

Appendix C: Ranking of policy issues by countries

Country	Ordering of policy issues	Additional issues
Australia	<ol style="list-style-type: none"> 3. The contribution of the national educational system to industry 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 6. Gender related mobility 4. The importance of brain drain/brain gain 5. Regional effects 	<p><i>How successful graduates are in finding work and how useful their qualifications are in that work. Is the education system meeting the needs of the labour market?</i></p>
Austria	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	
Belgium	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry 5. Regional effects 6. Gender related mobility 2. Inter-firm flows of highly skilled human resources 4. The importance of brain drain/brain gain 	
Canada	<p><i>New.</i> <i>Employment/job creation for the highly skilled</i></p> <p><i>New.</i> <i>The quality of employment (skill level and innovation) for the highly skilled</i></p> <ol style="list-style-type: none"> 1. The degree of linkage between the universities and government laboratories, the 'science system', and industry (i.e. the interaction between industry and the public research infrastructure) 5. Geographical distribution (i.e. regional effects) 3. The flows from universities to other sectors of the economy (i.e. the contribution of the national education system to industry) 4. The importance of brain drain/brain gain 2. Inter-firm flows of highly skilled human resources 	

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Canada (cont.)	<i>Not an important policy issue in Canada:</i> 6. Gender related mobility	
Czech Republic	5. Regional effects 4. The importance of brain drain/brain gain 3. The contribution of the national educational system to industry 2. Inter-firm flows of highly skilled human resources 1. The interaction between industry and the public research infrastructure <i>Not considered to be a separate issue but a sub-issue of all the above:</i> 6. Gender related mobility	
Denmark	All issues of policy relevance, no ranking provided.	
Federation of Russia	4. The importance of brain drain/brain gain 1. & 3. The interaction between industry and the public research infrastructure & the contribution of the national educational system to industry (both of these were considered to be equally important) 5. Regional effects 6. Gender related mobility 2. Inter-firm flows of highly skilled human resources	<i>Age related mobility. The problem of aging in the Federation of Russia is due to the outflow of young R&D scientists to other occupations. Thus, it is important to find out/study to what extent the older scientists are mobile?</i>
Finland	1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 6. Gender related mobility 5. Regional effects	<i>The shortage of IT-workers in Finland.</i>
France	3. & New. The contribution of the national educational system to industry <i>linked with consequences of the aging of the highly qualified work force</i>	

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France (cont.)	<ol style="list-style-type: none"> 1. & 2. The interaction between industry and the public research infrastructure & inter-firm flows of highly skilled human resources 6. Gender related mobility 4. The importance of brain drain/brain gain 5. Regional effects 	
Germany	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 6. Gender related mobility <p><i>Not considered to be a separate issue but a sub-issue of all the above:</i></p> <ol style="list-style-type: none"> 5. Regional effects 	<p><i>The general climate in Germany suggests that the labour market, employment and qualification dimensions belong to the most important policy issues.</i></p>
Greece	<ol style="list-style-type: none"> 4. The importance of brain drain/brain gain 3. The contribution of the national educational system to industry 1. The interaction between industry and the public research infrastructure 5. Regional effects 2. Inter-firm flows of highly skilled human resources 6. Gender related mobility 	
Hungary	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 5. Regional effects 4. The importance of brain drain/brain gain 6. Gender related mobility 	
Iceland	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 	<p><i>Mobility flows between foreign universities and Iceland.</i></p>

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Iceland (cont.)	<ol style="list-style-type: none"> 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	
Ireland	<p><i>Main priority areas:</i></p> <ol style="list-style-type: none"> 3. The contribution of the national educational system to industry 5. Regional effects <p><i>Secondary importance (not ranked):</i></p> <ol style="list-style-type: none"> 4. The importance of brain drain/brain gain 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 6. Gender related mobility 	<i>The potential for crowding out by multinational companies in Ireland.</i>
Israel	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 6. Gender related mobility <p><i>Not considered to be a separate issue but a sub-issue of all the above:</i></p> <ol style="list-style-type: none"> 5. Regional effects 	<p><i>(i) To what degrees do Israeli students spend time abroad while pursuing their university diplomas (by degree, field of study, for post doctoral work, etc).</i></p> <p><i>(ii) What role does spending time abroad play in career advancement. Are people who had spend time abroad more likely to become research managers and administrators? Where did these people go when they went abroad and at what stage in their careers did they go?</i></p>
Italy	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	
Japan	<ol style="list-style-type: none"> 3. The contribution of the national educational system to industry 2. Inter-firm flows of highly skilled human resources 	<i>Joint activities among universities and firms and the outsourcing of activities as a means of exchange of knowledge.</i>

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Japan (cont.)	<p>New. <i>Inter-field flows of highly skilled human resources</i></p> <ol style="list-style-type: none"> 1. Interaction between industry and public research infrastructure 5. Regional effects 4. The importance of brain drain/brain gain 6. Gender related mobility 	
Korea	<ol style="list-style-type: none"> 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 1. The interaction between industry and public research infrastructure 4. The importance of brain drain/brain gain 6. Gender related mobility 5. Regional effects 	
Luxembourg	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry 5. Regional effects 4. The importance of brain drain/brain gain 2. Inter-firm flows of highly skilled human 6. Gender related mobility 	
Mexico	<ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry 5. Regional effects 2. Inter-firm flows of highly skilled human resources 4. The importance of brain drain/brain gain <p><i>Not an important policy issue in Mexico:</i></p> <ol style="list-style-type: none"> 6. Gender related mobility 	
The Netherlands	<p>New. <i>The inflow into the Ph.D. programs and S&T-studies</i></p> <ol style="list-style-type: none"> 1. & 3. The interaction between industry and the public research infrastructure & the contribution of the national educational system to 	<p><i>For the universities, the knowledge mobility issues are at present mainly linked to employment/employability issues and to research policy issues: Does industry drain experts from the</i></p>

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The Netherlands (cont.)	industry 2. & 4. Inter-firm flows of highly skilled human resources & the importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility	<i>universities, are graduates able to find jobs, can experts from industry be hired, how can internal mobility be stimulated, and how can the societal relevance of research be determined and stimulated?</i>
New Zealand	<i>New. The strength of the countries skill base</i> 1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain <i>New. Retraining</i> 2. Inter-firm flows of highly skilled human resources <i>New. Age mobility</i> 6. Gender related mobility 5. Regional effects	<i>Retraining. Learning organisations, life-long learning, the role of industry training, adult education, etc., are becoming increasingly important. Retraining is a process of mobility between skill areas and a process of the cross fertilisation of knowledge between skill areas.</i>
Norway	1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility	
Poland	1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry 2. Inter-firm flows of highly skilled human resources 5. Regional effects 4. The importance of brain drain/brain gain 6. Gender related mobility	
Portugal	1. The interaction between industry and the public research infrastructure 3. The contribution of the national educational system to industry	

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Portugal (cont.)	<ul style="list-style-type: none"> 5. Regional effects 6. Gender related mobility 2. Inter-firm flows of highly skilled human resources 4. The importance of brain/drain brain gain 	
Slovak Republic	All issues of policy relevance, no ranking provided	
Spain	<ul style="list-style-type: none"> 3. The contribution of the national educational system to industry 1. The interaction between industry and the public research infrastructure 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	
Sweden	<p><i>New. Migration with a special focus on the highly educated</i></p> <ul style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	<i>An issue that can be expected to become of interest in the future is the degree new forms of labour organisation and employment will influence the circulation of knowledge.</i>
Switzerland	All issues of policy relevance, no ranking provided	
Turkey	No ranking provided	
United Kingdom	<ul style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry 5. Regional effects 6. Gender related mobility 4. The importance of brain drain/brain gain 	

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United States	<p><i>More important:</i> New. <i>The surplus of highly qualified science personnel in the 90's (who can't find jobs corresponding to their qualifications)</i></p> <ol style="list-style-type: none"> 1. The interaction between industry and the public research infrastructure 2. Inter-firm flows of highly skilled human resources 3. The contribution of the national educational system to industry <p><i>Less important although not unimportant:</i></p> <ol style="list-style-type: none"> 4. The importance of brain drain/brain gain 5. Regional effects 6. Gender related mobility 	<p><i>(Issues that are discussed in media but not considered to be top policy issues):</i></p> <p><i>(i) Are foreign scientists and engineers in the United States being exploited by being paid lesser wages, etc.?</i></p> <p><i>(ii) Do American firms choose to locate certain parts of their facilities in developing countries in order to take advantage of the lower cost of highly qualified personnel in these countries?</i></p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
Australia	<p>(i) The Bureau of Industry Economics published a benchmarking study of the Australian Science System in 1996 which included an analysis of job mobility of S&T personnel.</p> <p>(ii) The Australian Department of Employment, Education and Training (DEETYA) recently completed a study of the supply and demand for Scientists and Engineers in Australia (not publicly released). The Graduate Destination survey provides a range of data and analysis.</p> <p>(iii) An analysis of immigration statistics between 1987-96 was commenced by Department of Industry, Science and Tourism (DIST) in 1997, but is currently in abeyance (resumption is expected in the second half of 1998). Some broad results were published in <i>Australian Science and Technology - at a Glance 1997</i>. A 1990 study <i>Professional Engineers in Australia</i> concluded that immigrants make up a substantial proportion of the engineering labour force in Australia.</p> <p>(iv) Cullen, R.B. <i>The Impact of Mass Post-Secondary Education and Training on Employment in Australia: An Analysis of Qualification Profiles in Australian Industry</i>. The Australian National Training Authority.</p>
Austria	-
Belgium	<p>(i) A study on the basis of the Canberra manual of what HRST data existed in Belgium is currently being conducted at the request of the Federal Department of Scientific Studies. The study consisted of two parts: (i) a feasibility study which examines if different administrative data sources can be combined, what would it cost, etc; and (ii) the combination itself - checks of data, building databases, etc. The study is to be concluded by the end of this year. Contact person: Mr. Peter Van der Hallen, Steunpunt W.A.V., Katholiek Universiteit Leuven, Belgium. Telephone: +32 16 32 32 39 , E-mail: peter.vanderhallen@hiva.kuleuven.ac.be.</p>
Canada	-
Czech Republic	-
Denmark	<p>(i) The Ministry of Education through the Forskerakademiet has conducted a study of the flow of Ph.D.'s to industry. The report was expected to be published in March this year.</p>
Federation of Russia	<p>(i) <i>The emigration of scientists and engineers 1993/94</i>. This study has been conducted annually since 1993/94.</p> <p>(ii) <i>Researchers engaged abroad on temporary arrangements</i>. To be published later this year.</p> <p>(iii) <i>Trends in the graduation of higher education and post graduates</i>. Several different reports based on this study were to be published later this year.</p> <p>(iv) <i>The motivation and career incentives of scientists and engineers</i>. Amongst other things this large scale socio-economic study showed that expectations of becoming unemployed was not considered a serious threat by the group of scientists and engineers.</p> <p>(v) A brand new all comprehensive HRST study, drawing information from the population census, the labour force survey, from the R&D and</p>

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Federation of Russia (cont.)	from the educational statistics, is in planning.
Finland	<p>(i) The working group on the shortages of IT-workers in Finland that the Ministry of Education has put together, published a report in December 1997 (only available in Finnish). The chairman of the working group was Director Heikki Mäenpää.</p> <p>(ii) Ms. Aija Leiponen at the Research Institute of the Finnish Economy had by defining a competency variable done recent econometric work, using data from Statistics Finland, on trying to explain the relationships between competence and firm performance.</p>
France	<p>(i) Centre de Etude et de Research sur l'Emploi et les Qualification (CEREQ) follow cohorts of young people by diploma. Data on occupation, etc. Contact person: Mr. Daniel Martineli.</p> <p>(ii) Institut national d'études démographiques (INED)/ Institut National de la Statistique et des Etudes Economiques (INSEE) follow cohorts of couples by diploma. Information on occupation, etc. Contact person: Mr. Daniel Courgeau.</p> <p>(iii) Association Bernard Gregory (ABG) an association of firms and highly skilled workers established to help the workers find work and the firms to find the highly qualified workers they needed. Produce occasional studies/statistics. Contact person: Mr. Marc Joucla.</p>
Germany	<p>(i) <i>Germany's Technological Performance</i>, update 1997. This study discusses and analyses problems related to the impact of education, knowledge and innovation on growth, employment and structural change, especially in the context of indicators. On behalf of the Federal Ministry of Education, Science Research and Technology (BMBF) teams from four research institutions in Germany work in this area and present annual studies.</p> <p>(ii) Background Material to Germany's Technological Performance, e.g. <i>Innovationen und Humankapital der Unternehmen in den 90er Jahren</i> (Innovation and Human Capital of Enterprises in the nineties), Marian Beise et al. ZEW, Mannheim 1997 (on behalf of the BMBF). The authors were members of the four teams that worked on the study under on Germany's Technological Performance: the German Institute for Economic Research (DIW), the Fraunhofer Institute for Systems Analysis and Innovation Research (ISI), the Lower Saxon Institute for Economic Research (NIW) and the Centre for European Economic Research (ZEW). In background papers to Germany's Technological Performance, the results of the research was discussed in more depth, e.g. human capital in industry, start-up firms and self-employment. Several indicators were also presented and discussed. The indicators were based partly on regular surveys, partly on special surveys. These studies were planned to go on for the next couple of years. Coverage: R&D and innovation, internationalisation, globalisation, technological specialisation of a country/of industry, structural change, qualification and education, etc. Indicators: General economic indicators (employment, production, trade, etc.), R&D statistics, innovation statistics, education statistics, patent statistics, trade in R&D intensive industries, to name the most important areas. Covered time period: 1991 to 1995/1996. Contact persons: (i) human capital in the business enterprise sector - Dr. Birgit Gehrke, Niedersächsisches Institut für Wirtschaftsforschung (NIW), Schiffgraben 33, D-30175 Hannover, Fax: +49 11 31 80 400; (ii) intangible investment/internationalisation of R&D - Florian Straßberger, DIW, Königin-Luise-Straße 5, D-114195 Berlin, Fax: +49 30 89 78 92; (iii) innovation, qualification and employment/start-up firms - Ms. Marian Beise, ZEW, L 7, 1, D-68161 Mannheim, Fax: +49 621 12 35 170 and (iv)</p>

Appendix D: Specialist studies specified by country

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Germany (cont.)	<p>patenting/performance of public R&D institutions - Dr. Andre Jungmittag, Fraunhofer ISI, Breslauer Straße 48, D-76139 Karlsruhe, Fax: +49 721 68 09 176.</p> <p>(iii) <i>Results of the innovation surveys</i>, Georg Licht et al, ZEW, Mannheim 1995, 1996. Results of the innovation surveys in Germany. The surveys had been performed annually since 1992. Contact person: Dr. Georg Licht, ZEW, Mannheim.</p> <p>(vi) <i>Patentwesen an Hochschulen</i> (Patenting in the Higher Education Sector), BMBF-booklet, Bonn 1997. The booklet covered patenting in the higher education system in Germany and the role of patents in the technology transfer between the higher education and business enterprise sector. Contact person: Dr. Ulrich Schmoch, Fraunhofer ISI, Breslauer Straße 48, D-76139 Karlsruhe.</p> <p>(v) <i>BMBF-Patentinitiative</i> (BMBF-patent initiatives), Bonn 1997. Covers the promotion of inventions such as for instance: framework conditions for inventors, initiatives for the higher education institutions and non-university institutions, and activities for SME's information system. Contact: BMBF/Div. Z 16.</p> <p>(vi) <i>Absolventenbefragungen</i> (Survey of graduates from the higher education system), e.g. Karl-Heinz Minks <i>Absolventenreport Ingenieure</i> (Report on the survey of graduates from engineering studies), Bonn 1996 (study on behalf of the BMBF). Are not conducted on an annual basis. Contact person: Mr. Karl-Heinz Minks, Higher Education Information System Institute (HIS GmbH), Gosseriede 9, D-30159 Hannover, Fax: +49 51112 20 250.</p> <p>(vii) Peter Müßig-Trapp/Klaus Schnitzer <i>Vorbereitung auf Europa durch Mobilität und Internationalisierung</i> (Preparation for Europe through Mobility and Internationalisation), Bonn 1997 (study on behalf of the BMBF). The study covers motives and impediments of German students for staying abroad. Is not conducted on an annual basis. Contact person: Mr. Karl-Heinz Minks, HIS GmbH, Gosseriede 9, D-30159 Hannover, Fax: +49 5111 20 250.</p> <p>(viii) Various studies by DIW and the Institute for Research into Labour Market and Profession (IAB). Contact person: Dr. Erika Rost, BMBF, D-53170 Bonn; Fax: +49 228 57 3233.</p> <p>(ix) Research teams: DIW, ISI, NIW, ZEW, IAB, HIS GmbH and SV-Wissenschaftsstatistik (Science Statistics in the Donors' Association for the Promotion of German Science).</p>
Greece	-
Hungary	(i) The Ministry of Education and Culture (OMFB) has contracted out a feasibility study on fresh graduate carrier mobility. The study was still in a research design stage only.
Iceland	(i) In 1992 the OECD conducted an investigation of the R&D-system in Iceland that resulted the report <i>Science, technology and innovation policies in Iceland</i> . The purpose of this background report was to give data on and an overview of present socio-economic conditions in Iceland and the state of its scientific and technological system.
Ireland	(i) The Expert Group on Future Skills, an ad hoc group with representatives from industry, the ministries and the academia looked at what could be done about the skills shortage in Ireland (a project/report is in progress). They also tracked demand and supply and forecasted

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Ireland (cont.)	<p>future demand and supply. The group is supported by Forfás. Contact person: Mr Niall O'Donnellan, Forfás – The Policy Advisory Board for Industrial Development, Wilton Park House, Wilton Place, Dublin 2. Telephone: +353 1 607 30 42.</p> <p>(ii) The Economic and Social Research Institute (ESRI) is a publicly funded organisation that has been asked by the Expert Group on Future Skills to collect data and to perform various forecasts. The National Training and Employment Authority (FAS) and ESRI have been involved in manpower planning together. These experiences have been drawn upon by the Expert Group on Future Skills. ESRI had also released the report <i>Irish PhDs: An Analysis of Their Labour Market and Career Paths</i>. The report related to the early 1990s but will be updated in 1998. Contact persons: Dr Gerard Hughes and Dr Philip O'Connell, ESRI, 4 Burlington Road, Dublin 4, Ireland. Telephone: +353 1 676 01 15. FAS, Research Department, 27 Upper Baggot Street, Dublin 4. Telephone: +353 1 607 05 00.</p> <p>(iii) Women in Technology and Science (WITS) is an organisation that tries to encourage women to go into S&T careers. Contact person: Dr. Jacqueline Allan, Women in Technology and Science, c/o Forfás, Wilton Park House, Wilton Place, Dublin 2, Ireland. Telephone: +353 1 607 30 44.</p>
Israel	-
Italy	<p>(i) L. Pacelli, F. Rapiti, R. Revelli, <i>Mobilità del lavoro e attività innovativa delle imprese: una analisi empirica da un pane di dati individuali di lavoratori e di imprese</i>. Economia a Lavoro, XXXI, n. 3-4, 1997. The English version of this paper is forthcoming (Employment and mobility of workers in industries with different Intensity of Innovation: Evidence on Italy from a panel of workers and firms) in Economics of Innovation and New Technology.</p> <p>(ii) B. Contini, M. Filippi, L. Pacelli, C. Villosio, <i>Working career of skilled vs. unskilled workers</i> mimeo Dec. 1997. Contact persons: Lia Pacelli and Claudia Villosio, R&P, Ricerche e Progetti, (a private research centre) Via Bava 6, 10124 Torino. Telephone: +39 11 888 10 00, Fax: +39 11 812 30 28 and E-mail: rep@inrete.it. Fabio Rapiti, ISTAT, National Statistics Bureau, Via C. Balbo 8, 00186 Roma. Telephone: +39 6 7297 62 86. In the same institution (ISTAT) Mr. Pietro Gennari is the head of the statistics unit on research (he is also a delegate to the OECD-NESTI Group) Via Tuscolana 1788, 00173 Roma. Telephone. +39 6 722 22 86, Fax. +39 6 721 38 28.</p> <p>(iii) A. Golini, A. Donato, F. Donato <i>Strutture demografiche e territoriali degli addetti alla ricerca scientifica pubblica</i>, (Demographic and territorial structure of research personnel in the public sector), CNR, Rome 1996. Contains some data on territorial mobility. Contact person: Mr. Golini, Rome University (a professor of demography). Telephone: +39 6 855 92 94.</p> <p>(iv) S. Avveduto, P. E. Cipollone <i>La mobilità delle intelligenze in Europa</i>, Milano, F. Angeli 1998. A report on the mobility of Ph.D.'s. A technical report in English had been published. S. Avveduto, P. E. Cipollone <i>The internationalisation of research training: the Italian experience</i>, CNR, Technical Report n. 49, Dec. 1996.</p> <p>(v) M. C. Brandi, <i>La formazione e l'occupazione degli stranieri residenti a Roma nel 1996: potenziali risorse umane per la scienza e la tecnologia</i>, CNR, technical report n. 21, October 1997. The report deals with qualifications and employment of resident immigrants in Rome as potential human resources for science and technology, as defined by the Canberra Manual. Contact person: Ms. Brandi (a geographer) at CNR, Rome. Telephone: +39 6 448 792 16.</p>

Appendix D: Specialist studies specified by country

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Japan	<p>(i) Dr. Keiichi Yoshimoto, Kyusyu University and a group from the Japan Institute of Labour (JIL) has worked on a project focusing on education and job careers.</p> <p>(ii) Prof. Shin'ichi Kobayashi, Graduate School of Information Systems, University of Electro-Communication and colleagues has in a project focused on the mismatches between educational background and research fields of university graduates and their jobs.</p> <p>(iii) The Institute of Future Technology (IFTEC), an institution responsible for a technology foresight in Japan, has twice conducted surveys aimed at measuring the mismatches between educational background and research fields of university graduates and their jobs. Prof. Shin'ichi Kobayashi also participated in this project.</p> <p>(iv) In the mid 1980's, The Science and Technology Agency attempted to measure inter-firm and inter-sector flow of researchers via an ad hoc survey by sending out questionnaires to firms and institutions. Prof. Shin'ichi Kobayashi took part in this project as well.</p> <p>(v) Another research institute with interests in this field is the Japan Institute of Science and Technology Policy.</p>
Korea	<p>(i) The book <i>Labour mobility of Korea</i> by Dr. Uh-Soo Bong of the Korean Labour Institute (KLI), was published in 1992.</p> <p>(ii) Dr. Lee Ju-ho and Kim Dae-il of Korea Development Institute (KDI) recently wrote a working paper, <i>Labour Market Developments and Reforms In Korea</i> which includes the analysis of inter-firm mobility of workers across firm sizes.</p>
Luxembourg	<p>(i) One research team at a joint research center studied historic migration in Luxembourg (immigration from Italy in the 1920's and from Portugal in the 1960's and 1970's - why did these people chose to come to Luxembourg and how did they spread in the workforce, etc). They did however not go into the more recent phenomenon of "daily migration".</p>
Mexico	<p>(i) Valenti, Giovanna. <i>Competencies and Human Resources in the Mexican Innovation System</i>, Conacyt. Part of the work in progress on the NIS project. Deals mainly with human resource flows to and from the higher education system. Also includes a section on the demand for scientist and engineers in the labour force.</p> <p>(ii) Fundación Barros Sierra, <i>Supply and Demand of Engineers in Mexico</i>, Mexico, 1992.</p> <p>(iii) Mexican Engineering Academy, Conacyt, <i>State of the Art of Engineers in Mexico: A Comparative Analysis</i>, Mexico, vol. III, 1995, 128 pp.</p> <p>(iv) ITESM, Centro de Estudios Estratégicos, <i>The fulfilment of ITESM's mission through its graduates</i> (longitudinal study), Mexico, 1993.</p> <p>(v) Valenti, Giovanna. <i>UAM's Graduates: training resources towards high acceptance in labour markets</i> (longitudinal study) Mexico, 1996.</p> <p>(vi) Valenti, Giovanna, <i>Employment and Professional Performance of UAM Iztapalapa's Graduate Students</i>, Mexico 1992.</p> <p>(vii) INEGI, <i>Professionals in Mexico</i> (based on the 1990 census) INEGI 1995. (Limited in scope).</p> <p>(vi) Valenti, Giovanna, <i>UAM's Undergraduates at the Labour Market: Qualitative evaluation</i> (under preparation).</p> <p>(vii) Conacyt, <i>Science and Technology Indicators</i>, 1996 edition, Mexico, 1997.</p> <p>(viii) Conacyt, <i>Organisational Change Survey 1997</i>, Mexico, 1997.</p> <p>(ix) Conacyt, <i>R&D Survey</i>, Mexico, 1996.</p> <p>(x) Universidad Autónoma de NL, <i>Study on Graduates</i>. A periodical that might be annual (unfortunately handled as proprietary information and therefore not readily available).</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
Mexico (cont.)	<p>(xi) Muñoz Izquierdo, Carlos <i>Institutional Differentiation of Higher Education and Labour Market</i>, Mexico 1996, UAM.</p> <p>(xii) There are two research teams that have been working on related issues for a number of years. Dr. Giovanna Valenti heads one team at UAM Xochimilco (a public higher education institute) and the second team is headed by Mr. Carlos Muñoz Izquierdo at the Universidad Iberoamericana (private higher education institute).</p> <p>(xiii) The Fundación Barros Sierra, has done some work on mobility of human resources between the private and public sector. It seems however that the group that pursued this line of work was dismissed a while ago.</p>
The Netherlands	<p>(i) L. Zegveld, <i>Mobility of students and teachers in the European Union</i>, 1996. Report nr. 4, Den Haag, The Netherlands Organisation for International Co-operation in Higher Education (NUFFIC).</p> <p>(ii) S.M. Dankelman, <i>Decision making on European recognition of architects and engineers</i>, (research project) Department of Public Administration Science, Erasmus University Rotterdam. 1997.</p> <p>(iii) Drs. S.G.M. van de Bunt-Kokhuis, <i>Determinants of international faculty mobility</i>, (research project) Department of General and Theoretical Psychology, Tilburg University, 1995.</p> <p>(iv) Dr. J.N. Streumer, <i>Curriculum profiles and mobility</i>, (research project) Department of Curriculum Technology, University of Twente, 1996/99.</p> <p>(v) Drs. J. van Dijk, <i>Modernisation of regional production structure and the related labour market adjustments and labour mobility in Poland and Hungary</i>, (research project) Department of Geography, University of Groningen, 1994/98.</p> <p>(vi) M.C. van der Wende, <i>Internationalising the curriculum in Dutch higher education</i>, 1996. A NUFFIC study on international mobility i.e. brain gain/brain drain.</p> <p>(vii) L. Bremer, <i>Financing and effects of internationalization in higher education</i>, 1996. A NUFFIC study on international mobility i.e. brain gain/brain drain.</p> <p>(viii) U. Teichler, F. Maiworm, <i>The Erasmus experience</i>. 1997. An EU-study on international mobility i.e. brain gain/brain drain.</p> <p>(ix) <i>Moving knowledge 1995</i>. Contact: The Ministry of Economic Affairs.</p> <p>(x) M.J.F. Hulshof, A.H.M. Verrijt and A. Kruijthoff, 1996. <i>Promoveren en de arbeidsmarkt: ervaringen van de 'lost generation'</i>. Policy studies for Higher education and Scientific research, no. 43. The Hague, SDU. A study on the careers of alumni and Ph.D.'s entering the labour market between 1990 and 1995.</p> <p>(xi) Verrijt, 1997. <i>Loopenen van beta-afgestudeerden aan de KU Nijmegen 1970-1995</i>. Nijmegen: IOWO instituut voor onderwijskundige dienstverlening, 1997. A study of the career patterns of alumni that graduated from science-studies at the Catholic University of Nijmegen in the period of 1970-1995. In both this study and the study above (item x) some data are available on mobility, mostly national, not international. These studies did not have any "monitoring" character. They have been performed at the request of the Ministry of Education (the former) and the Catholic University of Nijmegen (the latter) and will only be conducted again if commissioned and funded.</p> <p>(xii) Research into the careers of alumni of universities and polytechnics (hogescholen). These "alumni monitors" or "labour market position monitors" were becoming more and more institutionalised. The results of such studies are typically broken down by educational sector of the alumni: e.g. agriculture, science, technology, health, law studies, economy, behavioural sciences, liberal arts and education. The studies</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
The Netherlands (cont.)	<p>allow groups of science and technology alumni that has accepted a job in industry or in the public research infrastructure to be identified. Mostly these “monitors” address only the careers of alumni that have graduated from universities one year before. Hence, only information on “short careers” was available.</p> <p>(xiii) Regional effects are studied by WRA (a project group for geographical labour markets); the Erasmus Centre for Labour Market Analyses, Erasmus University, Rotterdam; the Dutch Departement of Regional Science Associations; Prof. F. Boekerna, Catholic university of Brabant, Tilburg; and TNO-INRO Delft, Dr. P. Louter.</p>
New Zealand	<p>(i) <i>A review of available information on the supply of scientific and technical human resources in New Zealand</i>, Report 59, July 1997. Contact person: Ms. Pamela Walker-Mulcahy and Mr. Frank Edwards, Ministry of Research, Science & Technology (MoRST). Telephone: +64 4 471 69 41, E-mail: Pamela@morst.govt.nz, Frank@morst.govt.nz.</p>
Norway	<p>(i) Olaf Tvede and Bo Sarpebakken, <i>Mobility of personnel between industry and research institutions in the autonomous institute sector</i>, NIFU, 1995. For the purpose of this study Mr. Tvede and Mr. Sarpebakken has utilised the national register of researchers which is under the responsibility of NIFU and the population register of the labour force which is under the responsibility of Statistics Norway, to study mobility by analysing the professional backgrounds of researchers. Contact persons: Mr. Olaf Tvede, Telephone: +47 22 59 51 40, E-mail: Olaf.Tvede@nifu.no; and Mr. Bo Sarpebakken, Telephone: +47 22 59 51 63, E-mail: Bo.Sarpebakken@nifu.no.</p> <p>(ii) Svein Olav Nås at the STEP group did work on the inter firm flows of highly skilled human resources. Contact person: Mr. Svein Olav Nås, Telephone: +47 22 47 73 23, E-mail: svein.nas@step.no.</p> <p>(iii) The labour market group at NIFU under the guidance of Ms. Clara Åse Arnesen studies the labour market of new graduates. Contact person: Ms. Clara Åse Arnesen. Telephone: +47 22 59 51 45, e mail: Clara.Arnesen@nifu.no.</p> <p>(vi) Olaf Tvede and Bo Sarpebakken, <i>Mobility within the Norwegian R&D system during the period 1989-95</i>, NIFU. This study focused on the mobility of Ph.D.'s and Ph.D. students.</p> <p>(v) Olaf Tvede and Kersti Rös vik Pedersen, <i>The recruitment of female researchers and changes in their career options during the last 20 years</i>, NIFU, 1997.</p>
Poland	<p>(i) <i>The Brain Drain from Science and Universities in Poland 1994-1996</i>. Contact persons: Professor Antoni Kuklinski and professor Bohdan Jalowicki. Address: University of Warsaw, European Institute for Regional and Local Development, ul. Krakowskie Przedmiescie 30, 00-927 Warszawa. Telephone: +48 22 826 16 54, Fax: +48 22 826 21 68, E-mail: euroreg@plearn.edu.pl.</p> <p>(ii) <i>Migration of the Polish population 1979-1988</i>. A monograph based on the population and housing census 1988. Contact person: Ms. Grazyna Niedbalska, GUS. Telephone: +48 22 608 37 39, E-mail: g.niedbalska@stat.gov.pl.</p> <p>(iii) Models of research staff reproduction. The size and structure of research staff employment in the years 1986 - 1993 was the matter of the work which was conducted in the Institute for Development and Strategic Studies (IRiSS). The object of analysis was the distribution of all researchers in four organisational sectors of science and main sectors of science. Markov chains were used for describing the process of shifts from one employment category to a higher category. The estimated transition matrixes of the probabilities that researchers will remain</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
Poland (cont.)	<p>in the same group and probabilities that researchers will change their position and will remove to the higher category were the basis of long-term forecasting of the employment in the sectors of Science. Contact person: Professor Izabela Kudrycka. Telephone: +48 22 693 54 97, E-mail: zukrowsk@medianet.com.pl.</p> <p>(iv) <i>Educational level of the Polish population in the years 1970-1988</i>. This study is based on the national censuses 1970, 1978 and 1988. Contact person: Mr. Stanislaw Radkowski, Head of Education, Culture, Foundations and Organisations Statistics Section, GUS. Telephone: +48 22 608 33 37, Fax: +48 22 608 31 82, +48 22 608 38 71.</p> <p>(v) <i>The mobility of scientific staff in Poland</i>. The main purpose of this study (both qualitative and quantitative) undertaken in the spring of 1997 was to answer the following questions: What kind of mobility of researcher staff is common in Poland in comparison to other OECD countries?; How does the mobility of Polish scientific staff influence the operation of the researcher sectors and scientific institutions in Poland?; What are economical, institutional and organisational conditions enhancing the mobility?; How is the readiness for and understanding of the importance of the mobility common among the scientific staff? and What conclusions for science policy can be drawn from the study? Contact person: Professor Malgorzata Dabrowa-Szefler. University of Warsaw, Centre for Science Policy and Higher Education. Telephone/Fax: +48 22 826 07 46.</p> <p>(vi) <i>Professional life of the school leavers in the years 1989-1994</i>. This study was based on a special module included in the November 1994 LFS. Contact person: Ms. Ewa Rychlik. This study was intended to be repeated every few years.</p>
Portugal	-
Slovak Republic	-
Spain	<p>(i) M.J. Martín-Sempere, L.M. Plaza and J. Rey, <i>La movilidad temporal de los investigadores postdoctorales en el extranjero</i>. Política Científica, nº 47, Nov. 1997, p. 50-53. Summary: Mobility of Scientists to foreign research centres plays a fundamental role in the exchange of knowledge and consequently in Spanish scientific progress. The study analyses data corresponding to applications from 4,554 postdoctoral researchers, granted under the National Programme for Researchers Training during the period 1984-1994. The results are compared with those of Spanish 'senior' scientists going abroad obtained in previous paper. Mobility is mainly observed in the field of Life Sciences being Molecular Biology the discipline in which a major number of postdoctoral and 'senior' scientists are involved. From results can be seen that the most important host countries chosen for Spanish scientists are the United States and the United Kingdom.</p> <p>(ii) As part of the National Programme of Training of Research Personnel, around 5.000 Spanish students and postdoctoral scientists were at present in training in foreign universities or research centres. Five years ago a public programme for financing Ph.D.'s conducted in local Spanish Ph.D.'s conducted in local Spanish industries, was furthermore set up. Some 600 Ph.D.'s in nearly 300 industries had taken advantage of this program. Based on mobility data of researches from these two programmes some academic studies have been published.</p> <p>(iii) During 1992-1997 a programme of grants for the exchange and training of research personnel between public research centres and enterprises was in place. Contact person: Mr. Javier Pascual (recently nominated for a new position.), the Secretary of State of Universities</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
Spain (cont.)	<p>and Research, Calle de Serrano, 150. 28002-Madrid. Telephone: +34 1 550 54 00, Fax: +34 1 562 37 75.</p> <p>(iv) Co-ordinate projects between research centres and industries, and between technological centres and industries have been in place in Spain since 1988. These projects involve researches mobility and are supported by the Center for Technological and Industrial Centre for Technological and Industrial Development (CDTI, Centro para el Desarrollo Tecnológico e Industrial), which belongs to the Ministry of Industry: Contact person: Mr. Andrés Zabala, Telephone: +34 1 581 55 00</p> <p>(v) Programa de Estímulo de Transferencia de Resultados de Investigación, PETRI (Action Programme to Promote the Transfer of Research Results). The program has been in place since 1989. Contact person: Mrs. Rosa Márquez: the Interministerial Commission for Science and Technology (CICYT), Calle Rosario Pino, 14-16, 28020-Madrid, Telephone: +34 1 336 04 36, fax: +34 1 336 05 75.</p> <p>(vi) Incorporación de Doctores en Empresas, IDE (Action Programme of contracts for the participation of post doctoral researchers in enterprises). This programme which commenced in 1997 was managed by CICYT. Contact person: Dr. Julián Salas, Telephone: +34 1 336 045 74, Fax: +34 1 336 05 75.</p>
Sweden	<p>(i) Stenberg, Gustafsson, Marklund. <i>Use of Human Resource Data for Analysis of the structure and dynamics of the Swedish Innovation System</i>. NUTEK.</p> <p>(ii) <i>Towards Flexible Organisations - a study on how labour organisations change</i>. NUTEK .</p> <p>(iii) <i>Education and the Labour market for IT-experts</i>. Report 1998:16, NUTEK.</p> <p>(iv) <i>Labour Information 1992:3: Who chooses medical and social services occupations ...and who stays?</i> Mobility and educational background of personnel within the medical and social services occupations. Statistics Sweden.</p> <p>(v) <i>Labour Information 1994:5: Labour Force Mobility. A study on those who remained in their chosen economic activities and those who changed economic activities between 1970-1992</i>. Statistics Sweden.</p> <p>(vi) <i>Labour Information 1995:2: Education and migration</i>. Statistics Sweden.</p> <p>(vii) <i>Labour Information 1996:2: Twenty years in the Labour market</i>. Mobility in the Labour market 1970-90 among lower educated compared to educated on other levels. Statistics Sweden.</p> <p>(viii) <i>Education and Labour Information 1996:3 Educational Groups in the Labour Market. From high demand to unemployment</i>. Statistics Sweden.</p> <p>(ix) <i>Education Statistics U 81SM9701: The transition from education to the Labour market 1989-1995</i>.</p> <p>(x) <i>The entrance to the labour market U 83 SM 9601</i>. Survey in the spring 1996 among graduated from upper secondary school and graduated from universities and university colleges 1993. Statistics Sweden.</p> <p>(xi) <i>Education and Labour Information 1996:7 The labour-force situation in Sweden today and before the economic crisis</i>. Statistics Sweden.</p> <p>(xii) <i>Education and Labour Information 1997:5 Transition to the labour market from technical, economic and medical education</i>. Statistics Sweden.</p> <p>(xiii) Gunnar Eliasson, <i>The use of highly educated people in production - Swedish, German and US practice</i> by order of the Ministry of Education and Science.</p> <p>(xiv) Schröder, L. (1994), <i>Scandinavian Skill Migration in perspective of European Commission's free labour market</i>, Economic Debate,</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
Sweden (cont.)	<p>Vol. 22, nr 3, 1994.</p> <p>(xv) Schröder, L. (1996), <i>Scandinavian Skill Migration in the 1980s</i>, Pedersen, P.J. (ed.) <i>Scandinavians Without Borders, Scandinavian Skill Migration and the European Integration Process</i>, Wadensjö, E. (ed.) <i>The Nordic Labour Markets in the 1990s</i>. North Holland, Amsterdam.</p> <p>(xvi) Swedish Natural Science Research Council: (i) <i>International Review of Swedish Research in Fundamental Chemistry 1995</i>; (ii) <i>International Review of Swedish Research in the Earth Sciences 1995</i>; and (iii) <i>International Review of Swedish Research in Biology within the NFR Sphere of Interest 1995</i>. These studies include special sections about the mobility of scientists. One of the recommendations made by the international peer groups concerns the mobility of those who completed their postgraduate studies. In order to improve the diffusion of knowledge and to encourage renewal they suggest that postgraduates should be encouraged to start working at another institution or university as the one they were examined from.</p> <p>(xvii) Öhrlings Coopers & Lybrand: <i>The mobility of Human Resources</i>. Appendix to their report <i>The importance of the Information and Communication sector for Sweden's economic growth and employment - in a global perspective</i>.</p> <p>(xviii) <i>Knowledge and competence. The Industries need of highly educated</i>. Federation of Swedish Industries.</p>
Switzerland	<p>(i) <i>La mobilité interuniversitaire, un programme politique, les programmes d'encouragement de la mobilité dans le contexte de la politique universitaire</i>. 1993. Ms. Ursula Streckeisen, Statistics Switzerland.</p> <p>(ii) <i>La mobilité interuniversitaire: l'avis des professeurs, Résultats de l'enquête menée auprès d'enseignants des hautes écoles suisses</i>. 1994. Ms. Ursula Streckeisen, Statistics Switzerland.</p> <p>(iii) <i>Mobilité interuniversitaire, déroulement des études et biographie estudiantine, étude qualitative menée auprès d'étudiants d'échange immigrés dans les hautes écoles suisses</i>. 1995. Ms. Ursula Streckeisen, Statistics Switzerland.</p> <p>(iv) A short study to determine if data on brain drain existed in Switzerland (on progress), Conseil Suisse de la Science.</p>
Turkey	-
United Kingdom	-
United States	<p>(i) Michael G. Finn and Joe G. Baker. <i>Non-academic Employment Patterns of Science and Engineering Doctorates</i>, 1993, Oak Ridge, TN: Oak Ridge Associated Universities, July 1996. This report shows net mobility between industry, government and academia by years and science degree.</p> <p>(ii) Dr. Finn has also completed some studies that estimate the proportion of foreign-national doctorate recipients from US universities who stayed in the US to work after graduation. This varies widely by country of origin. Some of these data were published in NSF's Science and Engineering Indicator's - 1998 (forthcoming soon) and there was more detailed information in the report: Michael G. Finn, Stay Rates of Foreign Doctorate Recipients from US Universities, 1995, Oak Ridge, TN: Oak Ridge Institute for Science and Education, 1997.</p>

Appendix D: Specialist studies specified by country

Country	Specialist studies
United States (cont.)	<p>(iii) Henderson, P.H., J.E. Clarke, and M.A. Reynolds. Summary Report 1995: <i>Doctorate Recipients from United States Universities</i>, Washington D.C., National Academy Press, 1996.</p> <p>(vi) There are several other studies dealing with foreign scientists and engineers in the United States that were prepared for the Alfred P. Sloan Foundation in New York. One of particular relevance is a study by economists Paula Stephan and Sharon Levin that provided evidence that immigrant scientists and engineering Ph.D.'s in the United States are at least as productive, probably more productive compared with native born scientists and engineers in the US.</p> <p>(v) <i>Immigration of Scientists and Engineers Increased Slightly in 1993, Despite Decline in Immigration Overall</i>, August 21, 1995. This, and other NSF reports can be found at their web site, Http://www.nsf.gov/sbe/srs.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Australia	<p>(i) The Australian Bureau of Statistics (ABS) performs a monthly labour force survey covering 0.3% of the population. The survey collects data on the transition of people from education to work once a year, and data on job mobility by gender, occupation and educational attainment every two years. Every three years data on the labour force participation of migrants, including data on educational attainment and occupation, is collected. (i) <i>Transition from Education to Work</i>, Australia ABS catalogue no. 6227.0, (ii) <i>Labour Mobility</i>, Australia ABS catalogue no. 6209.0, (iii) <i>Labour Force Status and other Characteristics of Migrants</i>, Australia ABS catalogue no. 6250.0. Contact person: Garth Bode, Head of the Labour Statistics Branch, The Australian Bureau of Statistics, PO Box 10, Belconnen ACT 2616, Australia. Telephone: +61 2 6252 7166, E-mail: garth.bode@abs.gov.au. (Enquiries: +61 2 6252 6627, Fax: +61 2 6207 0282, E-mail: client.services@abs.gov.au).</p> <p>(ii) In 1994 the ABS ran a survey on <i>Innovation in Australian Manufacturing</i> (ABS catalogue no. 8116.0). This included information on the source of ideas and information used in innovation activities. The survey, first performed in 1994, sampled 4,900 management units of manufacturing businesses of all sizes with a 93% response rate. The survey was repeated in 1997 and the results should become available in the second half of 1998. Contact person: John Ovington, Small Business, Science and Technology Section, The Australian Bureau of Statistics, PO Box 10, Belconnen ACT 2616, Australia. Telephone: +61 2 6252 5189, E-mail: john.ovington@abs.gov.au. (Enquiries: +61 2 6252 6627, fax: +61 2 6207 0282, E-mail: client.services@abs.gov.au).</p> <p>(iii) The Graduate Careers Council of Australia performs an annual Graduate Destination survey with details by gender, state, and institution, and a breakdown of destinations by occupation, and starting salary. Classification systems: Field of study codes are adapted from classifications used by the Australian Department of Employment, Education and Training (DEETYA). Great caution should be exercised in using the data for international comparisons, further discussions with the research manager would be needed to establish an appropriate methodology. Contact persons: Roger Bartley, Executive Director Graduate Careers Council of Australia, PO Box 28, Parkville Vic 3052, Australia. Telephone: +61 3 9344 9333, Fax: +61 3 9347 7298, E-mail: R.Bartley@gcca.unimelb.edu.au. Bruce Guthrie, Research Manager. Telephone: +61 2 6367 5347, E-mail: BruceGuthrie@onaustralia.com.au.</p> <p>(iv) DEETYA also undertakes a number of data collections. As part of a collection from universities, details are annually obtained on award course completions by level of course, field of study and gender. DEETYA, and some other organisations concerned with education, may have undertaken other collections or studies of relevance to the measurement of HRST. Consultations will be held with these organisations in the near future.</p> <p>(v) An analysis of brain gain/drain through immigration between 1987-96 was commenced by the Department of Industry Science and Tourism (DIST) in 1997, but has had to be deferred because of other priorities. It is expected that this study will be resumed in the second half of 1998. Some broad results were published in <i>Australian Science and Technology - at a Glance 1997</i>. Contact: DIST, Science and Technology Analysis Section.</p> <p>(vi) The ABS has recently started looking at existing data sources to try and measure HRST in Australia. The aim is to put out an Information Paper about the middle or second half of 1998.</p> <p>(vii) Population Census data are to be used to measure the stocks of HRST and net changes over time. The census is held every five years with the data for 1996 being currently disseminated. From the census it is possible to obtain details of qualification by level and by field, employment status, age, sex, occupation, industry and birthplace.</p> <p>(viii) Education and Training (ABS survey) - Surveys have been conducted in 1989, 1993 and 1997. Results from the 1997 survey are expected</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Australia (cont.)	<p>to be released in June 1998. The survey provides information on education and training outcomes. A range of information is collected including qualifications, work history, recent, current and intended future study and access to education/training. Contact: Director, Education & Training Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 5936, Fax: + 02 6251 5486, E-mail: mel.butler@abs.gov.au.</p> <p>(ix) Graduate Destination (ABS survey) - This survey was designed to collect information on the destination of 1994 Technical and Further Education (TAFE) graduates. It collected details of vocational education and training courses undertaken by students, as well as employer details and future study intentions. Contact: Director, Education & Training Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 5936, Fax: + 02 6251 5486, E-mail: mel.butler@abs.gov.au.</p> <p>(x) Transition from Education to Work (ABS survey) - This annual survey is conducted as a supplementary survey to the Labour Force Survey. It is designed to provide information on the movement of persons between the education sector and the labour market. It gives details of status in the work force, level of education and type of work. Contact: Director, Education & Training Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 5936, Fax: + 02 6251 5486, E-mail: mel.butler@abs.gov.au.</p> <p>(xi) Career Experience (ABS survey) - This survey is conducted on an irregular basis as a supplementary survey to the Labour Force Survey. It was conducted in 1993 and 1996 and is scheduled again for November 1998. It collects information on the career experiences of wage and salary earners including educational attainment, details of current job, changes in job such as promotions and transfers, and training opportunities. Contact: Director, Labour Force Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 6753, Fax: + 02 6252 778, E-mail: geoff.neideck@abs.gov.au.</p> <p>(xii) Employment and Unemployment Patterns (ABS survey) - This longitudinal survey was conducted in 1995, 1996 and 1997. It tracked the employment (or unemployment) history of the same group of people over three years. The data includes details of educational attainment and field of qualification. Contact: Director, Education & Training Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 5936, Fax: + 02 6251 5486, E-mail: mel.butler@abs.gov.au.</p> <p>(xiii) Labour Force Experience (ABS survey) - Prior to 1995, the survey was conducted annually. It is currently collected every two years. It provides information over a 12 month period. The survey is a major source of data for analysing the dynamic nature of the labour force. Details are available by level of educational attainment, industry and occupation. Contact: Director, Labour Force Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 6753, Fax: + 02 6252 778, E-mail: geoff.neideck@abs.gov.au.</p> <p>(xiv) Labour Mobility (ABS survey) - This survey is currently conducted every two years as a supplementary survey to the Labour Force Survey. It provides information on the movement patterns of persons who had worked at some time during the year ending February. It provides information on job mobility and job tenure. Data are available by level of educational attainment. Contact: Director, Labour Force Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 6753, Fax: + 02 6252 778, E-mail: geoff.neideck@abs.gov.au.</p> <p>(xv) Successful and Unsuccessful Job Search Experience (ABS survey) - This survey is currently conducted every two years as a supplementary survey to the Labour Force Survey. It presents information about the characteristics and experience of job seekers. Issues covered include method of job attainment, duration of looking for work, whether job starters were out of work prior to starting and whether they had obtained a job in their preferred occupation. Data are available by level of educational attainment. Contact: Director, Labour Force Section,</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Australia (cont.)	<p>Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 6753, Fax: + 02 6252 778, E-mail: geoff.neideck@abs.gov.au.</p> <p>(xvi) Job Search Experience of Unemployed Persons (ABS survey) - This annual survey is conducted as a supplementary survey to the Labour Force Survey. It examines two key aspects of job search experience - steps taken to find work and barriers to obtaining work that are encountered. Data are available on duration of unemployment by reason, educational attainment and main field of study. Contact: Director, Labour Force Section, Australian Bureau of Statistics, PO Box 10 Belconnen ACT 2616. Telephone: + 02 6252 6753, Fax: +02 6252 778, E-mail: geoff.neideck@abs.gov.au.</p>
Austria	<p>(i) A micro census was carried out four times a year.</p>
Belgium	<p>(i) The population census gives a "stock picture" of HRST and provided information on field of study, occupation, sector of work, etc. A population census was conducted every 10 years and the last one had been conducted in 1991. Because of budget problems the next census would probably be suspended. Instead, this data would be collected through passport applications (a passport had to be renewed every ten years in Belgium). However, it was not sure that data on occupation and education would be collected via these passport applications. Contact person: Mr. Willequet at the National Statistical Office.</p> <p>(ii) The household labour force survey was conducted in April every year by the National Statistical Office. One problem with the household labour force survey was that the sample was not large enough (30 000 households, the sample included all economically active and unemployed persons living in these household) to allow for statistically accurate information at detailed ISCO levels (3-4 digit level). From 1999 onwards, a weekly household labour force survey would be conducted according to Eurostats guidelines. Figures would be reported every 3 months. No micro census was conducted in Belgium. However, the labour force survey could be looked at as sort of a micro census of economically active people. Contact person: Mr. Colens at the National Statistical Office.</p> <p>(iii) The census was used as a base for the study HRST data sources that existed in (see also information on Belgium in appendix D). From the census the stock of people and their ISCO and ISCED codes were available. Furthermore, every individual in Belgium had a unique national registration number. By using the national registration numbers to link individuals to firms in the business enterprise registers of the Central Statistical Office, it was possible to obtain information on individual ISIC codes as well.</p> <p>(iv) National registration numbers were also used at the Kruispunt Social Security Databank to link data from the following registers: (i) the unemployment register under the responsibility of the National Employment Office (RVA); (ii) the register of pensioners under the responsibility of the Organisation for National Pension Funds (RWP); (iii) the register of the self employed persons under the responsibility of the National Administration for the Self-employed (RSVZ); and (iv) the register of all economically active persons under the responsibility of the National Office for Social Security (RSZ). These registers will be linked for 1993, 1994, 1995, 1996 and for the first 3 months of 1997. By reviewing the changes in these registers over time, one could study mobility patterns. Contact person at the Kruispunt Social Security Databank: Mr. Frank Robben.</p> <p>(v) The Flemish Technology Observatory, which has existed for two years, is in charge of conducting a bi-annual survey of the supply of S&T personnel. Contact person: Jan Larosse, the Flemish Technology Observatory.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Canada	<p>(i) A census of population is conducted every 5 years and, for the 20% long-form sample, there are questions on the highest qualification (i.e. M.Sc.) and the field of study (i.e. Physics) of the respondent as well the industry (i.e. all sectors are covered) in which the person works, the occupation, and where the person was at the time of the last census. These are in addition to socio-economic questions on age, gender, citizenship, employment status and salary. Census data supports analysis of the skill mix in industries and its change over time, as well as other characteristics of the working population. The only disincentive to this work is the cost of the data. Analyses of three industries for the years 1986, 1991 and 1996 are in preparation by W. Hansen for release by March 31, 1998. The industries are: computer services, telecommunications carriers and telecommunications equipment manufacture. The core of the analysis centres around the occupation of graduates from universities and colleges (occupational distribution of graduates, field of specialisation and where they end up working, earnings, unemployment, immigrants, age, educational base, etc).</p> <p>(ii) The National Graduate Survey (NGS) includes the same variables as the census above. For university graduates from the years 1982, 1986 and 1990, there is data on where they are working 2 years after graduation and 5 years after graduation. This supports analysis of the industries to which the graduates are moving, and the change of this distribution over time. One study is being prepared for release as a working paper: <i>A Dynamic Analysis of the Flows of Canadian Science and Technology Graduates into the Labour Market</i>, by M. Lavoie and R. Finnie.</p> <p>(iii) The innovation and Technology Use Surveys (occasional). In the 1996 occasional surveys of innovation in selected service industries (financial services, telecommunication services, computer services, scientific services and engineering services) and of the use and planned use of biotechnologies, there are questions about human resources. Examples are the change in employment and of skill level as a result of the most significant innovation. While these surveys do not identify the source of the the flows of skilled people, they do identify the outcome of the flow. Descriptive statistics for the two surveys are to be released by March 31, 1998.</p> <p>(iv) In the Longitudinal Economic Analysis Project (LEAP) project, data on firms and overall employment are linked over time, and these data include the births and deaths of firms. All industries are covered and data exists for at least for the last decade. As a result, analyses reveal not just which industries are the net creators of firms and of jobs, but also the characteristics of the firms in those industries where the job creation is taking place. Strictly, these analyses do not measure flows, other than implicitly, but they do identify where the flows must have been. Working Papers on the analysis of the LEAP data base, prepared by Daood Hamdani, are available.</p> <p>(v) Annual immigration data from Citizenship and Immigration Canada are available on immigrants, about 200,000 a year on a population base of 30 million, but there is no direct data on the 50,000 who emigrate each year. While there is information on the level of education, no occupational data is available and the industrial distribution is not available until it appears in the census of population data. In Canada, analysis of such issues as the "brain drain/ gain" requires the use of administrative data from outside of the country, and particularly the United States.</p> <p>(vi) Human Resources Development Canada maintains the Canadian Occupational Projection System (COPS), a model for analysis and projections of highly skilled human resources. It is based on census and labour force data and an input-output model.</p> <p>(vii) Professional associations and organisations, such as the organisations of professional engineers, maintain registers in each province of Canada. There is some potential for the use of this information for the analysis of flows.</p>
Czech Republic	<p>(i) An EU-based labour force survey had been launched four years ago and had since then been conducted quarterly. Contact person: Ms. Helena Glatzova, Central Statistical Office (CSO) or the Ministry of Education.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Czech Republic (cont.)	<p>(ii) A population census was conducted every 10 years. The last census had been conducted in 1991 and the next one is planned for the year 2001. Contact person: Ms. Helena Glatzova, CSO or the Ministry of Education.</p> <p>(iii) A micro-censuses was usually conducted twice in intermittent years between the regular population censuses. The two latest one's had been conducted in 1992 and 1996. The sample for the micro-censuses was made up of 0.5% of the households. Contact person: Ms. Glatzova, CSO or the Ministry of Education.</p> <p>(iv) The labour cost survey, a sample survey had been conducted annually since 1995. The sample frame consisted of all large and medium sized Czech firms together with individual entrepreneurs. Contact person: Ms. Helena Glatzova, CSO or the Ministry Education.</p> <p>(v) Starting last year R&D surveys of all the Frascati sectors were conducted. Contact person: Ms. Helena Glatzova, CSO or the Ministry of Education.</p> <p>(vi) Starting this year annual innovations surveys of both the industry and service sector were planned. Contact person: Ms. Helena Glatzova, CSO or the Ministry of Education.</p>
Denmark	<p>(i) Denmark has rather good registers and in principle opportunities for studying mobility issues are good. The Centre for Labour Studies (CLS) has experience with mobility studies but due to lack of funding the centre will probably only be in existence for another year. The Ministry of Education have databases which could be used to study flows within educational institutions at the higher level, but only through labour unions would individual data be available (and those data have so far only been accessible to the labour unions themselves). Contact: Forskerakademiet and Centre for Labour Studies, Forskerparken, Århus.</p> <p>(ii) Niels Groes the director of Amters and Kommuner Forskningsinstitut worked on some of these issues.</p>
Federation of Russia	<p>(i) Population censuses were conducted in ten year intervals. The last census was held in 1989 (and a micro census was carried out in 1994).</p> <p>(ii) The labour force surveys. The Ministry for Science and Technology and Russian Academic of Science was currently in the midst of discussing with the Central Statistical Office how to adapt the contents of the labour force survey to be more suitable for HRST.</p> <p>(iii) The survey of entrants, enrolments and graduates at the universities and the survey of post graduate training. Both of these surveys were conducted by the Central Statistical Office. However, because of recent restructuring the at Central Statistical Office, it was not exactly clear who was in charge of them.</p> <p>(iv) The R&D surveys.</p> <p>(v) An information technology or IT-survey was planned for next year or for the year 2000. In this survey there were plans to include questions on HRST.</p>
Finland	<p>(i) The best data source in Finland for studying the mobility of human resources are the register based employment statistics of Statistics Finland. These registers are based on links between the enterprise register and different survey results. Data using these registers were published for the first time in 1987. The registers has since then continually been expanded. These registers were considered to be the only real source for HRST-mobility statistics in Finland. Similar registers existed in all the Nordic countries. There was however some divergence between the countries as to the variable content of their registers.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
France	<p>(i) A labour force survey (enquête emploi) was conducted annually on a three year rotating panel basis. Contact person: Mr. Marc Christine, Division Emploi, Institut National de la Statistique et des Etudes Economiques (INSEE). Head of the Dept. Emploi-Revenus is Mr. Jean Louis Faure.</p> <p>(ii) Yearly registration of social data (déclaration annuelles de données sociales). Administrative material based on the compulsory registration (déclarations obligatoires) of all private firms. Contact: INSEE.</p> <p>(iii) The training, skills and occupational survey (Enquête formation et qualification professionnel, FQP). The FQP-survey has been carried out every 6 or 7 years since 1970. The FQP contains information on training, etc. Contact person: M Marc Christine, Division Emploi, INSEE.</p> <p>(iv) The youth and career survey (Enquête sur les jeunes et les carrieres). Contact: INSEE.</p> <p>(v) The youth survey (Enquête jeune). Contact: INSEE.</p> <p>(vi) Monthly registration of labour force mobility (Déclaration mensuel mouvement main d'oeuvre). Administrative material. Contact: INSEE.</p> <p>(vii) INSEE has also built up registers with matched firm-worker data for the period 1967-1995. The source of information on workers in these registers are filed tax returns. The register therefore amongst other things contains high quality data on income. The register contained a sample (1/25) of the labour force. The sample was drawn on the 6th of October every year. For one tenth of these (i.e. 1/10 of 1/25) data on educational attainment was also available. On the whole these registers are comparable to the ones that existed in the Nordic countries. One problem was however that the register was confidential. (Combining registers is a very sensitive issue in France for reasons dating back to the war). Contact: INSEE.</p> <p>(viii) Further data sources might be available at the Centre de Etude et de Research sur l'Emploi et les Qualification (CEREQ) and the Observatoire des Entres des la Vie Active (EVA).</p>
Germany	<p>(i) Through the population census detailed information on the population and on employment are available. A census is conducted approximately every 10 years (the last one had been held in 1987). Furthermore, a micro census (a sample survey of the population and the labour market) was conducted on an annual basis. The micro census collected basic data on employment, unemployment, search for employment, education, income, etc. Contact: Federal Statistical Office (Statistisches Bundesamt), D-65180 Wiesbaden.</p> <p>(ii) The labour force survey was part of the micro census in Germany. It supplied structural information of the labour force. Contact: Federal Statistical Office (Dept. VIII), D-65180 Wiesbaden.</p> <p>(iii) Statistics on employment under social insurance and structural data on the labour market was available through the Federal Statistical Office and the Federal Institute for Employment (Bundesanstalt für Arbeit). Contact: Federal Statistical Office (Dept. VIII), D-65180 Wiesbaden.</p> <p>(iv) The German Institute for Economic Research (DIW) was responsible for a socio-economic panel. Using a representative sample, data on income, employment, education, training, etc. was collected. Contact: DIW, SOEP Secretary, Koenigin-Luise-Straße 5, D-14191 Berlin. Fax: +49 30 897 89 200, E-mail: SOEPMail@DIW-BERLIN.DE.</p> <p>(v) A bi-annual survey of R&D in the business enterprise sector was conducted by the Science Statistics in the Donors' Association for the Promotion of German Science (SV-Wissenschaftsstatistik GmbH).</p> <p>(vi) The Federal Ministry of Education, Science Research and Technology (BMBF) and the Federal Statistical Office (Statistisches Bundesamt) were responsible for annual surveys of R&D in the higher education and government sectors.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Germany (cont.)	<p>(vii) Annual innovation surveys were conducted by the Centre for European Economic Research (ZEW) since 1992. Through these innovation surveys information on for example number of co-operations broken down by partnership in branch and industry, changes of employment with regard to qualification broken down by region, etc. was available.</p> <p>(viii) Migration statistics of migration within Germany and migration between Germany and other countries. No variables with regard to qualification existed. For mobility between Germany and the USA see: <i>Immigrant Scientists, Engineers, and Technicians</i>, 1991-1992, NSF, Washington D.C. 1995.</p> <p>(ix) Technical Series (fachserien) of the Federal Statistical Office. Annual publications covering the micro census, higher education statistics, population and employment, etc.</p> <p>(x) The statistical yearbooks of the Federal Statistical Office.</p> <p>(xi) <i>Report of the Federal Government on Research</i> (Bundesbericht Forschung) and <i>Facts and Figures</i> (Faktenbericht) was published every 4 years.</p> <p>(xii) <i>Numerical Barometer</i> (Zahlenbarometer) and <i>Basic Data</i> (Grund- und Strukturdaten) were annual booklets with indicators on education.</p> <p>(xiii) In addition, there are data and other information on various aspects of technology transfer and the exchange of scientists, in yearbooks and other regular publications of research organisations (in general annual publications), research institution and foundations, e.g. the German Research Association (DFG), the Max Planck Society (MPG), the Fraunhofer Society (FhG), the Alexander von Humboldt Foundation (AvH) and the German Academic Exchange Service (DAAD).</p>
Greece	<p>(i) No appropriate data sources/statistics existed in Greece for studying the mobility of highly qualified personnel. The data sources/statistics that were available were not reliable and did not incorporate the concepts of the Canberra manual. For further details contact: Dr. Dimitri Deniozof at the National Labour Institute, Palama Street, 111 41 Athens, Greece. Telephone: +30 1 211 12 27, +30 1 211 12 41, fax: +30 1 228 51 22.</p> <p>(ii) A database of scientists and engineers under the responsibility of the Ministry of Development, General Secretariat for Research and Technology existed in Greece. The database however needed to be updated before it could be used for the purpose of the forthcoming Greek HRST survey (see below).</p> <p>(iii) A Greek HRST survey based on the Canberra manual is to be launched in a few months. The survey will be two to three years in progress and will be the largest survey that the Ministry of Development, General Secretariat for Research and Technology has ever conducted. The design of this survey has not yet been finalised and the ministries are still discussing various proposals. The survey would however certainly reflect the content of the Canberra manual and would include all levels of scientists (Ph.D.'s and university graduates), fields of study and different geographical regions. One question to focus on would for example be to study which categories of scientists that were unemployed. Some results from the survey would be available in mid 1999 and the final results were due for release in the beginning of 2000.</p>
Hungary	<p>(i) The general mobility survey is a sample survey that is conducted every 10 years. The focus is on social or vertical mobility (an example of social mobility is someone with a university degree whose parents are blue collar workers). Contact persons: Mr. Istvan Harcsa (Head of</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Hungary (cont.)	<p>department), Ms. Erzsebet Bukodi (Staff member at social statistics department), Central Statistics Office. Telephone: +36 1 345 6527, Fax: +36 1 345 6671.</p> <p>(ii) Pilot survey of scientific degrees (PhD's and Doctors of science). A full scale survey was conducted for the first time in 1997. The target group was the individual. Unfortunately the response rates had not been very good. The focus of the survey was on living standards, on social mobility and on horizontal mobility (there was one question on mobility between jobs). Contact: Central Statistical Office.</p> <p>(iii) Stock data produced by the Ministry of Education. Contact persons: Dr. Andras Patkos (Head of Department) and Erzsebet Vizvary (statistician), Ministry of Education, H-1055, Budapest, Szalay u. 10-14, Hungary, Telephone: +36 1 332 9928, Fax: +36 1 332 0950.</p> <p>(iv) A population census is conducted every 10 years. Contact: The Central Statistics Office.</p> <p>(v) The labour force survey. Conducted yearly. Contact: The Central Statistics Office.</p> <p>(vi) The labour market study. A product of the Labour Force Research Institute that has been ordered by the Ministry of Labour. The study used data from the Central Statistical Office and the Labour Force Centre. Contact person: Terez Laky, Labour Force Research Institute, H-1066, Budapest, Mozsar u. 14, Telephone: +36 1 132 7787/27, fax: +36 1 112 7044.</p> <p>(vii) The Labour Force Centre also produce some data on labour mobility, employment/unemployment issues, etc. Contact: The Labour Force Centre, H-1087, Budapest, Konyves Kalman krt. 48-52; Telephone: +36 1 210 4251, Fax: +36 1 210 4255.</p> <p>(viii) The Hungarian spot survey. The Ministry of Education and Culture has recently ordered a panel survey of mobility of people with scientific degrees (PhD's/doctors of science). The Central Statistics Office was in charge of this survey. The questionnaire used included a question on the type (and name) of organisation that the person had last worked for. It also asked for information on whether it was a full or part time job. This question had however not been very successful and only had a 4% response rate.</p>
Iceland	<p>(i) The business register at Statistics Iceland gives information on firms and institutes and on where people work. Contact person: Ms. Holmfridur Gisladdottir, Statistics Iceland.</p> <p>(ii) The tax registers (available from 1998 onwards only). Updated monthly. Gives information on employees, who works where, full time/part time work (in percent), 2-digit ISCO and 5 digit NACE on the kind of activity unit. Contact: The National Taxation Authority.</p> <p>(iii) There was no education register available in Iceland, information on the level of education (but not on the field of study) was however accessible through the labour force survey. Contact person: Mr. Ómar S. Harðarson, head, labour market statistics, telephone: +354 560 9888, E-mail: omar.hardarson@hag.stjr.is</p> <p>(vi) The immigration/emigration register gives information on what country immigrants come from and to what countries emigrants move to. However, the emigration register only has data on first destination (i.e. if someone moves from Iceland to France and then moves on to Spain, only the first move to France would be recorded). Furthermore, the immigration/emigration register does not contain any information on education (i.e. ISCED) but the tax register now has information on occupation (i.e. on ISCO - what jobs emigrating people leave and what jobs immigrating people get). ISCO was thought more appropriate than ISCED for the purposes of immigration/emigration because of for example language problems. In rare cases this could for example lead an immigrating professor in say economics to take on a job cleaning fish. Contact person: Mr. Hermann Thrainsson, Statistics Iceland.</p> <p>(v) The population register gives information on where people live.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Iceland (cont.)	<p>(vi) The register of student loans and grants at the Icelandic National Student Board of Aid. The student loans and grants are no longer as advantageous as they had previously been but the loans are still better than the ones available on the "open mark". Because of this register it is possible to keep track of who went abroad to study. However, because of some of the restrictions involved not all students applied for these loans. Hence, the register of student loans and grants did not contain all of the university students. The student loan register did not really exist on a regular basis and were only created from time to time when there was a need for it. Therefore no one person was responsible, but the person most knowledgeable about this was Mr. Hjalti Kristgeirsson who mostly however work with educational statistics.</p> <p>(vii) The register of students enrolled at the Icelandic University.</p> <p>(viii) Through the social security registers it is possible to know who goes abroad to work or study. Students are insured while they are attending school abroad but workers however are only insured for the first 6 months.</p> <p>(ix) The educational statistics at Statistics Iceland.</p> <p>(x) The 3 innovation surveys that Iceland has already conducted (the Nordic innovation survey, CIS 1 and CIS 2).</p> <p>(xi) The population census.</p> <p>(xii) The R&D statistics. Statistics Iceland has since 1971 collected data on the full-time equivalents (FTE) devoted to R&D in all the Frascati sectors (the business enterprise sector, the government sector, the private non-profit sector and the higher education sector).</p>
Ireland	<p>(i) There are no registers with longitudinal mobility data in Ireland.</p> <p>(ii) Enrolment statistics and graduate output statistics from the Higher Education Authority (HEA). Contact: HEA, Information Section, 21 Fitzwilliam Square, Dublin 2. Telephone: +353 1 6612748.</p> <p>(iii) The First Destination of Award Recipients in Higher Education – also produced by the HEA (since 1982). Contact: HEA.</p> <p>(iv) The Labour Force Survey had been conducted annually by the Central Statistical Office (CSO) in the past but was is likely to be undertaken on a quarterly basis from here on. Contact: CSO, Office Information Section, Skehard Road, Cork. Telephone:+353 21 359000</p> <p>(v) In theory (but not in practice) another sources of data is the population census which includes a question on qualifications. The last census was conducted in 1996 but the data is not yet ready for release. Furthermore, the 1991 census data was not considered to be of good enough quality. Because of various coding problems, the CSO refused to release this data. However, this source of data may become usable in the future. Contact: CSO.</p>
Israel	<p>(i) Following the 1983 Census of Population and Housing, the Central Bureau of Statistics (CBS) conducted a major survey of persons with academic degrees, which was designed, among other goals to examine the relationship between field of study and occupational specialisation. Plans for a similar survey following the 1995 census were not realised because the necessary funding could not be obtained.</p> <p>(ii) The population and housing census is carried out whenever enough funding was available which is about every ten years. Censuses had been carried out in 1995, 1983, 1972, 1961 and 1948.</p> <p>(iii) The CBS conducted a survey of doctoral degree recipients from Israeli universities in 1989 and in 1990 to collect information on their studies and post-degree careers.</p> <p>(iv) In an annually prepared publication, the CBS publishes data on national expenditures on R&D. Part of the published data come from the R&D</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Israel (cont.)	<p>survey and part come from analysis of firm accounts. The CBS conducts a survey of R&D in industry which collects information on expenditures by enterprise, the number of persons engaged in R&D, whether they have academic degrees, and the amount of money received by the enterprise for R&D activities from either government funds or from the bi-national fund. The government sector was however not covered by a separate survey in Israel.</p> <p>(v) The CBS conducted surveys of immigrants from the former Soviet Union during 1990-1995. Many of these immigrants held academic/technical degrees, which provide some information on their employment in Israel. The absorption follow-up survey of immigrants from the former Soviet Union provide information on this sector of the population. This survey does not include information on ID numbers.</p> <p>(vi) The Planning and Budgeting Committee hopes to undertake an analysis of the employment of university graduates in selected S&T fields through a linkage of CBS files of university graduates with 1995 census information on employment, occupation and industry.</p> <p>(vii) The existence in Israel of a national population registry in which each resident has a unique ID number made possible record linkages among data files containing information collected independently. For purposes of S&T inquiries, the following files containing ID numbers are relevant: (i) a file of university students/graduates which follows cohorts of entering students through their university and graduate study careers at Israeli universities; and (ii) the 1983 and 1995 census files.</p> <p>(viii) The current labour force survey provides information on employment, and its panel design allows study of change within the two-year life of a panel (a new panel was selected every quarter that was followed for 5 quarters). The labour force survey did not include information on ID numbers.</p> <p>(ix) Other responsible organisations: the Ministry of Science (more of a policy institution, didn't collect any data), contact person: Mr. Naftali Arnon, Telephone: +972 2 584 79 79, Fax: +972 2 581 65 47 and the Planning and Budgeting Committee of the Council for Higher Education (which determined government allocations to the universities), contact person: Mr. Shlomo Hershkowitz, Telephone: +972 2 567 99 17, Fax: +972 2 566 06 25.</p>
Italy	<p>(i) The census was conducted every 10 years, the last census was conducted in 1991 and the next one is planned for 2001. Contact person: Alberto Zuliani (director), National Statistics Institute (ISTAT), Via C. Balbo 8, 00186 Rome.</p> <p>(ii) The labour force surveys were conducted quarterly. Contact person: Alberto Zuliani (director), National Statistics Institute (ISTAT), Via C. Balbo 8, 00186 Rome.</p> <p>(iii) Educational statistics (including foreign students) were collected annually on primary to post-graduate level by sending out questionnaires to educational institutions. Contact person: Alberto Zuliani (director), National Statistics Institute (ISTAT), Via C. Balbo 8, 00186 Rome.</p> <p>(iv) The graduate employment survey has been carried out 3 or 4 times already and is conducted every 3 years. It asks for information on occupation, position, etc. Contact person: Alberto Zuliani (director), National Statistics Institute (ISTAT), Via C. Balbo 8, 00186 Rome.</p> <p>(v) Annual R&D surveys of all the Frascati sectors.</p>
Japan	<p>(i) The basic employment survey conducted every 5 years. Contact: the Japan Institute of Labour (part of Ministry of Labour) and Japan Institute of Science and Technology Policy (part of the Science and Technology Agency).</p> <p>(ii) The census conducted every 5 years. Contact: the Japan Institute of Labour (part of Ministry of Labour) and Japan Institute of Science and Technology Policy (part of the Science and Technology Agency).</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Japan (cont.)	<p>(iii) The annual school teacher survey. Contact: the Japan Institute of Labour (part of Ministry of Labour) and Japan Institute of Science and Technology Policy (part of the Science and Technology Agency).</p> <p>(iv) The annual basic school survey. Contact: the Japan Institute of Labour (part of Ministry of Labour) and Japan Institute of Science and Technology Policy (part of the Science and Technology Agency).</p> <p>(v) Statistics relating to job placements of university graduates are collected through annual surveys by the Ministry of Education. These are large scale surveys of all master and Ph.D. graduates and a sample of graduates with bachelor degrees. The data contain detailed information on industry, educational background, job type, gender, etc. Contact: The Ministry of Education.</p>
Korea	<p>(i) There are various mobility statistics. However, there is no statistics for researcher mobility or human resources for science and technology if HRST is confined to the natural sciences and engineering fields. If a broader definition of HRST as in Canberra manual is used, that is to include all highly educated and relevant occupations, then the Report on the Employment Structure Survey could be used as a source for mobility statistics of HRST. The Employment Structure Survey is a household survey conducted every five years and it investigates the inter-industry mobility and inter-occupation mobility for one year. In the report itself mobility of highly educated is not dealt with. However, by accessing the micro data files it would be possible to estimate mobility of highly educated. Furthermore, for the mobility of researchers, no statistics are available. The Internet site http://www.nso.go.kr/examine/ep5.htm gives the following information about the Employment Structure Survey:</p> <ul style="list-style-type: none"> · The first reference year: 1983. · Periodicity: quinquennial (years ending in 2 & 7 after 1992). · Reference period: 1st day of September (in 1997). · Survey period: 1-10 September (in 1997). · Sample size: 120,000 households. · Coverage: all persons aged 15 years old and over, the armed force, prisoners and foreigners are excluded. · General items covered (6): name, sex, relationship to household head, age, marital status, educational attainment, place of residence a year ago. · Checking item (1): usual type of activity. · Items for the employed (20): industry, types of organisations, occupation, status of workers, number of workers in the establishment, years engaged in the same enterprise, method of seeking present job, duration of looking for present job, working months in a year (days worked in a year, regularity, hours worked in a week), reasons for working less than 36 hours, desire for an additional job or changing a job, desire for status of worker, whether or not seeking work, duration of looking for a job, reason for not looking for a job, reason for wishing to change a present job, receiving job-training of relation with present job before taking a job, receiving job training of relation with present job after taking a job, income, activity type a year ago, whether or not taking a job within 5 years ago. · Items for a person not engaged in work (10): payment desired, reason for wanting to work, desire for status of worker, whether or not looking for a job, method of looking for a job, duration of looking for job, reason for not looking for a job though wanting job, whether or not starting a job, activity type a year ago, whether or not taking a job within 5 years ago. · Items for job change for the last 5 years (9): number of job change within 5 years, time of quitting a job, place of residence that time, of starting

Appendix E: Data sources specified by country

Country	Data source/statistics
Korea (cont.)	<p>a job, occupation, status of worker, number of workers in the establishment, reason for quitting a job. Contact person: Ms. Hwa Young Lee, assistant director of the social statistics division, NSO. Telephone: +82 2 222 1873.</p> <p>(ii) The Korean Science and Engineering Foundation published a book <i>Who's who in the universities - the science and engineering field</i> in 1996. The book contains information on all the professors in natural sciences and engineering, including their educational background. Hence, it might be possible to get partial information on brain gain by manipulating these data.</p> <p>(iii) Ph.D. graduates from foreign universities are obligated to register such a degree at the Korean Academic Promotion Foundation. In order to be able to apply to become a university professor, the certificate of registration is required. The data at the Korea Academic Promotion Foundation could be an important source.</p> <p>(iv) Existing stock of researchers in terms of education background, occupation or other relevant categories for all sectors, industries, type of organizations in union with ISIC, ISCED, and ISCO are covered by the annually conducted R&D surveys. These surveys are conducted by STEPI and the Ministry of Science and Technology (MOST). Contact person: Dr. Yong Soo Kwon, STEPI, HanSung Plaza, 13-1 HeungIn-Dong, Choong-Gu, Seoul, Zip 100-430, Republic of Korea. Telephone: +82 2 250 3045, Fax: +82 2 253 8678, E-mail: yskwon@stepimail.stepi.re.kr</p> <p>(v) The Internet site http://www.nso.go.kr/examine/ep1.htm gives the following information about the Economically Active Population Survey:</p> <ul style="list-style-type: none"> · The first reference year: 1962. · Periodicity: monthly (quarterly prior to July 1982). · Reference period: the week containing the 15th day. · Survey period: the week just after the reference period. · Sample size: 30,000 households. · Scope: all persons aged 15 years old and over the armed forces, prisoners and foreigners are excluded. · Survey items: name, relationship to household head, sex, age, educational attainment, marital status, activity status, any work for pay or profit, temporary absence of work and its reason, looking for work last week, looking for work last month, hours worked, usual working less than 36 hours, desire to have additional work or to change job, currently available for work, ways of looking for work, duration of looking for work, type of status for working, of work desired, willingness of work, reason for not currently looking for work last week(month), looking for work during the last year, willingness of looking for work the following year, whether of not working for pay or profit, reason for quitting a job, industry, occupation, working status, number or workers in the establishment. · Methods of data collection: direct interview. · Date of release: end of the following month. · Publications: Annual Report on the Economically Active Population Survey. <p>Contact person: Ms. Hwa Young Lee, assistant director of the social statistics division of National Statistical Office. Telephone: +82 2 222 1873.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Luxembourg	<p>Up till now there has been no real need for any R&D-statistics since it has basically been possible to know every researcher individually. However, Luxembourg is now in the preliminary stages of setting up such a system. Not much mobility data exists in Luxembourg. The Service Central de la Statistique et des Etudes Economiques (STATEC) do not collect any R&D data.</p> <p>(i) Labour force surveys have been conducted on an annual basis in Luxembourg since 1969. Contact: Service Central de la Statistique et des Etudes Economiques (STATEC).</p> <p>(ii) An innovation survey (as part of the Community Innovation Survey) Luxembourg was launched in April of 1997. The sample included 200 manufacturing and 200 service firms.</p>
Mexico	<p>(i) The higher education yearbooks from 1985 to date. Databases cover: fields of science, type of institution and regional distribution. Contact: The National Association of Higher Education Institutes (ANUIES).</p> <p>(ii) The population census 1980 and 1990. Cover educational attainment by gender, age group, fields of science and occupation. It does not cover sectors or industries or type of organisation (size). Data could be regionalised. Contact: The National Statistical Institute (INEGI).</p> <p>(iii) Professionals in Mexico. Refers only to 1990. Covers only occupation, gender, and field of study. Contact: INEGI.</p> <p>(iv) The national surveys of educational attainment, labour, and training, 1991, 1993 and 1995. Same coverage as (ii) above excluding age groups, but cannot be regionalised. Contact: INEGI/the Labour Ministry (STPS).</p> <p>(v) The organisational change survey 1997. Covers educational attainment by type of organisation and industry. Contact: The National Council for Science and Technology (Conacyt).</p> <p>(vi) The R&D Surveys 1996. (vii) The R&D survey has the regular information of educational attainment of personnel. Contact persons: Ruben Ventura, Conacyt, E-mail: ventura@mailer.main.conacyt.mx, or Samira Naranjo, Conacyt, E-mail: samira@mailer.main.conacyt.mx. Dr. Valenti is also quite involved in these issues and she can be reached at the following E-mail address: gvalenti@cueyatl.uam.mx.</p> <p>(vii) The National System of Researchers database 1990 to date. SNI database contains detailed information on the 5,900 members of the system, such as educational attainment, field of science, age, gender, published works, patents granted, occupation, etc. since 1990. Contact: Conacyt.</p>
The Netherlands	<p>(i) The individual universities and research institutes have various data collections, ranging from one-off inquiries for research projects to annual inquiries among alumni. There are also operational information systems about students and personnel.</p> <p>(ii) The Association of Universities in the Netherlands (VSNU) yearly publishes national statistics based on the university data for research and personnel. Data about mobility are currently not incorporated in these publications, but the data collection is under review from the point of view of human resource management. This will lead to an extension of the data, incorporating internal mobility, etc. As a result of the current OECD-project on mobility, inclusion of data about external mobility will also be considered.</p> <p>(iii) The Netherlands Organisation for International Co-operation in Higher Education (NUFFIC) has data on Leonardo, the EU-mobility program, on exchanges, destinations, study programs, etc. Contact: Nuffic Postbus 29777 2502 LT Den Haag, Telephone: +31 70 4260260, Fax: +31 70 4260399, E-mail: nuffic@nufficcs.nl, http://www.nufficcs.nl/home.html.</p> <p>(iv) CBS (Statistics Netherlands), Prinses Beatrixlaan 428, 2273 XZ Voorburg. Telephone: +31 70 337 38 00, fax: +31 70 387 74 29, E-mail:</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
The Netherlands (cont.)	<p>infoserv@cbs.nl, www.cbs.nl.</p> <p>(v) Science and Technology Indicators 1996 by MERIT (Maastricht Economic Research Institute on Innovation and Technology, University of Maastricht. B. Verspagen, M. Slabbers) and CWTS (Centre for Science and Technology Studies, Ste University of Lieden, RJW Thijssen and Th. N. van Leeuwen).</p>
New Zealand	<p>(i) R&D surveys were conducted annually between 1988/90 and 1993/4 and have been conducted every other year since then. Contact: The Ministry of Research, Science and Technology.</p> <p>(ii) Household labour force surveys are conducted four times a year. Contact: The Department of Labour/Statistics New Zealand.</p> <p>(iii) The population census is conducted every 5 years. Contact: Statistics New Zealand.</p> <p>(iv) Surveys of innovation and competitiveness (the 1997 manufacturing best practice survey). Contact: The Treasury and Ministry of Commerce.</p> <p>(v) The Ministry of Education along with the New Zealand Qualification Authority, generally collect their own education statistics on an annual basis.</p> <p>(vi) The surveys of graduate employment destinations (annual).</p> <p>(vii) The survey of 1990 graduates five years after graduation which the Ministry of Research, Science and Technology (MoRST) undertook jointly with the universities Vice Chancellors' Committee in 1996 (one-off so far).</p>
Norway	<p>NIFU has carried out mobility studies in one form or the other since the 1960's. These studies have in principle focused on the higher education sector, the private non-profit sector, the government sector, and research institutes in the business enterprise sector. The business enterprise sector has generally not been well covered because of problems in collecting such data. In 1975 and 1981 full scale studies were conducted. Missing data were collected manually. The growth of the research system including the universities has made such methods of data collection too costly, therefore computerised solutions have been sought. The population register of the labour force has changed the situation.</p> <p>(i) The national register of researchers which is updated every other year under the responsibility of NIFU. Contact person: Ms. Kirsten Wille Maus, telephone: +47 22 59 51 69, E-mail: Kirsten.W.Maus@nifu.no.</p> <p>(ii) The R&D survey of the business enterprise sector except the research institutes that Statistics Norway conduct every other year. Contact person: Mr. Frank Foyn, telephone: +47 22 86 45 00, E-mail: f.foyn@ssb.no.</p> <p>(iii) The R&D survey of the higher education sector, private non-profit sector, the government sector and research institutes in business enterprise sector that NIFU conducts every other year. Contact person: Ms. Kirsten Wille Maus, NIFU.</p>
Poland	<p>(i) The Yearbook of Labour Statistics 1997/Labour Force Surveys (LFS). LFS's have been conducted quarterly since 1992. They are fully in line with the Eurostat methodology. Contact person: Ms. Ewa Rychlik, Head of Labour Resources Section in the Labour Statistics Division, GUS. Telephone: +48 22 608 33 08, Fax: +48 22 608 38 72.</p> <p>(ii) Population and Housing Censuses are conducted in 10 years cycles. The next census will be conducted in the year 2000/1 and a large part of it will be devoted to education (for example number of Ph.D. holders, etc). Contact person: Ms. Alina Sabiesrak, Division of Demography, GUS. Telephone: +48 22 608 32 33, Fax: +48 22 608 31 81, E-mail: E.Jablonska@stat.gov.pl.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Poland (cont.)	<p>(iii) Educational data/The Household Budget Survey - Conducted quarterly. Contact person: Ms. Krystyna Siwiak, Head of the Household Budget and Monographic Survey Section, GUS. Telephone: +48 22 608 32 92, Fax: +48 22 608 31 82, 48 22 608 38 71.</p> <p>(iv) Higher Schools in the School Year 1996/97 - Input, output and throughput of the educational system. Data on students, post-graduates, university lecturers, studies for doctor's degrees, post-graduate courses, scholarships granted in Poland and abroad as well as scientific titles and degrees awarded, etc. Contact person: Mr. Stanislaw Radkowski, Head of Education, Culture, Foundations and Organisations Statistics Section, GUS. Telephone: +48 22 608 33 37; Fax: +48 22 608 31 82, +48 22 608 38 71.</p> <p>(v) The R&D surveys which are fully in line with the Frascati manual and conducted on an annual basis.</p> <p>(vi) The micro censuses, sample surveys conducted in periods between censuses (i.e. about every five years either a census or a micro-census. is conducted. The last census is conducted in 1989 and the next one was planned for the year 2000. A micro census was therefore conducted in 1995). Includes information on education.</p> <p>(vii) The Report on Science and Technology in Poland. The first comprehensive report of its kind (under preparation and due to be released in February or early March this year). Will include a broad range of information on R&D personnel and for the first time tables of HRST information based on data from the latest censuses, the micro census and educational statistics.</p>
Portugal	<p>(i) Data on upper university degrees (master and Ph.D.'s) granted in Portugal since 1974 by year, university/region and by field of science. Contact: Observatorio das Cincias e das Tecnologias (OCT), Rua das Pragas 13-B I', 1200 LISBOA, Telephone: +351 1 392 60 00, Fax: 351 1 395 09 79, E-mail: np50zf@mai1.te1epac.pt.</p> <p>(ii) Data on upper university degrees (master and Ph.D.'s) granted abroad by Portuguese students and officially recognised by the Portuguese universities since 1974 by foreign country and foreign university and also by year, university/region responsible for the recognition and by field of science. Contact: OCT, Rua das Pragas 13-B I', 1200 LISBOA, Telephone: +351 1 392 60 00, Fax: 351 1 395 09 79, E-mail: np50zf@mai1.te1epac.pt.</p> <p>(iii) Data on research and graduation (master and Ph.D.'s) scholarship grants since 1990 by year, university/region and by field of science. Contact: OCT, Rua das Pragas 13-B I', 1200 LISBOA, Telephone: +351 1 392 60 00, Fax: 351 1 395 09 79, E-mail: np50zf@mai1.te1epac.pt.</p> <p>(iv) Data on scientists and engineers performing R&D activities in 1995 (data on stocks are available since 1986, but they do not allow studies on flows, due, among other factors, to the fact that the codes of researchers were not kept in the different survey operations). See also item (ix) below. Contact: OCT, Rua das Pragas 13-B I', 1200 LISBOA, Telephone: +351 1 392 60 00, fax: 351 1 395 09 79, E-mail: np50zf@mai1.te1epac.pt.</p> <p>(v) Data on private and public research infrastructure (at the micro-level, on firms, universities and other research units that can capture highly qualified HR): business enterprises by NACE, GVA, region, size (number of personnel employed), etc. and institutions by sector (higher education, government and private non-profit), region, field of science and type of activities performed. Contact: OCT, Rua das Pragas 13-B I', 1200 LISBOA, Telephone: +351 1 392 60 00, fax: 351 1 395 09 79, E-mail: np50zf@mai1.te1epac.pt.</p> <p>(vi) Data on firms and industrial sectors (number, size, etc). Institutio Nacional de Estatistica (INE), Av. Ant6nio Jo&6 de Almeida, 1000 LISBOA CODEX, Telephone: +351 1 847 00 50, Fax: +351 1 840 71 94.</p> <p>(vii) Data on population (at the macro/national level) by region, education, occupation, gender, age and marital status. Institutio Nacional de</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Portugal (cont.)	<p>Estadística (INE), Av. Ant6nio Jo&6 de Almeida, 1000 LISBOA CODEX, Telephone: +351 1 847 00 50, fax: +351 1 840.</p> <p>(viii) Data on inflows and outflows (immigration and emigration). See also item (ix) below. Instituto Nacional de Estatística (INE), Av. Ant6nio Jo&6 de Almeida, 1000 LISBOA CODEX, Telephone: +351 1 847 00 50, Fax: +351 1 840 71 94.</p> <p>(ix) Databases available in OCT for the production of indicators on R&D personnel. Every two years, a data base on human resources devoted to R&D (namely researchers performing R&D activities in the government, higher education, business enterprise and private non-profit sectors) is up dated. This statistical information allows the construction of regional, institutional and sectorial profiles of researchers. The analysis of series of data bases allow the construction of indicators and the perception of recent, developments and future trends which reveal their usefulness for decision-making processes and priority settings. These indicators are constructed by means of cross-analysis studies of the information compiled in the databases (whose structure is defined bellow) produced with the R&D survey and other databases produced in the OCT with the co-operation of the Ministry of Education on academic production of Ph.D.'s and masters.</p> <p>a) Data on Researchers collected in the R&D survey (every two years, for ISCED levels 5 to 7). For each researcher:</p> <ul style="list-style-type: none"> · Biographic data: name, ID., sex, and date of birth. · Data on academic qualification: academic degree (level and scientific field), year and country of the higher degree level concluded. · Data on the R&D activity: name and address of the R&D unit(s) and for each of these; <ul style="list-style-type: none"> - administrative career and function - percentage of time engaged in R&D activities by type of activity performed (management, R&D, other S&T, teaching) - number and name of other R&D units where the researcher is engaged, scientific and technological fields (main and complementary) of R&D activities performed <p>b) Data on stocks of human resources compiled with the co-operation of the Ministry of Education (yearly exercise, for ISCED level 7 - upper and lower). For each:</p> <ul style="list-style-type: none"> · Biographic data: name, nationality, sex, and date of birth. · Data on the academic degree: university and school, year and country, title and abstract of thesis, name and data on the thesis director, scientific fields of thesis. <p>c) Data on scholarship students financed by the Ministry of Science and Education (biannual, for ISCED level 7 upper and lower). For each:</p> <ul style="list-style-type: none"> · Biographic data: name, nationality, sex, and date of birth. · Data on the academic degree: university and school, starting year and country, title of thesis (if concluded), name and data on the thesis director, scientific fields of thesis. · Data on conclusion of thesis and employment situation.
Slovak Republic	<p>(i) The data structure of the available data for the purposes of mobility of highly qualified personnel, which is related among others also to the personnel, qualification etc., does not comply with the requirements for HRST. The Statistical Office of the Slovak Republic (SOSR) is responsible for the collection of R&D data and annually puts out the publication Selected Indicators of R&D organisations in the Slovak Republic.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Spain	<p>(i) The databases of Ministry of Education and Culture on the programmes specified in appendix D (the national programme of training of research personnel, the programme for financing Ph.D.'s conducted in local Spanish industries, the programme of grants for the exchange and training of research personnel between public research centres and enterprises, the co-ordinate projects between research centres and industries, and between technological centres and industries, the action programme to promote the transfer of research results and the action programme of contracts for the participation of post doctoral researchers in enterprises).</p> <p>(ii) The database of the framework programme (of the European Union), where all the projects are stored, including the training and mobility programme. This database is under the responsibility of the Interministerial Commission for Science and Technology where the framework programme is managed in Spain. Contact person: Mrs. Angeles Gonzalez, Comisión Interministerial de Ciencia y Tecnología (CICYT). Telephone: 34-1-336 04 26, Fax: 34-1-336 05 76.</p> <p>(iii) The National Institute of Statistics does not include matters concerning mobility of scientists in its surveys.</p>
Sweden	<p>The following data sources (mainly registers) that can be used for mobility studies are available at Statistics Sweden. The registers are based on personal or organisational numbers that are unique for each person or unit, can often be combined if for example mobility is to be studied:</p> <p>(i) The employment register. (ii) The register of income verifications. (iii) The register of jobs and other activities. (iv) The business register. (v) The education register. (vi) The population register. (vii) The census. (viii) The labour force survey. (ix) The R&D surveys. (x) The innovation survey. (xi) The surveys on where graduates end up on the labour market.</p>
Switzerland	<p>(i) A labour force survey (Enquête suisse sur la population active, ESPA) was conducted for the first time in 1991, by the Office Fédéral de la Statistique (L'OFS) and has since been conducted annually. Participation in the survey was non-compulsory. The telephone directory, constituting 24 000 households, was used as a sample frame. Using a panel approach certain persons participated in a maximum of five consecutive surveys. In 1995, the sample consisted of 31 900 persons above the age of 15 (15 300 of which were part of the panel). Contact: L'OFS.</p> <p>(ii) A population census is carried out every ten years. The last census was held in 1990 and the next one is planned for the year 2000. Contact: L'OFS.</p>
Turkey	<p>(i) The population census was conducted every 10 years. The last census was conducted in 1990. Coverage: ISCO 68, ISCED (ISCED 6 and 7</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
Turkey (cont.)	<p>combined), ISIC rev. 2. Contact: the State Institute of Statistics.</p> <p>(ii) R&D surveys of the business enterprise sector, the government sector and the higher education sector are conducted annually. Coverage: The Frascati sectors - business enterprise, government, higher education. Instead of the ISCO classification the classifications of Frascati manual were used (researchers, technicians, other supporting staff). ISCED (detail for ISCED 7 exist), ISIC Rev. 3 (4 digit level for the business enterprise sector), fields of science (natural sciences, engineering, medical sciences, social sciences, humanities, agriculture) for the higher education sector. Contact: The State Institute of Statistics.</p> <p>(iii) The manufacturing industry survey which is conducted annually. Contact: the State Institute of Statistics. Coverage: Instead of ISCO and ISCED the following classification are used: High and medium level technical personnel ("assumed to be S&T staff"), technicians, workers. ISIC Rev. 2 (4 digit).</p> <p>(iv) The household labour force survey is a sample survey conducted twice a year. Contact: the State Institute of Statistics. Coverage: ISCO 68 (3 digit collected, 1 digit published because of problems with the sample). ISCED 1- 7 (however, ISCED 6 and 7 were combined). ISIC Rev. 2 (4 digit collected, 1 digit published).</p> <p>(v) The Higher Education Council of Turkey publishes higher education statistics on an annual basis. Contact: the Higher Education Council of Turkey.</p> <p>(vi) Special study of international migration for 1996. Contact: The Institute of Population Studies in Turkey. Coverage: ISCED 6 and above, fields of science as in the R&D surveys (student and teaching staff).</p>
United Kingdom	<p>(i) The New Earnings Survey (NES) is the only regular comprehensive source of information on the structure and distribution of earnings. It is conducted annually. The main purpose of the survey is to obtain annual information about the levels, distribution and make-up of earnings of employees in all industries and occupations and for the major collective agreements. NES is published to 3 digit in both SIC and SOC (Standard Occupational Classification). Contact person: Mr. Derek Bird, Office for National Statistics (ONS). Telephone: + 01928 79 2614, Fax: +01928 792826.</p> <p>(ii) The 1991 census. Statistics on population and households are collected in the periodic censuses conducted every 10 years by the Registrars General for England and Wales, Scotland and Northern Ireland. Contact person: Mr. John Dixie, ONS. Telephone: +01329 81 3531, Fax: +01329 81 3532.</p> <p>(iii) The quarterly labour force survey (LFS) is a survey of some 150,000 people at a representative sample of 60,000 private addresses throughout the UK and is carried out quarterly. It is the biggest regular household survey in the country. With 450 variables, the LFS provides a rich source of information about the labour force using internationally agreed definitions. Contact person: Ms. Cathy Gibbins, ONS. Telephone: +0171 533 5407, Fax: +0171 533 5300.</p> <p>(iv) The first destination of university graduates survey. Contact person: Mr. Brian Ramsden, The Higher Education Statistical Agency (HESA). Telephone: +01242 255577, fax: +01242 232648.</p> <p>(v) The Career Path Study. The results of this survey are expected in the summer of 1998. Contact person: Mr. Derek Barker, Office for Science and Technology (OST). Telephone: +0171 271 2040.</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
United States	<p>(i) The survey of earned doctorates. This survey asks for information on first destination data, if immigrant students have contracts with a firm making it possible for them to stay in the US after graduation, etc. Since the survey questionnaire is included in the package of other paper that students have to fill in, in order to get their diploma (probably leading many to believe that filling in the answers is compulsory) the response rate was as high as 95%. However, the portion of this survey that deals with employment plans upon graduation is of limited use because a higher proportion (about 1/3) do not have firm plans at the time of graduation and thus do not report any type of employer. Perhaps the greatest value of this survey as regards mobility of highly qualified personnel is its ability to document the number of doctorate recipients by country of nationality and detailed field of science. Also, it is useful for identifying trends as it is an annual survey. It shows, for example, that an increased proportion of doctorates are awarded to students from China and Korea, and that in recent years the number of those students planning employment in U.S. industry (as opposed to academia) has increased sharply. Contact: The National Science Foundation (NSF).</p> <p>(ii) SESTAT. Whereas NSF used to have registers with information on human resources for science and technology, this information is now collected through surveys instead. SESTAT consists of three components. One is the Survey of Doctorate Recipients described above. This is used for the doctorate recipients from U.S. universities. However, the central component of SESTAT is the 1993 National Survey of College Graduates, a longitudinal survey of scientists and engineers first conducted in 1993. It contained the same questions as the Survey of Doctorate Recipients but went to a sample of everyone who in the 1990 Census had a bachelors or higher degree. This survey thus contained any immigrant scientist or engineer who had arrived in the U.S. by 1990. These two surveys cover all doctorates and all S/Es in the U.S. by 1990. However, SESTAT relies on a third survey, the Survey of Recent College Graduates to ask the same questions to a sample of persons who received bachelors or masters degrees from U.S. universities since 1990. All three of these surveys were combined to produce the 1993 and 1995 SESTAT databases. It contained information on training, sector of employment, salary, sex, etc. It thus collected both educational and occupational data and could be used to for example compare differences in employment rates between different groups. Clearly, then SESTAT is the best sources of data on scientists and engineers in the U.S. By comparing the 1993 SESTAT estimates with 1995 SESTAT (and soon 1997) one can track changes over time such as regional shifts in employment. There is one big limitation of SESTAT however, for the purposes of mobility of highly qualified personnel. It unfortunately excludes immigrants to the U.S. since 1990 unless they earned a degree from a U.S. college or university. For some purposes the longitudinal nature (same people in 1993 and again in 1995) and the existence of retrospective questions (e.g. describe your last three jobs) make this particularly useful. These features can be used nicely to track the interaction between industry and public sector or university employment. They are not too useful for tracking inter-firm flows, but they can be used to identify regional effects, gender differences, and the stocks and flows to industry. They are also useful for brain drain questions (with the caveat noted above). Contact: NSF.</p> <p>(iii) Survey of Doctorate Recipients. Data from this cohort study of doctorates was available from the 1960's onwards (however the quality of the early data was in some doubt). The population of doctorate students in the study, a representative sample of all those educated in U.S. universities, were followed until they reached the age of 70 (only then would they stop receiving questionnaires). Quite a lot of information on immigrant students was available through this study. Examples are country of birth/origin, last resident country, occupation (self-classification down to an ISCED 5 level), type of employer, work activities, etc. Regardless of country 60% seemed to classify themselves as being some kind of engineer. The survey shows that the immigrant scientists and engineers in the U.S. are employed in private industry more often than the</p>

Appendix E: Data sources specified by country

Country	Data source/statistics
United States (cont.)	<p>U.S. natives (a result of their concentration in fields employed by industry) and focus on R&D more than management activities when compared with the U.S. born. However, this survey has serious limitations: it excludes scientists and engineers without doctorates and it includes doctorate scientists and engineers who received their doctorate outside the US (about 30 percent of our foreign-born doctorates.) Contact: NSF.</p> <p>(iv) The graduate student survey. This survey amongst other things asked for information on funding. It does not have data by country of origin, but did contain information on foreign split that could be used to answer questions such as who pays for the graduate education? Contact: NSF.</p> <p>(v) The census of population has data that is probably comparable to data collected in other countries at the start of each decade. There are questions in the U.S. census that allow one to identify immigrant scientists and engineers by country and date of entry to the U.S.</p> <p>(vi) The Institute of International Education in New York produces an annual report Open Doors, 1995/6 is the latest. This describes foreign students in the U.S. in great detail but some information on what happens to them after graduation. Contact: The Institute of International Education.</p> <p>(vii) There are other surveys that include scientists, most notably those conducted by the U.S. Department of Labour to track employment and unemployment. However, these usually are not as useful as NSF's because NSF's have a larger sample of scientists and engineers. Contact: The U.S. Department of Labour.</p>

Appendix F: The use of the international standard classifications ISIC, ISCED and ISCO specified by country

Country	Use of ISIC, ISCED and ISCO
Australia	Occupations are classified according to the Australian Standard Classification of Occupations (ASCO) which is comparable with the ISCO. Industries are classified according to the Australian and New Zealand Standard Industrial Classification (ANZSIC), which is aligned with ISIC wherever possible. Educational Attainment and Fields of Study are classified according to the ABS Classification of Qualifications (ABSCQ) - an electronic publication is available to explain the links between ABSCQ and ISCED: Links between ABSCQ and Other Educational Classifications (catalogue no. 1262.0.15.002).
Austria	ISIC, ISCED and ISCO are all used at Österreichisches Statistisches Zentralamt.
Belgium	ISCO and ISCED are used in both the population census and the household labor force survey. Instead of ISIC, NACE is used in Belgium. Conversion keys from the national classification systems into ISCO, ISCED and NACE exist.
Canada	Statistics Canada makes use of the North American Industrial Classification (NAIC), but a conversion key to ISIC exists. Similarly a conversion scheme exists from the national occupational classification system to ISCO. ISCO is only used when reporting to international organization, as is ISCED.
Czech Republic	Rather than ISIC the NACE standard is used in the Czech Republic. ISCO has been used for many years in the Czech Republic. The introduction of ISCED is under way. However, this introduction has not been completed and the domestic standard is therefore still in use. This national classification is not fully compatible with ISCED.
Denmark	Statistics Denmark makes use of ISIC, ISCED as well as ISCO.
Federation of Russia	A new ISIC/NACE domestic industrial classification system has been developed in 1993/94 and is being introduced. However, for the main part of the labor data the old classification system (which is not compatible with ISIC/NACE) is in use. The ISCED standard is not used in the Federation of Russia. There however exists a conversion key from the national classification system to ISCED. ISCO is used in labor statistics. The national classification system is "somewhat compatible" with ISCO.
Finland	Data on occupation is in Finland available through the tax registers. However, the quality of this information is in some doubt. The use of ISCO is extremely difficult in the development of mobility indicators as the information is unreliable and is included in the registers only every fifth year. Furthermore, Linda Hardy has already pointed out in her Evaluation report on the 1995/96 pilot data collection on HRST stocks, that the conversion of national occupational classifications into ISCO is problematic. The ISCO classification is therefore thought not very relevant for the study of highly qualified personnel and perhaps the Canberra approach could be reconsidered. A conversion key exists between the national Finnish educational classification system and ISCED.

Appendix F: The use of the international standard classifications ISIC, ISCED and ISCO specified by country

Country	Use of ISIC, ISCED and ISCO
Finland (cont.)	The Finnish industrial classification system is compatible with ISIC/NACE.
France	In France a national classification systems is used for industry. However, conversion key of these systems into NACE/ISIC exists that are not "too bad". Because of the complex educational system in France, there are many problems with the conversion key of the French national educational classification system into ISCED. The French occupational classification system is not at all compatible with the ISCO classification. No attention whatsoever has been paid to the ISCO when developing the French system. This is a very conscious choice as the ISCO system is believed to be far too theoretical. Instead one has opted for, from a practical statistical point of view, a more down to earth approach. Since the French are found to readily be able to identify themselves as belonging to one of the following three groups: (i) blue-collar workers, (ii) employés (and "agents de maîtrise") or (iii) the cadre, it is used as an origin for the classification system. This has been found to be a very effective system and problems such as the same persons reporting different occupations in different surveys depending on how the question is posed, has been eliminated.
Germany	In general the national classification systems are used for surveys in Germany. For the purpose of international surveys (e.g. OECD), the data can be converted using correspondence-classifications. Conversion keys from the national classification systems to ISIC, ISCED and ISCO exist.
Greece	ISIC, ISCO and ISCED are the basis of the Greek statistical system. The national classification standards are compatible with these international standards and conversion keys exist.
Hungary	The ISCO classification is used in Hungary for human resource mobility. Hungary introduced ISIC Rev3 in 1992. There are some modification on four digit level. Conversion keys exist.
Iceland	The national classification systems for industry, occupation and education are compatible with NACE, ISCO and ISCED (conversion keys exist).
Ireland	Conversion keys from the national classification systems into ISIC, ISCO and ISCED exist although the match between these and the national classification systems are not always perfect.
Israel	ISIC, ISCED, and ISCO adapted to the specific circumstances of the Israeli economy and educational system are used. Data is collected at levels of detail which enable recombination's of categories to fit alternate classification schemes.

Appendix F: The use of the international standard classifications ISIC, ISCED and ISCO specified by country

Country	Use of ISIC, ISCED and ISCO
Italy	The national classification systems used in Italy are basically comparable to ISIC, ISCED and ISCO.
Japan	Official statistics kept in Japan are consistent with official international standards (i.e. ISIC, ISCO and ISCED).
Korea	Existing stock of the economically active population in terms of education background, occupation or other relevant categories for all sectors, industries, type of organizations in union with ISIC, ISCED and ISCO, are covered by the Annual Economically Active Population Survey and the Employment Structure Survey. The Korean Standard Classification of Industries (KSIC) and the Korean Standard Classification of Occupation (KSCO) are used in the given surveys. KSIC and KSCO are highly compatible with ISIC (new) and ISCO. KSCO is almost identical to ISCO at least to two digit level.
Luxembourg	When a statistical system for R&D and human resource statistics was eventually set up in Luxembourg, one will make sure that it is compatible with the ISIC, ISCED and ISCO standards with some built in adaptations to fit the local needs. Yet, the national classification systems will still basically be coherent with these international standards.
Mexico	National classifications (which are not uniform) are used. However, correspondence keys for ISIC and ISCO have been developed by the National Statistical Institute (INEGI) so re-classification is possible if somewhat cumbersome. ISCED is not used, but it is not difficult to re-classify the Mexican databases into ISCED (with the exception of the organisational change survey whose definitions are not at all compatible with ISCED's in the sense that a professional is anyone 25 years or older with at least four years of university-equivalent schooling).
The Netherlands	The first two digits of the national industrial classification system used by Statistics Netherlands are identical to ISIC. The national educational classification system is likewise compatible with the old ISCED system. Finally, the Dutch occupational classification system can via a conversion key be translated into ISCO.
New Zealand	Generally, New Zealand's classification systems are compatible with international classification systems. Although they are not the same, it has been attempted to maintain an easy translation capability between the two. New developments in the use of three-dimensional ISIC classification, for example, may however result in some new incompatibilities.
Norway	NACE is the industrial classification system used at Statistics Norway. Furthermore, Statistics Norway makes use of ISCO (not the latest version of it though) but not of ISCED (however, a conversion key from the national classification system exists).

Appendix F: The use of the international standard classifications ISIC, ISCED and ISCO specified by country

Country	Use of ISIC, ISCED and ISCO
Poland	A Polish version of NACE rev. 1 (which is compatible with ISIC) is used and a Polish version of ISCO has officially been implemented. ISCED has however not been implemented as the national classification system but a conversion key exists (the national system only includes existing educations).
Portugal	-
Slovak Republic	ISIC Rev. 3 is used for R&D statistics. A national occupational classification has been created that is fully compatible with ISCO 88. ISCED is not used. The national classification is not compatible with ISCED (at least not fully compatible).
Spain	The Spanish National Institute of Statistics uses ISIC standards for industrial classification. ISCO is also used according to the recommendation of Frascati Manual for classification of occupation (researcher, technician, etc.). ISCED is used for education levels. The national Spanish classification systems are compatible with the above.
Sweden	The Swedish industrial classification system is compatible with ISIC on a two-digit level and a conversion key between the two systems exists. Likewise a conversion key exists between the national Swedish educational classification system and ISCED. The new Swedish classification of occupations is based on ISCO88com. It is compatible with ISCED on a three-digit level. For four- and five-digit conversions a conversion key has to be used. The new Swedish occupational classification has been in use since 1997. The earlier classification system used is not compatible with ISCO88.
Switzerland	Conversion keys from the national classification systems to ISCO and ISCED exist.
Turkey	ISIC rev. 2, ISIC Rev. 3, ISCO 68 and ISCED are all used at the Turkish State Institute of Statistics.
United Kingdom	-
United States	-

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
The interaction between industry and the public research infrastructure	<p><u>Australia</u></p> <p>(i) Outcome based indicators: The commercialisation of public sector research, the amount earned by government research organisations and universities from private sector contracts. Outcome based indicators assume that interaction is a necessary condition for achieving the outcome, they don't reveal the amount or quality of interaction which actually occurs.</p> <p>(ii) The number and size of Co-operative Research Centres (CRC's) - the main activity linking the public and private sectors.</p> <p>(iii) The number of person hours devoted to CRC-activities by all parties (universities, government agencies, private companies etc.). Person hours in government research agencies and universities devoted to earning external funds. Person hours may not be recorded by all relevant bodies, and in any case the degree or quality of interaction involved would vary a great deal between joint research (for example in CRCs) and contract work.</p> <p>(iv) Job mobility among academics. Low mobility among academics suggests that there is not much movement between academia and private industry either. However, if academics are highly mobile it does not necessarily indicate public/private sector movement.</p> <p>(v) Sources of ideas and information for innovation in the manufacturing sector according to the Australian Bureau of Statistics (ABS) survey. The ABS only surveys top level management units, which may not appreciate the significance of informal flows of knowledge for innovation, for example between R&D personnel and academic colleagues, journals, etc., and so may understate the importance of interaction with public sector researchers.</p> <p><u>Germany</u></p> <p>(i) The exchange of scientists between the business enterprise sector and other sectors.</p> <p>(ii) The number of spin-off firms from the higher education sector and research institutions.</p> <p><u>Korea</u></p> <p>(i) The transitional probability of individuals between industry, school and public research institute.</p> <p><u>The Netherlands</u></p> <p>(i) The number of university graduates per year in relevant fields of science and engineering. The contribution of the national educational system to industry is also an indicator of the interaction between industry and the public research infrastructure, since for example shortages would affect the knowledge potential.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
The interaction between industry and the public research infrastructure (cont.)	<p>(ii) The number of university graduates entering employment in industry. Shortages could affect development, and a surplus could indicate a mismatch.</p> <p>(iii) The number of university research staff who are also employed by industry.</p> <p>(iv) The amount of contract research for industry carried out by university research groups.</p> <p>(v) The number of patents per year per university. Many patents are developed in close co-operation with industry.</p> <p>(vi) The number of students doing internships or research projects in industry.</p> <p>(vii) The number of visiting staff from industry at public research institutions.</p> <p>(viii) The number of part-time professors with main employment in industry.</p> <p>(ix) The number of researcher working in Technological top institutes (TTI's)</p> <p><u>New Zealand</u></p> <p>(i) Researchers from each sector who held jobs in the other sector over the last 5 years.</p> <p>(ii) The extent to which business uses public agencies as source of assistance.</p> <p>(iii) The correlation of R&D spending by outputs for public/private.</p> <p><u>Poland</u></p> <p>(i) The number of researchers flowing from the public R&D sector and industrial R&D institutes and starting to work in the business enterprise sector.</p> <p>(ii) Spin-off firms. The number of spin-off firms could be measured by for example asking about them in the R&D-surveys.</p> <p><u>Sweden</u></p> <p>(i) Categorising different kinds of research institutes and enterprises and measuring the net and gross flows between these and industry.</p> <p><u>United States</u></p> <p>(i) The percentage of scientists and engineers in the public research infrastructure who worked in industry 5 years ago, or vice versa. If this is done by age, one can document the extent to which scientists and engineers move between these two sectors and if there is net movement into industry during the first several years after graduation. It is useful to gauge the extent to which there is movement of people between these sectors and also to understand the life-cycle phenomenon, i.e. that many scientists and engineers take a</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
The interaction between industry and the public research infrastructure (cont.)	first job in the university sector and then move on to industry or a government laboratory.
Inter-firm flows of highly skilled human resources	<p><u>Germany</u> <i>(i)</i> The number of start-up firms in R&D intensive industries.</p> <p><u>Israel</u> <i>(i)</i> Mobility between places of work and length of time spent in each job.</p> <p><u>Japan</u> <i>(i)</i> Proxies for net inter-industry flows (or net inter-field flows) of engineers using the population census data (every 5 years in Japan) i.e. inflow (5 year total) - outflow (5 year total).</p> <p><u>Korea</u> <i>(i)</i> "The survival rate of individuals in a firm" by individual and establishment characteristics (i.e. gender, educational attainment, industry, firm size). <i>(ii)</i> Transitional probability of highly educated by firm size, occupation, etc.</p> <p><u>Mexico</u> <i>(i)</i> A somewhat cumbersome indicator that would ideally purport the degree of adequacy of the training received by professionals with the demands placed on them on a day-to-day basis by the labour market. It is based on a combination of job profile, actual duties, responsibilities, and tasks, economic and personal rewards and social responsibility. In order to compute this indicator, a rather specialised survey of employed professionals is required.</p> <p><u>The Netherlands</u> <i>(i)</i> Cluster studies could be directed (amongst other things) to questions regarding the number of researchers within firms and their former employers. (For cluster stuies contact Prof. Danv Jacobs, Twente School of Management.)</p> <p><u>New Zealand</u> <i>(i)</i> Previous positions held during the last 5 years by field of study, qualification, organisation and industry.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Inter-firm flows of highly skilled human resources (cont.)	<p><u>Sweden</u> (i) See the indicator suggested under the interaction between industry and the public research infrastructure above.</p> <p><u>United States</u> (i) The percentage of scientists and engineers who changed employers and/or jobs during a specific time period. By looking only at persons who were employed in private industry both years, it would be possible to measure the extent of inter-firm mobility within industry.</p>
The contribution of the national educational system to industry	<p><u>Australia</u> (i) Highly qualified personnel as a proportion of the total work force. (ii) Proportion of work force educated overseas as an indicator of demand for graduates not met by internal supply. (iii) Graduate salary movements as an indicator of supply/demand. (iv) The number of graduates employed in their area of expertise (it should not be assumed they are not also useful in other areas, e.g. the value of science as a generalist degree/scientists in management, etc.). (v) The number of unemployed/under employed graduates (may indicate the incapacity of industry to make use of contributions from the education system).</p> <p><u>France</u> (i) It might be important to look at the numbers of new young researcher in industry. This is important as the unemployment rate is increasing even for young highly qualified persons. An indicator that could be is unemployment of the highly qualified 1, 2, 3, 4 and 5 years upon graduating (specified by discipline, industry/public sector, etc). And then to follow up to see where these highly qualified eventually find employment.</p> <p><u>Germany</u> (i) See the indicator suggested under the interaction between industry and the public research infrastructure above.</p> <p><u>Israel</u> (i) First place of employment after completing a university degree and the relation between the field of study and the type of work done.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
The contribution of the national educational system to industry (cont.)	<p><u>Korea</u> (i) Employment rate of highly educated by fields and educational attainments.</p> <p><u>The Netherlands</u> (i) See the indicator suggested under the interaction between industry and the public research infrastructure above.</p> <p><u>New Zealand</u> (i) New graduates employed in each industry annually and career paths.</p> <p><u>Poland</u> (i) Perhaps a question on new staff coming from the universities could be added to the innovation survey.</p> <p><u>Sweden</u> (i) The flows from universities to industry. Indicate the destination of the flows of the highly educated from education. Separate flows to employment status by industry, sector, etc., and newly started enterprises from from already existing ones.</p> <p><u>United States</u> (i) The number and percent of employees in industry with advanced education in the sciences and engineering. At times some of this advanced education may be simply surplus that the university sector cannot employ. Does industry really value the graduate education their employees increasingly have. To get insight into this, one could look at the earning differential for advanced degree holders in industry. The absolute differential is of only limited interest and we would understand more if we knew how the differential industry pays to scientists and engineers with graduate education in science and engineering compares with the differential it pays to its employees with graduate degrees in business and law.</p>
The importance of brain drain/brain gain	<p><u>Australia</u> (i) The balance of highly qualified personnel leaving and entering the country matched with the number of immigrants actually employed in their profession.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
The importance of brain drain/brain gain (cont.)	<p><u>Germany</u> (i) Data on the exchange of scientists between Germany and foreign countries by age, gender, discipline, bransch, etc.</p> <p><u>Hungary</u> (i) The R&D surveys of the business enterprise sector, the higher education sector and the government sector could perhaps be used for looking at how the number of man years or full time equivalents (FTE's) changes over time.</p> <p><u>Korea</u> (i) The proportion of researcher who received their degree in a particular foreign country. (ii) Inflows and outflows of foreign or domestic researchers.</p> <p><u>The Netherlands</u> (i) Cluster studies on an international level.</p> <p><u>New Zealand</u> (i) Researchers who have held jobs in other countries during the last 5 years by field of study.</p> <p><u>Sweden</u> (i) National versus international flows. (ii) Shares of immigrants in different industries and sectors by origin country. (iii) Education levels in foreign owned firms as compared to Swedish firms.</p> <p><u>United States</u> (i) The proportion of scientists and engineers who are working abroad. It should be noted, however, that an important part of the international movement of knowledge workers consists of temporary work in another country and that this may be hard to measure. (ii) The number of temporary visas awarded by occupational group.</p>
Regional effects	<p><u>Israel</u> (i) Co-operation between enterprises/researchers in different countries, as indicated by joint publications, joint</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Regional effects (cont.)	<p>patents and international R&D co-operation through for example the TSER (Targeted Socio-Economic Research) program of the European Union.</p> <p><u>The Netherlands</u> (i) The same indicators suggested for the issues above but aggregated by region.</p> <p><u>Poland</u> (i) Net internal mobility shifts. From what regions do highly educated people leave and to what regions do they go?</p> <p><u>Sweden</u> (i) Compare the educational level of staff in newly started enterprises/establishments located close to universities with those located in other parts of the country. (ii) If regional labour markets and knowledge infrastructures are homogenous or technology dependent.</p> <p><u>United States</u> (i) Net and gross flows between regions.</p>
Gender related mobility	<p><u>Australia</u> (i) Mobility of highly qualified female personnel.</p> <p><u>Korea</u> (i) See the indicators suggested under the interaction between industry and the public research infrastructure and inter-firm flows of highly skilled human resources above.</p> <p><u>The Netherlands</u> (i) The same indicators suggested for the issues above but broken down by gender. The State University of Lieden (Ms. Wil Portegijs) was the only university in the Netherlands where work in this area was carried out.</p> <p><u>New Zealand</u> (i) Gender distribution at census and R&D surveys, by field of study.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Gender related mobility (cont.)	<p><u>Poland</u> (i) Data broken down by gender and education.</p> <p><u>Sweden</u> (i) Mobility and commuting patterns of people with families compared with single persons.</p> <p><u>Germany</u> (i) See the indicators suggested under the importance of brain drain/brain gain.</p> <p><u>United States</u> Differences in mobility by gender are subtle and are not fully captured by simply measuring regional movements by gender. The principal problem is the fact that, in spite of many changes, it is still more common for men to move in response to opportunity and a women's move to be a career disruption caused by a need to follow her mate. It is thought that families with two professionals often resist moves for either, and that companies are more understanding of this than was the case 25 years ago. So some of the things that might be measured to get insight into this are: (i) Do married male scientists and engineers move less frequently than single ones? (ii) Do married male scientists and engineers move less frequently if their spouse has an scientists and engineers job? (iii) Do married female scientists and engineers move less frequently than married male scientists and engineers? (iv) Do single scientists and engineers (male and female) move more frequently? (v) Are more female scientists and engineers single, compared with male scientists and engineers? etc. There would be at least two problems with such measures: (i) many people who move far enough to require a change in residence still move to another place within the same region; and (ii) female scientists and engineers tend to be younger than males because of more recent entry into these occupations. Thus, it is necessary to control for age or gender effects will be confused with age effects.</p>
Indicators that either do not fit in under the given policy issues or for which the policy issues has not been specified	<p><u>Canada</u> (Indicators based on the specified sources) (i) The Population census: A census record has industry, occupation, qualification and specialisation, as well</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Indicators that either do not fit in under the given policy issues or for which the policy issues has not been specified (cont.)	<p>as all of the other socio-economic variables of a census. This means that for each industry there is a three by three matrix which can be examined in a variety of ways and changes over time can be noted. Some indicators of knowledge flow are (for an industry at different times):</p> <ul style="list-style-type: none"> - distribution of the work force by occupation - distribution of the work force by qualification and then by specialisation - for occupation the distribution of the work force by qualification and then by specialisation <p>(ii) The National Graduate Survey: An explicit measure of knowledge flow is the number of graduates, by specialisation, going to industry. This can be compared with the industrial distribution of later cohorts of graduates. The longitudinal data can be used to study the movement of graduates 2 years and 5 years after graduation.</p> <p>(iii) Innovation and Technology Use Surveys: The indicators are indirect and are the change in employment as a result of the activity, and the change in skill level. Then, if innovative firms increase employment and the skill level, there is evidence of knowledge flow into the firm.</p> <p>(iv) Longitudinal Economic Analysis Project: As in the previous case, industries that are net creators of jobs over time demonstrate that there must have been a net inflow of people and therefore of knowledge.</p> <p>(v) Professional Associations: In principle, these are sources of the industrial and occupational distribution of the membership, on an annual basis as that is the frequency of license renewal.</p> <p><u>Federation of Russia</u></p> <p>(i) Regarding researchers engaged abroad, the following breakdowns could be useful as indicators:</p> <ul style="list-style-type: none"> - by field of science - by recipient country - by type of arrangement (contract, etc.) - by age - by gender <p>(ii) Regarding the destination of university students, these could in the Federation of Russia be classified into the two categories: (i) those who received job offers within the university system; and (ii) those that did not.</p> <p><u>Germany</u></p> <p>In Germany, only few surveys contain flow variables. In part flows could be estimated via stock information. A number of indicators has been presented in the study of Germany's Technological Performance (see also appendix D) and in the Centre for Economic Research reports from results of the innovation surveys. Examples are:</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Indicators that either do not fit in under the given policy issues or for which the policy issues has not been specified (cont.)	<p>(i) The share of skilled employees by industry and the share of highly qualified employees by industry.</p> <p>(ii) Share of Scientists and Engineers in R&D personnel.</p> <p>(iii) Qualification structure of personnel in R&D and construction departments in enterprises.</p> <p>(iv) Training participation rate by qualification of employees.</p> <p>(v) Training participation rate by discipline of graduates from the higher education system.</p> <p>(vi) Number of start-ups in R&D intensive branches.</p> <p>(vii) Share of self-employment by industry.</p> <p>(ix) Share of self-employment by qualification.</p> <p>(x) Share of self-employment in graduates from the higher education system by discipline.</p> <p>(xi) Job creation in start-ups.</p> <p>(xii) Job creation by branch and by size-class of enterprise.</p> <p>(xiii) Job creation in R&D intensive branches.</p> <p>Contact person on S&T indicators in Germany: Dr. Erika Rost, BMBF, D-53170 Bonn. Fax +49 228 57 3233</p> <p><u>Greece</u></p> <p>(i) People not working in their field of study constituted a major part of the invisibly under employed. The higher the rate of people not working in their field of study, the lower the productivity. This rate could perhaps be used as a "hidden indicator" of the invisibly under employed.</p> <p><u>Israel</u></p> <p>(i) Financing by industry of university research locally and abroad.</p> <p>(ii) Government financing for R&D in industry.</p> <p><u>New Zealand</u></p> <p>(i) Full time equivalents by field of research (past and present), census head counts of science and technology personnel by occupation and qualification and R&D full time equivalents as indicators of the strength of a countries skill base.</p> <p>(ii) Technology advance or personal interest/reasons as an indicator of retraining.</p> <p>(iii) Age distribution of science and technology personnel at succeeding censuses and flows by field as indicators of age mobility.</p>

Appendix G: Suggested indicators specified by policy issue

Policy issues	Suggested indicators
Indicators that either do not fit in under the given policy issues or for which the policy issues has not been specified (cont.)	<p><u>Spain</u></p> <p>(i) Distribution of researches by different foreign countries and by fields of science.</p> <p>(ii) Distribution of researches by gender, foreign countries and fields of science.</p> <p>(iii) The number of scientists going abroad (or going from university or research centres to industry or enterprise) according to their field of science and size of industry.</p> <p>(iv) The number of scientists moving abroad (or moving from the universities or research centres to industry or enterprises) by field of admitting industry (ISIC classification) and size of industry.</p> <p>(v) The number of scientists residing abroad by country of acceptance and gender.</p> <p><u>Switzerland</u></p> <p>(i) Different bibliometric indicators could provide useful information on the co-operation between the higher education sector and industry, between different industrial sectors, etc. A good source for bibliometric information is the American SCI-database.</p> <p><u>United Kingdom</u></p> <p>(i) Inflows and outflows from the science base to industry, between industries and between regions. Average duration in employment. Similar analyses split by level of qualification.</p>