipients take up employment abroad reflects the urgency of the questions raised with regard to research policy. However, only the German data, focusing on the question of the international circulation of intellectual resources, include the reasons for moving abroad.

The field of study, a key variable in the description of employment, is thoroughly covered by the various surveys. Only the Portuguese survey, *Professional Situation of ex-PhD Grant Holders*, does not request this information, even though it focuses on the destination of doctorate recipients entering the labour market for the first time. Just as with the occupation variable, the role of classifications in coding the field of study is a key aspect of the comparability of data at an international level.

13. As stated in Table 5, salary information will be collected from 2003.

Lastly, few surveys ask recent doctorate recipients questions designed to elicit subjective information from which the strength of the link between training and employment and job satisfaction can be measured. It is a concern that may be found in *PhDs in Natural Science* (Denmark), *Génération 98* (France), *Employment of PhDs of the University of Roma* (Italy), *National Graduates Survey* (Canada), *Enquête auprès des docteurs diplômés* (Belgium), *Brain Drain - Brain Gain* (Germany), *Opportunities of Doctorate Recipients on the Labour Market* (Hungary), *Survey of Doctoral Recipients* (United States) and *Enquête auprès des nouveaux diplômés* (Switzerland).

Some surveys ask doctorate recipients about the relationship between the position held and research in general. This question about the match between doctoral training and employment is asked in the Italian, Canadian and Belgian surveys and in the American SDR.

Finally, a significant number of data sources produce relatively detailed descriptions of the position held at the time the survey is carried out. They include Canada, Denmark (although for a population of doctorate recipients in just a single field of study), France, Germany, Hungary, the United States (SDR) and Switzerland. The other data sources give partial descriptions, missing one or more criteria for defining the quality of a position, or no description at all (Israel, Sweden in the *Swedish Register Survey*).

Table 4. Surveys of doctorate recipients in 16 OECD countries and Israel: variables describing the first employment taken up by doctorate recipients

Country	Name of survey	Length of time between doctorate and first job	Occupation in first job	Type of contract for first job	Duration of first job	Employment abroad	Salary for first job	Satisfaction of first job	Number of jobs held
Australia	SETIT	-	▼	-	▼	-	▼	-	-
	SEW	-	▼	-	▼	-	▼	-	-
	GDS	-	▼	-	▼	-	▼	-	-
Belgium	Enquête auprès des docteurs diplômés	-	-	-	-	-	-	-	-
Canada	National Graduates Survey	-	-	-	-	-	-	-	-
Denmark	IDA	-	▼ ¹⁵	-	▼	-	▼	-	▼
	PhDs in Natural Science	-	▼	▼	▼	-	▼	▼	▼
France	Enquête sur les études doctorales	✓	✓	-	-	✓	✓	-	-
	S97	✓	✓	✓	✓	-	✓	-	✓
	S99	✓	✓	✓	✓	-	✓	-	✓
	G98	✓	✓	✓	✓	✓	✓	✓	✓
Germany	Brain Drain – Brain Gain Survey on International Job Careers	-	▼	▼	▼	▼	-	▼	-
Hungary	Opportunities of Doctorate Recipients on the Labour Market	-	▼	▼	▼	▼	▼	-	-
Ireland	First Destination of Award Recipients in Higher Education	-	-	-	-	-	-	-	-
Israel	Recipients of Degrees from Universities	-	-	-	-	-	-	-	-
Italy	Employment of PhDs of the University of Roma	✓	▼	▼	-	-	-	-	-

14. In Australia's GDS survey, the description of the job is requested for current employment. It is therefore entirely possible that the current job is also the first job, but there is nothing in the available information that permits us to determine whether that is the case.

15. The information is provided for previous employment, but it is not known whether it relates to the first job.

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Country	Name of survey	Length of time between doctorate and first job	Occupation in first job	Type of contract for first job	Duration of first job	Employment abroad	Salary for first job	Satisfaction of first job	Number of jobs held
Japan	Basic Survey on Schools	-	-	-	-	-	-	-	-
Norway	Doctoral Degree Register	-	-	-	-	-	-	-	-
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	-	-	▼	▼	▼	-	-	-
Sweden	Swedish Register of Education	Not specified							
	The Entrance to the Labour Market	-	▼	▼	-	-	▼	-	-
Switzerland	Enquête auprès des nouveaux diplômés	-	▼	▼	▼	▼	▼	▼	▼
United Kingdom	First Destination Survey	✓	✓	-	✓	✓	-	-	✓
United States	SDR SED	¹⁶ -	▼ ¹⁷ ✓	▼ ✓	▼ ✓	- -	▼ ✓	▼ (2001) -	▼ -

16. However, it is possible that the SDR survey provides information about the time that elapses between the award of the doctorate and first employment, because questions are asked about job-seeking.

17. The description of employment relates to the job held during the reference period. It is possible that that job is also the first job; the information must be verifiable, insofar as information is requested about the number of jobs held during the career.

Table 5. Surveys of doctorate recipients in 16 OECD countries and Israel: variables describing the occupation of doctorate recipients at the time of the survey

Country	Name of survey	Occupation in current job	Type of contract for current job	Duration of current job	Employment abroad	Salary for current job	Satisfaction of current job	Sector of activity	Other
Australia	SETIT SEW GDS	▼ ▼ ▼	- - -	- ▼ -	- ▼ -	▼ ▼ -	- - -	▼ - -	- - -
Belgium	Enquête auprès des docteurs diplômés	▼	▼	-	-	▼	▼	▼	Impression of valorisation of doctoral research, research activity, prospects
Canada	National Graduates Survey	▼	▼	▼	▼	▼	▼	▼	Match between job, field of study, doctoral research
Denmark	IDA PhDs in Natural Science	▼ ▼	- ▼	- ▼	- ▼	▼ ▼	- ▼	▼ -	- -
France	Enquête sur les études doctorales S97 S99 G98	▼ ▼ ▼ ▼	- ▼ ▼ ▼	▼ ▼ ▼ ▼	▼ ▼ - ▼	▼ ▼ ▼ ▼	- - - ▼	▼ ▼ ▼ ▼	- - - Level of skills used, desire to start own business
Germany	Brain Drain – Brain Gain Survey on International Job Careers	▼	▼	▼	▼	- ¹⁸	▼	▼	Reasons for moving abroad, comparison of working conditions with host country
Hungary	Opportunities of Doctorate Recipients on the Labour Market	▼	▼	▼	▼	▼	▼	▼	-
Ireland	First Destination of Award Recipients in Higher Education	▼	-	-	▼	▼	-	▼	-

18. Respondents are not asked to state their salary, only the type of remuneration.

DSTI/DOC(2003)9

Country	Name of survey	Occupation in current job	Type of contract for current job	Duration of current job	Employment abroad	Salary for current job	Satisfaction of current job	Sector of activity	Other
Israel	Recipients of Degrees from Universities	-	-	-	-	-	-	-	-
Italy	Employment of PhDs of the University of Roma	▼	▼	▼	-	-	▼	▼	Match between job-research, job-thesis
Japan	Basic Survey on Schools	▼	-	-	-	-	-	▼	-
Norway	Doctoral Degree Register	-	-	-	-	-	-	▼ ¹⁹	-
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	▼	▼	▼	▼	-	-	-	-
Sweden	SRE The Entrance to the Labour Market	▼	▼	-	-	▼	-	▼	-
Switzerland	Enquête auprès des nouveaux diplômés	▼	▼	▼	▼	▼	▼	▼	Assessment of job (19 proposals), impression of professional fulfillment
United Kingdom	FDS	▼	-	▼	▼	- ²⁰	-	▼	-
United States	SDR	▼	▼	▼	-	▼	▼ (2001)	▼	Links between job, field of study, doctoral research
	SED	-	-	-	▼	-	-	-	-

19. With information about the institution.

20. Salary information will be collected from 2002-2003.

3. Comparability of identified surveys of doctorate recipients in 16 OECD countries

Among the identified surveys, which are those that offer possibilities of comparison? Which would have to be adapted in order to make them comparable? Those are the questions we will be considering in this section. A closer look at certain countries (United States, Germany, France, United Kingdom) will give us a deeper insight into the question of the comparability of surveys of doctorate recipients.

Common points and divergences between data sources

There are various possibilities for assessing the potential comparability of several data sources. Our approach is based on the type of data collected because, as we have seen in Section 2, the very structure of the surveys and data makes them more or less easy to compare. Of course, that does not rule out studying the ways in which different types of survey are comparable. Since we have identified four types of data (Table 1), we have organised our discussion around four points: administrative data, population surveys, snapshot surveys and longitudinal surveys.

Administrative data

Our collection includes four sources of administrative data: *Integrated Database on the Labour Market* (IDA, Statistics Denmark), *Basic Survey on Schools* (Japan), *Doctoral Degree Register* (DDR, NIFU, Norway), *Swedish Register of Education* (SRE, Sweden). In theory, there is no structural factor that would hinder the comparison of administrative data with other types of data.

The data in the *Integrated Database on the Labour Market* (Denmark), which are longitudinal, offer a number of possible comparisons relating to employment after receipt of the doctorate. The database provides information on age, educational level (long-cycle further education and research education, which must correspond to a doctoral degree), the date of award of the diploma and the field of study, the profession, salary and sector of activity of the current occupation. Updated annually, this database can therefore produce year-by-year indicators of the situation of doctorate recipients on the labour market by year of diploma and field of study, by salary, profession and sector of activity. The classifications of profession and economic sector are both national and international (ISCO and NACE), which ensures a relatively high degree of comparability with other data. The unemployment rate may also be calculated by educational level and date of diploma. The data assembled by Statistics Denmark offer several points of comparison with surveys like the Canadian, American and French longitudinal surveys and snapshot surveys like the FDS (UK) and the *First Destination of Award Recipients in Higher Education* (Ireland).

The data collected by NIFU (Norway) afford very little potential for comparison because of their very specific coverage of the population. The database covers doctorate recipients who have found employment in a university or research institute (public or private). This rules out comparisons with private sector R&D, which is not included within the scope of the data. Although information is provided on age at dissertation (which produces indicators of average age at dissertation), the date of diploma award, which would make it possible to select cohorts of entrants, is not collected. Consequently, there is no possibility of comparison with the majority of identified surveys which concern cohorts of recent doctorate recipients taking their first steps in working life. No information is collected on the main indicators used to describe employment (salary, profession, duration of employment).

The data collected by Japan from universities offering doctoral training provide indicators of the professional situation during the year following award of the doctorate. Five indicators are counted: profession (national classification), sector of activity (national classification), salary, type of contract, duration and satisfaction. However, it is possible from this data to learn what has become of doctorate

recipients approximately one year after they complete their doctorate. Consequently, in Table 6, the profession and economic sector indicators are ranked as medium.

The fourth administrative data source, the *Swedish Register of Education*, includes census data on persons aged 16 to 74. The date of diploma award and the diploma title are collected (is it possible from that to identify doctorate recipients by field of study?), but the data do not relate to the labour market and are consequently incompatible with the other sources.

Overall, it is not possible, using the data derived from population registers as they appear here, to produce indicators that link the doctorate (duration, funding) with the labour market. It is therefore an unfavourable factor for their comparability with other data relating specifically to doctorate recipients, whose training is significantly different from that of other university programmes.

Population surveys

Household surveys are the two data sources produced by Australia, covering persons aged between 15 and 64 residing in the country. The big problem with these two surveys is that they do not provide information on the year in which the diploma was awarded, or the possibility of identifying doctoral diplomas. For that reason, their degree of comparability is deemed low.

Snapshot surveys

Because snapshot surveys cover the professional situation of doctorate recipients between six months and one year after award of the diploma, they may be compared with longitudinal sources as long as it is possible to clearly identify the same period. That is the main source of difficulty. Even so, they contain relatively little information about the destination of doctorate recipients and their integration into employment because the statistics are collected too soon after award of the doctorate.

The UK's *First Destination Survey* questions doctorate recipients in year t in January of the following year. It provides relatively detailed information about the occupation held in January of $t+1$: profession, salary, duration and country if the job is not in the UK. Here again, the degree of comparability may be hampered by the classifications used. The response to our questionnaire states that national classifications for profession and economic activity are used. However, concordance tables for ISCO and NACE can partly resolve the problem of international comparability. Ultimately, the FDS is probably most comparable with the Irish survey²¹, since the time factor is a real hindrance for comparability with the SDR (United States), Canada or France (CEREQ surveys). It is doubtless possible to draw comparisons with the results of the *Enquête sur les Etudes Doctorales* (France) since the data are collected approximately one year after award of the doctorate (Boulard and Méla, 2002) and the information also includes profession, duration, salary and country (for doctorate recipients employed abroad). The data of the Swedish *Entrance to the Labour Market* survey could also be compared with the UK data, since they contain the results of a survey in 2000 of doctorate recipients in 1998-1999, approximately one year after the doctorate award. In contrast, only profession and salary data are collected. Overall, the comparability of the *First Destination Survey* is low with regard to other data sources but high with regard to the French and Swedish surveys mentioned above. The same applies to the *Entrance to the Labour Market* survey (Sweden) but not to the *Enquête sur les Etudes Doctorales*, for which a second round is carried out two years after the doctorate award.

21. Though the Irish Survey of the Destination of Award Recipients in Higher Education makes no distinction between Masters and PhDs, which de facto makes it impossible to compare with the other data sources, even if it is similar in terms of overall structure to the FDS survey.

Table 6. Degree of comparability between administrative data sources and snapshot surveys regarding indicators relating to occupation

Data sources	High				Medium				Low			
	O	I	W	D	O	I	W	D	O	I	W	D
O: Occupation I: Industry W: Wage D: Duration												
Denmark												
IDA	●	●	●	●								
Japan												
BSS			●	●	●	●						
Norway			-	-			-	-	●	●	-	-
DDR												
Sweden	-	-	-	-	-	-	-	-	-	-	-	-
SRE									●		●	
ELM												
United Kingdom												
FDS									●	●	●	●

Longitudinal surveys

As we pointed out in Section 2, the identified longitudinal surveys are relatively dissimilar in terms of scope and time-span. To be able to compare data, whether national or international, care must be taken to ensure that the economic context does not distort the comparison. In other words, the economic conditions experienced by cohorts of labour market entrants in 1995 (Belgium) are doubtless different from those experienced by cohorts of labour market entrants in 1999 (Denmark). Whatever the value of this deliberately exaggerated example, the difficulty of linking data sources whose structure includes a time factor is plain to see. While snapshot surveys are generally annual, longitudinal surveys are less frequent and their time-spans do not necessarily correspond. Moreover, in order to be comparable, the situation measured must correspond to the same elapsed time since receipt of the doctorate. One instructive indicator that may be obtained from several surveys is the time it takes doctorate recipients to find a job that corresponds to their qualification, their aspirations, etc. (Recotillet, 2002). It is easy to increase the number of criteria; nevertheless, the important thing is to ensure that the elapsed time is to all intents and purposes identical.

To start with, here is a reminder of the structure of the available longitudinal studies (Table 7).

Table 7. **Populations covered by longitudinal surveys**

Country / Survey	Population covered
Belgium / Enquête auprès des docteurs diplômés	Doctorate recipients in 1987, 1991 and 1995 questioned in 2000
Canada / National Graduate Survey	Doctorate recipients in 1995 questioned in 1997 and 2000
Denmark / PhDs in Natural Science	Doctorate recipients between 1990 and 1999 questioned in 2000
France / Enquête sur les études doctorales	Doctorate recipients between September 1999 and December 2000 questioned in 2001
France / Enquête Enseignement supérieur 1997	Doctorate recipients in 1994 questioned in 1997
France / Enquête Enseignement Supérieur 1999	Doctorate recipients in 1996 questioned in 1999
France / Enquête Génération 98	Doctorate recipients in 1998 questioned in 2001
Germany / Brain Drain –Brain Gain	Award recipients (year unknown) of at least ISCED level 5 questioned in 2002
Hungary / Opportunities of Doctorate Recipients on the Labour Market	Doctorate recipients between 1990 and 2002 questioned in 2002
Italy / Employment of PhDs of the University of Roma	Doctorate recipients in 1995 questioned in 1998
Switzerland / Enquête auprès des nouveaux diplômés	Doctorate recipients questioned 1 year and 4 years after doctorate award
United States / Survey of Doctoral Recipients	Doctorate recipients aged under 76 questioned in 2001 (including new flows of entrants in 1999-2000)

A rapid overview shows that the survey dates are very dissimilar and that time-frames show little if any convergence. Nevertheless, some surveys are comparable.

The Canadian and Belgian surveys have a common time-frame, since they concern doctorate recipients in 1995 questioned in 2000. Two of the French surveys may be compared with NSF data from the SDR (United States). Both the *Enquête sur les Etudes Doctorales* (France) and the SDR concern doctorate recipients in 1999-2000 questioned in 2001. The *Enquête Enseignement Supérieur 1999* (France) can also be compared with an earlier NSF survey, the SDR, albeit by selecting doctorate recipients in the same year, namely 1996. The survey date differs, because the French survey was carried out in 1999 and the American survey in 1998. However, it is possible to extract from the French data the occupation in 1998, which is the period covered by the SDR survey.

There are no points of comparison between the Italian and German surveys and the other data sources, partly because the population covered by the German survey is relatively specific, and partly because their observation period does not match that of any other data source.

Lastly, the Swiss data are based on an initial round one year after receipt of the doctorate, which makes them comparable with the snapshot surveys. In contrast, the second round, four years after receipt of the doctorate, has no equivalent in the other sources.

Although the longitudinal surveys are rich sources of information in terms of statistical indicators, their comparability on an international level proves to be problematical to say the least.

The labour market for doctorate recipients in the United States, France, Germany and the United Kingdom

The various changes that have taken place in higher education converge on the same objective, namely increasing the production of scientific knowledge, especially doctorates. The increase in the number of doctorate recipients on labour markets which frequently offer limited professional prospects may lead to difficulties in finding employment. The existing statistical sources provide indicators for measuring entry into the labour market, such as the proportion of doctorate recipients in the academic

sector, in private R&D, wage levels, etc., which describe how the labour market for young scientists works. Are conditions the same or different according the country they trained in? How can existing indicators be compared, in the light of our previous conclusions?

Flows of doctorate recipients

The number of doctorate recipients in science and engineering has doubled over the last twenty years or so in countries like Japan, France, Germany and the United Kingdom (Table 8), under the stimulus of higher education and research policies based on the premise that the production of high-level scientific diplomas was a key to future economic growth. The stakes are high, especially in the medical, engineering and biological sciences. Yet the number of doctoral students in these fields is tending to decline, a trend which is offset by the arrival of doctorate recipients from other countries.

Table 8. Doctoral S&E degrees in selected industrialised countries, by field: 1980-99

Field	1980	1985	1990	1995	1996	1997	1998	1999
France								
Total	NA	NA	6,782	9,801	10,963	11,073	10,582	NA
Total S&E	NA	NA	5,158	7,027	8,511	8,962	8,359	NA
Natural scien	NA	NA	2,841	3,572	4,052	4,394	3,924	NA
Math and com	NA	NA	795	1,129	1,241	869	845	NA
Agricultural s	NA	NA	53	84	194	207	179	NA
Social and behavioral sciences	NA	NA	488	815	1,285	1,629	1,559	NA
Engineering	NA	NA	981	1,427	1,739	1,863	1,852	NA
Non-S&E	NA	NA	1,624	2,774	2,452	2,111	2,223	NA
Germany								
Total	12,222	14,951	22,372	22,387	22,849	24,174	24,890	24,545
Total S&E	4,780	5,738	10,762	10,889	11,472	11,728	11,966	11,984
Natural scien	2,462	2,986	5,319	5,868	6,078	6,418	6,625	6,271
Math and com	227	274	429	663	810	785	855	980
Agricultural s	331	414	997	507	512	521	562	522
Social and behavioral sciences	949	968	1,544	1,741	1,803	1,775	1,824	1,982
Engineering	811	1,096	2,473	2,110	2,269	2,229	2,100	2,229
Non-S&E	7,442	9,213	11,610	11,498	11,377	12,446	12,924	12,561
United Kingdom								
Total	5,804	6,208	8,242	7,557	9,761	10,214	10,993	11,338
Total S&E	4,287	4,608	6,207	5,134	6,526	6,765	7,268	7,386
Natural scien	2,300	2,409	3,113	2,580	3,380	3,421	3,665	3,668
Math and com	256	282	471	454	602	586	565	680
Agricultural s	176	159	241	271	351	324	392	326
Social and behavioral sciences	532	687	916	502	636	679	809	907
Engineering	1,023	1,071	1,466	1,327	1,557	1,755	1,837	1,805
Non-S&E	1,517	1,600	2,035	2,423	3,235	3,449	3,725	3,952
United States								
Total	31,020	31,297	36,067	41,743	42,414	42,555	42,683	41,140
Total S&E	17,775	18,935	22,868	26,535	27,229	27,245	27,309	25,953
Natural scien	7128	7440	8589	9988	10354	10432	10497	9989
Math/comput	962	998	1,597	2,187	2,043	2,035	2102	1935
Agricultural s	736	996	1,174	1,036	1,037	982	1037	965
Social and behavioral sciences	6,470	6,335	6,613	7,307	7,490	7,682	7743	7727
Engineering	2,479	3,166	4,894	6,008	6,305	6,114	5930	5337
Non-S&E	13,245	12,362	13,199	15,208	15,185	15,310	15,374	15,187
Summary								
Total S&E	26,842	29,281	44,995	49,585	53,738	54,700	54,902	NA
France	NA	NA	5,158	7,027	8,511	8,962	8,359	NA
Germany	4,780	5,738	10,762	10,889	11,472	11,728	11,966	11,984

Source: NSF.

Europe was the biggest producer of doctoral degrees in 1999 with just over 68 000 (of which France accounted for approx. 10 000 and Germany for approx. 25 000). The United States awarded over 41 000 doctorates in all fields (Table 9). Almost half of doctoral degrees were awarded in fields of study

connected with science and engineering, including 18 000 in the United States and almost 33 000 in Europe. Natural sciences and engineering alone accounted for over 80% of S&E doctorates in both the United States and Europe.

Table 9. Number of doctorates awarded in 1999: France, Germany, the EU and the United States

	FRANCE	GERMANY	EU	USA
Total	10 582	24 545	68 141	41 410
Total S&E	6 800	10 002	32 970	18 226
Natural sciences	3 924	6 271	18 099	9 989
Mathematics and computer science	845	980	3 731	1 935
Agriculture	179	522	2 022	965
Engineering	1 852	2 229	9 118	5 337
Total non S&E	3 782	14 543	35 171	22 914
Of which humanities and social sciences	1 559	1 982	6 051	7 727

Source: NSF, 2002 cited by CNRS office in Washington.

The proportion of foreign doctorate recipients has increased steadily in the industrialised countries since the end of the 1980s. In 1999, the proportion of foreign doctorate recipients stood at between 26% and 34% in France, Japan and the United States (Table 10). In the UK, 44% of engineering doctorate recipients are foreign, and the equivalent figures for the US and France are almost 50% and approx. 30% respectively (NSF, 2002a). The number of foreign doctorate recipients remains relatively low in Germany, representing 7% for all fields of study and 8% for science and engineering.

Table 10. Number of doctorates awarded in industrialised countries by nationality

Country and field	Total	Foreign	Percent foreign
France (1998)			
Total	10 582	2 622	24.8
Total S&E	7 772	1 784	23.0
Natural sciences	3 924	672	17.1
Mathematics/computer sciences	845	262	31.0
Agricultural sciences	179	37	20.7
Social and behavioural sciences	972	262	27.0
Engineering	1 852	551	29.8
Non-S&E	2 810	838	29.8
Germany (1999)			
Total	24 545	1 739	7.1
Total S&E	11 984	991	8.3
Natural sciences	6 271	461	7.4
Mathematics/computer sciences	980	85	8.7
Agricultural sciences	522	100	19.2
Social and behavioural sciences	1 982	124	6.3
Engineering	2 229	221	9.9
Non-S&E	12 561	748	6.0
Japan (1998)			
Total	8 543	NA	NA
Total S&E	4 436	1 169	26.4
Natural sciences	1 163	NA	NA
Mathematics/computer sciences	NA	NA	NA
Agricultural sciences	694	NA	NA
Social and behavioural sciences	229	NA	NA
Engineering	2 350	NA	NA
Non-S&E	4 107	NA	NA
United Kingdom (1999)			
Total	NA	NA	NA
Total S&E	7 386	2 469	33.4
Natural sciences	3 668	859	23.4
Mathematics/computer sciences	680	258	37.9
Agricultural sciences	325	162	49.7
Social and behavioural sciences	907	397	43.8
Engineering	1 805	793	43.9
Non-S&E	NA	NA	NA
United States (1999)			
Total	41 140	11 368	27.6
Total S&E	25 953	8 886	34.2
Natural sciences	9 989	3 413	34.2
Mathematics/computer sciences	1 935	912	47.1
Agricultural sciences	965	510	52.8
Social and behavioural sciences	7 727	1 459	18.9
Engineering	5 337	2 592	48.6
Non-S&E	15 187	2 482	16.3

The organisation of research

The organisation of research is a powerful factor structuring the labour market for recent doctorate recipients. Consequently, it influences the construction and interpretation of science and technology indicators for that population. One particular point relates to research jobs in academic systems. In the United States, for example, university teachers may be recruited on a permanent or non-permanent basis. Assistant professors may acquire tenure after four years (tenure track) or be hired on a temporary basis. Apparently, a growing number of assistant professorships are temporary, which causes the labour market to work in a particular way, involving various forms of mobility, experience and skill sets before tenure is acquired (Lanciana and Nohara, 2002). This trend is amplified by the extensive use of temporary contracts in general in the United States. The job status indicator loses some of its interest in this context, though it is still important to measure the proportion of temporary contracts by profession and by sector of activity, bearing in mind that around 50% of recent doctorate recipients enter the public research system. Access to tenured positions is not immediate in Germany either, and a substantial proportion of recent doctorate recipients take up jobs in private sector research (Verdier *et al.*, 2001), especially as the links between science and industry are traditionally strong. Cooperation between higher education and research through the universities is the foundation of the public research system (SPRU, 1999). In the United Kingdom, for different reasons, it is difficult for recent doctorate recipients to gain access to research jobs in the public research system and a large majority of them prefer better paid employment in private sector research. Studies of researchers' careers also show that the public research system finds it difficult to keep staff in fields of study where wage differentials with the private sector are large (Thewlis, 2001).

The education and research systems in France and Japan are rather different, offering rapid access to tenured positions (Lanciano and Nohara, 2002). In Japan, the difficulties of recruiting doctorate recipients to fill research posts in industry have encouraged the government to undertake far-reaching reforms of doctoral training. More specifically, the inclusion of management training in degree courses, whatever the field of study, reflects the determination to prepare excessively academically-minded doctoral students for employment in the private sector. The same trend may be seen in France, in the *doctoriales* designed to prepare doctorate recipients for business life, to encourage them to think in terms of extracting value from their skills after their doctorate rather than focusing on the outcome of a research project, and so on. In France, there has been little or no increase in the number of posts on offer in the public research system (Béret, Giret and Recotillet, 2002) and the queue for permanent research positions has created a specific labour market for doctorate recipients, characterised by a proliferation of post-doctoral programmes and fixed-term contracts financed by research contracts immediately after award of the doctorate (Recotillet, 2002).

The organisational particularities of public research systems in the countries mentioned above will therefore lead to differentiated measurements and interpretations, especially in the time and modalities of access to research jobs. When comparing the situation of doctorate recipients two or three years after award of the doctorate, the proportion of fixed-term jobs in public research needs to be interpreted differently in the United States and in France. Problematical in France because of the structure of the public research system, a high proportion of fixed-term contracts in the United States does not have the same meaning and should be seen in the context of the traditional operation of that particular labour market. Statistical indicators must therefore be constructed first and foremost to satisfy the national understanding of how the labour market works, while at the same time allowing for comparison with that of other national entities. These factors sometimes pull in opposite directions and a look at some statistical indicators of the situation on the labour market for doctorate recipients is instructive.

Existing indicators relating to the labour market for recent doctorate recipients: an overview

The comparison is limited to the United States and France, the only countries for which we have detailed data. It is further limited because our analysis is based on reports or articles in which the tables of results are drawn up according to the author's own choices which, from a comparative standpoint, would not necessarily have been ours.

The first indicator concerns the proportion of doctorate recipients in employment in the academic sector in the United States and France in 1997 (Tables 11 and 12). The comparison runs into several difficulties that we have mentioned on various occasions in this report. The population covered is not identical (slightly different fields of study regrouped differently, different year of doctorate award: 1995 for the United States, 1994 for France). Furthermore, the indicator is not truly comparable since in the United States the academic sector is defined on the basis of the type of institution while the indicator for France has been calculated from the French classification of occupations, which crosses both occupation and sector of activity.

With those reserves, however, a higher proportion of doctorate recipients is employed in the academic sector in France than in the United States, where a higher proportion is employed in non-academic sectors. Incidentally, the proportion of unemployed doctorate recipients in the US is very small, whatever the field of study, whereas the unemployment rate for doctorate recipients in France is much higher, especially in the fields of literature, languages and the human sciences (Béret, Giret and Recotillet, 2002). A high proportion of engineering doctorate recipients are employed in non-academic sectors in both the United States and France (this result is taken from detailed data by field of study for doctorate recipients in 1998). In contrast, whereas in France a majority of social science doctorate recipients find employment in the academic sector, this trend is much less marked in the United States.

Table 11. Proportion of doctorate recipients in the academic sector, United States, 1997

Field of study	% academic sector	% non-academic sector	Unemployed
Total	46.8	49.4	3.8
Computer sciences and mathematics	52.7	46.0	1.3
Natural and life sciences	61.0	34.2	4.9
Physical sciences	41.1	55.1	3.9
Social sciences	49.6	46.5	3.9
Engineering	26.3	70.8	2.9

Source: NSF 2001, Issue Brief.

Table 12. Proportion of doctorate recipients employed in public research, France, 1997

Occupation three years after award of doctorate	% public sector			Public sector teachers and researchers as % of all employment			Private sector R&D researchers as % of all employment		
	1997	1999	2001	1997	1999	2001	1997	1999	2001
Doctorate recipients	66	61	53	56	53	40	19	16	18
Physical sciences	61	55	47	53	51	35	24	22	24
Humanities and social sciences	85	77	70	67	57	53	2	3	1

Source: CEREQ, in Béret, Giret and Recotillet (2002).

The second indicator concerns the type of contract (Tables 13 and 14). The NSF *Survey of Doctorate Recipients* makes a distinction between:

- Tenured.
- On tenure track.
- Not on tenure track.
- Post-doctoral.

In France, the distinction is operated between fixed-term and open-ended contracts (in both the private and the public sector) according to whether the jobs are in public research or not. The comparison is not easy, because the ways in which the labour market is structured come into play directly. In fact, each national classification system reflects the operation of the labour market, which rather hinders the possibilities for comparison.

As can be seen from Tables 13 and 14, the post-doctoral situation is not reflected in the French data since post-doctoral programmes have probably been grouped together with fixed-term contracts. In contrast, there is an indicator in the data from the *l'Enquête sur les Etudes Doctorales* (France, 2001) which counts the number of post-doctoral researchers one year after award of the doctorate. This time, however, the survey dates are relatively far apart and the closeness of the doctorate award date gives a postdoc rate higher than it might have been if calculated two years after award of the doctorate. The postdoc rate one year after the doctoral degree is 17% for all fields of study, compared with 29% for American doctorate recipients in 1995. Interpreting the difference is not easy. Is it due to different policies at the two dates? Shouldn't the difference be greater if the comparison was with French data giving a postdoc rate two years after the doctoral degree? It is therefore difficult to conclude that recent doctorate recipients in the US go on to post-doctoral training more frequently than French doctorate recipients.

Table 13 . **Tenure track status, United States, 1997**

Tenure track status	%
Total	100.0
Tenured	5.0
On tenure track	35.8
Not on tenure track	30.3
Postdoc	28.9

Source : NSF 2001 Issue Brief.

Table 14. **Proportion of fixed-term contracts in public research, France, 1997-2001**

	% teachers/ researchers			% of fixed-term contracts		
	97	99	01	97	99	01
Public						
Physical sciences	78	85	74	24	34	27
Humanities and social sciences	77	74	75	15	16	13
Together	78	81	74	22	27	22

Source: CEREQ, in Béret, Giret and Recotillet (2002).

The two examples of indicators described above show that, while the SDR survey (NSF) and the *Enseignement supérieur* survey (CEREQ) might be assumed to be quite close in terms of their questionnaire (Sections 2 and 3), a comparison using published data makes the task much more difficult than might have been expected. Comparison is therefore a perilous exercise and, in view of the degrees of comparability of the existing sources, it seems difficult to establish rigorous comparisons of the

professional situation of doctorate recipients. It is a point that we shall discuss in Section 4, in the guise of a conclusion and suggestions for adapting existing sources.

4. Conclusion: some options for improving the comparability of existing statistical surveys

The conclusions of the previous sections of this report show that employment data are often difficult to compare between countries, and that there is an important lack of information about international mobility (whether in terms of questionnaires or the scope of surveys), links between doctorate recipients and their destinations (questions on scientific outputs, teaching activities, research, intention to set up in business, etc.), and the areas where academic research and industry overlap.

Faced with these findings, two options could be explored with a view to improving the comparability of statistical sources. Briefly, the first involves adapting existing sources, the second setting up a specific survey of doctorate recipient destinations at international level. The two possibilities are complementary rather than incompatible, since they would make it possible to analyse and compare flows of doctorate recipients between countries, measure types of mobility (internal mobility in private R&D, exchanges of scientists between laboratories, etc.) and develop common criteria for defining the shape of the labour market for young scientists. It is possible that there may be several labour markets for recent doctorate recipients, and the research seems to suggest the existence of an intermediate labour market (Lanciano and Nohara, 2002). How are labour markets organised in private R&D, in public research systems, at international and European level? How are links forged between science and industry at national and international level? To what extent are labour markets national, European, American, Asian, international? With a survey common to several national entities, all these issues could be investigated.

Possible adjustments to existing surveys

Certain adjustments to existing statistical sources would be sufficient to achieve a significant improvement in comparability between countries. Two options may be envisaged, according to the cost of implementation. The first would be to add or change questions, which would be inexpensive; the second would be to conduct a second round of snapshot surveys two (or perhaps three) years after the first, but this would be significantly more costly. We believe that it should be explored, however, since it would lead to several snapshot surveys becoming comparable with the USA's SESTAT system, Canada's NGS and the French surveys. The Swiss survey remains slightly different, with a first round after one year and a second round after four years.

Inexpensive adjustments

Among the first ideas for improving existing surveys should be common definitions of the different criteria to be measured (post-doctoral training, for example) and the addition or amendment of certain questions. The type of classification used is a crucial issue which needs to be looked at, though it may not be an inexpensive adjustment.

We propose to review the various available sources and to see how the questions in each one could be adjusted to improve comparability with the other sources. The proposals are summarised in Table 15. They concern only the data derived from statistical surveys.

Table 15. Possible adjustments to existing questionnaires with a view to increasing the comparability of surveys

Country	Data source	Proposals
Australia	Graduate Destination Surveys	<p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Type of contract for current employment. Job satisfaction in current employment.</p> <p>Link between current employment and research activity.</p> <p>Number of successive positions held.</p>
Belgium	Enquête auprès des docteurs	<p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Current employment abroad.</p> <p>Number of successive positions held.</p>
Canada	National Graduates Survey	<p>Funding of doctoral training.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Link between current employment and research activity.</p> <p>Number of successive positions held.</p>
Denmark	PhDs in Natural Science	<p>Time taken to complete doctorate.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Link between current employment and research activity.</p> <p>Extension of the survey to fields of study other than natural and life sciences.</p>
France	Enquête sur les Etudes Doctorales	<p>Time taken to complete doctorate.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Links between doctorate laboratory and industrial research, doctoral student's involvement in contracts with companies.</p> <p>Status of occupation at the two dates.</p> <p>Link between current employment and research activity.</p> <p>Number of successive positions held.</p>

Country	Data source	Proposals
	Generation surveys ²²	Inclusion of foreign award holders. For doctorate recipients: Type of funding Time taken to complete doctorate Post-doctoral training Link between current employment and research activity.
Germany	Brain Drain – Brain Gain	Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.
Hungary	Opportunities of Doctorate Recipients on the Labour Market	Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding. Link between current employment and research activity.
Ireland	First Destination of Award Recipients in Higher Education	Identification of doctorate recipients within higher degree recipients. Funding of doctoral training. Status of current employment. Link between current employment and research activity. Inclusion of post-doctoral training in options for describing professional situation nine months after doctorate award. Number of successive positions held.
Italy	Employment of PhDs of the University of Roma	Extension of the survey to other universities. Salary (previous and current). Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding. Characteristics of employment abroad (need to include doctorate recipients working abroad in the sample). Number of successive positions held.
Japan	Basic Survey on Schools	Funding of doctoral training. Current salary. Link between current employment and research activity. Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding. Characteristics of employment abroad (need to include doctorate recipients working abroad in the sample). Number of successive positions held.

22. Changes were made to the *Observatoire National des Entrées dans la Vie Active* (Entry into Working Life Observatory) in the late 1990s, and it is now based on a single, generation-type survey. Generation 92 (those leaving the education system in 1992) was the first one of this type; Generation 98, for which the sample of doctorate recipients is representative at national level, is the second.

Country	Data source	Proposals
Portugal	Professional Situation of Ex-PhD Grant Holders Survey	<p>Extension of description of post-doctoral training to all doctorate holders.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Link between current employment and research activity.</p> <p>Current salary.</p> <p>Number of successive positions held.</p>
Sweden	Entrance to the Labour Market	<p>Funding of doctoral training.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those engaged in post-doctoral training abroad to return to home country, type and amount of funding.</p> <p>Link between current employment and research activity.</p> <p>Employment abroad.</p> <p>Number of successive positions held.</p>
Switzerland	Enquête auprès des nouveaux diplômés	<p>Funding of doctoral training.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those engaged in post-doctoral training abroad to return to home country, type and amount of funding.</p> <p>Link between current employment and research activity.</p>
United Kingdom	First Destination Survey	<p>Status of current employment.</p> <p>Link between current employment and research activity.</p> <p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p>
United States	Survey on Doctoral Recipients	<p>Details of post-doctoral training: duration, type of contract, scientific output, desire of those in post-doctoral programmes abroad to return to their home country, type and amount of funding.</p> <p>Inclusion of doctorate recipients who have gone abroad.</p> <p>Link between current employment and research activity.</p>

It could be helpful in the longer term to create an operational computer tool that would enable survey managers to view the various questionnaires from similar sources and the survey methodologies. That would enable each country to situate itself in the range of statistical surveys on the entry into working life of recent doctorate recipients and consequently to improve data in order to make them comparable with other data. For example, an Access database could be set up and put online, the idea being that there should be a national version of each item of information in the database. For example, for each listed variable, information would be provided on how the variable is formed and constructed (with explanations if necessary) in one or more selected countries. This option is relatively inexpensive and could draw on the surveys already identified in this report.

Costly adjustments

A second option for improving the comparability of national surveys of the destinations of doctorate recipients could consist in extending the period of coverage by transforming snapshot surveys into panel

surveys. Thus, snapshot surveys after one year would form the basis for a second round after two or three years. The survey one year after receipt of the doctorate would remain valid, but at the same time this approach would enable an analysis of the early career paths of recent doctorate recipients. From that standpoint, a second round after three years would doubtless yield richer information than a second round after two years, which could still include a substantial number of doctorate recipients engaged in post-doctoral programmes, an intermediate situation between doctorate and employment. However, if the aim is to make the greatest number of existing data sources comparable, a second round after two years is preferable (see Table 16), especially as the Italian survey has been carried out only once (there is no system of repeated surveys at regular intervals) and there are no plans at present for a specific survey of doctorate recipients in the generation surveys carried out in France (in this case, it would not be possible to differentiate third-cycle doctorate recipients).

Table 16. **Surveys with an observation period in excess of two years**

Country / Survey	Period covered after receipt of doctorate			
	2 years	3 years	4 years	5 years
Canada National Graduate Survey	●			●
France Enquête sur les Etudes doctorales	●			
France Enquête Génération		●		
Italy Employment of PhDs of the University of Roma		●		
Switzerland Enquête auprès des nouveaux diplômés			●	
United States Survey on Doctoral Recipients	●			

In this way, it would be possible not only to make several surveys comparable with the two-year surveys listed in Table 16 but also to significantly enhance the destination surveys based on collected data.

That could be the case with the Graduate Destination Survey (Australia), Professional Situation of Ex-PhD Grant Holders Survey (Portugal), First Destination Survey (UK), Entrance to the Labour Market (Sweden), and First Destination of Award Recipients in Higher Education (Ireland). This procedure could considerably increase the potential of data sources on destinations for doctorate recipients, especially if questionnaires were harmonised more extensively, bringing us back to the first option for improving the comparability of existing data.

Proposed questionnaire

It is also possible to imagine taking existing data sources, having established their advantages and shortcomings, and constructing a survey of international scope that would meet the needs of the three issues raised in the introduction, especially that of the mobility of intellectual resources.

For example, a European initiative under the aegis of Euroscience has coordinated three associations of young researchers in Europe (Association des Boursiers Marie Curie, Pi Net and Eurodoc) and provided the framework for a survey of doctorate recipients in Europe (<http://www.mariecurie.org/>), "Training and Career Prospects of Young Scientists in Europe", questioning doctoral students and doctorate recipients.

This data source provides information about doctoral study (suitability, role of research director, foreign language training, etc.), about intentions to work abroad, contacts with the international scientific community during the doctorate, etc., but does not collect information about destinations.

As regards the survey methodology, two avenues could be explored:

- Conducting the same type of survey as the one carried out in Germany (Brain Drain – Brain Gain) in several countries simultaneously, covering a population both of doctorate recipients working in their home country and foreign doctorate recipients working in the country concerned (universities and public research organisations, companies).
- Conducting a survey in several countries simultaneously which, in each country, would select national and foreign recent doctorate recipients, questioned in their country or abroad if they are no longer in their home country at the time of the survey. This method could guarantee the national representativity of flows of doctorate recipients while at the same time enabling the measurement of flows of doctorate holders between countries.

From the review of the content of statistical surveys of doctorate recipients, it is then possible to propose a draft questionnaire for a statistical survey which would involve questioning doctorate recipients in a given year about their destinations one and three years after the doctorate award. The advantage of a two-round survey, the first round being close to the doctorate award, is that it is easier to locate the individuals concerned.

Proposed questionnaire		
Sex		
Age		
Date of doctorate award		
Place of doctorate award	Country	Institution
Time taken to complete doctorate		
Country of current residence		
Nationality		
Field of study	Canberra Manual classification	
Doctorate conditions		
Type of funding		
Amount of funding		
Effective place of research		
Attendance at conventions, conferences, etc.		
Of which attendance at international events		
Teaching activity		
Participation in research contracts during doctorate		
Time spent abroad during doctorate	Country	Duration
Time spent in companies during doctorate	Sector of activity	Duration
Scientific output	Publications / participation in patents	
On completion: desire to set up in business		
On completion: desire to move abroad		

Current situation (1 year / 3 years)		
	<ul style="list-style-type: none"> - occupation - unemployed or looking for work - unemployed and not looking for work - post-doctoral training - other 	
Current situation: employment		
Occupation		
Type of contract		
Salary		
Length of service		
Place	Country	
Field of research		
Link between doctorate field of study and field of research	Scale	
Modalities of access to employment		
Cooperation between industry and academic world	Form / Sector	Output (publication, patents, etc.)
Valorisation of research	Type (training, expert assignment, consulting, etc.)	
If employment abroad	Reason for leaving (internal mobility for private sector R&D)	Wish to return
Job satisfaction		
Intention to set up in business		
Current situation: post-doctorate		
Status		
Funding	Amount	
Starting date	Planned duration	
Institution / company		
Abroad	Yes / No	Country
Field of research	Field of study	
Means of finding post-doctoral training		
Scientific output since start of post-doctoral training		
Desire to return to home country after finishing post-doctoral training	Yes / No	Reasons
Description of career track from doctorate award to current situation		(example of Swiss survey)

This first draft of a questionnaire is clearly only an initial list of the major themes to be explored, some of them already present in the various national questionnaires. They are of considerable interest in understanding career structures for doctorate recipients and as such are intended only to stimulate further reflection and discussion.

ANNEX 1

**QUESTIONNAIRE ON THE AVAILABILITY AND CHARACTERISTICS
OF SURVEYS ON THE DESTINATION OF DOCTORATE RECIPIENTS IN OECD
COUNTRIES**

In the framework of their activities on human resources in science and technology, the OECD Working Party of National Experts on Science and Technology Indicators (NESTI) and the OECD Secretariat are making an attempt to collect information about the availability and characteristics of surveys on the destination of doctorate recipients. This questionnaire was sent to you by the NESTI delegate for your country. We would be grateful if you could fill it in and send back any information that you deem useful for this exercise (questionnaire, methodology, publication of results, etc.)

General information about the survey

1. What is the name of the institution conducting the survey?		
2. Please, give the name and address of a contact person		
3. What is the title of the survey?		
	Yes	No
4. Is the survey on the destination of doctorate recipients part of a wider survey on the destination of graduates?		
5. Please, give the name of a web site where additional information may be found (if existing)		
6. Many such surveys exist in other OECD countries. Do you see an interest in harmonizing this type of surveys internationally? Please comment.		

Specific questions about the survey

7. What is the target population? (please be as precise as possible)
8. How is the population sampled? (please be as precise as possible; in particular give information on how representative the sample)
9. What is the sample size? (in the case of a survey to a broader population of graduates, please, give the sample size of doctors)

10. What kind of survey is it?		
Snapshot survey		
Panel survey		
Longitudinal retrospective survey		
Other (please specify)		
11. What is the frequency of the survey?		
12. What survey methods are used? (Please, choose several responses if relevant)		
Telephone		
Postal		
E-mail		
Other (please specify)		
13. Please indicate starting time and final time of sample observation in the last survey round:		
Starting time		
Final time		
14. Do you collect the following type of information?		
	Yes	No
Sex		
Age		
Cityzenship		
Country of birth		
Children		
Field of study		
Title of diplomas		
Dates of diplomas		
Financial support for doctorate		
Post-doctoral training		
Post-doctoral training abroad		
Number of jobs occupied		
Past employment(s) <i>Of which</i>		
Duration		
Type of contract		
Occupation		
If occupation abroad		
Salary		
Satisfaction		
Other (please specify)		
Current employment <i>Of which</i>		
Duration of contract		
Type of contract		
Occupation		
If occupation abroad		
Salary		

Satisfaction		
Other (please specify)		
15. If you collect data on post-doctoral training, do you use a specific definition and which?		
16. Do you make use of any specific national or international classifications for the following variables (please, give name of classification)?		
	National	International
Field of study		
Diploma		
Occupation		
Industry		
Other (please specify)		
17. Please describe use made of survey results. In particular, are survey results used for policy purposes?		

ANNEX 2

Australia

There are three surveys: the *Survey of Education, Training and Information Technology* (SETIT), the *Survey of Education and Work* (SEW) and the *Graduate Destination Survey* (GDS).

Name of the survey

Survey of Education, Training and Information Technology (SETIT)

Responsible institution

Australian Bureau of Statistics

Population surveyed

Target population:	Persons aged 15 to 64 years, with a private dwelling as their principal residence.
Sample:	Dwellings are selected at random from the universe of private dwellings.

Further details on sampling:

The initial sample on which the survey was based consisted of approximately 18 000 dwellings, in which there might be more than one household. Of the 13 200 households remaining in the survey field (some dwellings selected had no residents in the field, some were vacant or abandoned buildings, or buildings under construction), about 12 000 (92%) were survey respondents, *i.e.* households in which each person in the survey field was a respondent. In total, about 24 400 individuals responded to the survey.

The SETIT is a household survey conducted in urban and rural areas of all Australian states and territories. However, people living in sparsely populated areas of Australia were excluded. This exclusion had only a minor impact on estimates produced for individuals living in states and territories, except for the Northern Territory, where aborigines represent 20% of the territorial population. The exclusion of these territories therefore had an impact on estimates of aborigines, because 20% of the aboriginal population lives in these sparsely inhabited areas. Since the education level and access to training of Australian aborigines living in these sparsely inhabited areas may differ substantially from those of aborigines living outside these areas, analysis of the results is significantly distorted by this sampling bias.

The survey covers only private dwellings, including houses, apartments and other structures used as private residences at the time of the survey. Special dwellings such as hotels, motels, hospitals and mobile homes, were not included in the survey.

Survey description

Type of survey:	Snapshot survey, conducted over 14 weeks from the end of April to the beginning of August 2001.
Frequency of survey:	The survey was conducted in 1989, 1993, 1997 and 2001.
Data collection method:	Personal interviews
Timing of survey:	2001
Sample size:	24 400 individuals, no detail on the number of the PhDs.

Survey questionnaire

Sex.
 Age.
 Field of study.
 Country of birth.
 Children.
 Title of diploma (most recent and previous).
 Field of study.
 Duration of past jobs.
 Occupation in past jobs.
 Salary in past jobs.
 Occupation in current job.
 Salary in current job.

Classifications used

	National	International
Field of study	✓	-
Diploma	✓	-
Occupation	✓	-
Industry	✓	-

Name of the survey

Survey of Education and Work (SEW)

Responsible institution

Australian Bureau of Statistics

Population surveyed

Target population: persons aged 15 to 64 years, with a private dwelling as their principal residence.

Sample: dwellings were selected at random from the universe of private dwellings. All habitual residents of the dwelling aged 15 to 64 years were surveyed.

Further details on the sample

This survey is a supplement to the monthly labour force survey. The sample consists of taking seven or eight groups in the labour force survey for a given month (May), equivalent to about 26 000 households. The survey excludes people living in aboriginal tribes.

The survey covers only private dwellings, including houses, apartments and other structures used as private residences at the time of the survey. Special dwellings such as hotels, motels, hospitals and mobile homes, were not included in the survey. The groups excluded from the survey are the same as those excluded from the SETIT survey.

Survey description

Type of survey:	Snapshot survey, coupled with the monthly Labour Force Survey.
Frequency of survey:	Annual, in May.
Data collection method:	Telephone and face-to-face interviews.
Timing of survey:	2002 (date of last survey)
Sample size:	26 000 individuals, no detail on number of PhDs.

Further details on survey frequency

The first survey was conducted in 1964, but the series has been interrupted several times since then. Until 1976 the survey was limited to people aged 15 to 24. Between 1977 and 1980, the survey was restricted to people aged 15 to 25. Since 1981, the survey has been extended to persons aged 15 to 64 years. Information on training has been collected since 1993, and data on the level of education since 1989. The most recent surveys were conducted in May 2001 and 2002. The next survey is scheduled for 2003.

Survey questionnaire

- Sex.
- Age.
- Field of study.
- Country of birth.
- Children.
- Title of diploma (most recent and previous).
- Field of study.
- Duration of past jobs.
- Occupation in past jobs.
- Salary in past jobs.
- Occupation in current job.

Classifications used

	National	International
Field of study	✓	-
Diploma	✓	-
Occupation	✓	-
Industry	✓	-

Name of the survey

Graduate Destination Survey (GDS)

Responsible institution

Graduate Careers Council of Australia

Population surveyed

Target population: Persons graduating from university in the 12 months preceding the survey.

Sample: no sampling: All graduates are included in the survey.

Survey description

Type of survey: Snapshot survey

Frequency of survey: Annual, in May

Data collection method: Postal survey with telephone and Internet follow-up

Timing of survey: April 2002 (date of last survey)

Sample size: Not available

Survey questionnaire

Sex.

Age.

Citizenship.

Country of birth.

Field of study.

Title of diploma (not requested but available from university records).

Financial support for doctorate.

Postdoctoral training (no further detail).

Postdoctoral training abroad.

Length of time in current job (*i.e.* 12 months after doctorate completed).

Occupation in current job.

If occupation abroad.

Salary.

Satisfaction in light of training.

Classifications used

	National	International
Field of study	ASCED	-
Diploma	-	-
Occupation	ASCO	-
Industry	ANZSIC	-

Belgium**Name of the survey**

Survey of doctorate recipients (Enquête auprès des docteurs diplômés)

Responsible institution

Association Objectif Recherche

Population surveyed

Target population: PhDs who received their diplomas 4, 8 or 12 years ago, *i.e.* in 1987, 1991 and 1995.

Sample: PhDs with known addresses in the European Union

Survey description

Type of survey: Retrospective survey

Frequency of survey: Not applicable

Data collection method: Postal survey

Timing of survey: 2000

Sample size: 242 PhDs of an initial population of 950: 42 PhDs graduating before 1998, 86 PhDs graduating between 1990 and 1993, 11 between 1994 and 1997; includes 62 PhDs in the humanities,²³ 39 in medical sciences²⁴, 79 in natural sciences,²⁵ and 62 in applied sciences.²⁶

-
23. Philosophy and letters, social sciences, economics and management, psychology and pedagogy law, criminology and religious studies.
 24. Medicine, biomedical studies, pharmacy, physical education.
 25. Physics, chemistry, biology, mathematics, earth sciences.
 26. Civil engineering, agronomy, computer sciences.

Survey questionnaire²⁷

Sex.
 Age.
 Field of study.
 Date of diploma.
 Title of diploma.
 Duration of doctoral studies.
 Financing of doctoral studies (IRSIA, teaching assistantships, FNRS²⁸ or other major funds, private financing, regional financing, special French Community funds, federal government financing, etc.).
 Reasons for pursuing doctoral degree (love of research, prospect of an academic career, “this was the only route available after graduation”, etc.).
 Satisfaction with doctoral education received (thesis advisors, equipment, operating budgets, etc.).
 Occupational status at time of survey (employee, self-employed, unemployed, etc.).
 Type of contract in current job.
 Salary in current job (including income from self-employment).
 Satisfaction in current job: do you feel that your PhD degree is being put to good use?
 Research work in current job.
 Economic sector of current job.
 What are your feelings about your occupational future?

Classifications used

	National	International
Field of study	Not reported	Not reported
Diploma	Not reported	Not reported
Occupation	Not reported	Not reported
Industry	Not reported	Not reported

Canada**Name of the survey**

National Graduates Survey

Responsible institution

Statistics Canada

Population surveyed

Target population: University graduates (PhDs are part of the population covered) two years and five years after graduation.

Sample: All PhDs are covered by the survey.

27. The available information is not complete because it was taken from a report that provided a summary presentation of the survey results. We must assume, therefore, that other information was collected but not presented in that report.

28. National Fund for Scientific Research.

Survey description

Type of survey:	Longitudinal survey, two years and five years after graduation.
Frequency of survey:	Roughly five-year intervals (available cohorts are in 1982, 1986, 1990, 1995 and 2000).
Data collection method:	Telephone survey
Timing of survey:	1998
Sample size:	4 000 PhDs, 40 000 university graduates

Survey questionnaire

Sex.
 Age.
 Field of study.
 Date of diploma (most recent and previous).
 Title of diploma (most recent and previous).
 Occupation in current job.
 Type of contract in current job.
 Length of time in current job.
 If employed abroad.
 Salary in current job.
 Satisfaction in current job.
 Economic sector and branch of current job.
 Match between current job and field of study.
 Appropriateness of job.

Classifications used

	National	International
Field of study	✓	-
Diploma	✓	-
Occupation	✓	-
Industry	✓	-

Denmark

Denmark has two sources of data on young doctorate recipients: one of these is more general, covering the entire population aged 15 to 64 years, while the other is specific to PhDs in natural science.

Name of the survey

IDA -- Integrated Database on Labour Market

Responsible institution

Statistics Denmark

Population surveyed

Target population:	Population aged 15 to 64 years
Sampling:	ID numbers drawn from the total population

Survey description

Type of survey:	Sample taken from a longitudinal register database.
Frequency of survey:	Annual
Data collection method:	Register data (combination of several registers)
First available base year:	1980
Last available base year:	2000

Survey questionnaire

Sex.
 Age.
 Citizenship.
 Country of birth
 Field of study
 Date of diploma (year)
 Number of jobs occupied (partial information).
 Duration of past jobs
 Occupation in past jobs
 Salary in past jobs
 Occupation in current job
 Salary in current job

Classifications used

	National	International
Field of study	ERHVUDDE2	-
Diploma	ERHVUDDE2	ISCED 97
Occupation	DISCO 88	ISCO
Industry	PBRANCH2	NACE

Name of the survey

PhDs in Natural Science -- Careers for the 1990-1999 Cohorts

Responsible institution

FUR - The Danish Research Education Council

Population surveyed

Target population:	Doctors in natural and life sciences who earned their degrees during the period 1990-1999.
Sampling:	Addresses collected from the registers at universities and from register information identifying doctorate recipients; representative sample of doctorate recipients in natural and life sciences.

Survey description

Type of survey:	Snapshot
Frequency of survey:	Not applicable
Data collection methods:	Postal survey
Timing of survey:	2000
Sample size:	465

Survey questionnaire

Sex
Age
Citizenship
Children
Field of study
Title of diploma
Date of diploma
Financial support for doctorate
Postdoctoral training
Postdoctoral training abroad
Number of jobs occupied
Duration of past jobs
Type of contract for past jobs
Occupation in past jobs
Salary in past jobs
Satisfaction in past jobs
Length of time in past jobs
Type of contract in current job
Occupation in current job
If occupation abroad
Salary in current job

France

There are several types of surveys: the Doctoral studies survey [*Enquête sur les études doctorales*] conducted by the Ministry of Research and surveys conducted by the CEREQ>

Name of the survey

Doctoral studies survey [*Enquête sur les études doctorales*]

Responsible institution

University Science Office, Directorate of Research, Ministry of Research

Population surveyed

Target population:	In 2001, doctors registered in 1999-2000 who had received their degree between September 1999 and December 2000; in 2002, doctors who had received their degree in calendar 1999.
Sample:	The survey is targeted at graduate schools and not at doctorate recipients themselves.

Survey description

Type of survey:	Longitudinal survey beginning in 2002, snapshot until 2001. For 2002, survey conducted in October 2002, with retrospective information at two points, March 2001 and March 2002.
Frequency of the survey:	Annual
Data collection methods:	Postal survey with telephone follow-ups
Timing of survey:	2002 (October)
Sample size:	In 2001, 39% of doctorates earned during the period covered.

Survey questionnaire

Sex.

Age.

Citizenship.

Field of study.

Title of diploma.

Date of diploma (month, year).

Financial support for doctorate.

Postdoctoral training (include duration).

Postdoctoral training abroad (country code).

Date of hiring in job occupied at March 1, 2001, and March 1, 2002.

Occupation in job occupied at March 1, 2001, and March 1, 2002.

If employed abroad.

Salary in job occupied on March 1, 2001, and March 1, 2002.

Classifications used:

	National	International
Field of study	✓	
Diploma	✓	
Occupation	✓	
Industry	✓	

Name of the surveys

S97 Higher Education Survey, 1997

S99 Higher Education Survey, 1999

S99 Higher Education Survey, 1999

Responsible institution

CEREQ, Ministry of National Education and Ministry of Employment

Populations surveyed

S97

Target population:

Those leaving (*sortants*²⁹) higher education in 1994 (including those earning their doctorates in 1993-1994).

Sample:

Random drawing from national doctorate records files, by region (Ile de France/Province), by level of study (*cycle*) and by broad discipline group (science, law and economics, letters-languages-humanities).³⁰

Further details on sampling:

The database of addresses for the survey was compiled from two centralised files: the sciences file of the ANRT³¹, which also covers doctorates in economics and in health, which were filtered out, and a file on doctorates in letters and humanities. These files do not include date of birth, and so no age filtering was

29. The notion of “*sortant*” has a very specific meaning in the CEREQ surveys (see Recotillet (2002)). In the higher education surveys, *sortants* are students who were registered in year t-1, but who did not reregister in year t, in higher education establishment (universities, business schools, engineering schools, etc.); for the S97 survey, it refers to students registered in 1993 who did not reenroll in 1994 (and are thus assumed to have left the higher education system in 1994).

30. The stratification variables selected make the sample representative of doctors by field of discipline.

31. ANRT: *Association Nationale pour la Recherche et la Technologie*.

done. The universe of doctorate recipients was stratified by geographic location of the institute of learning (Ile de France/Province). As well, for non-science doctorates, recipients were stratified according to two broad types of training: law/economics and others. Doctors with an address abroad were filtered (as were those in the Dom-Toms), using the postal code. All of the 482 CIFRE³² transmitted by ANRT were included in doctors to be surveyed.

S99

Target population:	Those leaving higher education in 1997 (including those earning their doctorates in 1995-1996).
Sample:	Random drawing from university doctorate records, by region (Ile de France/Province), by level of study (<i>cycle</i>) and by broad discipline group (science, law and economics, letters-languages-humanities).

G98

Target population:	Young people leaving the education system in 1998 (including those receiving their doctorates and candidates who abandoned their studies in 1997-1998, aged 35 years or less and of French nationality).
Sample:	Random drawing from the national records of registration in secondary education establishments, and from university registration records for higher education.

Surveys description

S97

Type of survey:	Longitudinal survey
Frequency of survey:	Conducted in 1994 ³³ , 1997 (S97) and 1999 (S99)
Data collection method:	Telephone survey
Timing of survey:	1997
Sample size:	-

32. CIFRE: *Convention Industrielle pour la Formation par la Recherche en Entreprise*. Doctoral studies subsidised by private businesses: the candidate conducts research in the firm, as well as in an assigned research laboratory.

33. The 1994 survey did not include a doctor-specific sample.

S99

Type of survey:	Longitudinal survey
Frequency of survey:	Conducted in 1994, 1997 (S97) and 1999 (S99)
Data collection method:	Telephone survey
Timing of survey:	1999
Sample size:	1 744

G98

Type of survey:	Longitudinal survey
Frequency of survey:	Every 3 years, beginning in 2001, panel re-surveyed in 3 years ³⁴
Data collection method:	Telephone survey
Timing of survey:	2001
Sample size:	1 740 doctors, 1 265 graduates and 475 doctoral dropouts. The 1 740 doctors were representative of 6929 doctors leaving the university system for the first time ³⁵ , the 1 265 graduates are representative of 5 005 doctors, and the 475 dropouts are representative of 1 924.

Surveys questionnaire**S97**

Sex.
 Age.
 Citizenship (French, European Union, beyond European Union).
 Field of study.
 Date of diploma (month and year).
 Financial support for doctorate.
 Postdoctoral training (yes/no).
 Postdoctoral training abroad (France, U.S.A., Japan, Europe, other country).
 Number of jobs held.
 Occupation in past jobs (first job).
 Type of contract in past jobs (first job).

34. Individuals surveyed in 2001 were re-surveyed in 2003.

35. The notion of "first-time leaver": an individual leaving the education system for the first time, *i.e.* one who does not reenroll the following year in an institution of higher learning and has not pursued studies in the year thereafter. This makes it possible to exclude doctors, particularly in letters, languages or the humanities, who frequently interrupt their studies during the course of their doctoral work.

Salary in past jobs (first job).
 Field of activity in past jobs (first job).
 Occupation in current job.
 Type of contract in current job.
 Length of time in current job.
 Economic sector and branch of current job.
 Time elapsing between receipt of diploma and first job.
 Number of periods of unemployment.

S99

Sex.
 Age.
 Citizenship
 Field of study.
 Date of diploma (month and year).
 Financial support for doctorate.
 Postdoctoral training (yes/no).
 Number of jobs held.
 Occupation in past jobs (first job).
 Type of contract in past jobs (first job).
 Salary in past jobs (first job).
 Field of activity in past jobs (first job).
 Occupation in current job.
 Type of contract in current job.
 Length of time in current job.
 Salary in current job.
 Industrial sector and branch of current job.
 Time elapsing between receipt of diploma and first job.
 Number of periods of unemployment.

G98

Sex.
 Age.
 Citizenship
 Country of birth
 Field of study.
 Title of diploma.
 Date diploma obtained (indirectly).
 Number of jobs held.
 Between entry into labour market and April 2001 (three years of observation):
 Occupation in all jobs.
 Type of contract in all jobs.
 Salary in all jobs.
 Duration of all jobs.
 Employment abroad in all jobs.
 Satisfaction in all jobs.
 To what extent did you use your skills?
 The sector of activity in all jobs.
 Number of periods of unemployment.

Time elapsing between receipt of diploma and first job.
Would you like to be working for yourself in April 2001?

Classifications used

	National	International
S97		
Field of study	✓	
Diploma	✓	
Occupation	PCS INSEE	Crosswalk possible with ISCO88
Industry	-	
S99		
Field of study	SIZE	
Diploma	✓	
Occupation	PCS INSEE	Crosswalk possible with ISCO88
Industry	NES	Crosswalk possible with NACE
G98		
Field of study	SIZE	
Diploma	✓	
Occupation	PCS INSEE	Crosswalk possible with ISCO88
Industry	NES	Crosswalk possible with NACE

Germany

Name of the survey

Brain Drain -- Brain Gain Survey on International Job Careers

Responsible institution

Gesellschaft für empirische Studien (GES)

Population surveyed

Target population:

Three types of populations are covered:

1. German graduates at ISCED 5 or beyond, currently working abroad.
2. Foreign graduates at ISCED 5 or beyond, currently working in German universities or research institutes.
3. Foreign personnel at ISCED 5 or beyond, working in German companies.

Sample:

Three types of samples are needed for these three types of population:

1. Selection of individuals in the ALUMNI database on "German and European exchange services and research promotion agencies", currently living abroad (either in their home country or another country).

2. Selection of all foreign personnel working under contract or enrolled in German universities and research institutes. Information provided by the host organisation.

3. Selection of individuals in companies that are members of a specific association³⁶.

Survey description

Type of survey:	Snapshot
Frequency of survey:	Not applicable, conducted only once
Data collection method:	Postal survey
Timing of survey:	October 2001-February 2002
Sample size:	4 228, including 1 394 PhDs distributed as follows:

	PhDs	Total
German graduates	1 177	1 690
Foreign personnel in German universities and research institutes	1 309	2 197
Foreign personnel in German companies	85	341

Survey questionnaire

Sex.
 Age.
 Citizenship.
 Country of birth.
 Marital status.
 Children.
 Field of study.
 Title of diploma.
 Date of diploma.
 Financial support for doctorate.
 Postdoctoral training.
 Postdoctoral training abroad.
 Number of jobs held.
 Duration of past jobs.
 Type of contract in past jobs.
 Occupation in past jobs.
 Past jobs abroad.
 Satisfaction in past jobs.
 Economic sector and branch of past jobs.
 Length of time in current job.
 Occupation in current job.
 Date of contract in current job.

36. Stifverband, Donors Association for the Promotion of Science and Humanities.

If employed abroad.
 Satisfaction in current job.
 Type of remuneration in current job.
 Economic sector and branch of current job.
 Comparison of working conditions in home country and host country.
 Reasons for leaving the host country.
 Resident status.

Definition of postdoctoral work: Postdoctoral programme covered by specific funding.

Classifications used

	National	International
Field of study	DESTATIS	-
Diploma		ISCED 76
Occupation	DESTATIS	-
Industry	WZ 93	-
Country code		ISO 316

Hungary

Name of the survey

Opportunities of doctorate recipients on the labour market

Responsible institution

Universitas Press Kft.

Population surveyed

Target population:	PhDs graduating between 1990 and 2002
Sample:	Representative sample by field of discipline, sex and region.

Survey description

Type of survey:	Retrospective survey
Frequency of survey:	Conducted once; the survey is to be repeated every four years.
Data collection method:	Face-to-face interviews
Timing of survey:	April 2002-November 2002
Sample size:	750 doctors

Survey questionnaire

Sex.
 Age.
 Citizenship.
 Children.
 Field of study.
 Date of diploma.
 Postdoctoral training.
 Postdoctoral training abroad.
 Number of jobs held.
 Duration of previous jobs.
 Type of contract in previous jobs.
 Occupation in previous jobs.
 If previously employed abroad.
 Salary in previous jobs.
 Length of time in current job.
 Type of contract in current job.
 Occupation in current job.
 If employed abroad.
 Salary in current job.

Classifications used

	National	International
Field of study	✓	-
Diploma	✓	-
Occupation	✓	-
Industry	✓	-

Iceland

Iceland does not conduct surveys of doctorate recipients. The only information we were able to obtain is that nearly 95% of PhDs obtained their degrees in other countries.

Ireland***Name of the survey***

First Destination of Award Recipients in Higher Education

Responsible institution

HEA, Higher Education Authorities

Population surveyed

Target population: All graduates of universities and technology institutes for the year in question (the last survey covered graduates in 2000).

Sample: All graduates are included in the survey: for the year 2000, of 37 500 individuals contacted, 23 000 responses were received (response rate of 61.2%). Of 3 476 higher degree recipients, 64% responded to the survey. PhDs are not identified separately within the category "Higher Degree", which corresponds to Level 3 of the Irish classifications and covers "Higher Diploma, Master's Degree and Doctorate Degree".

Survey description

Type of survey:	Snapshot
Frequency of survey:	Annual
Data collection method:	Postal survey
Timing of survey:	April 2001
Sample size:	Since PhDs are not identified within the Higher Degree category, the number of PhDs is not available.

Survey questionnaire

Sex.
 Field of study.
 Date of diploma.
 Labour market situation after leaving university (employment in Ireland, abroad, job hunting, further study, not available for work).
 Situation nine months after the end of the university year 2000 (research work or pursuing academic studies, teacher training, other vocational training, government-assisted employment, not available for work or for study, job hunting, working).
 Occupation in current job.
 Salary in current job.
 Economic sector of current job.

Classifications used

	National	International
Field of study		
Diploma		
Occupation		
Industry		

Italy***Name of the survey***

Employment of PhDs of the University of Rome

Survey title and responsible institution

CNR

Population surveyed

Target population:	Doctorate recipients in the last three years.
Sample:	Random drawing among doctorate recipients from the University of Rome in a given year (1995)

Survey description

Type of survey:	Snapshot
Frequency of survey:	Not applicable (conducted only once)
Data collection method:	Telephone survey
Timing of survey:	1998
Sample size:	200 (of 500 doctorate recipients)

Survey questionnaire

Sex.
 Age.
 Field of study.
 Date of diploma (year)
 Financial support for doctorate.
 Children.
 Occupation in past jobs.
 Type of contract in past jobs.
 Occupation in current job.
 Type of contract in current job.
 Length of time in current job.
 Satisfaction in current job.
 Economic sector and branch of current job.
 Match between current job and research activity.
 Match between current job and type of doctorate.
 Time elapsed between obtaining doctorate and first job.

Classifications used

	National	International
Field of study	MIUR	-
Diploma		ISCED
Occupation		ISCO
Industry		NACE

Japan

Name of the survey

Basic Survey on Schools

Responsible institution

Analytical Research Planning Division, Lifelong Learning Policy Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Population surveyed

Target population: Universities offering doctoral degrees

Sample: Census data: no sampling

Survey description

Type of survey: Snapshot data

Frequency of survey: Annual data

Data collection method: Postal survey

Timing of survey: May of each year, just after award of diplomas.

Population size: Not supplied

Survey questionnaire

Sex.

Age.

Field of study (department and course).

Date of diploma (this information is provided by the survey system).

Title of diploma.

Occupation in current job.

Sector of economic activity in current job.

Type of contract in current job.

Length of time in current job.

Satisfaction in current job

Classifications used

	National	International
Field of study	Department Systematic Classification Table	-
Diploma	-	-
Occupation	Standard Occupation Classification of Japan	-
Industry	Standard Industry Classification of Japan	-

Mexico

No survey of doctorate recipients

Netherlands

No survey of doctorate recipients

Norway***Name of the survey***

Doctoral Degree Register

Responsible institution

NIFU

Population surveyed

Target population:

Doctorate recipients who have found employment at a university or research institute (public or private).

Sample:

Register on doctorates awarded, updated twice a year, register on research personnel, updated every two years (these two databases are linked). The second source includes doctorates earned abroad, but it does not cover doctorate recipients working in private business.

Survey description

Type of survey:

Register data

Frequency of survey:

Not applicable

Data collection method:

Not applicable

Timing of survey:

Not applicable

Population size:

Not supplied

Survey questionnaire

Sex.
Year of birth.
Age at time doctorate received.
Number of children.
Marital status.
Parents' level of education.
Citizenship.
Field of study.
Financial support for doctorate.
Institution awarding the diploma.
Sector/institution of employment after receiving doctorate.
Discipline of the institution recruiting the doctor (for those recruited to universities or research institutes).

Portugal

Name of the survey

Professional Situation of Ex-PhD Grant Holders Survey

Responsible institution

Observatory for Sciences and Technologies, Ministry for Science and Higher Education

Population surveyed

Target population: Former doctoral students who have received funding from the Ministry of Science and Higher Education.

Sample: The survey covers the entire target population.

Survey description

Type of survey: Snapshot

Frequency of survey: Annual (students who completed their doctorates in year t-1 are interviewed in year t).

Data collection method: Telephone, post and Internet

Timing of survey: December 2001 (latest survey).

Sample size: Not available

Survey questionnaire

Sex.
Age.
Citizenship.

Field of study.
 Date of diploma (most recent and previous).
 Title of diploma (most recent and previous).
 Financial support for doctorate.
 Postdoctoral training (only for those who have received funding from the ministry).
 Postdoctoral training abroad.
 Type of contract in previous jobs.
 Occupation in previous jobs.
 If previously employed abroad.
 Length of time in current job.
 Type of contract in current job.
 Occupation in current job.
 If employed abroad.

Classifications used

	National	International OECD main fields ISCED
Field of study	✓	
Diploma	-	
Occupation	✓	-
Industry	✓	-

Note:

The results are not published, and are used for policy purposes.

Slovakia

No survey of doctorate recipients

Sweden

There are two data sources: the *Swedish Register of Education* (SRE) and the survey on *Entrance to the Labour Market* (ELM).

Name of the survey

Swedish Register of Education (SRE)

Responsible institution

Statistics Sweden

Population Surveyed

Target population:	Total population of Sweden, age 16 to 74 years
Sample:	The sample is selected from the Swedish Population Census

Survey description

Type of survey:	Census
Frequency of survey:	Annual
Data collection method:	Administrative data, no survey
Timing of survey:	Not applicable
Sample size:	33 000 doctorate recipients age 16 to 74 years, out of a population of 6.4 million.

Survey questionnaire

Sex.
Age.
Citizenship.
Country of birth.
Title of diploma.
Field of study.
Date of diploma

Classifications used

	National	International
Field of study	SUN 2000	-
Diploma	SUN 2000	-
Occupation	-	-
Industry	-	-

Name of the survey

Entrance to the Labour Market (ELM)

Responsible institution

Statistics Sweden

Population surveyed

Target population:	Graduates from higher education during the academic year 1998-1999.
Sample:	Stratified random sample; the sample is drawn from the Register of Higher Education, issued by universities and colleges concerned.

Survey description

Type of survey:	Snapshot
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Frequency of survey:	Every two years
Data collection method:	Telephone and postal survey
Timing of survey:	June of the year in question
Sample size:	1 408

Survey questionnaire

Sex.
 Age.
 Title of diploma.
 Field of study.
 Date of diploma.
 For jobs held in June of the year following the university year 1998-1999:
 Type of contract.
 Occupation.
 Salary

Classifications used

	National	International
Field of study	SUN 2000	ISCED 97
Diploma	SUN 2000	ISCED 97
Occupation	SSYK 96	ISCO 88
Industry	SNI 92	-

Switzerland***Name of the survey***

Survey of new doctorate recipients (*L'enquête auprès des nouveaux diplômés*)

Responsible institution

Office Fédéral de la Statistique

Population surveyed

Target population:	Graduates from universities and specialised schools (<i>hautes écoles</i>), questioned one year and four years after completion of their studies.
Sample:	All new doctorate recipients included in the target population are selected (exhaustive survey). The response rate varies between 57% and 66%.

Survey description

Type of survey:	Longitudinal retrospective survey, using a panel (panel is questioned again three years after the first survey).
Frequency of survey:	Every two years
Data collection method:	Postal survey, with option of responding by Internet.
Data survey:	The last survey was conducted in June 2001
Sample size:	908 doctorate recipients for the 2001 survey (response rate 33%).

Survey questionnaire

Sex.
Age.
Citizenship.
Country of birth.
Children.
Field of study.
Title of diploma.
Date of diploma.
Postdoctoral training.
Postdoctoral training abroad.
Number of jobs held
Employment one year after end of studies:
Duration.
Type of contract.
Occupation.
Salary.
If employed abroad.
Satisfaction in job.
Employment 4 years after end of studies:
Duration.
Type of contract.
Occupation.
Salary.
If employed abroad.
Satisfaction in job.
Describe all occupational activities:
Duration.
Field of activity.
Occupational status.
Full-time/part-time.
Place.
New employer (yes/no)
Field of activity in current job.
Full-time/part-time in current job.

Classifications used

	National	International
Field of study	Swiss University Information System (SIUS)	
Diploma	SIUS	ISCED
Occupation	OFS Database	-
Industry	-	-
Occupational status	OFS	-

United Kingdom**Name of the survey**

First Destination Survey³⁷

Responsible institution

HESA, Higher Education Statistics Agency.

Population surveyed

Target population: Individuals leaving higher education with qualifications as listed (including PhDs).

Sample: The target population is not sampled: all individuals are covered by the survey. The response rate is about 75%.

Survey description

Type of survey:	Snapshot
Frequency of survey:	Annual
Data collection method:	Telephone survey, after contact by post or e-mail. ³⁸
Timing of survey:	April 2002-November 2002
Sample size:	750 PhDs

Survey questionnaire

Sex.
Age.
Title of diploma.
Field of study.

37. As of 2002-2003, this has become « Destinations of Leavers from Higher Education »

38. As of 2002-2003, the questionnaire will be available at some institutions' Web sites.

Date of diploma.
Financial assistance for doctorate.

Number of jobs held.

For past jobs, since the survey is conducted just after graduation, respondents are asked a few questions about employment during their studies.

Length of time in current job.
Occupation in current job.
If employed abroad.
Salary in current job (this information will be collected in the next survey).

Classifications used

	National	International
Field of study	✓ ³⁹	-
Diploma	-	-
Occupation	SOC ⁴⁰	-
Industry	SIC	-

United States

There are two related surveys which are part of the same system: the *Survey of Doctorate Recipients* (SDR) and the *Survey of Earned Doctorates* (SED).

Name of the survey

Survey of Doctorate Recipients (SDR)

Responsible institution

NSF, National Scientific Foundation

Population surveyed

Target population:

The population consists of all recipients of doctorates in S&T from US institutions, under the age of 76, and living in the United States (reference period is April 15, this will change to October 1, as of 2003).

Sample:

A sampling rate of 1/16 is applied to the target population. In 2001, the SDR sample included the 1999 sample (the survey was conducted in both years) as well as a sample of young doctorate recipients (PhDs earned between June 1998 and June 2000).

39. As of 2002-2003, JACS classification.

40. SOC 2000 as of the next survey.

Survey description

Type of survey:	Panel survey (every two years, a new sample of doctorate recipients is added to the SDR database).
Frequency of survey:	Every two years
Data collection method:	Postal survey, with follow-up by telephone and e-mail for non-respondents.
Timing of survey:	Last survey was conducted in 2001 (reference date April 15, 2001)
Sample size:	40 000

Survey questionnaire

Sex.
 Age.
 Citizenship.
 Country of birth.
 Children.
 Title of diploma.
 Date of diploma.
 Postdoctoral training.
 Number of jobs held

For each snapshot survey (new doctorate recipients) there is little information on the jobs held between the date the doctorate is received and the date of reference. On the other hand, with the panel sample, it is possible to reconstruct an individual's occupational history⁴¹.

If the individual is not employed:

Last date of employment.
 Reason why the individual is not employed.

Length of time in current job.

Duration of work (full-time, part-time, number of hours and weeks worked).

For academic positions, rank and status (tenure).

Postdoctoral internship is considered as employment: the individual is asked whether employment is in postdoctoral work or not (see the definition below).

Occupation.

Salary.

Satisfaction (only in the 2001 survey, specific module).

Economic sector of current job.

Match between field of employment and doctoral training.

41. The panel sample, however, generates some methodological problems, because the panel is created artificially from different snapshot surveys (see Recotillet, 2002). In the end, the panel sample is not really usable.

Definition of postdoctoral internship in the SDR

A temporary position in the academic sector, industry or the public sector, designed to round out doctoral training and create conditions for pursuing research.

Classifications used

	National	International
Field of study	NCES, CIP(see www.nces.ed.gov/ipeds/web2000/cip2000.asp)	-
Diploma		-
Occupation	SOC (see www.bls.gov/soc)	-
Industry		-

Name of the survey

Survey of Earned Doctorates (SED)

Population surveyed

Target population:	Doctorates received in the 12 months prior to June of year t (June 2001 for SED 2001).
Sample:	All PhDs are supposed to receive the questionnaire through their university coordinator.

Survey description

Type of survey:	Retrospective survey
Frequency of serving:	Annual, conducted since 1957.
Data collection method:	The questionnaires distributed in universities
Timing of survey:	Last survey was conducted in June 2002
Sample size:	Response rate of 92.2% for an initial population of 40 744 PhDs, representative of 40 744 doctorates received during the period.

Survey questionnaire

Sex.
 Date of birth.
 Citizenship at time of diploma.
 Country of birth.
 Marital status.
 Children.
 Parents' education level.
 Post-secondary educational history.

Field of study (seven categories).

Level of diploma.

Title of thesis.

Type of institution awarding the diploma.

Financial assistance for doctorate in (details on sources of financing, plus the two most important sources).

Duration of thesis.

Postdoctoral training (including financial assistance for postdoctoral training).

Employment after receipt of doctorate:

- Type of employer (education, government, private sector, other).
- Nature of activity (research and development, teaching, administration, services, other)

Expected situation in the year following award of doctorate (research contract, job hunting, etc.).

Classifications used

	National	International
Field of study	NCES, CIP(see www.nces.ed.gov/ipeds/web2000/cip2000.asp)	-
Diploma		-
Occupation		-
Industry		-

Israel

Name of the survey

Recipients of Degrees from Universities

Responsible institution

Central Bureau of Statistics

Population surveyed

Target population:

Recipients of doctorates from Israel universities recognised by the Council on Higher Education.

Sample:

The sample is drawn from doctorate award records.

Survey description

Type of survey:

Snapshot

Frequency of survey:

Annual

Data collection method:

-

Timing of survey:

September-October of each year

Sample size:

-

Survey questionnaire

Sex.

Age (this can be obtained by matching against census records).

Country of birth (“).

Field of study.

Title of diploma.

Date of diploma.

Classifications used

	National	International
Field of study	✓	Unesco
Diploma	✓	Unesco
Occupation	✓	-
Industry	✓	-

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