International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

▶ simultaneous translation

The objective of the symposium is to highlight the importance of tracking the careers of doctoral graduates. Although doctorate holders are important for research and innovation, their career paths are unclear. Data concerning their careers would be useful for policymaking in human resources and economics.

The National Institute of Science and Technology Policy (NISTEP) invites key persons in this field to share their visions. In the symposium, key speakers will make presentations in regard to tracking the careers of doctoral graduates and evidence-based human resource policies. In addition, Ministry of Education, Culture, Sports, Science and Technology (MEXT) will explain current reform policies for graduate schools. NISTEP will summarize the plan for a new database of doctoral graduates. We look forward to your attendance.

Host: National Institute of Science and Technology Policy (NISTEP)

Date: Wednesday, February 27, 2013 [Doors Open 12:30 / Symposium 13:00-17:30]

Venue: Auditorium No. 2, (6th floor of the former building of the Ministry of Education)
　　　　Tokyo Metro Ginza Line, Tranomon (G07): 2 min. walk from Exit 6 / 11
　　　　Chiyoda / Hibiya Line, Kasumigaseki (C07 / H15): 5 min. walk from Exit A13

Language: Japanese and English (Simultaneous Translation)

Attendance Registration: Online Registration from NISTEP Website before February 22
　　　　　　　　　　　（http://www.nistep.go.jp/en/）

Inquiry regarding the Symposium:
　　　　Keiji Saito
　　　　National Institute of Science and Technology Policy
　　　　E-Mail: ksaito@nistep.go.jp

Inquiry regarding the Attendance Registration:
　　　　Office for International Symposium on Tracking Careers of Doctoral Graduates
　　　　(Agency: Simul International)

Symposium Timetable ▶ simultaneous translation

Opening Speech (13:00-13:05): Terutaka Kuwahara [NISTEP (Japan): Director General]

1

International Frameworks of Career Tracking of Doctoral Graduates and Policy Implications (13:05-14:20)

This session will focus on international frameworks of career tracking of doctoral graduates.
Key speakers from overseas will make presentations about the visions and its utilizations from international standpoints.

◉ **Presentation 1-1 (13:05-13:30) Careers of Doctorate Holders:** Developing the Statistical Evidence
   Laudeline Auriol [OECD-STI / EAS: Administrator]

◉ **Presentation 1-2 (13:30-13:55) Career Tracking: Why, for whom, and how?** Toward a European Platform of Career Tracking
   Laura Marin [European Science Foundation: Senior Manager Member]

◉ **Presentation 1-3 (13:55-14:20) Managing research under constraints**
   Luis Sanz Menéndez [CSIC IPP (Spain): Director / OECD-CSTP: Chair]

2

Reforms of Graduate Schools and Plan for a Database of Doctoral Graduates in Japan (14:20-14:45)

In this session, MEXT will explain current reform policies for graduate schools. The reform policies utilize the data of destinations of doctoral graduates for reviews. NISTEP will summarize the plan for a new database of doctoral graduates.

◉ **Presentation 2-1 (14:20-14:30) The Reform of Graduate Education in Japan**
   Hiroshi Matsuzaka [MEXT (Japan): Director, Office for University Reform]

◉ **Presentation 2-2 (14:30-14:45) Visions and Plan for a Database of Doctoral Graduates in Japan**
   Keiji Saito [NISTEP (Japan): Research Fellow]

3

Tracking Careers of Doctoral Graduates and Utilization of the Data in the US and the UK (14:45-15:35)

The US and the UK have been conducting detailed large-scale surveys for doctoral graduates. In this session, key speakers from the US and the UK will make presentations of the visions, methods, and policy implications in each country.

◉ **Presentation 3-1 (14:45-15:10) Methods and Analyses of Surveys of Doctorate Recipients**
   Lynn Milan [National Science Foundation (the US) : project officer]

◉ **Presentation 3-2 (15:10-15:35) Revealing the Landscape and Impact of Researchers' Careers**
   Janet Metcalfe [Vitae (the UK): Chair and Head]

Break Time (15:35-15:50)

P

Evidence-Based Human Resource Policies and International Cooperation (15:50-17:30)

Starting with a presentation titled **"Enhancing Quality of Doctoral Education:** Fostering Innovative Leaders for Sustainable Development**"** by **Ayao Tsuge [The Japan Federation of Engineering Societies: President]** , we will hold a panel discussion with key persons from overseas. This panel discussion will offer a platform to exchange opinions about tracking the careers of doctoral graduates, evidence-based human resource policies, and direction of the international cooperation.

Moderator: **Toshiyuki (Max) Misu [NISTEP (Japan): Senior Research Fellow]**
   （1）**Introduction**
   （2）**Issues of Tracking the Careers of Doctoral Graduates**
   （3）**International Cooperation in Surveys, Analyses, and Human Resource Policies**
   （4）**Q&A Session from the Floor**

Closing Speech: Sotaro Ito [NISTEP (Japan): Deputy Director General]

博士課程修了者の
キャリア把握に関する国際シンポジウム
―国際的フレームワークと各国の調査分析の動向―

▶ 日英同時通訳

　文部科学省 科学技術政策研究所では、博士課程修了者のキャリア把握の重要性を広く共有することを目的として、本シンポジウムを開催します。博士課程修了者は、研究及びイノベーションに対して重要な役割を果たしつつも、我が国においてそのキャリアパスは不透明となっています。一方、海外においては博士課程修了者のキャリアの把握やそれらのデータに基づいた政策立案に関して、先進的な取組が見られます。

　本シンポジウムでは、博士課程修了者のキャリア把握や人材育成政策に関する海外の有識者をお招きし、各国、各機関における博士課程修了者のキャリア把握の取組、そのデータの分析や利活用に関する講演を行います。併せて、文部科学省における大学院改革の取組や科学技術政策研究所が構築している博士人材データベースに関する情報共有やパネルディスカッションを行います。皆様のご参加をお待ちしております。

主催：文部科学省 科学技術政策研究所

開催日時：2013 年 2 月 27 日（水）［12：30 開場 / 13：00 開演（17:30 終演）］

会場：文部科学省 第 2 講堂［旧文部省庁舎 6 階］
　　　　　東京メトロ 銀座線 虎ノ門駅（6 番 / 11 番出口）より徒歩 2 分
　　　　　　千代田線・日比谷線 霞ヶ関駅（A13 出口）より徒歩 5 分

使用言語：日本語及び英語（日英同時通訳）

参加登録：科学技術政策研究所のウェブサイト（http://www.nistep.go.jp/）から 登録
　　　　　（参加登録締め切り日：2013 年 2 月 22 日（金））

シンポジウムの内容に関するお問い合わせ：
　　　科学技術政策研究所　SciSIP 室（サイシップしつ）　担当：齋藤経史（さいとうけいじ）
　　　E-Mail: ksaito@nistep.go.jp

参加登録に関するお問い合わせ：
　　　「博士課程修了者のキャリア把握に関する国際シンポジウム」事務局
　　　（事務局代行：株式会社サイマル・インターナショナル）

プログラム　▶ 日英同時通訳

開会挨拶（13:00–13:05）：桑原輝隆 ［文部科学省 科学技術政策研究所長］

1 博士課程修了者のキャリア把握の国際的な進展とデータの利活用（13:05-14:20）

本セッションにおいては、OECD における CDH（Careers of Doctorate Holders）プロジェクトをはじめとする博士課程修了者に関するデータ収集の国際的フレームワークおよびデータに基づくキャリア支援や政策立案を紹介します。

◉講演 1-1 (13:05-13:30)　OECD における Careers of Doctorate Holders プロジェクト : 統計的エビデンスの発展
　　　Laudeline Auriol [OECD-STI / EAS: Administrator]

◉講演 1-2 (13:30-13:55) ヨーロッパ科学財団におけるキャリア把握
　　　Laura Marin [European Science Foundation: Senior Manager Member]

◉講演 1-3 (13:55-14:20) 制約下の研究マネージメント
　　　Luis Sanz Menéndez [スペイン CSIC IPP: Director / OECD-CSTP: Chair]

2 日本における大学院改革と博士人材データベースの計画（14:20-14:45）

本セッションにおいては、日本における大学院改革および構築中の博士人材データベースの目的と計画を紹介します。
大学院改革の現状と進展を踏まえて、博士課程修了者の長期的なキャリアデータ把握の枠組みを議論します。

◉講演 2-1 (14:20-14:30) 大学院教育の改革状況
　　　松坂浩史 [文部科学省 高等教育局 大学改革推進室：室長]

◉講演 2-2 (14:30-14:45) 博士人材データベースの目的と計画
　　　齋藤経史 [文部科学省 科学技術政策研究所：研究員]

3 米国、英国における博士課程修了者調査の実態と活用（14:45-15:35）

米国、英国では博士課程修了者に関する大規模調査を行い、人材育成政策および科学技術政策に活用しています。
本セッションでは、米国、英国における博士課程修了者調査の実態とその活用を紹介します。

◉講演 3-1 (14:45-15:10) 米国における博士課程修了者調査の方法と分析
　　　Lynn Milan [米国 National Science Foundation : project officer]

◉講演 3-2 (15:10-15:35) 英国における研究者キャリアデータの把握と活用
　　　Janet Metcalfe [英国 Vitae: Chair and Head]

休憩（15:35–15:50）

P データに基づく人材育成政策のビジョンと国際協調（15:50-17:30）

柘植綾夫氏 [日本工学会会長] による「博士課程教育の質の向上 - 持続的成長のためのイノベーティブリーダーの育成 -」
の講演の後、5 名の海外の有識者とのパネルディスカッションを行います。
データに基づく人材育成政策や博士課程修了者のキャリア把握に関する意義や課題を議論します。
併せて、人材育成政策および博士課程修了者のキャリア把握に関する国際的な協調の可能性を検討します。

　　モデレーター：三須敏幸 [文部科学省 科学技術政策研究所：上席研究官]
　　　（1）パネリストの紹介
　　　（2）博士課程修了者のキャリア把握の重要性と課題
　　　（3）調査、分析、人材育成政策に関する国際的協調の展望
　　　（4）フロアからの質疑、コメント

閉会挨拶：伊藤宗太郎 ［文部科学省 科学技術政策研究所 総務研究官］

International Symposium on Tracking Careers of Doctoral Graduates
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Session 1:
International Frameworks of Career Tracking of Doctoral Graduates and Policy Implications

Presentation 1
Careers of Doctorate Holders:
Developing the Statistical Evidence
Laudeline Auriol [OECD-STI / EAS: Administrator]

Presentation 2
Career Tracking:
Why, for whom, and how? Toward a European Platform of Career Tracking
Laura Marin [European Science Foundation: Senior Manager Member]

Presentation 3
Managing research under constraints
Luis Sanz Menéndez [CSIC IPP (Spain): Director / OECD-CSTP: Chair]

CAREERS OF DOCTORATE HOLDERS: DEVELOPING THE STATISTICAL EVIDENCE

Laudeline Auriol (OECD)

International Symposium on Tracking Careers of Doctoral Graduates

NISTEP, Tokyo, 27 February 2013

OECD
BETTER POLICIES FOR BETTER LIVES

Outline of the presentation

- Why track careers of doctoral graduates?
- The Careers of Doctorate Holders Project (CDH) vs. other relevant surveys
- Results of the latest data collection
- Conclusions and prospects

Why track careers of doctoral graduates?

- Massive expansion of higher education (HE) leading to increased number of postgraduate students and doctorate awards
- Internationalisation of HE and research systems leading to competition for talents and recognition of doctorate as the reference degree for research careers
- Change in research system organisation with more limited number of tenured positions and less linear careers
- Bottlenecks at the early research career stage with increased number of postdoc and temporary contracts
- Diversification of doctoral graduate careers with increased numbers in business and non research jobs
- Aging of the HE and research labour force
- Increased number of women but not across all disciplines and positions
- Changes in the skill mix requested on the labour market
- ...

But limited statistical evidence...

Typology of international data sources

	Coverage of doctoral population	Size of doctoral population	Type of relevant information	Other remarks
Mainstream household and population surveys				
Censuses	Full	Good	Limited	Unfrequent; doctorate not always identified
Labour force surveys	Full	Limited	Limited	Doctorate not always separately identified
...				
Careers of Doctorate Holders surveys	Good	Good	Good	
Graduate surveys				
US National Science Foundation surveys				
Survey of Doctorate Recipients	Good	Good	Good	
Survey of Earned Doctorates	Early career	Good	Good	
...				
Japan				
Survey of Recent Doctoral Graduates	Early career	Good	Good	Limited international comparability
United kingdom				
Destinations of Leavers from Higher Education (DLHE)	Early career	Good	Good	Limited international comparability
Longitudinal DLHE (L DLHE)	Early career	Good	Good	Limited international comparability
France				
'Géneration' surveys	Early career	Good	Good	Limited international comparability
...				
Administrative sources				
Nordic type populaton registers	Good	Good	Limited	
Social security registers	Good	Good	Limited	Doctorate not always separately identified
Migrant information	Good	Good	Limited	Doctorate not always separately identified
...				

Source: OECD Secretariat.

Survey type and target population

Evolution of cohorts in time
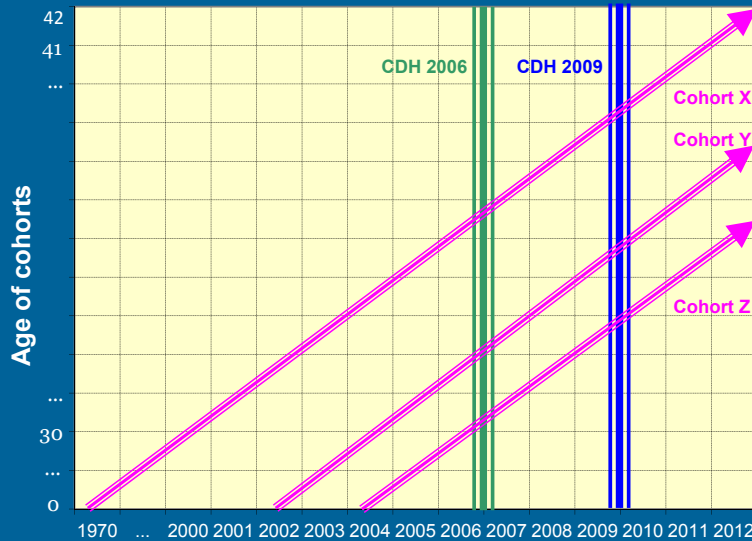
While early destination surveys cover selected cohorts only, CDH captures all cohorts at a certain point in time: it is a cross-sectional retrospective survey.

Source: OECD Secretariat.

Why a cross-sectional retrospective survey?

- Basic contextual data missing on the total number of doctorate holders and structure of the doctoral population in certain countries
- In others, possibility to draw from already existing data sources (censuses, registers) to get these numbers and/or constitute a sample to be surveyed
- All career stages are of interest (e.g. for mobility measurement)
- Possibility to look at aging
- Need to compare with other labour force data and populations of interest

The Careers of Doctorate Holders (CDH) project

- A joint OECD/Eurostat/UNESCO project launched by the OECD Secretariat in 2004 to collect data on personal, educational, labour market, employment and mobility characteristics of doctorate holders and their perception and satisfaction with work
- Technical guidelines, including a model questionnaire, developed by an expert group of statisticians, but varied data sources allowed
- The target population is all doctorate holders aged 70 years and below who reside on the national territory
- One pilot in 2005 and two large scale data collections in 2007 and 2010 covering 25 countries (2 to 2 ½ million doctorate holders)
- Several analytical working papers, technical guidelines and indicators available on www.oecd.org/sti/cdh
- The project was in 2011-2012 funded as part of the EU FP 7 *KnowINNO* activities and involved a first exploitation of micro data coupled with analysis from early destination surveys → more detailed results for around 10 countries on early career, job-to-to job and international mobility

7

Survey infrastructure for Careers of Doctorate Holders

			GRADUATE SURVEYS					OTHER DATA SOURCES

Early destination surveys

		Recent graduates	All graduates (including recent)						All graduates

| Doctoral graduates | | (Canada) Japan | **CDH dedicated surveys:** | **(Argentina)** (Austria) Belgium Bulgaria **Chile** | Croatia (Cyprus) (Czech Rep.) (Estonia) Hungary | Iceland Israel Latvia Lithuani | Malta Netherlan Poland Portugal Romania | Russia Turkey Serbia (Slovak Rep.) Slovenia Spain | CDH ↔ | **Adminirative source** Chinese Taipei |

| All graduates (includes doctoral graduates) | | France Switzerland United-Kingdom | **Other graduate surveys** **Germany** United States | | | | | | **Register data** Denmark + Finland Norway + Sweden **Labour force surveys** Germany Switzerland **Censuses** Australia Canada United States |

Note: For the CDH dedicated surveys, the list of countries relates to those that have conducted a survey in 2010, those in parentheses conducted a survey in a preceding year while those in bold have conducted or will conduct a carvey after 2010. Among those countries producing data from registers, Denmark (marked with '+') has also used a complementary survey in 2007 to report additional variables to those from registers and Norway plans to do so for the future data collection.
Footnote by Turkey:
The information in this document with reference to « Cyprus » relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve position concerning the "Cyprus issue".
Footnote by all the European Union Member States of the OECD and the European Commission
The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective co Government of the Republic of Cyprus.

Limitations of CDH surveys

- Difficulty to build and maintain registers of doctorate holders
- Diversity of the data sources used
- Difficulty to cover non-citizens and those having received their doctorate abroad
- In some cases, difficulty to cover those inactive, unemployed or having received their degree a long time ago
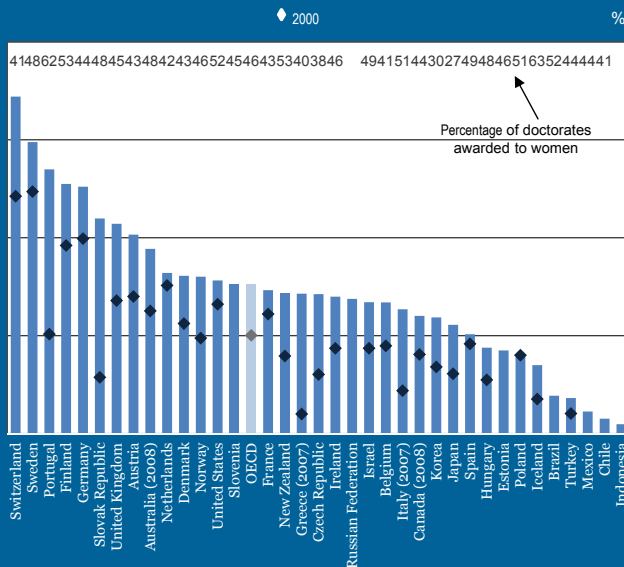
Results from the latest data collection

- Results from the second large scale CDH data collection conducted in 2010 for 25 countries.
- In addition to the analysis of aggregate indicators , a co-ordinated analysis of micro data from dedicated CDH surveys was undertaken.
- Expert teams from ten governmental agencies and research institutions have collaborated with the OECD to carry out econometric analyses on the factors that shape the labour market experience and performance of doctorate holders .
- Special effort to define common populations of doctorate holders among surveys of university graduates in France, Japan and the United Kingdom, and subsamples within CDH surveys carried out in other countries.
- The OECD secretariat also carried out a comparative analysis of microdata on doctorate holders and individuals holding other postgraduate qualifications for the United States and the United Kingdom.
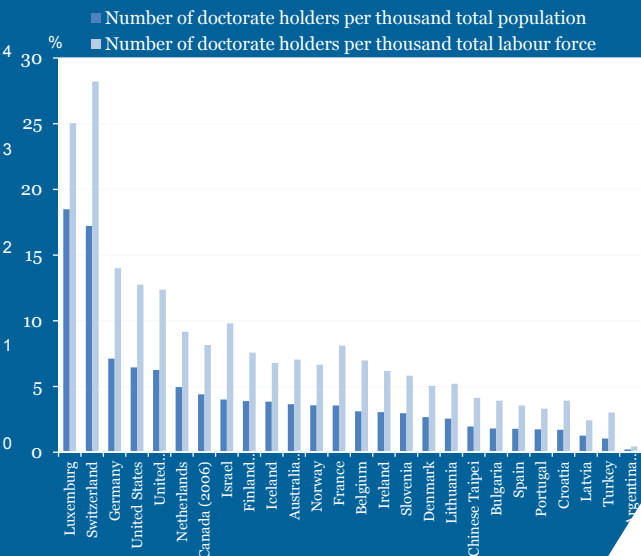
The supply of new graduates has increased raising the share of doctorates in the population

Graduation rates at doctoral level 2000 and 2009
As a percentage of population in reference age cohort

◆ 2000   %

414862534448454348424346524546435340384649415144302749484651635244441

Percentage of doctorates awarded to women

Switzerland, Sweden, Portugal, Finland, Germany, Slovak Republic, United Kingdom, Austria, Australia (2008), Netherlands, Denmark, Norway, United States, Slovenia, OECD, France, New Zealand, Greece (2007), Czech Republic, Ireland, Russian Federation, Israel, Belgium, Italy (2007), Canada (2008), Korea, Japan, Spain, Hungary, Estonia, Poland, Iceland, Brazil, Turkey, Mexico, Chile, Indonesia

The relative importance of doctorate holders in the population
2009 or most recent year, doctorates per thousand

■ Number of doctorate holders per thousand total population
■ Number of doctorate holders per thousand total labour force

Luxemburg, Switzerland, Germany, United States, United..., Netherlands, Canada (2006), Israel, Finland..., Iceland, Australia, Norway, France, Belgium, Ireland, Slovenia, Denmark, Lithuania, Chinese Taipei, Bulgaria, Spain, Portugal, Croatia, Latvia, Turkey, Argentina..
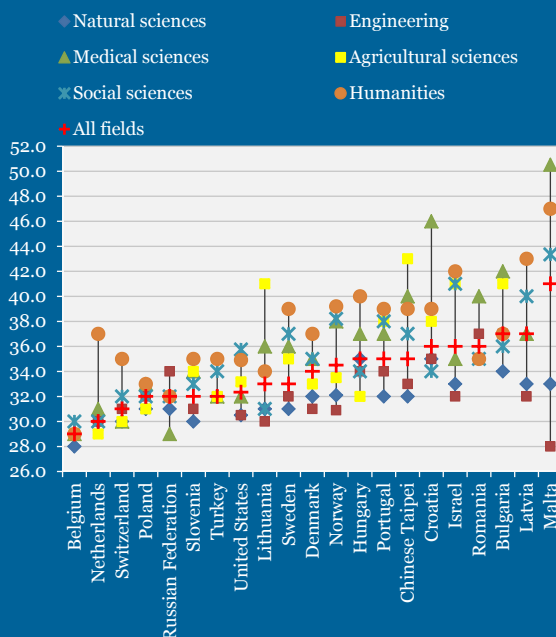
Source: OECD, based on OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010; OECD Main science and technology indicators, OECD Education attainment database, Education at a Glance Indicators 2009 and 2011, US Census Bureau (ACS, 2009).
Notes: Data for the Netherlands and Spain refer to graduation years 1990 onwards. For Spain, there is limited coverage of individuals who graduated over the years 2007 to 2009. Data for Chinese Taipei only include those doctorates in National Profiles of Human Resources in Science and Technology (NPHRST) made by STPI, NARL, Chinese Taipei.
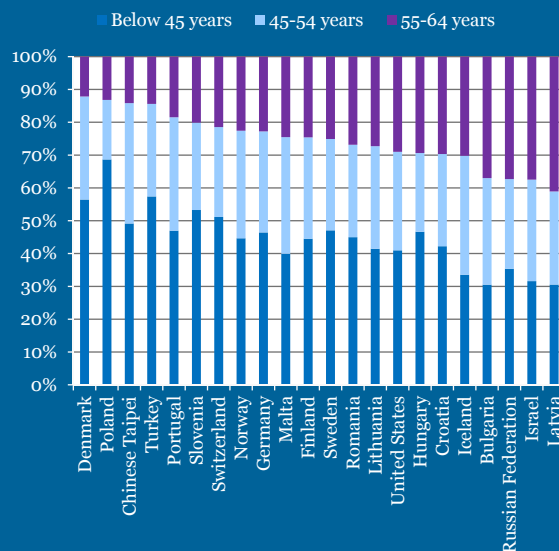

Doctorate holders arrive late on the labour market

Median age at graduation of recent doctorate holders

◆ Natural sciences   ■ Engineering
▲ Medical sciences   ■ Agricultural sciences
✕ Social sciences   ● Humanities
+ All fields

Belgium, Netherlands, Switzerland, Poland, Russian Federation, Slovenia, Turkey, United States, Lithuania, Sweden, Denmark, Norway, Hungary, Portugal, Chinese Taipei, Croatia, Israel, Romania, Bulgaria, Latvia, Malta

Age breakdown of doctorate holders, 2009

■ Below 45 years   ■ 45-54 years   ■ 55-64 years

Denmark, Poland, Chinese Taipei, Turkey, Portugal, Slovenia, Switzerland, Norway, Germany, Malta, Finland, Sweden, Romania, Lithuania, United States, Hungary, Croatia, Iceland, Bulgaria, Russian Federation, Israel, Latvia
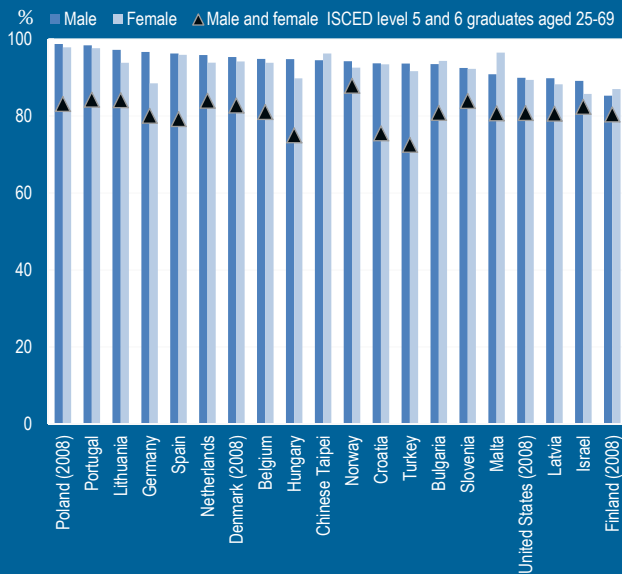
Source: OECD, OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010.
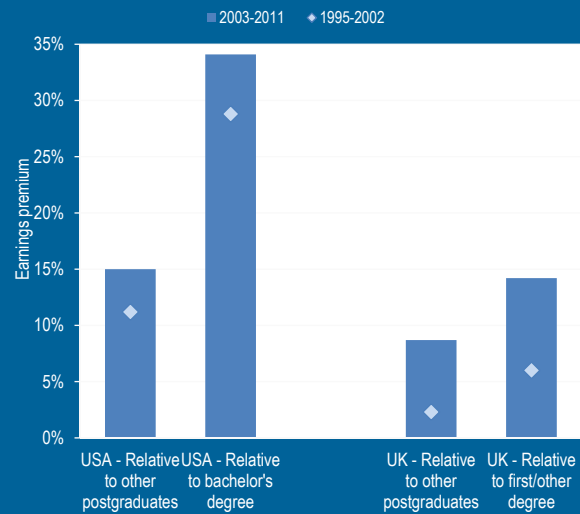
High demand for doctorates as revealed by employment and earnings 'premium'

Employment rate of doctorate holders by gender, 2009
As a percentage of total doctorate holders

Legend: ■ Male ■ Female ▲ Male and female ISCED level 5 and 6 graduates aged 25-69

Categories (x-axis): Poland (2008), Portugal, Lithuania, Germany, Spain, Netherlands, Denmark (2008), Belgium, Hungary, Chinese Taipei, Norway, Croatia, Turkey, Bulgaria, Slovenia, Malta, United States (2008), Latvia, Israel, Finland (2008)

Notes: Data for Belgium, Germany, Hungary, the Netherlands and Spain refer to graduation years 1990 onwards. *For Belgium and Malta, data for the 65-69 age class include doctorate holders aged 70 years and above. For Spain, there is limited coverage of doctorate holders for the years 2007 to 2009. Data for Chinese Taipei only include those PhD in National Profiles of Human Resources in Science and Technology made by STPI, NARL, Chinese Taipei: http://hrst.stpi.narl.org.tw/index.htm#noticeChinese. Data for Turkey exclude foreign citizens. For the United States, data exclude doctorate holders who received their degree abroad and who received a doctorate in humanities.
Source: OECD, based on OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010; Eurostat 2012; Education at a Glance 2012.

Doctorate wage premium in the United States and the United Kingdom
Estimated differences in log hourly earnings

Legend: ■ 2003-2011 ◆ 1995-2002

y-axis: Earnings premium (0% to 35%)

Categories: USA - Relative to other postgraduates, USA - Relative to bachelor's degree, UK - Relative to other postgraduates, UK - Relative to first/other degree
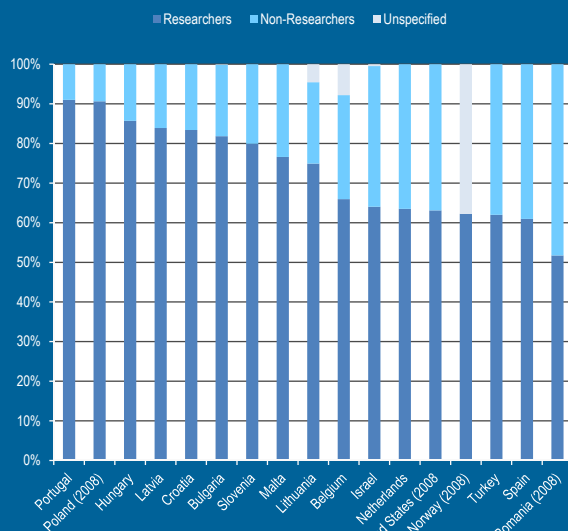
Notes: Based on ordinary least square regressions of log hourly earnings, controlling for other personal and job characteristics.
Source: OECD calculations based on the US Current Population Survey and the UK Labour Force Survey.
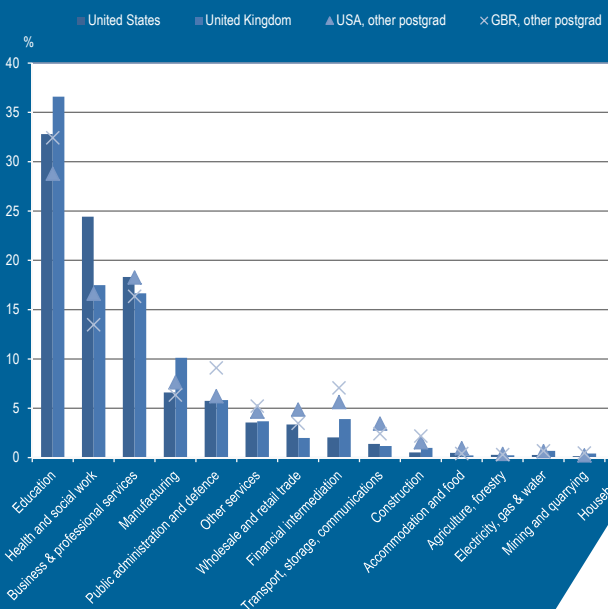

Higher education and academic careers are the main destination of doctorates but demand is apparent in other knowledge intensive sectors

Doctorates employed as researchers
As a percentage of employed doctorate holders

Legend: ■ Researchers ■ Non-Researchers ■ Unspecified

Categories (x-axis): Portugal, Poland (2008), Hungary, Latvia, Croatia, Bulgaria, Slovenia, Malta, Lithuania, Belgium, Israel, Netherlands, United States (2008), Norway (2008), Turkey, Spain, Romania (2008)

Notes: Data for Belgium, Hungary, the Netherlands and Spain refer to graduation years 1990 onwards. For Belgium, Malta and the Russian Federation, data for the 65-69 age class include doctorate holders aged 70 years and above. For Spain, there is limited coverage of doctorate holders for the years 2007 to 2009. Data for Turkey exclude foreign citizens. For the United States, data exclude doctorate holders who received their degree abroad and who received a doctorate in humanities.
Source: OECD, based on OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010.

The sector of economic activity for UK and US doctorates, 2003-2011
As a proportion of total doctorates or "other postgraduate" qualification group

Legend: ■ United States ■ United Kingdom ▲ USA, other postgrad × GBR, other postgrad

Categories (x-axis): Education, Health and social work, Business & professional services, Manufacturing, Public administration and defence, Other services, Wholesale and retail trade, Financial intermediation, Transport, storage, communications, Construction, Accommodation and food, Agriculture, forestry, Electricity, gas & water, Mining and quarrying, Households
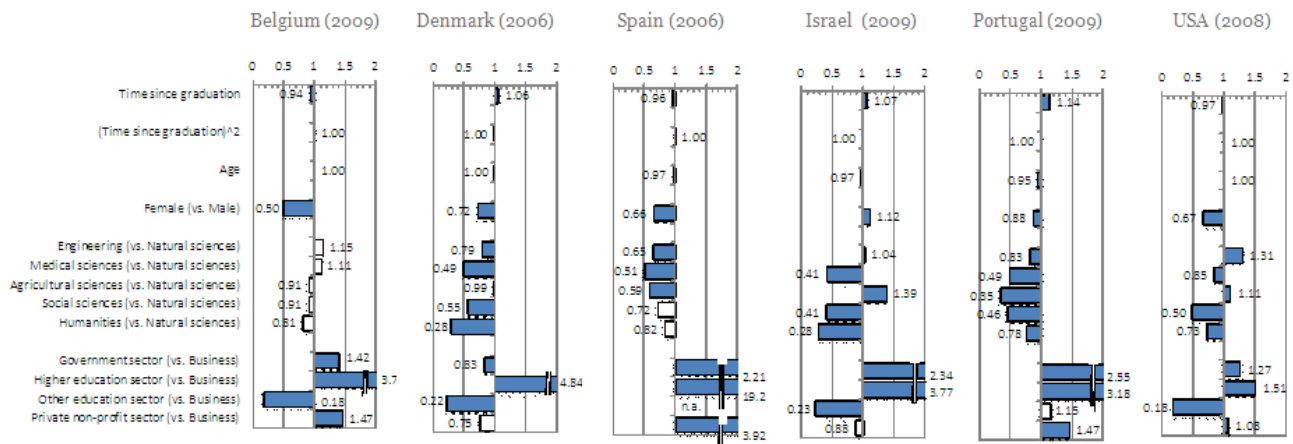
Source: OECD, estimates based on US Current Population Study and UK Labour Force Survey micro-data.

Certain categories of doctorates are more likely to work as researchers

Factors determining the probability of working as a researcher
Odds ratios

Notes:
* The odds ratios from logistic regression analysis are shown and illustrate the odds of corresponding group of being a researcher relative to those of reference group, controlling for the other variables. For instance, for Belgium, the odds of being a researcher among doctorates employed in the higher education sector are 3.7 times higher than for those employed in the business sector.
* Filled boxes correspond to estimates that are statistically significantly different from one, with p-values less than 5 percent.
* For the United States, most individuals specialised in humanities are outside the scope of the survey.
Source: OECD, based on ad hoc analysis of CDH micro data, October 2012.

Earnings vary across countries, gender, research premia, experience, sector pay, field of study, part time and temporary work…

Differences in annual earnings
Estimated coefficients from regressions of log earnings (i.e. percentage differences)
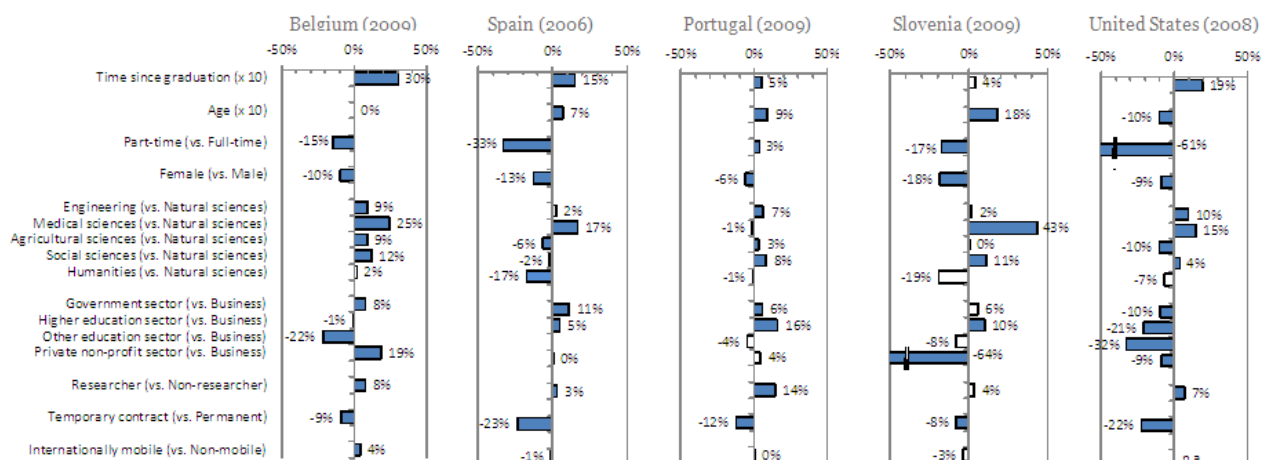
Notes:
* Results based on orindary least square regressions of log annual earnings on individual and job characteristics.
* Filled boxes correspond to statistically significant estimates with p-values less than 0.05.
* For the United States, most of those specialised in humanities are outside the scope of the survey.
Source: OECD, based on analysis of CDH micro data, November 2012.

# Job perception and satisfaction

The share of doctorates employed in jobs related to their doctoral degree varies greatly across countries. In Belgium, Spain, the Netherlands and Latvia, between 15% and 30% of doctoral graduates consider their job not related to their field of specialisation.

The share of doctorates employed in jobs that are related to their degrees is higher for the younger cohorts in nearly half of the countries .

Overall, doctorate holders are satisfied with their employment situation, but less so with their salaries and benefits.

Satisfaction levels intellectual challenges and with opportunities for advancement are remarkably higher for those working as researchers.
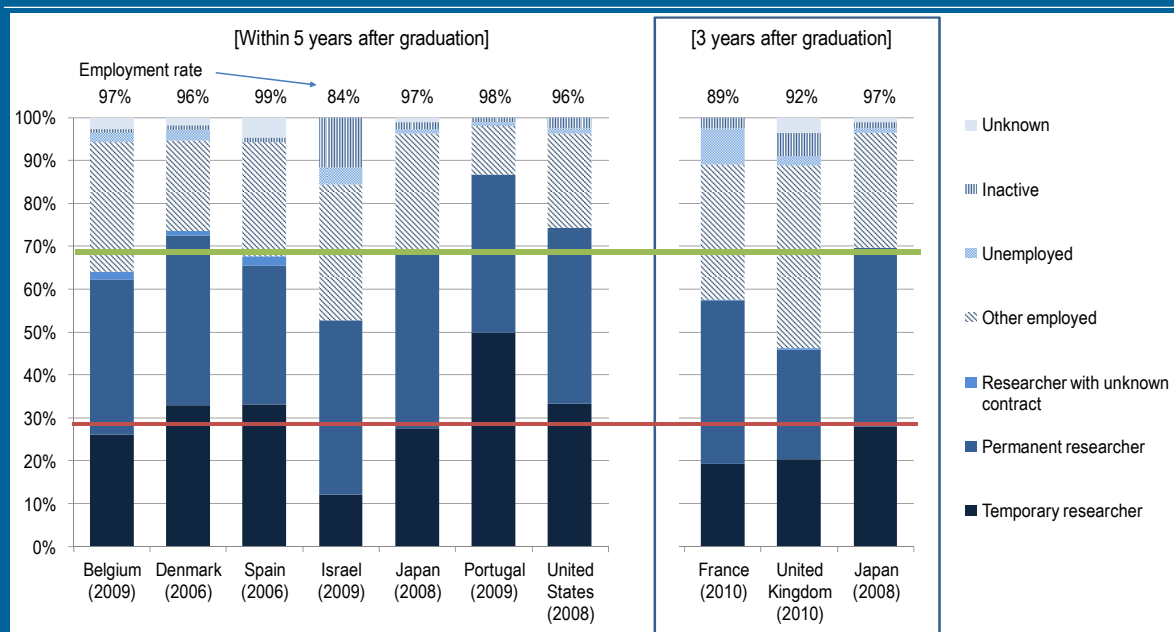
Percentage of DH dissatisfied with their employment situation, by reason of dissatisfaction, 2009
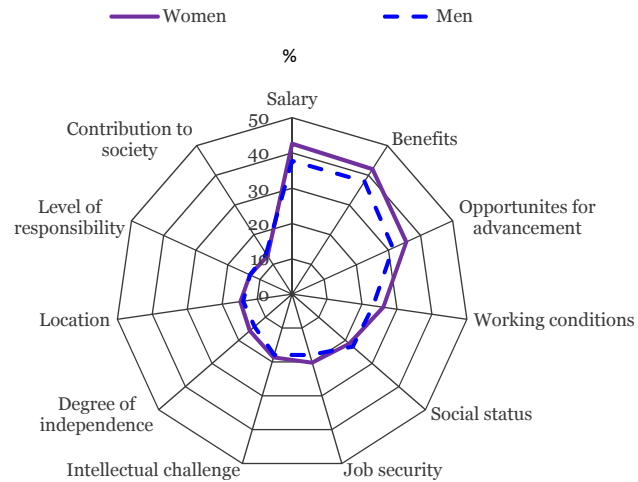
Source: OECD, OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010.
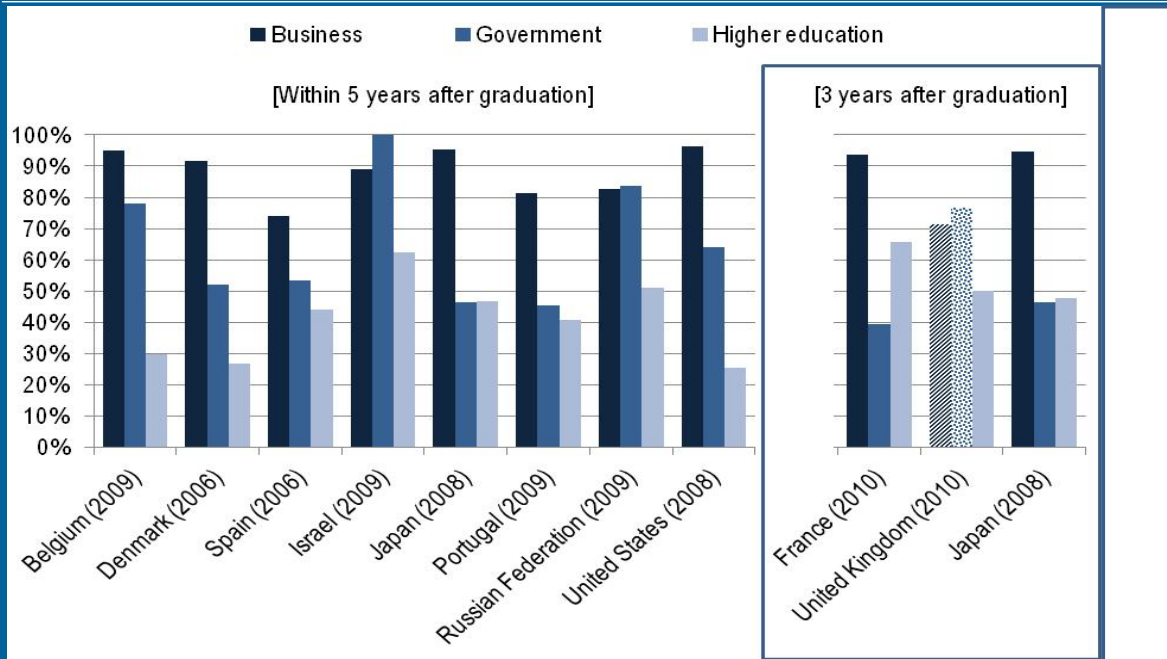
Employment status of recent doctoral graduates

Notes:
• Only doctorate holders who obtained an advanced degree from the reporting country are considered for better comparability.
* "Other employed" includes those with unknown research status.
•For France, only those graduates aged 35 years old or less were surveyed.
• For Japan, some higher education teaching personnel such as part-time lectures are also classified as researchers.
• Non-EU domiciled students are outside the scope of the survey for the United Kingdom. The research status was derived using a combination of information on employment sector and occupation and is not exactly the same as the Frascati definition.

The incidence of permanent contracts among recent doctoral graduates engaged in research

[Within 5 years after graduation] — Belgium (2009), Denmark (2006), Spain (2006), Israel (2009), Japan (2008), Portugal (2009), Russian Federation (2009), United States (2008)

[3 years after graduation] — France (2010), United Kingdom (2010), Japan (2008)
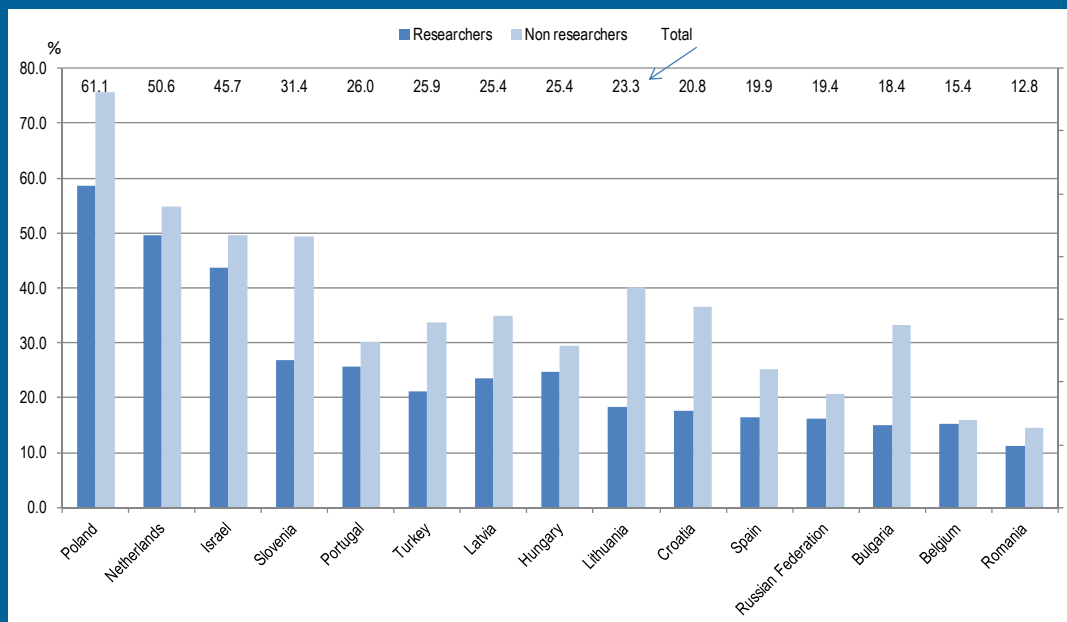
Legend: Business, Government, Higher education

Notes:
• Only doctorate holders who obtained an advanced degree from the reporting country are considered for better comparability.
• * "Other employed" includes those with unknown research status.
• For France, only those graduates aged 35 years old or less were surveyed.
• For Japan, some higher education teaching personnel such as part-time lectures are also classified as researchers.
• Non-EU domiciled students are outside the scope of the survey for the United Kingdom. "Business" combines 'Finance business and IT', 'Manufacturing", 'R&D' and 'Other sectors'. "Government" corresponds to 'Health and social work' and 'public administration and defense'.

Doctorate holders who work as researchers are found to have been less mobile than their counterparts who do other types of jobs

The job mobility of doctorate holders
Percentage of doctorate holders who changed jobs in the last 10 years, 2009

Legend: Researchers, Non researchers, Total

Values across top: 61.1, 50.6, 45.7, 31.4, 26.0, 25.9, 25.4, 25.4, 23.3, 20.8, 19.9, 19.4, 18.4, 15.4, 12.8

Countries: Poland, Netherlands, Israel, Slovenia, Portugal, Turkey, Latvia, Hungary, Lithuania, Croatia, Spain, Russian Federation, Bulgaria, Belgium, Romania

Notes: Data for Belgium, Germany, Hungary, the Netherlands and Spain refer to graduation years 1990 onwards. For the Russian Federation, data relate only to those doctoral graduates employed as researchers and teachers. For Spain, there is limited coverage of individuals who graduated between 2007 and 2009. Data for Turkey exclude foreign citizens.
Source: OECD, based on OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010.
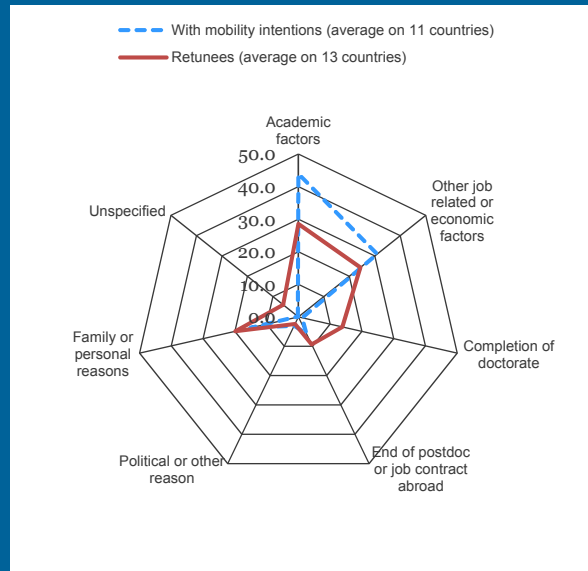
20

International mobility of doctorate holders

Percentage of national citizens with a doctorate having lived/stayed abroad in the past ten years, 2009
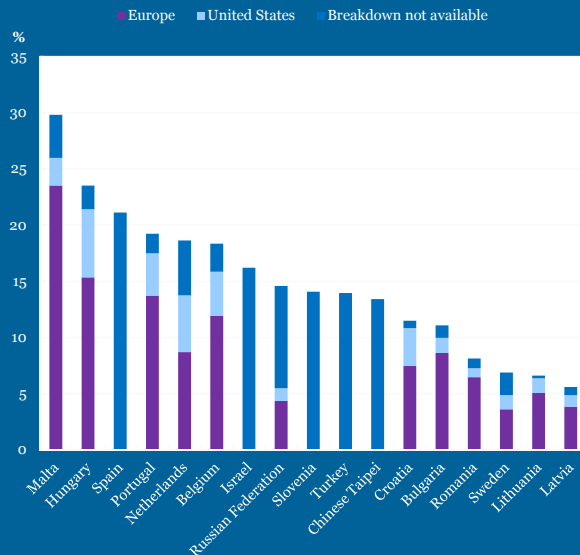
Reasons for going abroad or for returning to the home country, 2009

Source: OECD, OECD/UNESCO Institute for Statistics/Eurostat data collection on careers of doctorate holders 2010.

Conclusions and prospects

- This analysis showcase the potential of CDH data to inform policy questions, notably through the use of micro-data based econometric methods.

- This makes a strong case for improving researchers' access to data on doctorate holders with a view to promoting the coordinated use of micro-data across countries and conduct more in-depth analyses.

- Early destination surveys constitute important complementary data sources to look at the early stage of the career and developments should aim at harmonizing the questions and variables collected with those of CDH.

- The CDH initiative is continuously evolving and the revised methodological guidelines and model questionnaire include proposals for capturing new information such as competencies and skills.

Thank you!

Laudeline.auriol@oecd.org

www.oecd.org/sti/cdh

Career Tracking: why, for whom and how?

– the European Platform for Career Tracking and Monitoring

Laura Marin

Senior Science Officer, European Science Foundation

International Symposium on Tracking Careers of Doctoral Graduates, Tokyo, 27 February 2013

Presentation outline

- About ESF

- ESF Member Organisation Forum on Research Career Development

- European efforts on Research Career Tracking
  - Initiatives
  - Rationale of Research Career Tracking in Europe

- Development of a European Platform for Career Tracking and monitoring

- Next steps

2

About European Science Foundation

ESF is an independent association of 67 Member Organisations

- research funding organisations
- research performing organisations
- academies and learned societies

in 29 countries

To:

- advance European research
- explore new directions for research at the European level

ESF Member Organisation Fora & the ERA Road Map Actions

EUROHORCs
EUROPEAN HEADS OF RESEARCH COUNCILS

Science Policy and Strategy

> *Published in 2009*
> *10 Actions:*

1. Strengthen the **relations** between **science, society and the private sector**
2. Promote **European research careers**
3. Develop **scientific foresight** for **joint strategy**
4. Create a **European Grant Union**
5. Address **peer review** of proposals
6. Develop common approaches to **ex-post evaluation**
7. Create **ERA Connect** and **Regional Clusters of Excellence**
8. Develop shared funding and exploitation of **research infrastructure**
9. Implement common policy on **Open Access**
10. Connect **European research to the world**

EUROHORCs and ESF Vision on a Globally Competitive ERA and their Road Map for Actions

Contents

| 1 Foreword to The EUROHORCs and ESF Vision | 6 The Road Map for Actions to Help Construct the ERA | 20 Annex I EUROHORCs-ESF Task Force Members |

Foreword

The Heads of European Research Councils (EUROHORCs) and the European Science Foundation (ESF) wish to play an active and concrete role in shaping a European Research Area of Excellence. Following the publication of the EUROHORCs and ESF's comments on the European Commission's Green Paper 'The European Research Area: New Perspectives', they therefore decided to produce a Road Map to excellence in science in Europe.

The EUROHORCs Assembly and ESF Governing Council, in their April 2008 meetings, approved a Vision Statement on the goals to be reached in the next five to ten years to build a globally competitive European Research Area (ERA). This Vision Statement was complemented by an outline for a Road Map for the actions which could be taken by EUROHORCs and ESF Member Organisations, as well as partners, to help build such an ERA ideal.

These outline actions have now been further elaborated, identifying the main goals and their timelines. Some actions are already quite concrete and committing, others require more preparation and study. This reflects that this is a document describing a process, rather than a final statement.

It is important to stress that the Road Map is an action plan where EUROHORCs and ESF Member Organisations have a primary role. It does not intend to give a full policy agenda for all actors in the ERA.

It is a pleasure to recommend the Vision Statement and the Road Map for your consideration and support for our joint efforts. Member Organisations of EUROHORCs and ESF will take the lead in the implementation of action lines of the Road Map.

This project benefited from the continuous support from among many others – Professor Matthias Kleiner, President of the Deutsche Forschungsgemeinschaft (DFG) and Chair of the EUROHORCs–ESF Task Force, Professor Pär Omling, Director General of the Vetenskapsrådet and former President of EUROHORCs, and Dr. John Marks, former ESF Director of Science and Strategy and Deputy Chief Executive, who skilfully edited the final version of this document.

Professor Ian Halliday
President of ESF

Professor Dieter Imboden
President of EUROHORCs

www.eurohorcs.org
www.esf.org

ESF Member Organisation Fora: committees to address the Roadmap actions

- Output-oriented strategy platforms for Member Organisations to develop joint actions on specific issues, involving others as appropriate

- To contribute to strategy development and/or lead to the development of
  o Good practice
  o Common procedures
  o Joint activities

- Recent results:
  o European Code of Conduct for Research Integrity
  o European Peer Review Guide
  o Developing Research Careers in and Beyond Europe

▶ *www.esf.org/mo-fora*

MO Forum *European Alliance on Research Career Development (2009-2013)*

Aim

Adopt a common strategy to ensure the attractiveness of research careers in Europe

Focus

- o New concepts of mobility
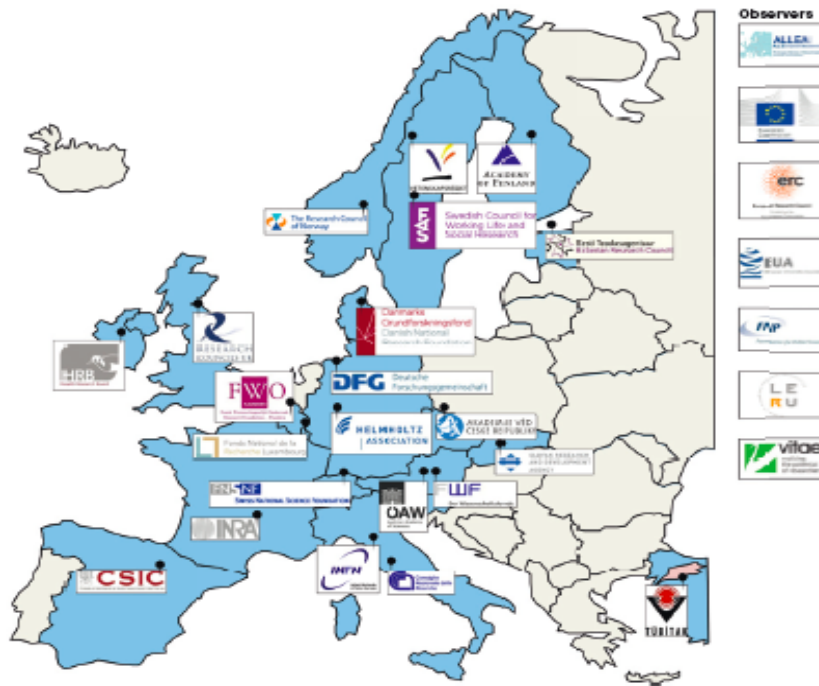- o Skills development
- o Career tracking

Participation

21 member organisations (European national Research Councils) from 19 countries, 7 Observers: European Commission, ERC, EUA, LERU, Foundation for Polish Science, ALLEA, Vitae

www.esf.org/EARCD

MO FORUM – Members & Observers

MO Forum *European Alliance on Research Career Development – December 2013*

Focus areas & key recommendations

- Enabling: creating a European Researcher Development Framework

- Observing: setting up an International Platform for Researcher Career Tracking & Monitoring

- Guiding: establishing guidelines to acknowledge new concepts of researcher mobility (international, intersectoral, interdisciplinary, virtual)

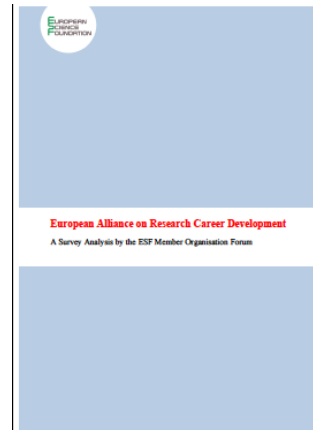- Going Global: working towards a Global Forum for Research Career Development

www.esf.org/EARCD

European efforts (1)
The Forum's Survey – 2011

The questionnaire

- Addressing major fields of activities
  - Taxonomy, career tracking, continuous professional skills development, mobility, peer review & portfolio careers

The participants

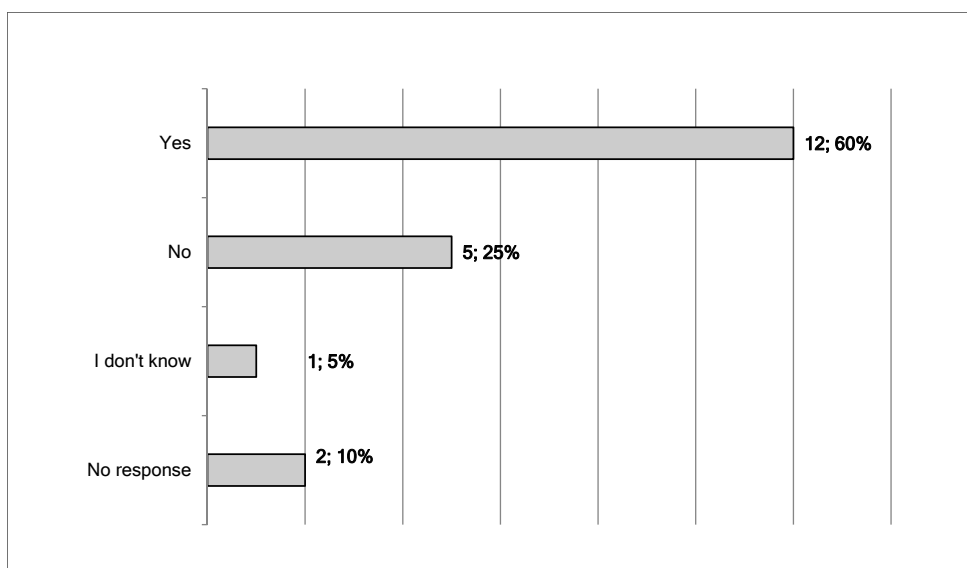- 20 organisations from 17 countries across Europe

Report January 2012

http://www.esf.org/fileadmin/links/cssd/mo_fora/careers/MOF_RC_surveyreport_final.pdf

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Career tracking

Earlier experience in career tracking of researchers

| Category	Value
Yes	12; 60%
No	5; 25%
I don't know	1; 5%
No response	2; 10%

But: Do all have a common understanding of career tracking?

Distinctive features of career surveys

- **Researchers' career stages**
  - E.g. doctorate holders, senior researchers
- **Level of analysis**
  - National or organisational level
- **Types of studies**
  - E.g. programme evaluation, monitoring
- **Methodology**
  - E.g. survey, database analysis

→ No common understanding of career tracking
→ Some refer rather to monitoring

Awareness of good practice in career tracking of researchers

Yes — 6; 30%
No — 12; 60%
No response — 2; 10%
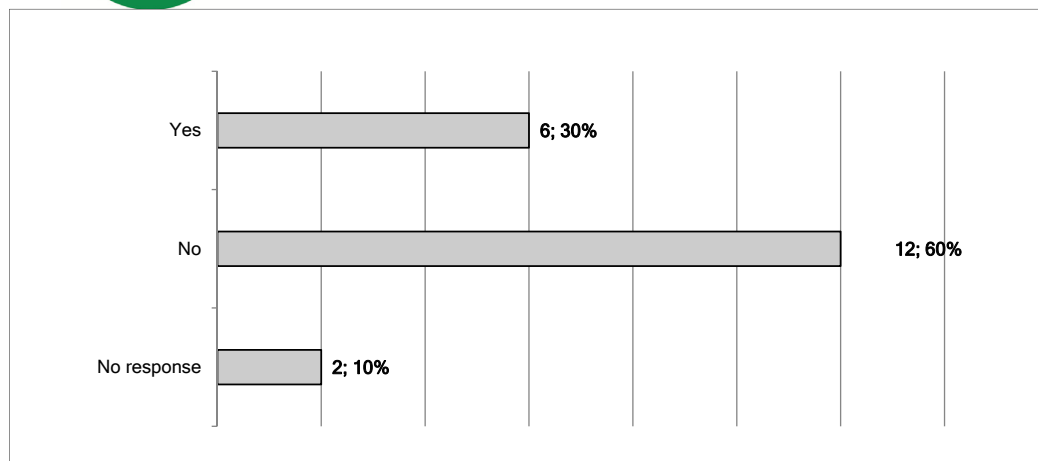
Examples

- Centre on R&D monitoring, branch at Ghent University
- Panel survey by Institut für Forschungsinfomation & Qualitätssicherung
- OECD CDH, VITAE, EUA

Career tracking: plans & motivation for setting up own systems

N = 20

Motivation

- Career tracking as tool to measure impact & success
    - Funding or qualification schemes (RPOs)

Forum's Survey conclusions

Researchers' career stages
- Mostly doctorate holders

Level of analysis
- National or organisational level

Types of studies
- E.g. programme evaluation, monitoring

Methodology
- E.g. survey, database analysis

➔ No common understanding of career tracking
    ➔ Some refer rather to monitoring
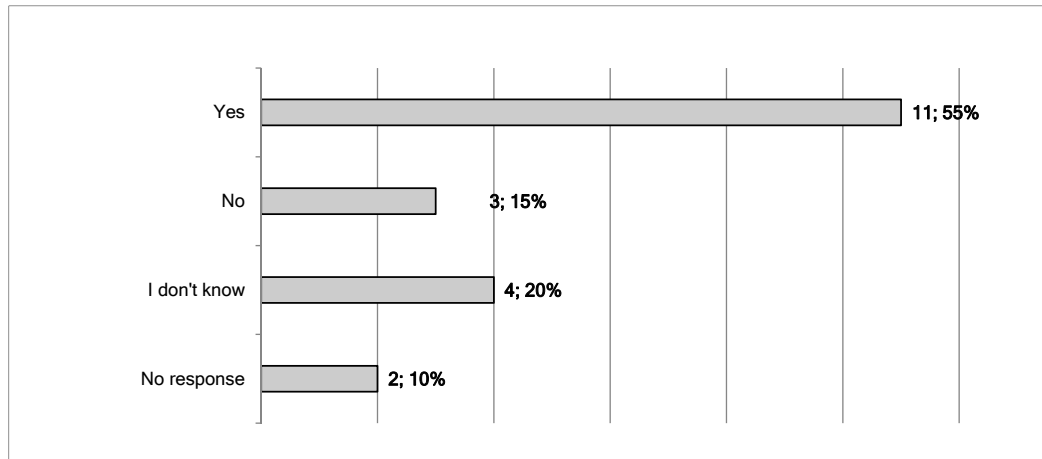➔ Common denominator missing

![European Science Foundation logo]

European efforts (2)

International Workshop:

"How to Track Researchers' Careers", Luxembourg, 9-10 Feb.12

http://www.researcherscareers.eu

Over 100 participants from Europe, Asia, Africa, US

• a mix of theory and practice through presenting career tracking initiatives, their methodologies and major findings,

• a forum of learning how to set up a tracking of doctorate holders / researchers in a funding agency, university, region or country.

![European Science Foundation logo]
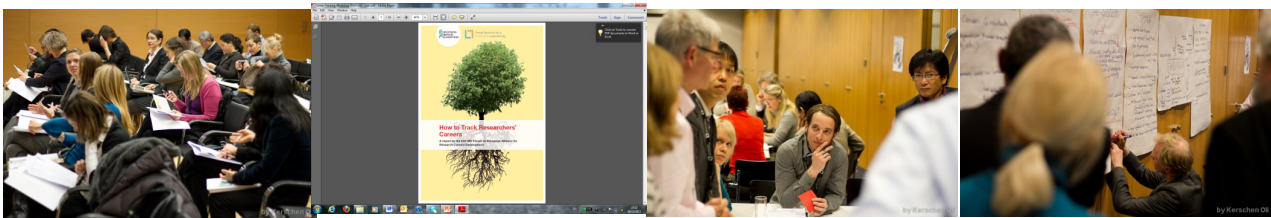
Workshop discussion:
Typologies of Career Tracking at different institutional level

International undertakings: OECD CDH

Large-scale national initiatives

UK 'Where do researchers go'; German 'ProFile'

Register/Administrative Data: examples from Flanders, Denmark, Norway

Institutional Initiatives

Wellcome Trust (UK); CIFRE Fellowships (FR); FWO Senior Researchers Survey (BE); Alexander Von Humboldt Alumni Survey (DE); European University Association (International/IT)

University pan –European initiative

EUA TRACKIT 2010-2012

www.eua.be/trackit

Workshop
Practical Recommendations

- Researchers' & PhD holders Tracking Studies should complement national Statistics or Data Registers
- Avoidance of Duplication of Data Collection
- Complementarity of Tracking Studies, Programme Evaluations & Indicator based follow-up
- Career Tracking helps identifying Systemic Weaknesses
- Choice of Purpose(s) & Scope of a Tracking Study essential before Start
- Terminological and Methodological Concerns, integrating New Approaches (CV depositories; Social Media, etc)

➢ **International Platform promoting researchers' career tracking, career surveys and career monitoring**
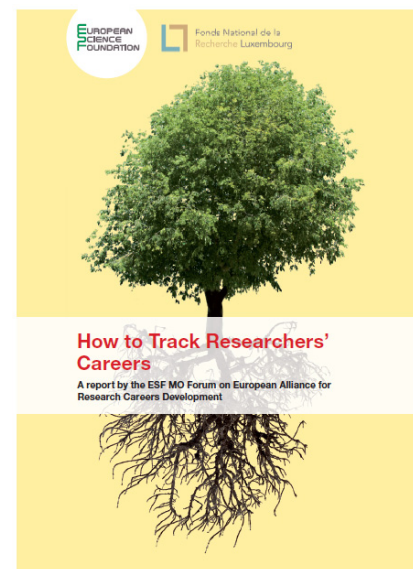
Report main conclusions and recommendations:
Rationale of Research Career Tracking

Why, for Whom and How is a specific Career Tracking Study set up?

Workshop Report: How to Track Researchers' Careers

www.esf.org/EARCD

How to Track Researchers' Careers
A report by the ESF MO Forum on European Alliance for Research Careers Development

Report main conclusions and recommendations:
Rationale of Research Career Tracking (1)

Why and For Whom? Stakeholders benefits

<u>Research funders / policymakers:</u>

•Impact: What is the true value of a PhD? (compared e.g. to a masters)

•Accountability

   o Inform about policy and practice

   o Inform about outcome of career funding schemes and impact of doctoral programmes in view of their mission and objectives

   o Identify the effect of (non) funding

   o Justify public investment in doctoral training

   o Awareness raising/communication about benefits of research careers

•Enhance effectiveness and efficiency

•Structural approach to research careers and the labour market for researchers: capacity building according to supply/demand

•Understand and enable different forms of mobility

•Policy planning

Report main conclusions and recommendations:
Rationale of Research Career Tracking (2)

Why and For Whom? Stakeholders benefits

<u>Research performing organisations / universities:</u>

   • Creating transparency and know-how about institutional workforce, jobs and career paths

   • Career development

   • Institutional competitiveness/profiling the institution

   • Inter-institutional/inter-sector collaborations and networks

<u>Individual researchers</u>

   • Provide career orientation and information on career destinations, programmes etc.

   • Job satisfaction

   • Demonstrate attractiveness of research career/perception of quality of career

   • Understand the motivation to engage in doctoral training

   • Realising the broad variety of successful careers – not just in academia.

Developing Guidelines:
Setting up a
Career Tracking Study

HOW?

Definition of the Scope, Implementation Strategy and Methodology

Phases of the Implementation Process of a career tracking study

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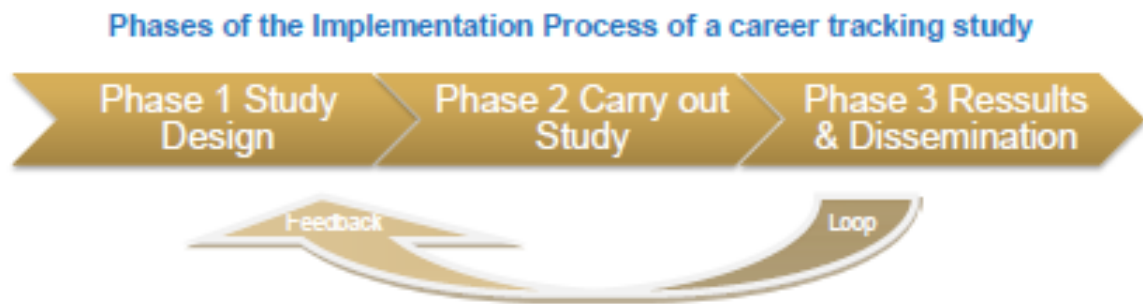
Workshop
Recommendations

Way forward

➢**International Platform promoting researchers' career tracking, career surveys and career monitoring**

"Imagine a Europe in which we know the career trajectories of the many you PhD and Postdocs that we fund. Imagine being able to correct the imbalance between opportunities for young researchers in private sector and the relative paucity of positions in academic settings"

European efforts (3)
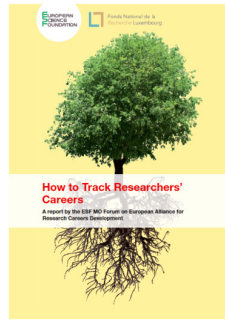# Ways forward/1

Joint initiative to promote career tracking across Europe

- Achieve a coherent approach across Europe (& beyond): Establishing a **Dialogue**

- Set up an open **platform**
    - Involvement of different stakeholders: why? for whom? how?
    - New approaches to tracking
    - Monitoring of research careers
    - Use of novel technologies & social media

- Vision: develop a Career Observatory
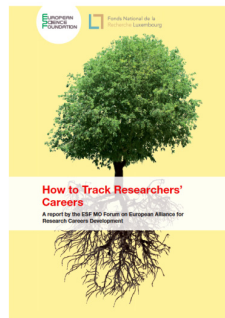
Ways forward/2

Joint initiative to promote career tracking across Europe

- **Purposes**
    - Tracking the quality of research training and skills
    - Tracking to find out where researchers move in their careers
    - Tracking for accountability & impact assessment
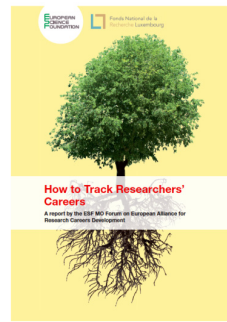
Ways forward/3

Joint initiative to promote career tracking across Europe

- Modular approach: **elements**
  - Repository of data & good practice models
  - Provide **orientation** on how to conduct a career tracking study: Manual on how to conduct career tracking surveys efficiently
  - Tool box/ Manual
  - **Pilot study** based on a mixed methods approach, using questionnaire modules and defining a minimal 'core' questionnaire
  - **Build a data-portal** as a decentralised information source, giving access to national/supranational data sources

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Next steps:

- Needs analysis: February 2013
- European Expert Workshop: London, 22 March, 2013
- International Workshop: Oslo, May 2013
  ### "Developing Research Careers In and Beyond Europe"
  www.esf.org/oslo-workshop
- Start of the pilot projects
- Develop common methodology / manual: autumn 2013

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More info:

www.esf.org/EARCD

Acknowledgements: in collaboration with Ulrike Kohl and Beate Scholz

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Managing research under constraints

Luis Sanz-Menéndez,

Institute of Public Goods and Policies (IPP), Director
Consejo Superior de Investigaciones Científicas -CSIC-, Spain
OECD CSTP Chair

International Symposium of Tracking Careers of Doctoral Graduates, Tokyo,
National Institute of Science and Technology Policy (NISTEP)
27 February 2013

www.ipp.csic.es

Outline of the presentation

1. Relevance of tracking doctorate holders careers
2. Many audiences and stakeholders, various solutions
3. Country differences and diverse strategic organizational actorhood
4. Organizational dilemmas
5. Some issues linking careers and research management of HHRR
6. Managing resource under constraints.

1. Relevance of tracking doctorate holders careers

- In the context of the knowledge economy one dimension is R&D investments,

  but also investment in education (higher education).

- The increase of the research labor force is a relevant factor,

  but also the increase of the supply of highly-qualified people.

Evolution of World GERD in real terms (PPS€ at 2000 prices and exchange rates), 1995-2008

Evolution of World GERD in real terms (PPS€ at 2000 prices and exchange rates), 1995-2008
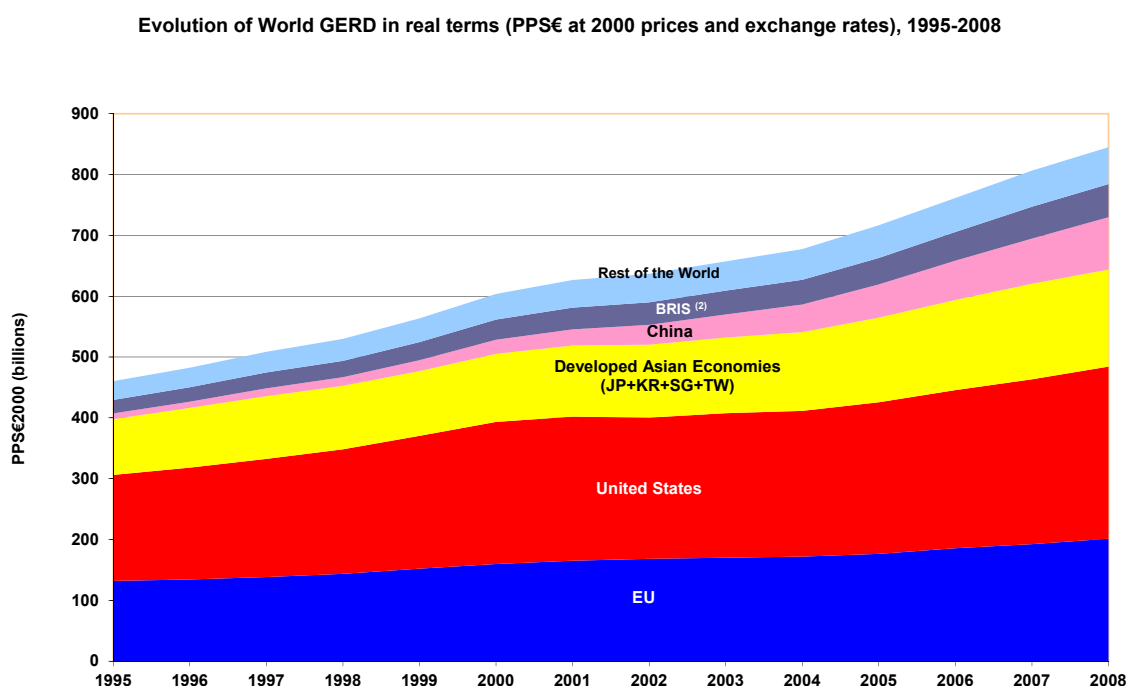
Annual growth rates GERD
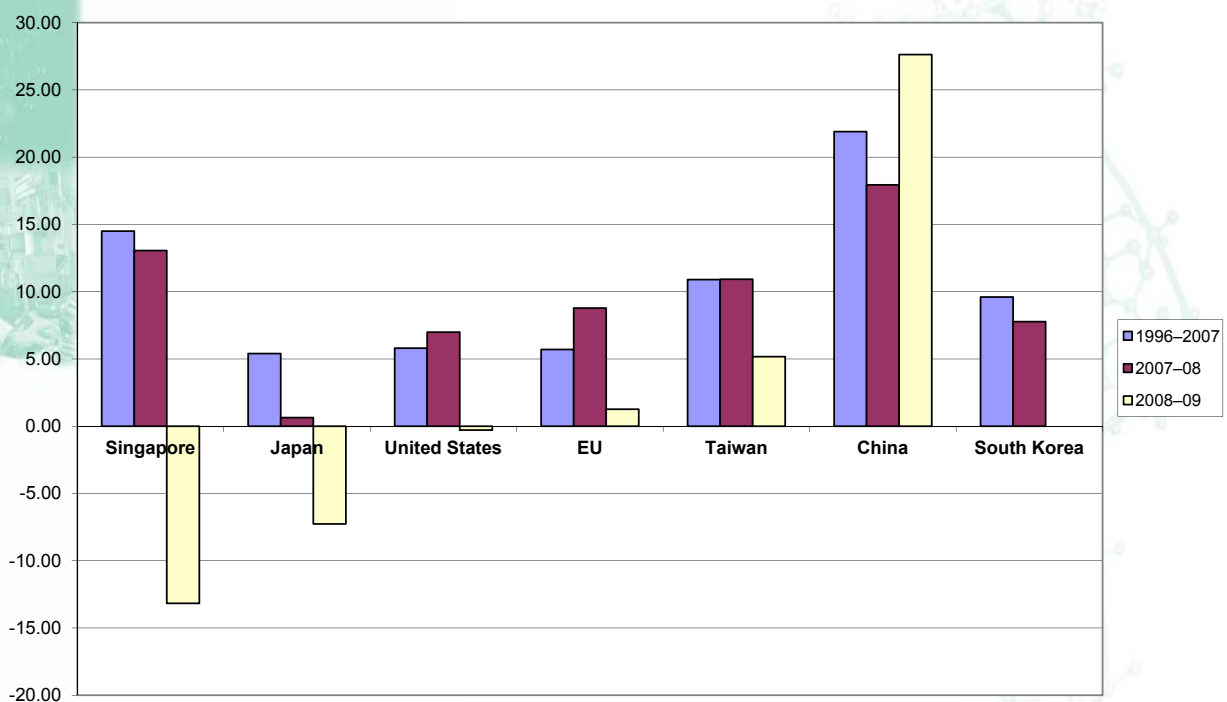
Researchers (FTE) broken down by public and private sector, 2000 and 2008 CN, EU, US,JP, KR

Researchers (FTE) broken down by public and private sector, 2000 and 2008 [1]
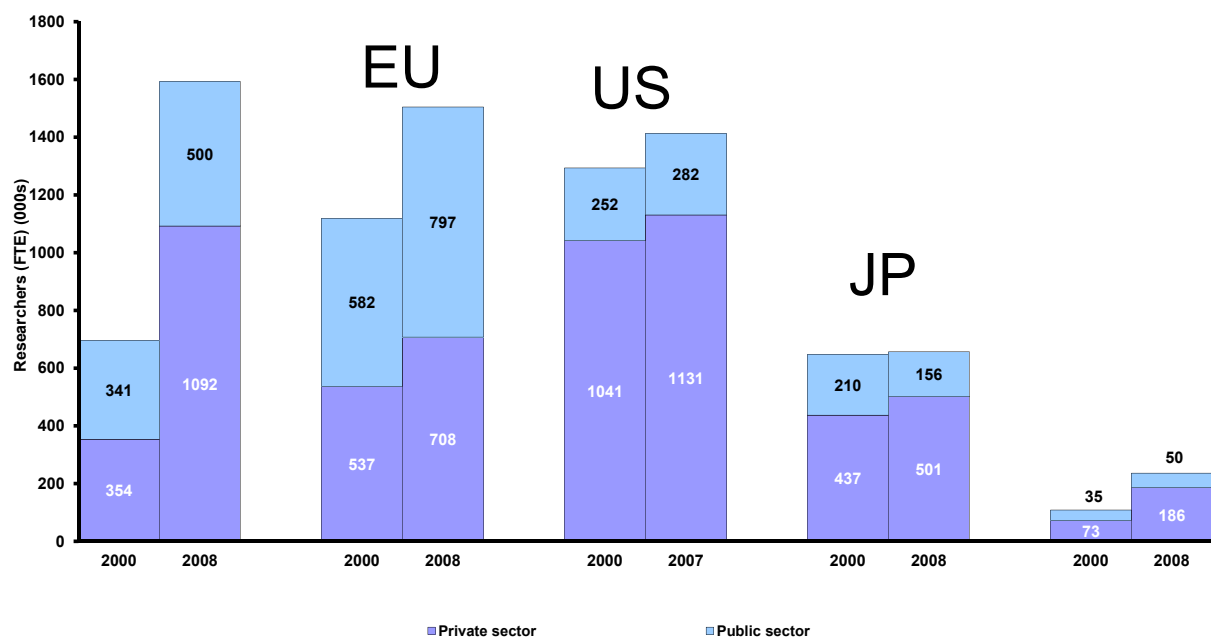
Total Researchers (FTE) - average annual growth (%), 2000-2008

Total Researchers (FTE) - average annual growth (%), 2000-2008 [2]
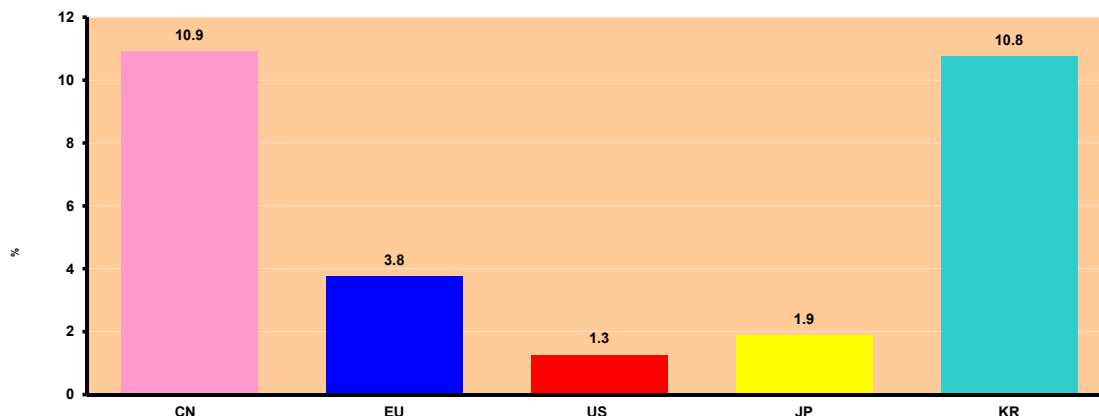
Participation in global R&D - % shares Researchers, GERD, Top Pub, Patents

Participation in global R&D - % shares

Legend: EU | United States | Developed Asian Economies (JP+KR+SG+TW) | China | BRIS (BR+RU+IN+ZA) | Rest of the World (5)
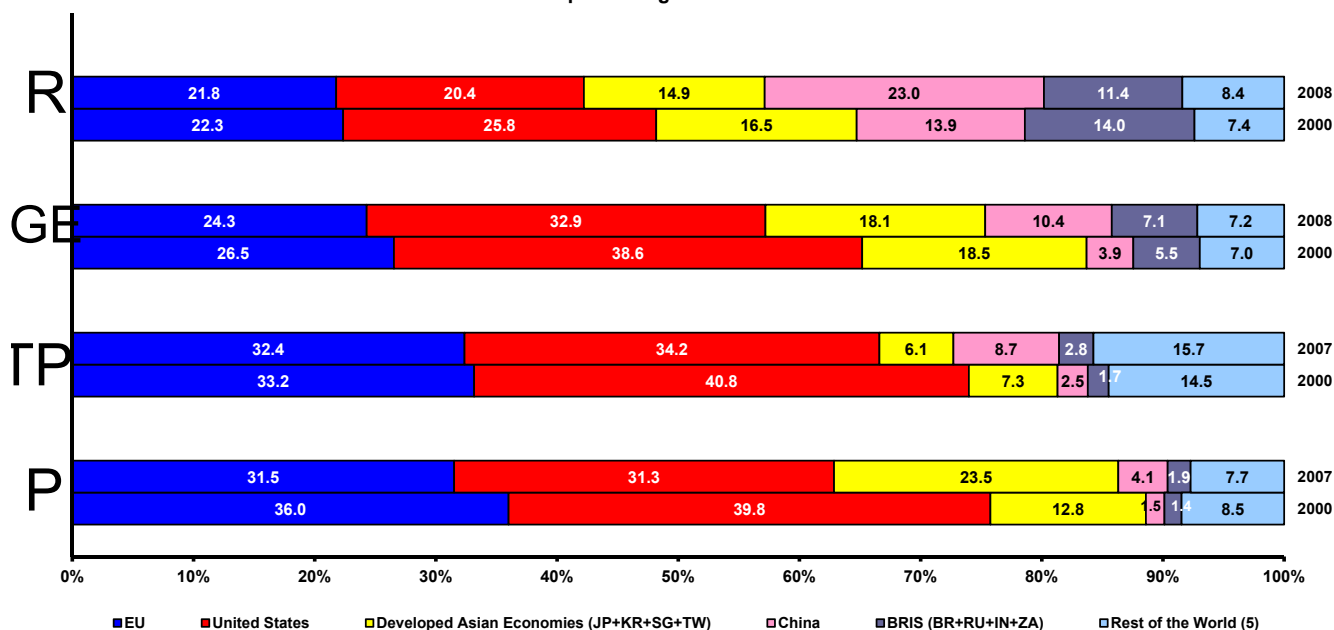
Investment in R&D and education as % of GDP, 2000 and 2007, US, Kr, Jp, EU

Investment in R&D and education as % of GDP, 2000 and 2007

Legend:
- ☐ Public and private expenditure on education - all other sectors (1)
- ☐ Public and private expenditure on education - tertiary sector (1)
- ■ Public and private expenditure on R&D (GERD) not including higher education expenditure on R&D (HERD)
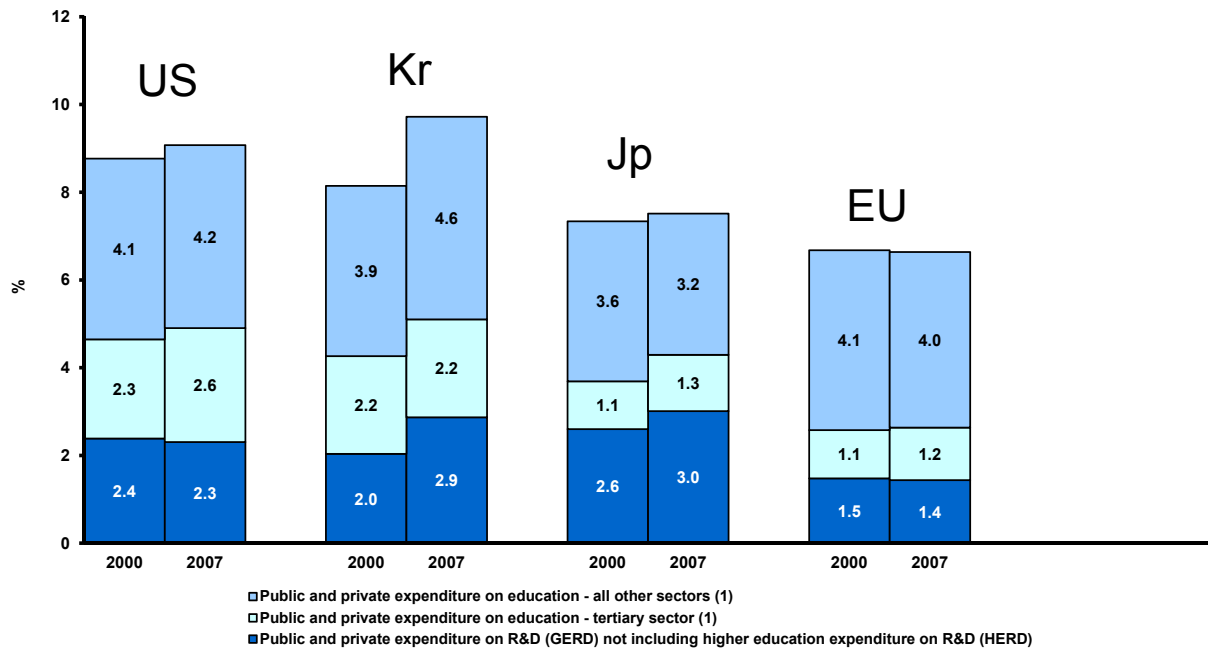
Share of population aged 25-34 having completed tertiary education, 2000 and 2009

Share of population aged 25-34 having completed tertiary education, 2000 and 2009 (1)

Legend: ☐ 2000   ☐ 2009 (1)
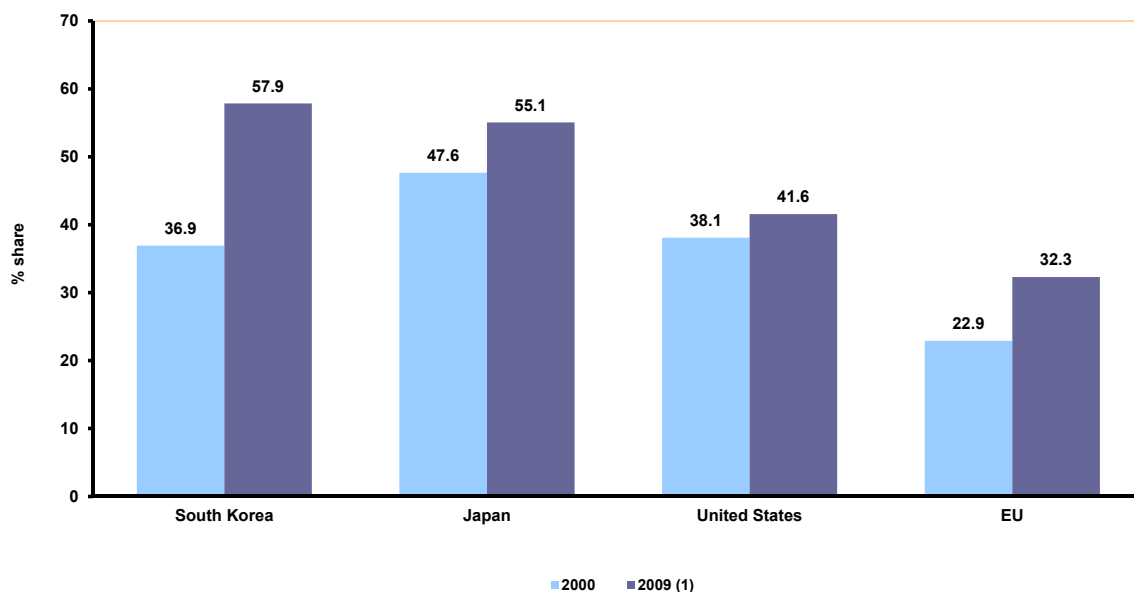
First university degrees in natural sciences and engineering, by selected region/country: 2008

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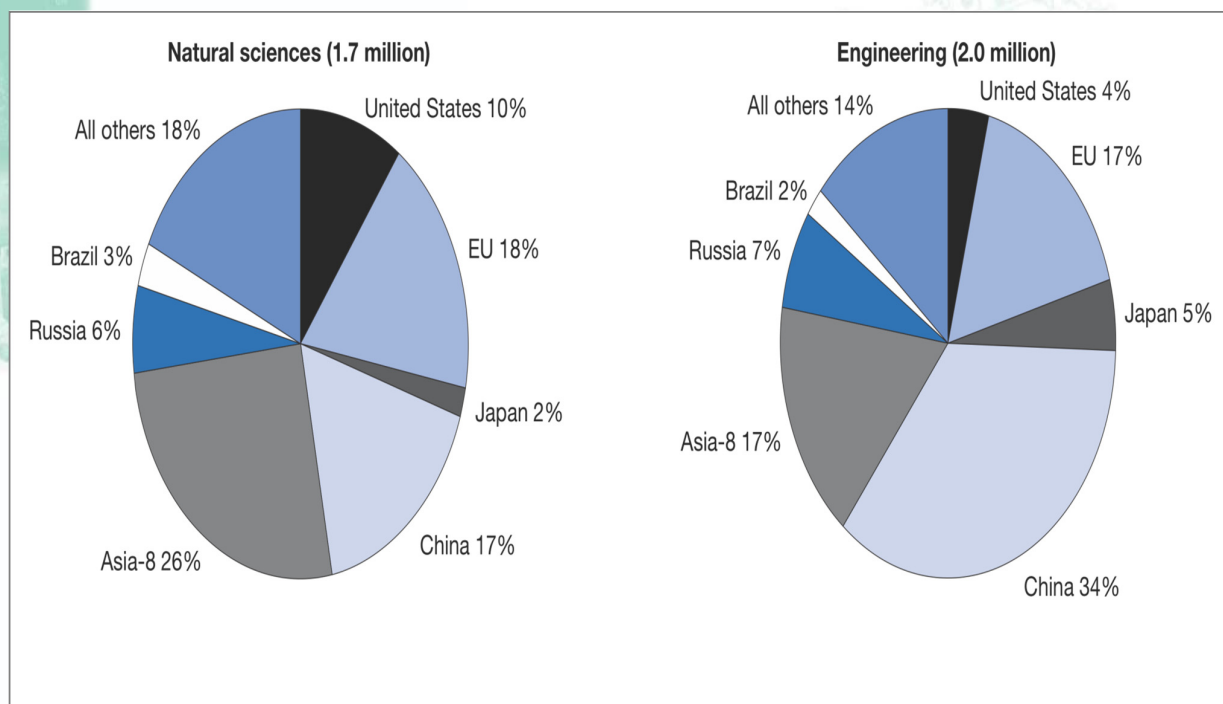
1. Some historical facts on Doctorate

- In 1940, US was producing 186K graduates, 26K Masters and 3.200 PhDs.

- In the 50s, with the growth of fellowships, graduate education exploded.

- More than 50 years ago the US NSF started the collection of data on Doctorates Survey of Earned Doctorates (1957-58) and latter on tracking their careers (Survey of Doctorate recipients (1973)

- But we still have very little comparable data on the Doctorate holders supply and demand in the world economy

1. Some emerging policy issues

- Claims of shortage and overproduction,
- Basic knowledge is a public good, society should make a decision of the appropriate level of public investments, considering social return.
- Length of time in training and skills acquired
- Earning and returns to investments in education
- Matching areas,
- Transferability of skills,
- International and job to job mobility,
- Etc….

2. Different audiences and stakeholders

- In this context, doctorate holders and researchers' career tracking and monitoring have become important in order to inform decisions by different stakeholders and the public.
  - **Individuals** making decisions about entry in the labor market versus enrolling in a PhD program,..
  - **Governments and systemic stakeholders** concerned about supply and demand, the skills the economy need or the appropriate level of government support,..
  - **Institutions and organizations** managing their HHRR and competing for talent, ...

2. ….and various solutions

- And to provide support for the management of the research activities. E.g. the Spanish, Brazilian, and other countries initiatives for "Normalized Curriculum Vitae" (CVN):
  - CVN: Standardize CV to exchange research information of individual among research information systems (web based formats)

3. Global competition, nationally shaped

- PRI & Universities worldwide **compete for reputation** in local and global markets
  - The <u>attraction of talent</u> has become a key dimension in this competition
- Trends for performance-based funding models incentivise the selection of the best possible academics
- However, diverse <u>governance structures</u> of universities, and resources, <u>influence the choice</u> of ways in which this can be achieved.
- <u>Structural and Organizational features</u> are essential to understand the diverse effects that the same variables might have.

3. Universities as organisations

- Universities and PRI can be characterized as "**professional bureaucracies**" (also "organized anarchies" and "political coalitions"), **as decentralized forms of organization which give a high degree of autonomy to individual professionals**, who concentrate power and status (Management has to relay.

- But, heterogeneity among countries is the rule regarding universities' autonomy, funding allocation, discretion in the use of resources, employment relationships, etc. having very **different capabilities as strategic actors.**

- In some countries where universities are public and **compete very little among themselves**.

- Public policy (regulations and funding) is expected to be a key driver of changes and **more competitive funding is a general trend**, but the management of HHRR and the authority structures move slowly.

3. Science systems diversity

- Public Science Systems can be described along two dimensions (Whitley 2008):
  - According to the **centralization of provision of resources** and **control over scientific employment**, we can distinguish among state delegated and pluralist systems.
  - According to the **level of diversity of funding and competition among actors**, we can distinguish between stable (low competition) and competitive systems

- Different models will show **diverse levels relative authority** of: the state, the funding agencies, the PRO centers, the reputational elites, and the private interests, **then providing very diverse opportunities to the Organizations to act strategically**.

4. Organizational dilemmas

- Universities and research organizations even if there share with other bureaucracies some attributes they have specificities. **The organization of the academic enterprise shapes the academic work**.

- Organizations confront DILEMMAS (Blau 1973)

- The outcome of the dilemmas (in which the interest of various groups conflict) tend to be determined by the distribution of resources and power in the stratification systems.

- **The simple dilemma occurs when the accomplishment of two or more ends depends on the same scare means, since the more of one end is attained the more of the other must be sacrificed.**

4. Recruitment dilemmas

- Faculty recruitments illustrate the dilemmas. To recruits good students an academic institution must have good faculty… to recruit good faculties.. good salaries.. large better but …. less attractive

- To recruit and keep good faculty, authority over that appointments should be decentralise (competence to judge candidates), but biases in selection decisions

- Universalistic values, shared by the community. The merit criterion is shared and unites the academic community. But the question is if select the best qualified or those belonging to the in-group: Loyalty to the institution.

- Faculty member with superior qualifications (more involved in research are less committed with their local institutions), but their presence strength their local commitment to the rest.

- **For the institution (in a world with restrictions) is better to hire people with less local links (but superior qualifications) because it contribute to academic standing (but bad for local commitments).**

- But some organizations respond to the dilemma between **mobility and loyalty** by developing a strategy based on rewarding commitment (inbreeding)

4. Some organizational dilemmas

- Understanding the organizational features is essential, for understanding the different solution to the dilemmas.
- Universities operate in the context of institutionally embedded organizational dilemmas
- We know little about:
  - whether, in practice, access to a permanent academic position is governed by merit and universalism or by more parochial and particularistic factors;
  - We also lack a proper understanding of how institutional incentives and mechanisms for assigning recognition shape access to a permanent job and the consequences of the organizational strategies in academic careers
  - And how universities cope with the dilemmas between **retention and turnover**, **loyalty and mobility**, **universalism and particularism**, etc..

  Tracking careers of doctorate holders could help us to understand the issues above.

5. Institutional foundations of heterogeneity (I)

5 Variables for understanding the different <u>models of markets and careers</u> in institutional context:

- <u>Control on the number of staff, vacancies</u>, evolution and autonomous decision power for recruiting and hiring over time.

- The balance between central control and delegation on the subunits and if the <u>decisions over recruitment and promotion</u> are executive or collegial

The way in which those variables are defined create incentives to increase the value of loyalty confronting uncertainty.

5. Institutional foundations of heterogeneity (II)

- Institutional and organizational autonomy for <u>individual negotiating of working conditions and salaries</u> enhance or inhibit the development of one or other type of market.

- The <u>way in which institutions are funded</u>, the contribution of researchers to overheads and the evaluations systems influences the authority structures and facilitate or difficult the development of incentives

- The availability of <u>information accepted on the reputation, prestige, quality and outputs of</u> institutions and the reputational value different actors allocate to this information is also key variable.

5. General Features of models of academic careers based in **internal labor markets**

- Limited relevance of educational and training external credentials
- Early entry in low level of the organizational structure
- Relevance of the training in the job
- Aims of the probationary periods: learning competencies more than demonstrated competencies
- Low salary dispersion, among scales and over the career
- Relevance on the part of the salary associated to seniority (years in the job)
- Implicit contracts that links recruitment, access to a permanent job and loyalty to the group and organization
- Possible contradiction between the intrinsic transferability of researcher competencies and this type of market

5. General features of the models based on the "academic jobs markets"

- High levels of mobility in all stages of the career; mobility as precondition of the hiring and promotion
- Results as precondition for recruitment (but in junior recruitment could be relevant external educational credentials as sign of potential)
    - The distribution of prestige among departments and institutions of origin (granting the PhD) could be the key variable to explain recruitment and career advancement
- Final results of the process of selection is conditions by the markets. Departments compete among them to fill out vacancies, applicants decide where to apply, departments make offers and candidate decide among them.
- There are some "*tenure track positions*", whit a probationary period in which the key is not training but fulfilling objectives (publication, funding, etc.)
- There are individual negotiation or working conditions and higher salary dispersion
- Strong competition among institutions for the Human resources of higher quality, because the effect in reputation, getting funding resources and god students.

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5. Two Organizational strategies

5. Problems identified in careers that limit results in countries and institutions in international competition

- In countries with significant presence of internal labor markets it is important to assess the **tensions between role of merit, mobility and particularistic factors in recruitment, getting tenure and promotion.**
- Beyond the data on careers ,we should provide them with meaning because the institutional structures and organizational features of the R&D systems in countries determines the dilemmas
- Inbreeding and internal labor markets, associated to a limited or lack of mobility (especially international mobility)
- In the last decades Japan & Spain (mentioned in Science and Nature) regarding inbreeding and limited mobility.
- This "career" problems are associated to structural and systemic features.

5. Traditional model of career in southern E (I)

- Low levels of Mobility, national and international, pre and postdoctoral. Mobility is not rewarded.
- Dominant model in the career (Bachelor, master, PhD, tenure and promotion) in the same organization. Permanence is linked to early entry, but not necessarily more productivity.
- Entry moment in career is through a training position
- Lack of a well-defined career structure, without postdoctorate and tenure track" as clear stages in career.

6. Traditional model of career in southern E (II)

- Management of HHRR is a centralized function (creation, transformation, etc) with little delegation in subunits (evaluation and selection)

- The extreme institutional dependence of positions approved by external actors (depending on budgetary decision) could introduce perverse incentives regarding assessment of candidates (lack of standards)

- The entry and promotion determined by the investments decisions of government

- Limited capability strategic planning of HHRR by the institutions reinforce the inbreeding

CSIC

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6. Initiatives that contribute to break the internal labour markets models and have increased diversification

- Funding systems based on outputs (improve the recruitment strategies)

- New R&D policies and instruments of funding to support the opening of labor markets

- Creation of new Research centers not directly dependent on the Government and with management of human resources not linked to civil servant status, etc

- Emergence inside traditional institutions of new units (Institutes & groups) in which new types of employees linked to contracted research exist simultaneous with traditional positions (risk of Dualization).

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- Tracking doctorate career is a good mechanism for analysis and for providing better opportunities for the management of institutions in which human resources are central

Thanks a lot for your attention!

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CSIC

International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

Session 2:
Reforms of Graduate Schools and
Plan for a Database of Doctoral Graduates in Japan

Presentation 1
Current Reform Policies for Graduate Schools in Japan
Hiroshi Matsuzaka [MEXT (Japan): Director, Office for University Reform]

Presentation 2
Visions and a Plan for a Database of Doctoral Graduates in Japan
Keiji Saito [NISTEP (Japan): Research Fellow]

大学院教育の改革状況

文部科学省高等教育局大学振興課大学改革推進室

The Reform of Graduate Education in Japan

Office for University Reform, Higher Education Bureau,
Ministry of Education, Culture, Sports, Science and Technology (MEXT)

知識基盤社会における大学院の重要性

・グローバルな知識基盤社会の中，
大学院の果たす役割が拡大
・大学院の進学率は，終戦直後の
学部進学率の水準

・各国とも，人類社会の課題解決を
牽引する博士の養成を強化
・国籍を問わず優れた人材の獲得
競争が激化

【大学（学部・大学院）進学率の推移】

大学（学部）進学率

大学院進学率

7.9
0.2

51.0
7.0

% 60 50 40 30 20 10 0

昭和 30 35 40 45 50 55 60 平成 2 7 12 17 2223

注）大学（学部）進学率は、１８歳人口に占める入学者の割合
大学院進学率は、２２歳人口に占める修士・博士（前期）課程、一貫制博士
課程及び専門職学位課程入学者の割合

【主要国の博士号取得者数の推移】

アメリカ：61,716人
中国：43,759人
インド：18,730人
日本：16,735人
イギリス：16,610人
韓国：9,369人

70,000 60,000 50,000 40,000 30,000 20,000 10,000 0

1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

NSF science and engineering indicators 2012,2010,2008

The Importance of Graduate School in a Knowledge-Based Society

- Graduate schools play an expanded role in a global knowledge-based society
- The entry rate to graduate school is close to the entry rate to undergraduate studies in the immediate postwar period

- Many countries are strengthening the training of doctors who can solve the issues that human society faces
- The competition for highly skilled human resources—regardless of nationality—is intensifying

Trends in entry rate to university (undergraduate and graduate school)

Rate of entrants to university (undergraduate)

Rate of entrants to graduate school

7.9
0.2

51.0
7.0

% 60 50 40 30 20 10 0

Showa 30 35 40 45 50 55 60 Heisei 2 7 12 17 2223

Note: Rate of entrants to university (undergraduate) represents the percentage of the 18-year-old population that enrolls in university.
Rate of entrants to graduate school is the percentage of the 22-year-old population that enrolls in a master's program or first-term doctoral program, an integrated (5-year) doctoral program, or professional degree program.

Trends in doctoral degrees conferred annually in major countries

USA: 61,716
China: 43,759
India: 18,730
Japan: 16,735
UK: 16,610
South Korea: 9,369

70,000 60,000 50,000 40,000 30,000 20,000 10,000 0

1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

Based on NSF Science and Engineering Indicators 2012,2010,2008.
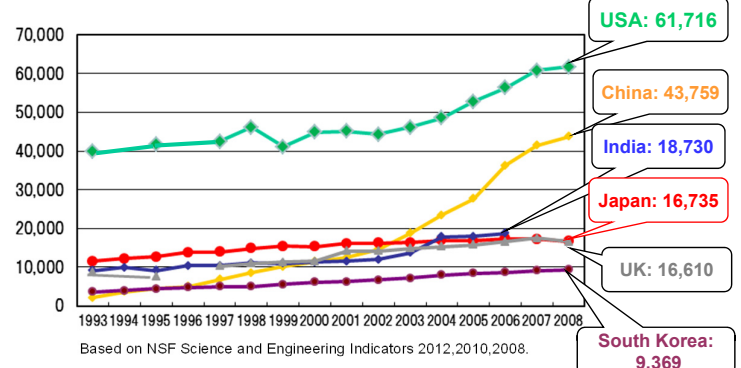
我が国の大学院の現状

大学院を持つ大学は約8割，その約6割の専攻が持つ博士課程の殆どは前期（修士）と後期（博士）の区分制

・平成3年以降大学院の量的整備を推進
・しかし，近年、優秀な人材が修士で就職等し，博士課程入学者が減少傾向

【大学院を置く大学の割合】

国立　86(45)
公立　72 (6)9
私立　456(78)　140

■大学院を置く大学
□大学院を置かない大学
カッコ内は専門職大学院を置く大学

【大学院学生数の推移】

H3　68,739　29,911
H12　142,830　62,481　約2.1倍
H20　165,422　74,231　23,033
H21　167,043　73,565　23,381
H22　173,831　74,432　23,191
H23　175,988　74,655　21,808　約2.8倍

修士課程
博士課程
専門職学位課程

【大学院の課程別専攻数】

区分	修士課程のみ	博士課程（5年一貫制）	博士課程（区分制）	博士課程（後期3年のみ）	博士課程（医歯獣医学）	専門職学位課程	全体
国立	693	25	643	195	131	64	1,751
公立	147	0	130	23	25	9	334
私立	893	13	1,106	153	147	107	2,419
計	1,733	38	1,879	371	303	180	4,504

【我が国の博士課程入学者数の推移】

2000　18,232人
2004　17,944人
2005　17,553人
2006　17,131人
2007　16,926人
2008　16,271人
2009　15,901人
2010　16,471人
2011　15,655人

Current Status of Graduate Schools in Japan

About 80% of all universities have graduate programs; of those, about 60% offer doctoral programs, most of which are divided into a first term (master's) and second term (PhD)

・From 1991, Japan has promoted quantitative improvements in graduate schools
・However, in recent years highly talented personnel are seeking jobs after completing a master's degree, and there has been a drop in doctoral program enrollment

Ratio of universities with graduate schools

National　86(45)
Public　72 (6)9
Private　456(78)　140

■Universities with graduate schools
□Universities with no graduate schools
No. in parentheses indicates those with professional graduate schools

Trends in number of graduate school students

H3　68,739　29,911
H12　142,830　62,481　Approx. 210% increase
H20　165,422　74,231　23,033
H21　167,043　73,565　23,381
H22　173,831　74,432　23,191
H23　175,988　74,655　21,808　Approx. 280% increase

Master's program
Doctoral program
Professional degree program

Number of departments, by type of graduate program

Category	Master's only	PhD program (5-year integrated)	PhD program (divided term)	PhD program (3-yr. 2nd term only)	PhD program (medical, dental, vet school)	Professional degree program	Total
National	693	25	643	195	131	64	1,751
Public	147	0	130	23	25	9	334
Private	893	13	1,106	153	147	107	2,419
Total	1,733	38	1,879	371	303	180	4,504

Trends in enrollment in Japanese doctoral programs

(No. of students)

2000　18,232
2004　17,944
2005　17,553
2006　17,131
2007　16,926
2008　16,271
2009　15,901
2010　16,471
2011　15,655
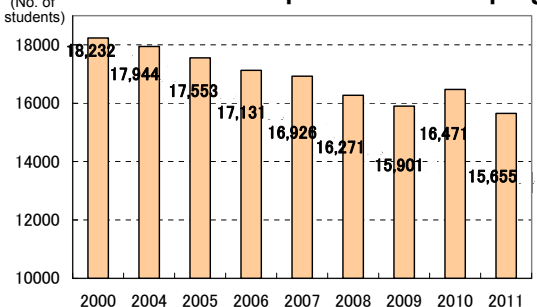
博士課程に関する課題～キャリアパス～

・修士号取得者の大半は就職
・博士号取得者の過半の進路は大学（ポストドクターは全体の約2割）

博士号を持つ企業の研究者の割合が諸外国と比べ少ないなど、我が国の博士が産学官を問わず十分活躍しているとはいえない

【博士課程修了者の進路状況】
（平成22年修了者の11月時点調査）

研究生・専修生・科目等履修生・聴講生等, 209人, 1.3%
帰国者（外国人留学生）341人, 2.1%
その他進路未定者（確認済み）, 312人, 1.9%
不明者, 1,136人, 7.1%
進学者, 212 人, 1.3%
家事手伝い、アルバイト, 184人, 1.1%
無給の研究員等, 197人, 1.2%
非常勤職員、非常勤研究員、非常勤講師, 459人, 2.9%
ポストドクター等, 2,877人, 17.9%
就職者 9,673人 60.2%

就職者の進路状況
3.2%
16.4%
29.8%
5.7%
3.9%
40.9%

不明・非該当
その他・無所属
民間企業
公的研究機関
その他教育機関
大学等
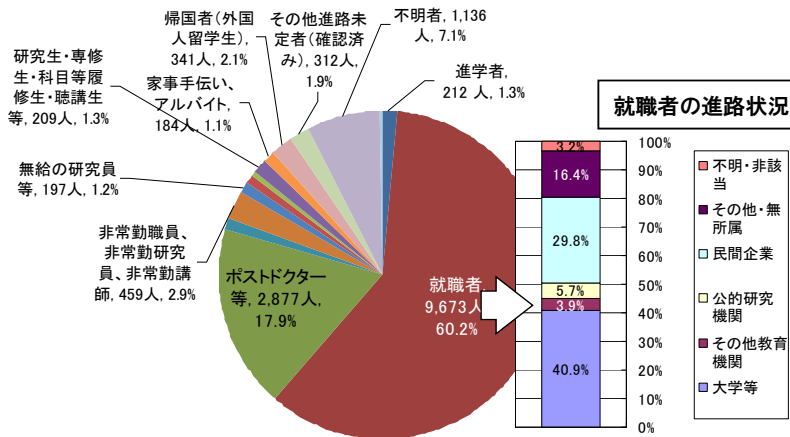
文部科学省「博士課程修了者の進路実態に関する調査研究」（平成２２年度）

【企業研究者に占める博士号取得者の割合】
（２００９年）

アイルランド、オーストリア、ベルギー、ノルウェー、ロシア、ハンガリー、アメリカ、シンガポール、イタリア、台湾、トルコ、日本、ポルトガル
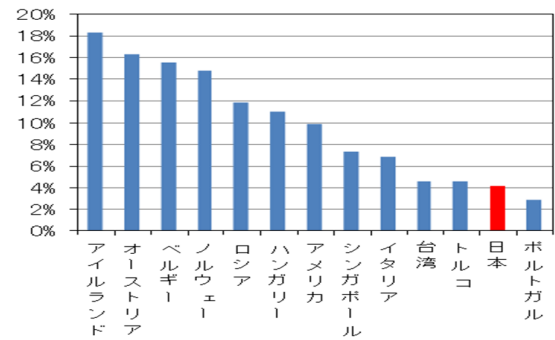
日本：総務省科学技術研究調査
アメリカ：NSF,SESTAT
その他の国：OECD Science, Technology and R&D Statisticsのデータを基に作成）

Issues Related to Doctoral Education—Career Path

- Most master's degree recipients find employment
- The majority of PhD recipients work in universities (postdocs are roughly 20% of total)

The percentage of researchers in Japanese companies who hold a PhD is smaller than in other countries; Japanese PhDs are not yet fully playing active role in industry, academia, government, etc.

Career status of those completing the doctoral course
(Survey conducted in November 2010 of those who graduated in March 2010)

Research student, special student, credited auditor, auditor, etc. (209/1.3%)
Returned to own country (foreign students) (341/2.1%)
Others with undecided career paths (312/1.9%)
Unknown (1,136/7.1%)
Domestic help, part-time work (184/1.1%)
Continuing education (212/1.3%)
Unpaid researcher, etc. (197/1.2%)
P-T staff, P-T researcher, P-T lecturer (459/2.9%)
Postdoc, etc. (2,877/17.9%)
Employed (9,673/60.2%)

Careers of those employed
3.2%
16.4%
29.8%
5.7%
3.9%
40.9%

Unknown/not applicable
Other/unaffiliated
Private company
Public research institute
Other educational institution
University, etc.

MEXT, "Career Trends Survey of Recent Doctoral Graduates in Japan" (2010)

Doctoral degree holders as a percentage of corporate researchers (2009)

Ireland, Austria, Belgium, Norway, Russia, Hungary, USA, Singapore, Italy, Taiwan, Turkey, Japan, Portugal
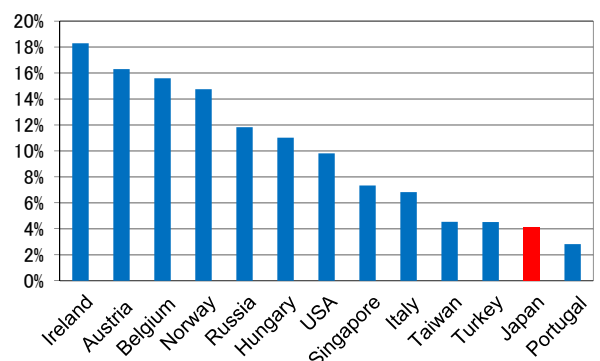
Compiled based on data from the Survey of Research and Development, Ministry of Internal Affairs and Communications (Japan); NSF and SESTAT (USA); and the OECD Science, Technology and R&D Statistics (other countries).

グローバル化社会の大学院教育（平成23年1月 中央教育審議会答申）

グローバル化や知識基盤社会が進展する中，大学院教育の強化は一刻の猶予も許されない課題
「17年大学院答申」で掲げた大学院教育の実質化の一層の強化を基本に，
①産学官が協力し国内外の多様な社会の要請に的確に応える開かれた体系的な教育の展開
②社会人や外国人学生を含む多様な学生が将来の見通しを持って切磋琢磨する環境の整備
に力点を置き，以下の柱に基づき大学院教育を強化することが必要

１．学位プログラムとしての大学院教育の確立

学位プログラムとして，修得すべき知識・能力を明確にした教育を通じて，学生の質を保証

- 教育情報の公表による大学院教育の「可視化」
- 優れた学生が大学院で学ぶ環境の整備（経済的支援）
- コースワークから研究指導に有機的に繋がる体系的教育
- 学生の質を保証する組織的な教育・研究指導体制
- 産業界等との連携の強化と多様なキャリアパスの確立

２．グローバルに活躍する博士の養成

課程を通じ一貫した博士課程教育を確立し，グローバルに活躍する高度な人材を養成

- 独創的な研究活動を自立して遂行できる一貫した博士課程教育
- 成長を牽引する世界的な大学院教育拠点（リーディング大学院）
- 日本人・外国人学生の垣根を越えた協働教育の推進

Graduate School Education in a Globalized Society

(January 2011 Report of the Central Council for Education)

Enhancement of systematic development of graduate courses, raised in the "2005 Report," must be further strengthened, more focusing on,

(1) collaboration among industry, academia, and government to provide systematic education that can respond effectively to the needs of a diverse society; and

(2) development of environment where students can work hard knowing that their career prospects are bright.

1. Establish graduate school education as degree programs

By clarifying the knowledge and skills that students must acquire to receive their degree, education structured as degree programs can guarantee the quality of students.

- Improve transparency of educational information to make graduate school education more "visible"
- Provide a graduate school environment where exceptional students can learn (financial aid)
- Provide systematic education that offers organic linkages from coursework to research guidance
- Create a systematic education and research guidance structure that ensures the quality of students
- Strengthen collaboration with industry and other sectors and establish diverse career paths for students

2. Foster PhDs to play an active role globally

Establish consistent doctoral programs that train highly skilled personnel who can play a role in a globalized community.

- Establish consistent doctoral programs that allow students to independently pursue innovative research
- Launch new initiative, "Leading Graduate Schools" to foster PhDs who can lead the creation and growth of a new society
- Promote collaborative cross-border education for Japanese and foreign students

第2次大学院教育振興施策要綱

平成23年8月5日
文部科学大臣決定

中教審答申を踏まえ，文部科学省として早急に取り組むべき重点施策を明示し，体系的かつ集中的に施策を展開することを目的とし，「第2次大学院教育振興施策要綱」（対象期間：平成23〜27年度）を策定

◆基本的な視点

グローバル化や知識基盤社会の更なる進展，震災からの復興・再生，新たな社会の創造・成長等を見据え，大学院教育の実質化に向けた取組を強化することを基本に，国内外の多様な社会への発信と対話，大学院修了者の活躍の視点を重視し，大学院教育の質の保証・向上のための施策を実施する。

◆具体的な施策

1．学位プログラムに基づく大学院教育の確立

- 課程制大学院制度の趣旨に沿った教育
- 学生の質を保証する組織的な教育・研究指導体制の確立
- 実効性ある大学院評価の取組の推進

2．新たな社会の創造・成長を牽引する博士の養成

前期・後期一貫した博士課程教育の確立

- ・複数専攻制，研究室ローテーションなど専門分野の壁を破る統合的な教育の推進
- ・博士論文作成に必要な基礎的能力の包括的な審査（Qualifying Examination）を，修士論文に代えて行う仕組みの導入と推進

社会の創造・成長を牽引するリーダー養成と世界的な大学院教育拠点の形成

- ・「リーディング大学院」の形成促進（博士課程教育リーディングプログラム）

3．社会との対話と連携による教育の充実と，学生が将来への見通しを持てる環境の構築

- 教育情報の公表の推進
- 学生が将来への見通しをもって学ぶ環境の整備
- 社会との連携の強化と多様なキャリアパスの確立
  - ・企業と大学による従来の枠を超えた対話を通じた産学協働の推進（産学協働人材育成円卓会議）
- 若手教員等の教育研究環境の改善

4．大学院教育のグローバル化の促進

- 国際的な連携・交流と質保証の推進
- 外国人・日本人学生の垣根を越えた協働教育

5．専門職大学院の質の向上

2nd Guidelines on Measures for the Promotion of Graduate School Education

(approved by MEXT on August 5, 2011)

Based on the Report, the 2nd Guidelines on Measures for the Promotion of Graduate School Education (2011–2015) was drawn up to clarify which priority measures MEXT should address right away and to develop policies in a systematic and integrated manner.

◆ Basic perspective

In view of our increasingly globalized and knowledge-based society, the efforts to recover and revive from the disaster of 2011, the creation and growth of a new society, and so on, Japan will implement measures to ensure and improve the quality of its graduate school education. Based on the strengthening of initiatives to enhance systematic development of graduate courses, it will place priority on communicating to and with the diverse society within and outside of Japan and on brightening the prospects of students.

◆ Specific measures

1. Establish graduate school education based on degree programs

- Education in keeping with the goals of course-based graduate school systems
- Establishment of a systematic education and research guidance framework to ensure student quality
- Promotion of efficient graduate school evaluation initiatives

2. Foster PhDs who can lead the creation and growth of a new society

Establish consistency in doctoral program

- • Encourage a multiple-major system, research lab rotation, and other steps to promote integrated education that breaks down walls between disciplines
- • In place of a master's thesis, encourage the introduction of a comprehensive "qualifying examination" that covers the basic skillset needed to prepare a doctoral dissertation

Train leaders who can spur the creation and growth of society and create global centers of graduate school education

- • Promote the formation of "Leading Graduate Schools" (Program for Leading Graduate Schools)

3. Enhance education through dialogue and cooperation with society and create an environment where students will have bright prospects for the future

- Promote greater transparency in education information
- Create an environment where students can learn knowing they will have bright prospects for the future
- Strengthen collaboration with society and establish diverse career paths
  - • Promote industry-university collaboration through dialogue that goes beyond the current framework (Roundtable on Industry-Academia Collaboration in Human Resource Development)
- Improve the research/teach environment for young faculty members and others

4. Promote the globalization of graduate school education

- Promote international cooperation and exchange and quality assurance
- Collaborative education that transcends the divide between foreign and Japanese students

5. Improve the level of professional graduate schools

「グローバル化社会の大学院教育」（博士課程教育に関して）

- ・5年制博士課程の殆どは区分制
- ・研究指導が個々の研究室中心
- ・卒研，入試，修論等で早期に研究テーマが特定

博士号取得者が産学官の中核人材としてグローバルに活躍できるよう，一貫した博士課程教育を構築し，質を向上を図ることが急務

講座・研究室

博士論文
研究指導
入試
修士論文
研究指導
専門基礎教育
入試
卒業論文・研究

博士論文
研究指導
フィールドワーク研究プロジェクト
入試
修士論文
研究指導
コースワーク
入試

制度と予算で強力に推進

国際機関　研究機関　大学　企業　行政機関
対話の場の形成

博士論文
研究指導
研究計画書審査
フィールドワーク研究プロジェクト
専攻分野の選択
Qualifying Examination
分野を超えた研究室ローテーション等
コースワーク
入試

- 産・学・官の参画による国際性・実践性を備えた現場での研究訓練
- 国内外の多様なセクターから第一級の教員を結集した密接な指導体制
- 優秀な学生が切磋琢磨しながら、主体的・独創的に研究を実践
- 専門の枠を超え知の基盤を形成する体系的教育と包括的な能力評価

※Qualifying Examination
:博士論文作成に必要な基礎的能力の包括的な審査

Graduate School Education in a Globalized Society
(Regarding Doctoral Program Education)

- Almost all five-year doctoral programs use a two-term system
- Research guidance is centered on each individual research lab
- Research theme is set early through graduation research, entrance exam, master's thesis, etc.,

In order to ensure that PhD recipients are able to play an active role globally as core resource personnel for industry, academia, and government, it is urgent that a consistent doctoral education be created to raise the quality

research lab

Dissertation
Research guidance
Entrance exam
Master's thesis
Research guidance
Specialized basic education
Entrance exam
Research for undergraduate thesis

Dissertation
Research guidance
Fieldwork research project
Entrance exam
Master's thesis
Research guidance
Coursework
Entrance exam

Strongly promote by using system and budget

International organizations　Research institutes　Universities　Businesses　Government institutions
Creation of a space for dialogue

Dissertation
Research guidance
Review of research plan
Fieldwork research project
Choice of field of study
Qualifying Examination
Interdisciplinary lab rotation, etc.
Coursework
Entrance exam

- International and practical onsite research training through the participation of industry, academia, and government
- Closely connected guidance system that brings together first-class instructors from diverse sectors in Japan and abroad
- Enabling of exceptional students to work hard and conduct independent and creative research
- Systematic education that forms a knowledge base that transcends disciplinary frameworks, and comprehensive evaluation of abilities

博士課程教育リーディングプログラム

・俯瞰力と独創力を備え産学官にわたりグローバルに活躍するリーダーを養成
・分野の枠を超え一貫したプログラムを持った世界に通用する博士課程教育を構築し、最高学府に相応しい大学院の形成を推進

【3つの支援類型】

オールラウンド型
国内外の政財官学界で活躍しグローバル社会を牽引するトップリーダーを養成する、大学の叡智を結集した文理統合型の学位プログラム構築

文理統合型の新たな学位プログラム ← 人社 / 理工 / 生命

複合領域型
人類社会が直面する課題解決に向けて、産学官のプロジェクトを統括し、イノベーションを牽引するリーダーを養成する、複数領域横断の学位プログラム構築

複合領域の学位プログラム — 材料 / 化学 / 機械

オンリーワン型
新たな分野を拓くリーダーを養成する、世界的に独自の優れた資源を生かした学位プログラム構築

独自の資源を生かした学位プログラム

【類型と選定計画】

※平成25年度については、予算積算上の件数。

類型・テーマ	平成23年度	平成24年度	平成25年度
1. オールラウンド型	3件	2件	2件
2. 複合領域型			
環境	4件	2件	
生命健康	4件	2件	
物質		3件	
情報		3件	10件
多文化共生社会		3件	
横断的テーマ	2件	2件	
安全安心	1件	2件	
3. オンリーワン型	6件	5件	5件

平成25年度予定額: 178億円 (平成24年度予算: 116億円)
・平成25年度新規採択の実施
　オールラウンド型　　2 件 (x 300 百万円)
　複合領域型　　　　10 件 (x 250 百万円)
　オンリーワン型　　5 件 (x 150 百万円)
・平成23年度、平成24年度採択プログラムの着実な実施

Program for Leading Graduate Schools

- **Train PhD students who can overview the fields of intelligence and create new values, so that they can play active roles as "global leaders" in industry, academia, and government**
- **Support the educational reform to create consistent doctoral programs that transcend the disciplinary boundaries and have top-level competitiveness in the world, and promote the formation of graduate schools that deserve "the highest seat of learning"**

3 categories of support

All-around category
Construct a degree program that uses an integrated arts & sciences model and pools the university's collective wisdom to nurture top leaders who will play an active role in the political, financial, administrative, and academic worlds in Japan and abroad, and who can lead the global society

New integrated arts & sciences degree program — Humanities/social sciences / Science/engineering / Life sciences

Composite category
Create a degree program that cuts across multiple fields in order to train leaders who can supervise industry-academia-government projects and who can drive innovation in solving the problems facing human society

Multidisciplinary degree program — Materials / Chemistry / Mechanics

Only-one category
Create a degree program that develops leaders who can open up new fields, utilizing Japan's unique and exceptional resources

Degree program that makes use of unique resources

Categories and Selection Plan

* From FY2013 on, changes are possible depending on budget conditions, etc.

Category/theme	FY2011	FY2012	FY2013
1. All-around category	3 cases	2 cases	2 cases
2. Composite category			
Environment	4 cases	2 cases	
Life sciences & health	4 cases	2 cases	
Materials		3 cases	
Information		3 cases	10 cases
Symbiotic multicultural society		3 cases	
Cross-cutting themes	2 cases	2 cases	
Safety & security	1 cases	2 cases	
3. Only-one category	6 cases	5 cases	5 cases

FY2013 : ¥17.8 billion (FY2012 budget: ¥11.6 billion)
・FY2013 newly selected programs
　All-around category　　2 cases (x ¥300 million)
　Composite category　　10 cases (x ¥250 million)
　Only-one category　　5 cases (x ¥150 million)
・Takes the budget required for the programs selected in FY2011 and FY2012 as the average year

平成23年度「博士課程教育リーディングプログラム」選定プログラム一覧

【オールラウンド型】

大学名	プログラム名称
京都大学	京都大学大学院思修館
大阪大学	超域イノベーション博士課程プログラム
慶應義塾大学	超成熟社会発展のサイエンス

【複合領域型（環境）】

大学名	プログラム名称
東京大学	サステイナビリティ学グローバルリーダー養成大学院プログラム
東京工業大学	環境エネルギー協創教育院
名古屋大学	グリーン自然科学国際教育研究プログラム
慶應義塾大学	グローバル環境システムリーダープログラム

【複合領域型（生命健康）】

大学名	プログラム名称
筑波大学	ヒューマンバイオロジー学位プログラム
東京大学	ライフイノベーションを先導するリーダー養成プログラム
東京工業大学	情報生命博士教育院
大阪大学	生体統御ネットワーク医学教育プログラム

【複合領域型（安全安心）】

大学名	プログラム名称
京都大学	グローバル生存学大学院連携プログラム
高知県立大学	災害看護グローバルリーダー養成プログラム（兵庫県立大学、東京医科歯科大学、千葉大学、日本赤十字看護大学と共同実施）

【複合領域型（横断的テーマ）】

大学名	プログラム名称
東京大学	フォトンサイエンス・リーディング大学院
広島大学	放射線災害復興を推進するフェニックスリーダー育成プログラム

【オンリーワン型】

大学名	プログラム名称
北海道大学	One Healthに貢献する獣医科学グローバルリーダー育成プログラム
群馬大学	重粒子線医工学グローバルリーダー養成プログラム
東京工業大学	グローバル原子力安全・セキュリティ・エージェント養成
山梨大学	グリーンエネルギー変換工学
名古屋大学	法制度設計・国際的制度移植専門家の養成プログラム
兵庫県立大学	フォトンサイエンスが拓く次世代ピコバイオロジー

List of Programs Selected in FY2011 for the Program for Leading Graduate Schools

All-Around Category

University	Program
Kyoto University	Graduate School of Advanced Leadership Studies, Kyoto University
Osaka University	Cross-Boundary Innovation Program
Keio University	Science for Development of Super Mature Society

Composite Category (Environment)

University	Program
The University of Tokyo	Graduate Program in Sustainability Science : Global Leadership Initiative
Tokyo Institute of Technology	Academy for Co-creative Education of Environment and Energy Science
Nagoya University	Integrative Graduate Education and Research Program in Green Natural Sciences
Keio University	Global Environmental System Leaders Program

Composite Category (Life sciences/health)

University	Program
University of Tsukuba	Ph.D. Program in Human Biology
The University of Tokyo	Graduate Program for Leaders in Life Innovation
Tokyo Institute of Technology	Education Academy of Computational Life Sciences
Osaka University	Interdisciplinary graduate school program for systematic understanding of health and disease

Composite Category (Safety & Security)

University	Program
Kyoto University	Inter-Graduate School Program for Sustainable Development and Survivable Societies

Composite Category (Cross-Cutting Themes)

University	Program
The University of Tokyo	Advanced Graduate Course for Photon Science
Hiroshima University	Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster

Only-one Category

University	Program
Hokkaido University	Fostering Global Leaders in Veterinary Science for contributing to One Health
Gunma University	Program for Cultivating Global Leaders in Heavy Ion Therapeutics and Engineering
Tokyo Institute of Technology	Global Human Resource Development Program for Nuclear Safety and Security
University of Yamanashi	Green Energy Conversion Science and Technology
Nagoya University	The Program for Cross-Border Legal Institution Design
University of Hyogo	Next generation picobiology pioneered by photon sciences

平成24年度「博士課程教育リーディングプログラム」選定プログラム一覧

オールラウンド
東京工業大学	グローバルリーダー教育院
名古屋大学	PhDプロフェッショナル登龍門

複合領域型（環境）
東京農工大学	グリーン・クリーン食料生産を支える実践科学リーディング大学院の創設
九州大学	グリーンアジア国際戦略プログラム

複合領域型（生命健康）
京都大学	充実した健康長寿社会を築く総合医療開発リーダー育成プログラム
熊本大学	グローカルな健康生命科学パイオニア養成プログラムHIGO

複合領域型（安心安全）
東北大学	グローバル安全学トップリーダー育成プログラム
高知県立大学	災害看護グローバルリーダー養成プログラム

複合領域型（物資）
東京大学	統合物質科学リーダー養成プログラム
大阪大学	インタラクティブ物質科学・カデットプログラム
九州大学	分子システムデバイス国際研究リーダー養成および国際教育研究拠点形成

複合領域型（情報）
東京大学	ソーシャルICT　グローバル・クリエイティブリーダー育成プログラム
京都大学	デザイン学大学院連携プログラム
大阪大学	ヒューマンウェアイノベーション博士課程プログラム

複合領域型（多文化共生社会）
金沢大学	文化資源マネージャー養成プログラム
大阪大学	未来共生イノベーター博士課程プログラム
同志社大学	グローバル・リソース・マネジメント

複合領域型（横断的）
名古屋大学	フロンティア宇宙開拓リーダー養成プログラム
早稲田大学	リーディング理工学博士プログラム

オンリーワン
秋田大学	レアメタル等資源ニューフロンティアリーダー養成プログラム
山形大学	フロンティア有機材料システム創成フレックス大学院
千葉大学	免疫システム調節治療学推進リーダー養成プログラム
東京大学	数物フロンティア・リーディング大学院
長崎大学	熱帯病・新興感染症制御グローバルリーダー育成プログラム

List of Programs Selected in FY2012 for the Program for Leading Graduate Schools

All-Around Category
Tokyo Institute of Technology	Academy for Global Leadership
Nagoya University	PhD Professional: Gateway to Success in Frontier Asia

Composite Category (Environment)
Tokyo University of Agriculture and Technology	Creation of the Practical Science Leading Graduate School for Green and Clean Food Production
Kyushu University	Advanced Graduate Program in Global Strategy for Green Asia

Composite Category (Life sciences/health)
Kyoto University	Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society
Kumamoto University	HIGO: Health life science Interdisciplinary and Glocal Oriented

Composite Category (Safety & Security)
Tohoku University	Inter-Graduate School Doctoral Degree Program on Science for Global Safety
University of Kochi	Disaster「Nursing Global Leader; DNGL

Composite Category (Material)
The University of Tokyo	Materials Education program for the future leaders in Research, Industry, and Technology (MERIT)
Osaka University	Interactive Materials Science Cadet Program
Kyushu University	Graduate School for Molecular System & Device Science

Composite Category (Information)
The University of Tokyo	Graduate Program for Social ICT Global Creative Leaders
Kyoto University	Collaborative Graduate Program in Design
Osaka University	Humanware Innovation Program

Composite Category (Symbiotic multicultural society)
Kanazawa University	Guraduate Program in Cultural Resource Management
Osaka University	Doctoral Program for Multicultural Innovation
Doshisha University	Global Resource Management

Composite Category (Cross-Cutting Themes)
Nagoya University	Leadership Development Program for Space Exploration and Research
Waseda University	Leading Graduate Program in Science and Engineering

Only-one Category
|	
Akita University	New Frontier Leader Program for Rare-metals and Resources
Yamagata University	Graduate School of Science and Engineering
Chiba University	Nurture of Creative Research Leaders in Immune System Regulation and Innovative Therapeutics
The University of Tokyo	Leading Graduate Course for Frontiers of Mathematical Sciences and Physics
Nagasaki University	Program for Nurturing Global Leaders in Tropical and Emerging Communicable Diseases

【オールラウンド型】

東京工業大学大学院　グローバルリーダー教育院
Academy for Global Leadership , Tokyo Institute of Technology

■　養成したい人材像

博士の学位を有する者として専門領域の世界的コミュニティに敬意を持って受け入れられるに足る深い知識と独創性を含めた高い能力を有し、自身の専門以外の学術を、学問領域の枠を越えて普遍化して、シームレスに理解できる俯瞰力と、国・地域や文化の違いを越えて他者の意見を理解し、自身の意見を合理的に説明して、合意形成ができるコミュニケーション力、ならびに合意の結果を形にし、社会に貢献することができる行動力と創造性を併せ持つ人材

■　プログラムの特色

① 本学の強みである卓越した専門領域の教育体系による主専門教育

② 人間力を養う学生の修練の場としての「道場」群の設置と、専門分野・国籍・志向の異なる学生が主体的に共同作業することによる切磋琢磨

③ 道場における文理の壁を越えた切磋琢磨のための一橋大学との連携

④ 主専門教育、道場教育を通して身につけつつある能力を実社会で試す機会として、海外企業等での6ヶ月以上のオフキャンパス教育の実施

⑤ 主専門教育・道場教育・オフキャンパス教育間でシナジー効果を生む組織的な教育体系運営

⑥ 道場教育における実践的PBL、オフキャンパス教育における実務的プロジェクト遂行によるキャリア意識の涵養とメンターによるアドバイスの実施

⑦ 教育内容の高度化・着実な修了生のキャリアパス確保のための東工大産官学連携人財養成コンソーシアムとの協働

⑧ リーダーシップ・コミュニケーションの素養、議論の合理性などを複数教員が評価する2泊3日の選抜合宿による厳格な履修者選抜（15名程度/年）

⑨ 修了時点での人間力の達成目標と評価のためのルーブリックに基づく、ディフェンスによる厳格な修了審査

⑩ 外部評価委員会およびアドバイザリーボードからの意見聴取と、修了生の社会での活躍状況のフォローアップによる持続的な教育内容の改善

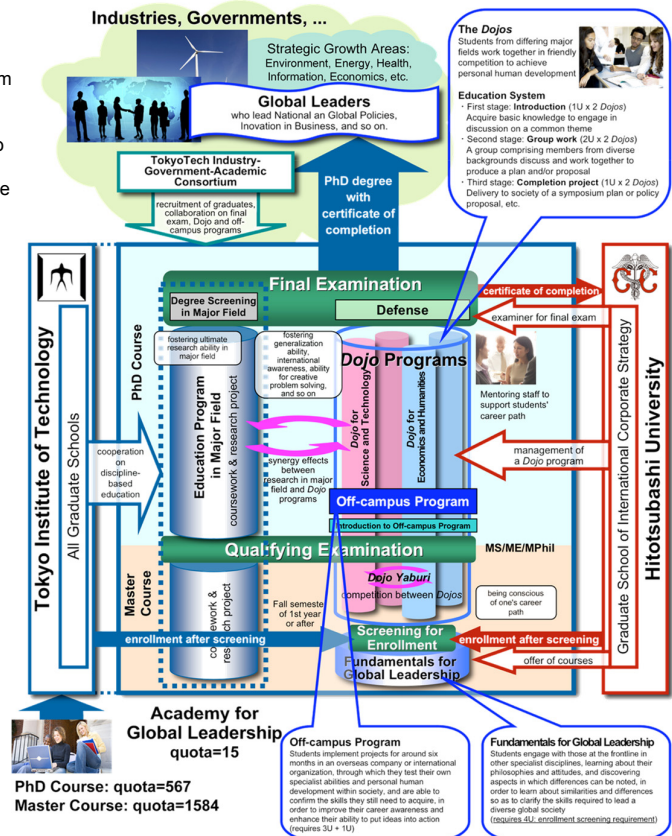
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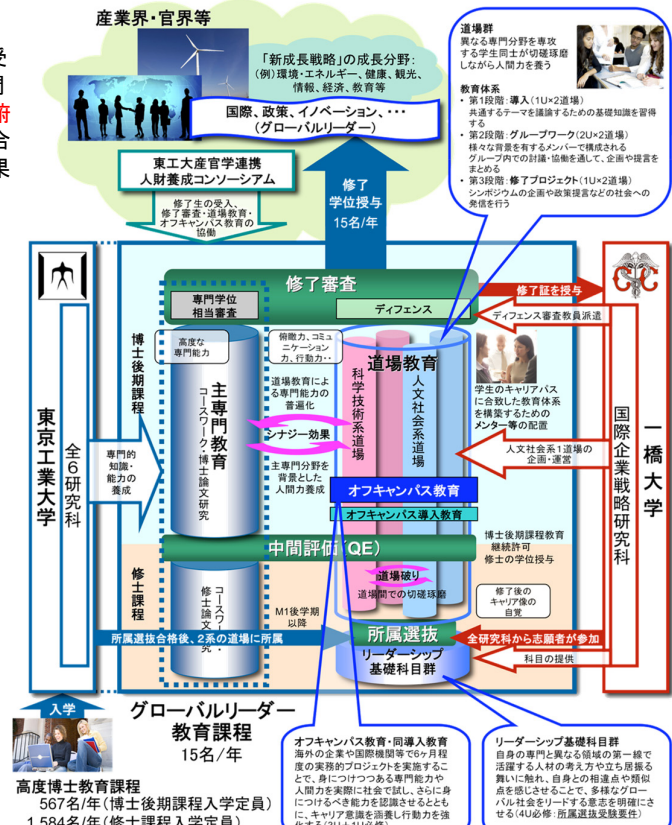
Tokyo Institute of Technology

Academy for Global Leadership

■　Human resources we wish to develop

The human resources we wish to develop are:
- Generalization ability across the boundaries of academic disciplines to understand them in a seamless manner, and contextual intelligence,
- Communications skills that enable them to understand the views of others despite national, religion or cultural differences, to explain their own opinions rationally, and to build a consensus, and
- Sufficient vitality and creativity to turn the consensus into tangible results and contribute to society, as well as
- Profound knowledge and creativity sufficient to ensure that they are accepted with respect by the global community of the specialized field as a PhD holder.

■　Unique features of the program

① Research program in the major field of academic disciplines, which is one of the traditional strength of our existing graduate schools.

② *Dojo* program in which students acquire skills and abilities necessary for global leaders through collaborative work to complete unified project with diverse scholars from multiple academic disciplines.

③ Cooperatively organized Dojo program with Hitotsubashi University to enhance connection between the social and humanities field and the science and technology field.

④ Off-campus program, which is a long-term internship for six months or longer, to make students test their ability in the "real world."

⑤ Synergy effect among the research program in the major field, Dojo program and off-campus program.

⑥ Cultivation of students' career awareness through Project-Based-Learning in the Dojo program and the off-campus program, along with advice from mentors.

⑦ Cooperation with the "TokyoTech Industry-Government-Academic Consortium for Human Resources Development" to ensure the career paths for our graduates.

⑧ Rigorous selection process for candidates, which is 3 day-long camp with multiple members of faculty.

⑨ Strict completion evaluation requiring defense based on rubric designed to assess attainment levels in personal human developments.

⑩ Continual improvements to education and training contents based on the opinions of the advisory board, as well as follow-up of the activities of our graduates within society.

【オンリーワン型】
秋田大学

レアメタル等資源ニューフロンティアリーダー養成プログラム
New Frontier Leader Program for Rare-metals and Resources
～国際資源開発人材の実践的育成～

■ 養成したい人材像

レアメタル等資源の安定確保をはじめ21世紀の複雑な資源開発に挑む俯瞰力を持った人材、すなわち資源から素材分野に至る総合的な専門知識・応用力に加え、国際的な視野と独創性豊かな考察力、実践力、資源リテラシー、英語力、マネジメント能力、課題解決力、異文化理解力、政策立案能力等を身に付けた「資源ニューフロンティアリーダー」の養成

■ プログラムの特色

① 秋田大学大学院工学資源学研究科に「資源ニューフロンティア特別教育コース」を設置
② 最先端の教育研究を通じて身に付けた知識・技術、応用力等により、21世紀の資源分野を拓き、資源開発に主体的に挑む俯瞰力の取得
③ 資源学の専門領域から環境・生体影響、地域文化、異文化コミュニケーション、資源経済等MOT科目に至る多様なコースワーク整備とラボローテーション、原則英語による専門科目講義
④ 海外の鉱山等を活用した海外インターンシップ／フィールドワーク。およびそれらを通じた実学教育（*On-the-Job-Education*）と実践力の養成
⑤ 産学間連携や海外研究者による多様な講師陣と最新講義並びに研究指導
⑥ 資源学の全体像を理解するためのリテラシー教育やPBL等の充実および企業講師を巻き込んだキャリアパスの支援教育
⑦ コース生の国際公募から学位取得に至る質保証審査（10名程度／年）
⑧ 産官学の専門家および海外研究者等によるプログラム外部評価と自己評価
⑨ 大学改革と一体化した資源系大学院の強化・拠点形成とプログラムの継続的な保証

資源分野を拓く世界のリーダーへ
大学・研究機関、資源関連企業、政府系機関等での活躍

資源ニューフロンティアリーダー
学位取得者

資源開発の最前線に立つ資源ニューフロンティア人材の育成と国際ネットワークの構築

国内外から第一級の教員・技術者を結集
学内教員　22名（3学部・1全学センター）
学外教員　国内8名（5大学）
　　　　　海外8名（7カ国・7大学）

レアメタル等の資源調査
高効率生産技術、新規リサイクル技術の開発などを通した最新の教育研究

充実した学修環境・グローバルな資源学教育

メンター制度／ポートフォリオ

国際公募（入学者選抜）（Preliminary Examination）
年間10名

多方面との連携による産・学・官からの講師陣

秋田大学
工学資源学研究科博士課程
「資源ニューフロンティア特別教育コース」

キャリアパスフォロー等

5年目：資源学総合・俯瞰力修得
★学位論文「資源学特別論究課題」研究
●リサーチワーク
●中間報告
学位・最終審査（1次・2次）（Dr. Examination）

4年目：研究力・就業力養成
●リサーチワーク（OJE型教育研究）
●プロジェクトベーストレーニング
●中間報告／国際シンポジウム等発表
第2ピリオド
On-the-Job Education
・海外インターンシップ
・フィールドワーク
国際シンポジウムやセミナー、サマーキャンプ等の企画・参加発表

地球資源学コース / 資源開発素材コース

1年目：基礎・専門力養成
●コースワーク
●ラボローテーション
●グローバル資源学特論（資源学リテラシー）
第1ピリオド
海外インターンシップフィールドワーク

2年目：基礎・専門力養成
★資源学特定必修課題研究
●グローバル資源学特論（資源学リテラシー）
●コースワーク
●ラボローテーション

3年目：課題解決・実践力養成
●研究プロポーザル
●研究活動（OJE型教育研究）
●グローバル資源学特論（資源学リテラシー）
中間審査（Qualifying Examination）

海外鉱山等の活用
フィリピン　Victoria鉱山、Padcal鉱山
モンゴル　Oyu Tolgoi鉱山
カザフスタン　アルタイ地域
ボツワナ　リンポポ変動帯　など
東カザフスタン工科大学
レアメタル等資源地質調査
高効率金属回収技術　　など

【Only-One Type】
Akita University

New Frontier Leader Program for Rare-metals and Resources
- Practical human resource training for international resource development -

■ Human Resources Training Ideals

Targets on training the students as "**New Frontier Leaders of Resources**" capable of challenging issues in the complicated field of resource developments in the 21st Century, such as continuous resource supplies including minor/rare metals. Leaders will be trained to acquire the adaptability and overall expertise knowledge of resources and also substances. Additional abilities will be learned throughout the program such as universal vision, unique examination, resource literacies, English skill, management, problem solving, understanding foreign culture, policy-making, etc..

■ Distinction of the program

1. Established the special education course "New Frontier Leaders on Resource" within Akita University Graduate School of Engineering and Resource Science.
2. Students will learn knowledge, skills and adaptability thorough the latest research education to be able to take an important part of the future of resource industry independently.
3. Students take various subjects and classes, such as environment influences, local cultures, intercultural communications, MOT and lab-rotation, as well as special subjects of resource science.
4. Overseas internship and field work at mines. On-the-job-education to build practical abilities.
5. Updated lectures and research trainings by various lecturers and international researchers.
6. Literacy education and PBL to understand the whole aspect of resource science Career paths support education by instructors from companies.
7. Advertise for enrollment publicly and internationally to keep a high students level. (Approx. 10 students per year)
8. This program will be analyzed by specialists from different department and researchers from overseas. Also, we evaluate the program ourselves.
9. We aim to strengthen graduate school of resource science and to build a base and a universal network of resource science study connecting with university reform.

Pioneer leaders to open the field of Resource Science
Activities in universities, research organizations, companies related to resources, government agencies.

New Frontier Leaders on Resource
Degree acquirer

・Training the future pioneers to lead the field of resource science.
・Building a global network.

Inviting national and international leading experts and professors.
・On-campus professors (3 faculties, 1 campus center)
・Off-campus professors (8 professors from Japanese universities, 8 professors from 7 oversea universities)

·Resource survey for resources including minor metals.
·Latest educational research by learning efficient development technologies and new recycling technologies.

5th year: Learning and mastering overall knowledge and overview of Resource Science
★Ph.D. Research thesis on the subject "Resource science special theory"
●Research work
●Qualifying report
Degree/Final examination (First, Second) (Dr. Examination)

· Outstanding learning and mastering environment
· Global resource education

Mentor and portfolio systems

4th year: Expanding the abilities of research and employability
●Research work (On the job educational research)
●Project based learning
●Qualifying report / Presentations at international
Second period
On-the-Job Education
・Oversea internships
・Field experiences
・Planning and participating in international symposiums, seminars, summer camps

International recruiting (enrollment selection) (preliminary Examination)
10 students per year

Lecturers from various fields by cooperating with other universities, private companies, and government agencies.

Akita University
Engineering and Resource Science Doctorate Course "New Frontier Leaders on Resources"

Following up on career path

Earth Science and Technology Course / Resource Development and Processing Course

1st year: Basic and expertise training
●Course work
●Lab rotation
●Global resource science theory (Resource science literacy)
First period
Oversea internships, field experiences

2nd Year: Basic and expertise training
★Research on Resource science mandatory subjects
●Global resource science theory (Resource science literacy)
●Course work
●Lab rotation

3rd Year: Training for Resolving and Practicing
●Research proposal
●Research activities (OJE type educational research)
●Global resource science theory (Resource science literacy)
Qualifying Examination

Practical use of oversea mine
Philippines – Victoria Mines, Padcal Mines
Mongol – Oyu Tolgoi Mines
Kazakhstan - Altay area
Botswana – Limpopo Mobile Belt
East Kazakhstan State Technical University
·Geological surveys for resources including minor metals
·Efficient metal recycling technologies

Visions and a Plan for a Database of Doctoral Graduates in Japan

National Institute of Science and Technology Policy
Ministry of Education, Culture, Sports, Science and Technology (Japan)

Keiji Saito (ksaito@nistep.go.jp)

Surveys on Human Resource in NISTEP

Fostering and securing **HR(human resource)** is important for every country. In particular, doctoral graduates and researchers are important for **STI(Science, Technology and Innovation)**.

The Government of Japan has been steadily implementing HR and STI policies.

NISTEP has conducted several surveys and analyses regarding Human resources to support policy-making.

The Government of Japan

内閣府 Cabinet Office

文部科学省 MEXT
MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN

information support

information support

information support

information support

Examples of NISTEP's Surveys on HR

- Surveys on doctoral students and graduates
  (Financial support and first destination)
- Surveys on postdoctoral fellows
  (Employment situation and next destination)
- Surveys on researchers
  (Mobility and research environment)
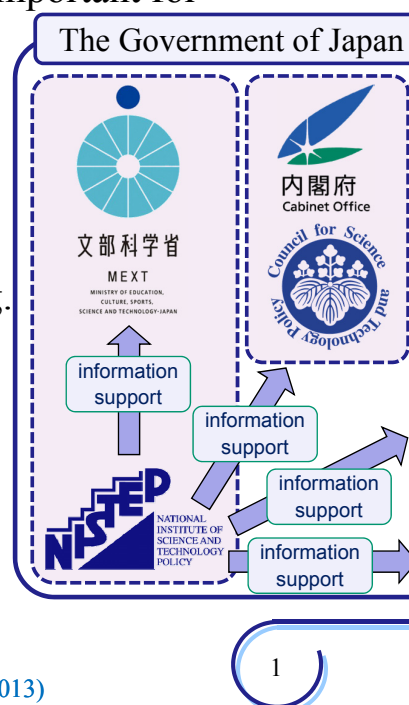
1

Issues to Be Resolved for Surveys to Be Effective

MEXT/NISTEP have generally conducted HR surveys by asking **universities and public research institutes** to answer/distribute questionnaires.

Flows of Surveys on HR

There are issues to be resolved for the HR Surveys

I. **Respondents to the survey are limited to universities / public research institutes or its current staffs / students.**

➡ **MEXT/NISTEP** cannot conduct survey on
- graduates in private companies
- graduates working as non-research positions
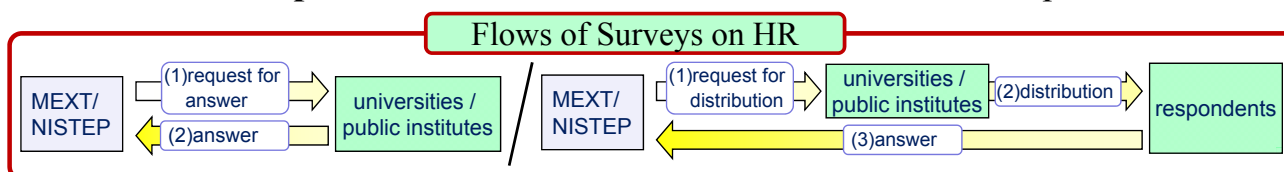- graduates in foreign countries

II. **MEXT/NISTEP can't identify one person across surveys.**

➡ Surveys for doctoral graduates, postdoctoral fellows, and researchers are separated.
MEXT/NISTEP cannot analyze the longitudinal career path of graduates.

What Become Possible with Tracking Data of Doctoral Graduates

With **tracking data** on **the database of doctoral graduates**, the individually matched data of the following two figures would be available.

First jobs of doctoral graduates as per research field

Next jobs of postdoctoral fellows as per research field
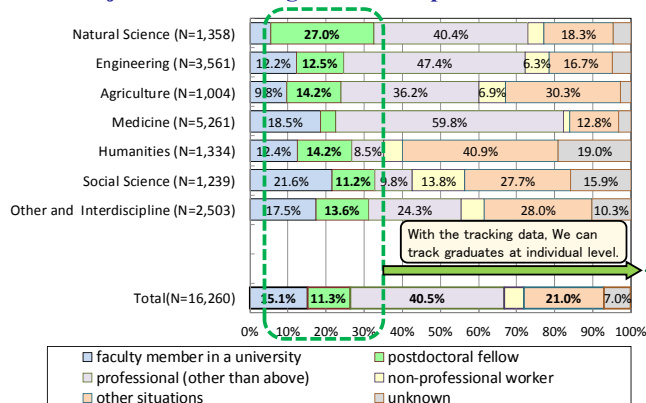
* Based on FY2012 the School Basic Survey, the first job of doctoral graduates in FY2011 calculated by NISTEP (The survey includes students who terminated their student status on obtaining required credits in graduates for descriptive purposes.)
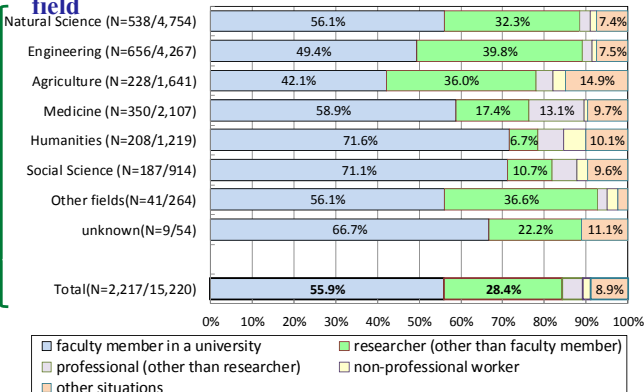
* Based on the Survey regarding postdoctoral fellows, the time for counting is November 2009. The denominator in the label is total postdoctoral fellows at that time. The numerator in the label is the number of postdoctoral fellows who changed his/her job before April 2010. (Excluding the next job is unknown)

MEXT/NISTEP will be able to identify **the roots** of each career by conducting backward analyses. The tracking data indicate **causes and effects**.

SciREX:
Data/Information Infrastructure

MEXT/NISTEP will construct **the database of doctoral graduates** as a part of its **"Data/Information Infrastructure"** programs in **"Science for RE-designing Science, Technology and Innovation Policy (SciREX)".**

SciREX (from FY2011-)

SciREX aims to prepare a system and foundation for the realization of "evidence-based policy formation": proposal of policies effective in addressing different challenges, based on multifaceted analyses and assessments of social and economic impacts from STI. **SciREX** is composed of the following four parts. (http://scirex.mext.go.jp/)

Implemented by NISTEP

Fundamental Research and Human Resource Development

Research Funding

Mission-Oriented Research

Data / Information Infrastructure

- Data on knowledge production in public research
- Data on innovation in industries
- Panel Data on consciousness survey on STI experts
- **Database of doctoral graduates**
- Database of intangible assets and productivities
- Database of budget allocations and key policies

Through the database of doctoral graduates, we will track the careers of doctoral graduates and collect data for "evidence-based policy formation".

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(1)Objects of
the Database of Doctoral Graduates

- MEXT/NISTEP tracks the careers of doctoral graduates **for the formulation of effective HR and STI policies.**

- Each university uses the data on graduates **to improve educational programs and career support.**

- Information on graduates is **important for accountability,** both to potential doctoral students and tax payers.

- The database **supports information management** between universities and alumni.

(2)System for
the Database of Doctoral Graduates

- NISTEP constructs a web-system of the database of doctoral graduates **based on coordination with related sections and institutions.**

- NISTEP **distribute ID to each doctoral student** through university.

- NISTEP and each university **jointly manage information of doctoral students** in graduates schools and right after his/her graduation.

- Variable information (e.g. affiliation, position) is mainly **updated by each doctoral graduate** through periodic E-mail notification.

- Specialized surveys are feasible through identifying characteristics by prior information. (e.g. postdoctoral fellows, workers in private companies)

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(3)Subjects of
the Database of Doctoral Graduates

- In the first stage, NISTEP distributes IDs **to current doctoral students in Japan** and collects the data on new graduates.

- NISTEP consider expanding the range of subjects by coordinating with related sections and institutions.

Through identification of doctoral programs of

- researchers in Japan
  (e. g. coordination with ReaD&Researchmap [http://researchmap.jp/])

- doctorate graduates of a foreign universities living in Japan
  (e. g. online registration forms and incentives)

(4)Data Availability for the Database of Doctoral Graduates

- In principle, NISTEP/universities **publish compiled statistical data** as per courses, or financial supports etc.

  Universities/courses show positive impression of disclosure/support by joining DB-DG.

- NISTEP/universities publish or **provide identifiable personal data only if the respondent explicitly agrees to this** in each time.

  For example
  - "Messages from alumni in each career" in the brochures of a universities
  - Arranging for students-alumni interactions for career support

- As a part of **"SciREX Data/Information Infrastructure"**, NISTEP will build a framework to receive applications for restricted-use data. After screening, NISTEP will provide applicants with detailed data.
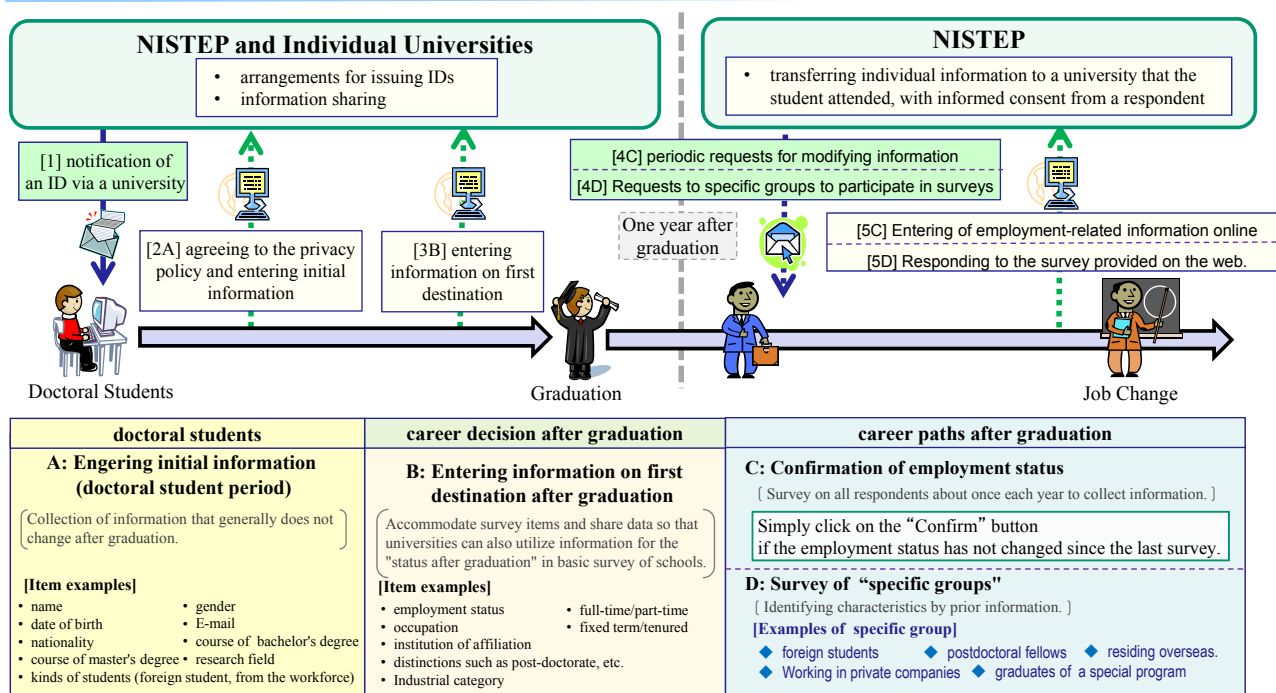

Data / Information Infrastructure
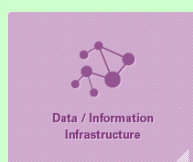
The program pursues to expand accessibility to the accumulated data and research outputs as much as possible while paying enough attention on the regulations and laws concerned with confidentiality issues.

A Tentative Plan for Information Flow of the Database of Doctoral Graduates

NISTEP and Individual Universities
- arrangements for issuing IDs
- information sharing

NISTEP
- transferring individual information to a university that the student attended, with informed consent from a respondent

[1] notification of an ID via a university

[2A] agreeing to the privacy policy and entering initial information

[3B] entering information on first destination

[4C] periodic requests for modifying information

[4D] Requests to specific groups to participate in surveys

One year after graduation

[5C] Entering of employment-related information online

[5D] Responding to the survey provided on the web.

Doctoral Students → Graduation → Job Change

doctoral students	career decision after graduation	career paths after graduation
A: Engering initial information (doctoral student period)	**B: Entering information on first destination after graduation**	**C: Confirmation of employment status** [Survey on all respondents about once each year to collect information.]
[Collection of information that generally does not change after graduation.]	[Accommodate survey items and share data so that universities can also utilize information for the "status after graduation" in basic survey of schools.]	Simply click on the "Confirm" button if the employment status has not changed since the last survey.
[Item examples] • name • gender • date of birth • E-mail • nationality • course of bachelor's degree • course of master's degree • research field • kinds of students (foreign student, from the workforce)	**[Item examples]** • employment status • full-time/part-time • occupation • fixed term/tenured • institution of affiliation • distinctions such as post-doctorate, etc. • Industrial category	**D: Survey of "specific groups"** [Identifying characteristics by prior information.] **[Examples of specific group]** ◆ foreign students ◆ postdoctoral fellows ◆ residing overseas. ◆ Working in private companies ◆ graduates of a special program

The Progress and Expected Plan
for the Database of Doctoral Graduates

Concept Design

FY2011
April 2011
- March 2012

- Conceptual planning of tracking doctoral graduates
- Start information sharing and coordination with related section and institutions
- Setting up a **committee of experts for building a database of doctoral graduates**
- Investigating tracking surveys in foreign countries.
- Conducting a survey on information collection of HR etc.

subject of the survey：universities and public research institutions in Japan (Total=1575)
Response rate：81.6% (national / municipal university 100%, private university 84.9%)

A committee of experts for DB-DG
The chairman of the committee is Yoshio Higuchi.
(Dean: Faculty of Business and Commerce, Keio University)
The committee comprises of 14 members in FY2012.

- policy-maker for HR • DB expert for HR
- policy-maker for IT • legal expert for personal data
- researcher for HR • Director of career information

Basic Design

FY2012
April 2012
- March 2013

- Start developing of the web-system of the database
- Publishing a report for the plan of the database

(NISTEP Research Material No.216) **System Design for Tracking Doctoral Graduates**
- Background of Database of Doctoral Graduates and Survey of Graduates in Foreign Countries -
http://data.nistep.go.jp/dspace/handle/11035/1175

Today!

- Meetings with stakeholders in universities for the introduction of the web-system of the database
- Worldwide information sharing **"International Symposium on Tracking Careers of Doctoral Graduates"**

Trial and Refining

Plan for
FY2013
April 2013
- March 2014

- Launching a website of the Database of Doctoral Graduates for participating universities/graduate schools
- Setting up meetings for the practical operations and experts committee for the system design of the DB-DG.
- Distribution of IDs to universities and final-year students of doctoral courses.
- Obtaining the feedbacks from universities and students.
- Refining the system by considering feedbacks

Spread

Plan for
FY2014
April 2014
- March 2015

- Trial survey of the first doctoral graduates and obtaining feedbacks
- After coordinating with related sections and institutions, sending request letters to universities.
- Conducting orientation sessions to introduce the system to every doctorate course.

10

International Symposium on Tracking Careers of Doctoral Graduates (February 27, 2013)

What become possible with
the published statistical data alone

With the published statistical data alone, we can easily see the situations of graduates.

Example: Shares of the getting a tenured position five years after graduation

characteristics / course	students didn't apply to an intern program.	students applied to an intern program. And, he/she is rejected	students applied to an intern program. And, he/she is accepted	Total
A university chemistry course	73% (N=22)	75% (N=8)	93% (N=15)	80% (N=45)
B university chemistry course	66% (N=18)	71% (N=7)	83% (N=12)	72% (N=37)
⋮	⋮	⋮	⋮	⋮
chemistry course across the university	65% (N=200)	70% (N=50)	85% (N=110)	69% (N=360)

Such information is important for policy-makers, researchers, directors of universities/courses, (potential) doctoral students, and tax payers.

With reference to the published data,

- Policy-makers and researchers consider/analyze HR and STI policies.
- Directors of universities/courses consider the curriculum and career support.
- (Potential) students consider choosing a course and applying for a program.
- Taxpayers consider the ways tax money is used.

11

International Symposium on Tracking Careers of Doctoral Graduates (February 27, 2013)

The Database of
Doctoral Graduates for Tracking Careers

In order to obtain useful information for policy-making, MEXT/NISTEP have to **track careers of doctoral graduates from a student to an innovative worker.**

NISTEP constructs **the database of doctoral graduates** based on coordinated efforts with related sections and institutions.

The information within the database would be useful

for
- HR and STI policies (e.g. design for financial support and identifying priority fields)
- reforming of curriculum and career support
- considering and choosing a course and applying for a program
- accountability to taxpayers
- Creating a network of students, alumni, universities, and companies

In order to build a worthwhile system for various stakeholders, we would appreciate your advice and support.

International Symposium on Tracking Careers of Doctoral Graduates (February 27, 2013)

12

Mobility of Science and Technology Researchers in Japan

Keiji Saito (ksaito@nistep.go.jp)
Research Unit for SciSIP & 1st Policy-Oriented Research Group,
National Institute of Science and Technology Policy (NISTEP)
Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

Background

Third Science and Technology Basic Plan
(cabinet decision on 18 March 2006)

"From the perspective of improving the mobility of human resources and creating a vibrant research environment, universities and public research institutions are to continue to strive for the extensive establishment of the fixed-term system."
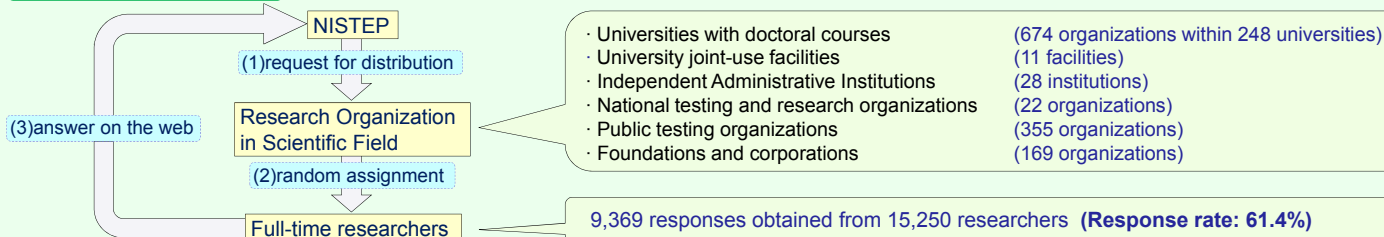
However,
◆ The quantitative data on the mobility of researchers had been insufficient.
◆ The relationship between the mobility and the performance of researchers had been unclear.

➡ **This survey collected the data and analyzed the relationship.**
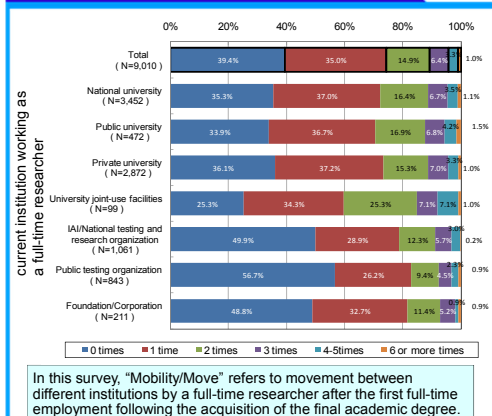
Methodology

NISTEP have conducted sequential survey in November 2008: (1) Survey of Research Organizations, (2) Survey of Securing Human Resources, and (3) Survey of Researchers. This poster illustrates the summary of "(3) Survey of Researchers".
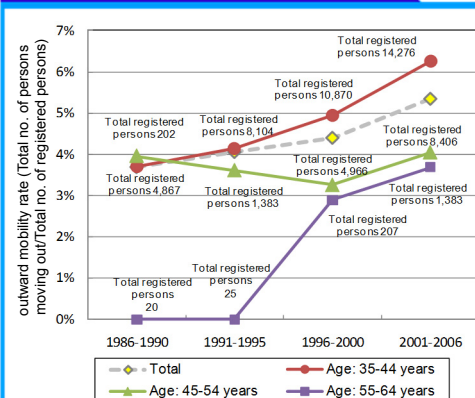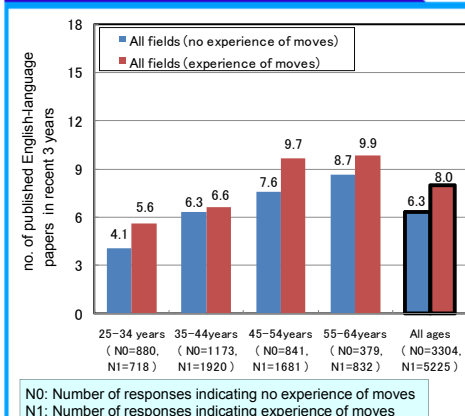
Survey of Researchers

NISTEP
(1) request for distribution
(3) answer on the web
Research Organization in Scientific Field
(2) random assignment
Full-time researchers

- Universities with doctoral courses — (674 organizations within 248 universities)
- University joint-use facilities — (11 facilities)
- Independent Administrative Institutions — (28 institutions)
- National testing and research organizations — (22 organizations)
- Public testing organizations — (355 organizations)
- Foundations and corporations — (169 organizations)

9,369 responses obtained from 15,250 researchers **(Response rate: 61.4%)**

Main Results

[Fig. 1] Number of Moves as A Full-time Researcher by Current Institution

In this survey, "Mobility/Move" refers to movement between different institutions by a full-time researcher after the first full-time employment following the acquisition of the final academic degree.
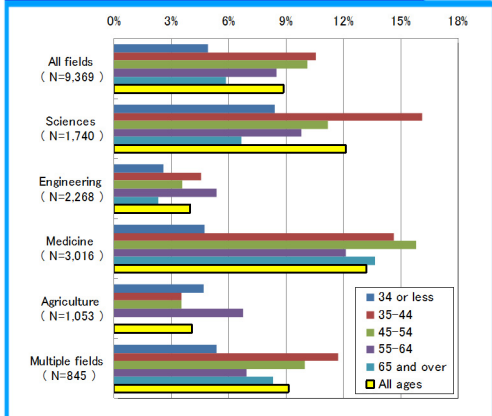
[Fig. 2] Transition of Outward Mobility Rate by Age Group

[Fig. 3] Experience of Moves and Number of English-language Papers

N0: Number of responses indicating no experience of moves
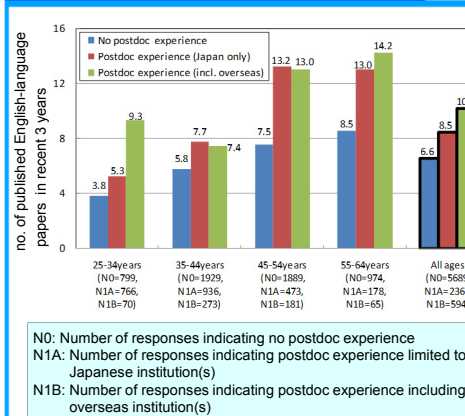N1: Number of responses indicating experience of moves

[Fig. 4] Percentage of Researchers with Overseas Full-time Job Experience

[Fig. 5] Overseas Full-time Job Experience and Number of English-language Papers

N0: Number of responses indicating no overseas full-time job experience
N1: Number of responses indicating overseas full-time job experience
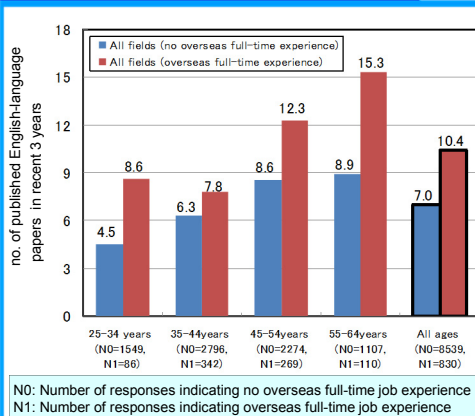
[Fig. 6] Postdoc Experience and Number of English-language Papers

N0: Number of responses indicating no postdoc experience
N1A: Number of responses indicating postdoc experience limited to Japanese institution(s)
N1B: Number of responses indicating postdoc experience including overseas institution(s)

[Fig. 1] Overall, 60.6% of researchers have experience of moves to other research institutions.

[Fig. 2] The overall outward mobility rate increases from 3.7%(1986-1990) to 5.3% (2001-2006).

[Fig. 3] Researchers with moving experience have published 27% more English-language papers on average than researchers without such experience.

[Fig. 4] The percentage of researchers who have experience of overseas full-time job is 8.9%.

[Fig. 5] Researchers with overseas full-time job experience have published 49% more English-language papers on average than researchers without such experience.

[Fig. 6] Researchers with postdoc experience have published more English-language papers on average than researchers without such experience.

An Analysis of the Independence Processes of Researchers in Japan
- academic career paths and research environments -

Keiji Saito (ksaito@nistep.go.jp)

Research Unit for SciSIP & 1st Policy-Oriented Research Group,
National Institute of Science and Technology Policy (NISTEP)
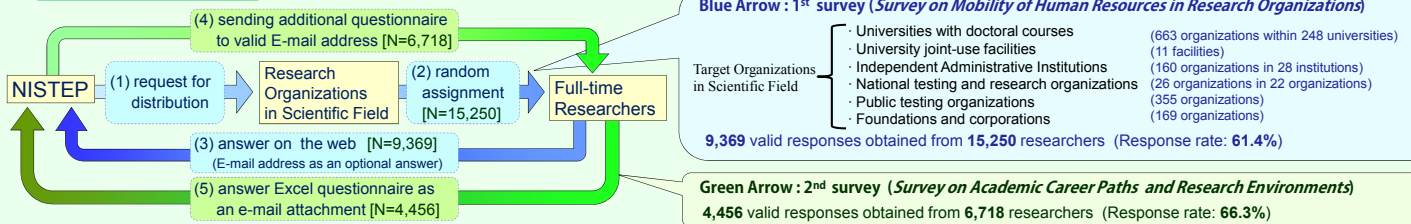Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

Background

The 3rd Science and Technology Basic Plan in Japan (FY2006–FY2010) recommended increasing the mobility of the researchers and the transparency of career paths for an independent researcher. Though we had performed survey on mobility in 2008, internal promotion occupies a high share in the career path of researchers. For this reason, we collected quantitative data of career paths, including internal promotion and research environment. Using the data, we quantitatively assess the independence processes of researchers.
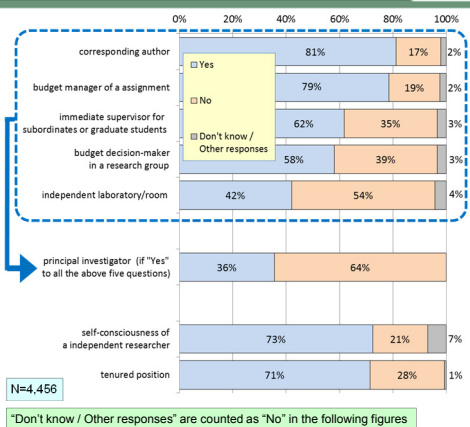
Methodology

Through a survey of researchers in 1,384 scientific research organizations, NISTEP had collected mobility data from 9,369 researchers in 2008. In November 2009, NISTEP sent an additional questionnaire in Excel format to 6,718 of the respondents who answered valid E-mail address in the first questionnaire. The additional questionnaire asked questions related to internal promotions and research environment in each position.
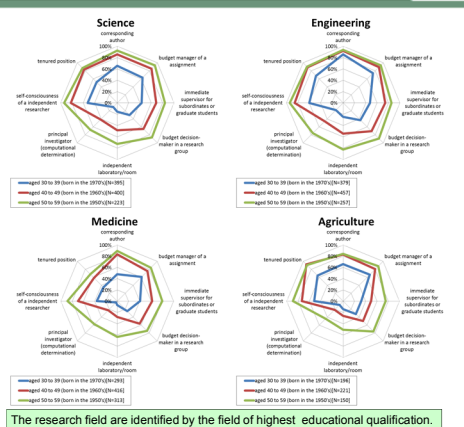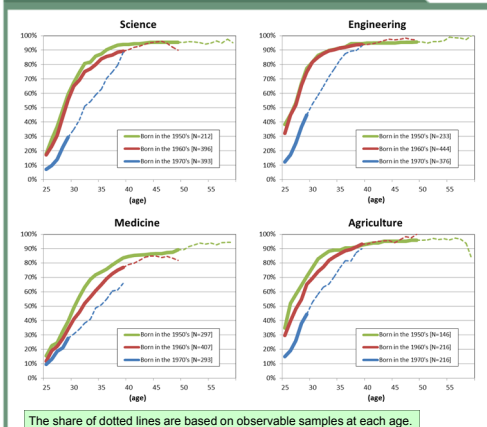
Flow Chart of Surveys

(1) request for distribution
(2) random assignment [N=15,250]
(3) answer on the web [N=9,369] (E-mail address as an optional answer)
(4) sending additional questionnaire to valid E-mail address [N=6,718]
(5) answer Excel questionnaire as an e-mail attachment [N=4,456]

NISTEP → Research Organizations in Scientific Field → Full-time Researchers

Blue Arrow : 1st survey (*Survey on Mobility of Human Resources in Research Organizations*)

Target Organizations in Scientific Field
- Universities with doctoral courses (663 organizations within 248 universities)
- University joint-use facilities (11 facilities)
- Independent Administrative Institutions (160 organizations in 28 institutions)
- National testing and research organizations (26 organizations in 22 organizations)
- Public testing organizations (355 organizations)
- Foundations and corporations (169 organizations)

9,369 valid responses obtained from 15,250 researchers (Response rate: 61.4%)

Green Arrow : 2nd survey (*Survey on Academic Career Paths and Research Environments*)
4,456 valid responses obtained from 6,718 researchers (Response rate: 66.3%)

Main Results

[Fig. 1] Share of Each Aspect of Research Environment in Current Primary Position

(Yes / No / Don't know / Other responses)

- corresponding author: 81% / 17% / 2%
- budget manager of a assignment: 79% / 19% / 2%
- immediate supervisor for subordinates or graduate students: 62% / 35% / 3%
- budget decision-maker in a research group: 58% / 39% / 3%
- independent laboratory/room: 42% / 54% / 4%
- principal investigator (if "Yes" to all the above five questions): 36% / 64%
- self-consciousness of a independent researcher: 73% / 21% / 7%
- tenured position: 71% / 28% / 1%

N=4,456
"Don't know / Other responses" are counted as "No" in the following figures

[Fig. 2] Aspects of Research Environment in Current Primary Position by Research Field

(Science, Engineering, Medicine, Agriculture radar charts)
aged 30 to 39 (born in the 1970's)
aged 40 to 49 (born in the 1960's)
aged 50 to 59 (born in the 1950's)

The research field are identified by the field of highest educational qualification.

[Fig. 3] Cumulative Share of Tenured Positions at Each Age by Generation

(Science, Engineering, Medicine, Agriculture)
Born in the 1950's, Born in the 1960's, Born in the 1970's

The share of dotted lines are based on observable samples at each age.

[Fig. 4] Cumulative Share of PI at Each Age by Generation (Researchers in Universities)

(Science, Engineering, Medicine, Agriculture)
Born in the 1950's, Born in the 1960's, Born in the 1970's

The share of dotted lines are based on observable samples at each age.

[Fig. 5] Age to Become a PI and the Number of Papers (Researchers in Universities)

average no. of published English-language papers in recent 3 years

Total / International joint author / Sole/First author

[Fig.5] is based on Researchers born in the 1950's.

[Fig. 6] Age to Become a PI and Share of the Carrier Path (Researchers in Universities)

Only internal promotion / Moving experience in Japan / Moving experience including overseas institution(s)

[Fig.6] is based on Researchers born in the 1950's.

[Fig. 1] Given the above five criteria to identify Principal Investigator, 36% of researchers are PI.

[Fig. 2] In the engineering field, the share of PI is larger than the other fields.

[Fig. 3] The share of tenured position decrease sharply in the researchers born in 1970's.

[Fig. 4] Except for the engineering field, the younger researchers in universities generally take more time to become a PI.

[Fig. 5] The researchers who had become PI before age 40 have published more English-language papers on average.

[Fig. 6] In the medicine field, researchers who have experience of overseas show a greater chance to become a PI.

Quantitative Analysis of Postdoctoral Fellows in Japan

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Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

Background

In order to promote the development of science and technology, it is important to secure creative human resources. The Japanese government has endeavored to expand the class of young researchers by supporting polices for postdoctoral fellows under the Science and Technology Basic Plans.

However, it has been pointed out that the career paths after postdoctoral fellows are unclear. It is important to understand the actual situations and career paths of postdoctoral fellows. NISTEP has conducted complete surveys of postdoctoral fellows engaged in research activities at universities and public research institutes. The latest survey investigated not only employment statuses in FY 2009, but also those at the beginning of FY2010. Through the additional items of the survey, we can assess the movement of postdoctoral fellows and their next employment statuses.

Methodology

In the survey for FY2009 (employment from April 2009 to March 2010), request letters were distributed to 1,182 public research organizations in Japan. The request letters asked the office of each research organization to download MS-Excel questionnaire in a specified survey website.

We received the completed questionnaires as e-mail attachments. We collected responses including those that replied "There is no Postdoctoral Fellow in our organization." The valid response rate was 100% thanks to consistent efforts to remind participants.

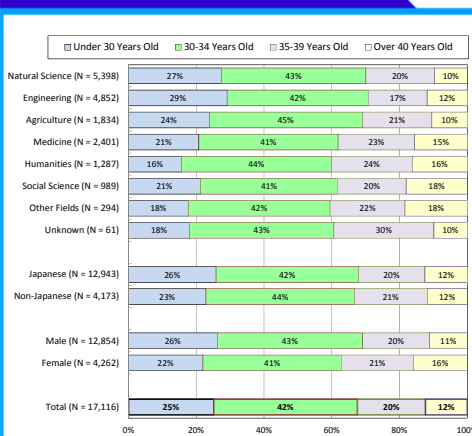| Organizations	No. Sent	Response Rate
Universities	770	100%
National Universities	86	100%
Municipal and Prefectural Universities	79	100%
Private Universities	601	100%
Inter-university Research Institutes	4	100%
Administrative Research Agencies	31	100%
National Research Institutes	31	100%
Municipal and Prefectural Research Institutes	350	100%
Total	**1,182**	**100%**

(1) This survey include persons who have been enrolled in a doctoral course for the required number of years or longer, and who terminated their student status after obtaining the required number of credits (generally referred to as "withdrawal upon obtaining required credits").
(2) As subjects of the survey, "Postdoctoral Fellows" includes cases in which a salary or the like is not paid (i.e., persons not in an employment relationship, but who have been accepted based on internal regulations, etc.).
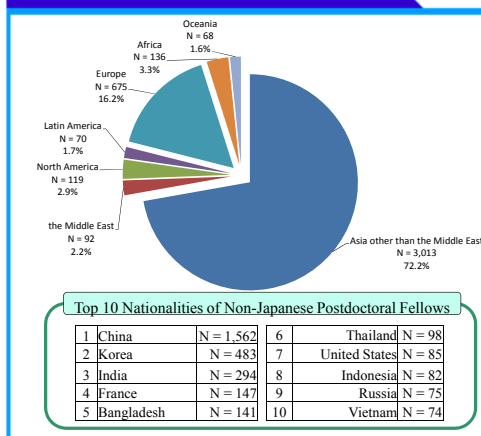
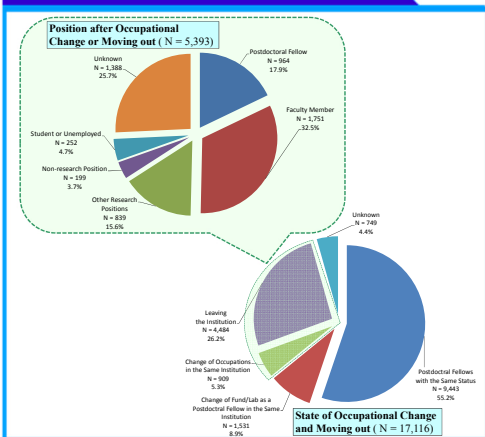## Main Results

[Fig. 1] Breakdown by Research Field
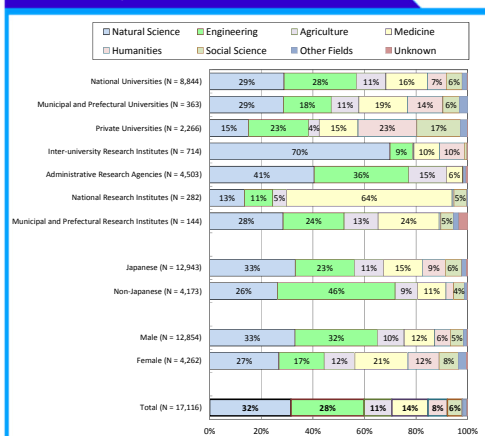
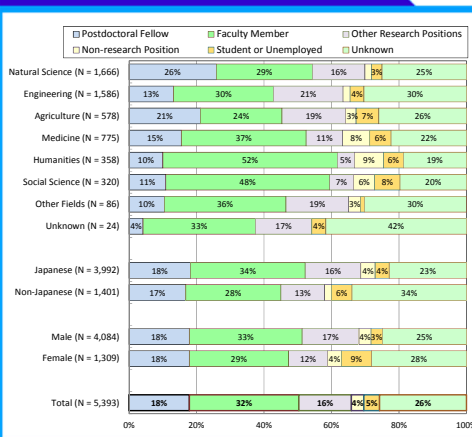[Fig. 2] Breakdown by 5-year Age Group

[Fig. 3] Areas of Nationality of Non-Japanese

Top 10 Nationalities of Non-Japanese Postdoctoral Fellows

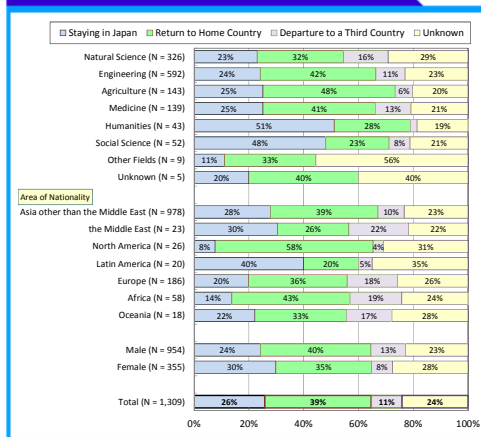| 1	China	N = 1,562	6	Thailand	N = 98
2	Korea	N = 483	7	United States	N = 85
3	India	N = 294	8	Indonesia	N = 82
4	France	N = 147	9	Russia	N = 75
5	Bangladesh	N = 141	10	Vietnam	N = 74

[Fig. 4] State of Occupational Change and Moving out

[Fig. 5] Position after Occupational Change or Moving out by Research Field

[Fig. 6] Location of non-Japanese postdoctoral fellow after Moving out

[Fig. 1] In the breakdown by research field, natural science accounts for the largest share (32%), followed by engineering (28%).

[Fig. 2] In the breakdown by 5-year age group, 30-34 years old accounts for the largest share (42%). The average age of female postdoctoral fellow is higher than that of males.

[Fig. 3] In the breakdown by area of nationality among non-Japanese postdoctoral fellows, Asia other than the Middle East accounts for 72%, followed by Europe (16%).

[Fig. 4] 55% of postdoctoral fellows continued working in the same position at the beginning of the next fiscal year. 26% of postdoctoral fellows left their institution in a fiscal year.

[Fig. 5] Postdoctoral fellows in the natural science field tend to repeat positions. Postdoctoral fellows in the humanities and social science fields tend to become faculty members.

[Fig. 6] After leaving an institution, non-Japanese postdoctoral fellows in the humanities and social science fields tend to stay in Japan.

International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

Session 3:
Tracking Careers of Doctoral Graduates and Utilization of the Data in the US and the UK

Presentation 1
Methods and Analyses of Surveys of Doctorate Recipients
Lynn Milan [National Science Foundation (the US): project officer]

Presentation 2
Revealing the Landscape and Impact of Researchers' Careers
Janet Metcalfe [Vitae (the UK): Chair and Head]

Methods and Analyses of Surveys of Doctorate Recipients

Lynn M. Milan

International Symposium on Tracking Careers of Doctoral Graduates
National Institute of Science and Technology Policy

February 27, 2013

National Science Foundation
National Center for Science and Engineering Statistics (NCSES)
www.nsf.gov/statistics

Presentation Outline

- NCSES and Human Resources Statistics (HRS) program overview
- Survey of Earned Doctorates (SED)
  – Methodology
  – Data usage
- Survey of Doctorate Recipients (SDR)
  – Methodology
  – Data usage
- Data dissemination
- Future step for the SDR

National Center for Science and Engineering Statistics (NCSES)

- NCSES is responsible for statistical data on the following:

  – The science and engineering workforce
  – Research and development (R&D)
  – U.S. competitiveness in science, engineering, technology, and R&D
  – The condition and progress of Science, Technology, Engineering, and Mathematics (STEM) education in the United States

- Mission: Provide information useful to practitioners, researchers, policymakers, and the public

2

Human Resources Statistics Program (HRS): Postsecondary Education & Workforce Data

- Survey of Institutions: Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS)

- Surveys of Individuals
  – **Survey of Earned Doctorates (SED)**
  – **Survey of Doctorate Recipients (SDR)**
  – National Survey of College Graduates (NSCG)
  – National Survey of Recent College Graduates (NSRCG)*

- Scientists and Engineers Statistical Data System (SESTAT) - combines SDR, NSCG, and NSRCG

- Project: Early Career Doctorates Project (ECD)

*Now defunct

3

Survey of Earned Doctorates (SED) Background

- Annual census of new recipients of *research* doctorates from accredited U.S. institutions
  - Research doctorates require an original contribution of knowledge to the field (typically a dissertation); not primarily intended for the practice of a profession

- Survey content: demographics, educational history, financial support, postgraduation plans

- Each year SED data are added to the Doctorate Records File (DRF), a virtually complete database of doctorate recipients from 1920 to the present that includes records of nearly 2 million doctorate recipients

4

SED Data Collection Methodology
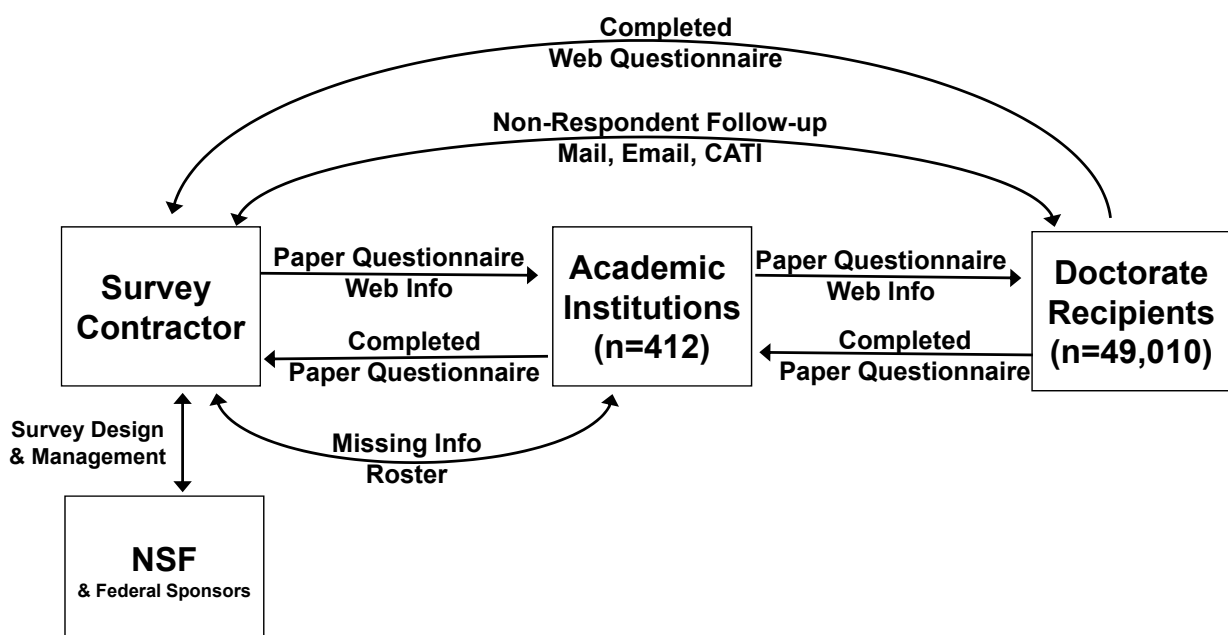
5

2011 SED Response

- 412 institutions conferred ≥1 doctorates between 1 July 2010 – 30 June 2011

- 49,010 records of new doctorate recipients

- 45,502 completed SED questionnaires

- Overall response rate = 93%

- Completions by mode

Mode	2010 SED	2011 SED
Paper questionnaire	70.6%	56.5%
Online survey	27.8%	41.5%
Telephone (CATI)	1.5%	2.0%

6

SED Data Dissemination

- Data tables and reports are available from NCSES

- "Institution Profiles," which compare each institution's doctorate recipients to national and peer group profiles, are sent annually to deans at institutions that participated

- Institution data sets, containing all information on requesting institutions' graduates recorded in the DRF, are distributed upon request

- Special tabulations are produced at cost for external users

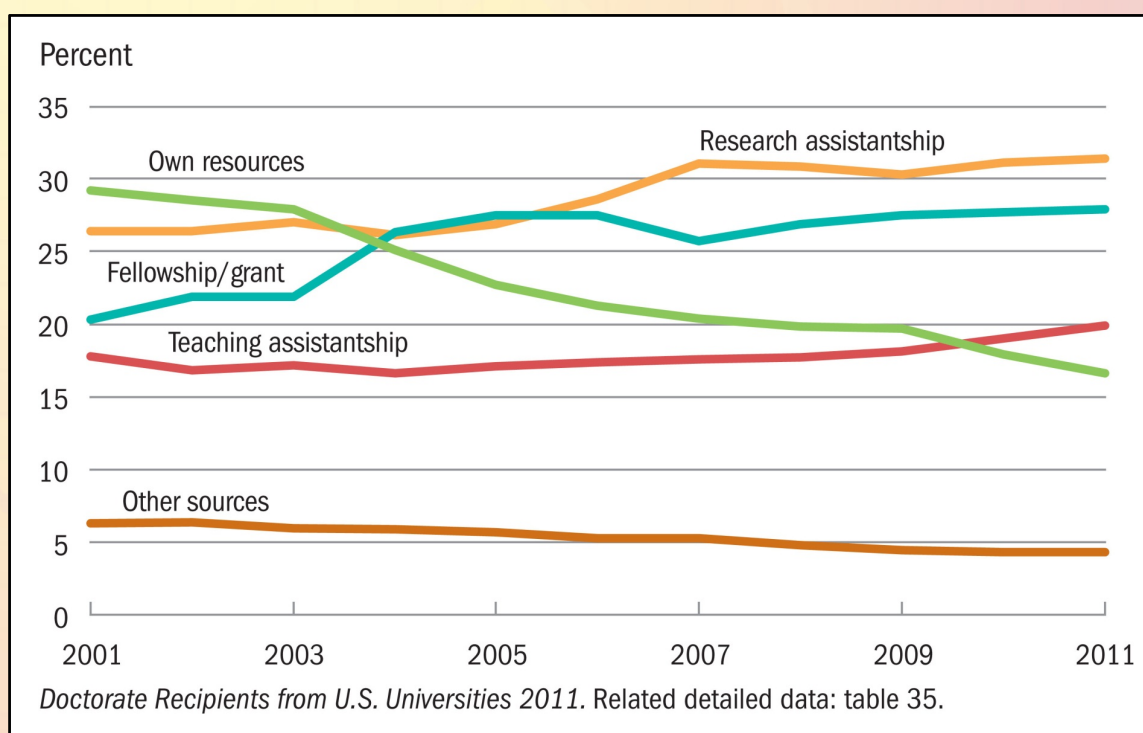- Licensing agreements are made by NSF for detailed analyses

7

Policy/Program Uses of SED Data

- Policy makers: Evaluation of federal programs
  - Graduate and Undergraduate Fellowship, Scholarship, Traineeship, Dissertation, and other programs administered by federal SED sponsors*

- Associations/organizations: Program development
  - Obtaining grants, planning, measuring & reporting progress

- Universities
  - Program development
  - Program comparison (internal and external)
  - Faculty recruiting, doctoral student placement

* National Science Foundation, National Institutes of Health, US Department of Agriculture, Department of Education, National Endowment for the Humanities, National Aeronautics & Space Administration

8

Primary source of financial support: 2001–11

Percent

- Own resources
- Research assistantship
- Fellowship/grant
- Teaching assistantship
- Other sources

Doctorate Recipients from U.S. Universities 2011. Related detailed data: table 35.

Doctorate Recipients from U.S. Universities 2011; www.nsf.gov/statistics/sed/
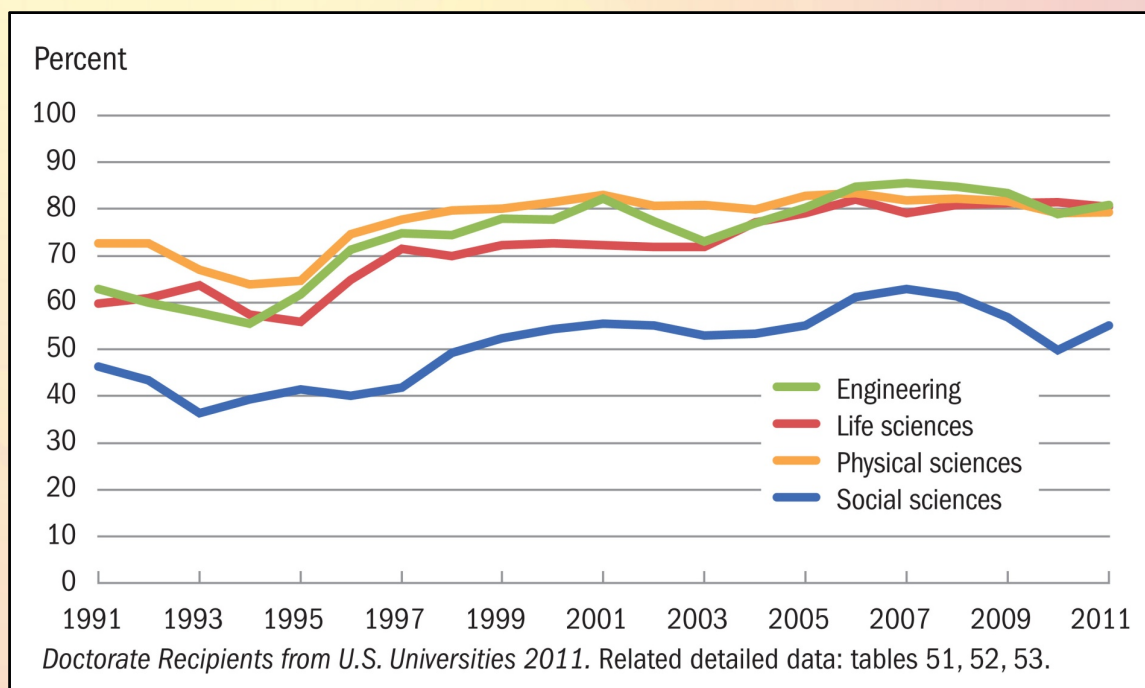
Research Uses of SED Data

SED data items	Recent studies using SED data

• Demographics
• Degree history (type, year, field, institution)
• Financial support during graduate school
• Debt incurred
• Time to degree
• **"Employment plans" for coming year**
  – Postgraduation status (e.g., definite commitment, searching for position)
  – Type of position
  – Type of employer
  – Postgraduation location
  – Primary/secondary work activity
  – Salary
	• Predictors of characteristics of initial postgraduate position
	  – Location decision (within U.S.)
	  – Location decision (U.S. vs. foreign)
	  – Employed position vs. postdoc
	  – Employment sector (academe vs. industry)
	• Predictors of time-to-degree

Stay rate of temporary visa holders with definite U.S. commitments, by science and engineering fields of doctoral study: 1991–2011

Doctorate Recipients from U.S. Universities 2011. Related detailed data: tables 51, 52, 53.

Doctorate Recipients from U.S. Universities 2011; www.nsf.gov/statistics/sed/

NSF Surveys of Doctorate Holders

	Survey of Earned Doctorates (SED)	**Survey of Doctorate Recipients (SDR)**
Survey type	Census	Longitudinal sample survey
Target population	<u>New doctorate recipients</u> at U.S. institutions	<u>U.S. degreed doctorate holders</u> in SEH* fields, age 75 or less
Periodicity	Annual	Biennial
Size	49,010 doctorate recipients (2011)	45,697 doctorate holders (2010)
Response Rate	93%	80%
Inception	1957	1973

* SEH = Science, Engineering, and Health

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SDR Data Collection Methodology
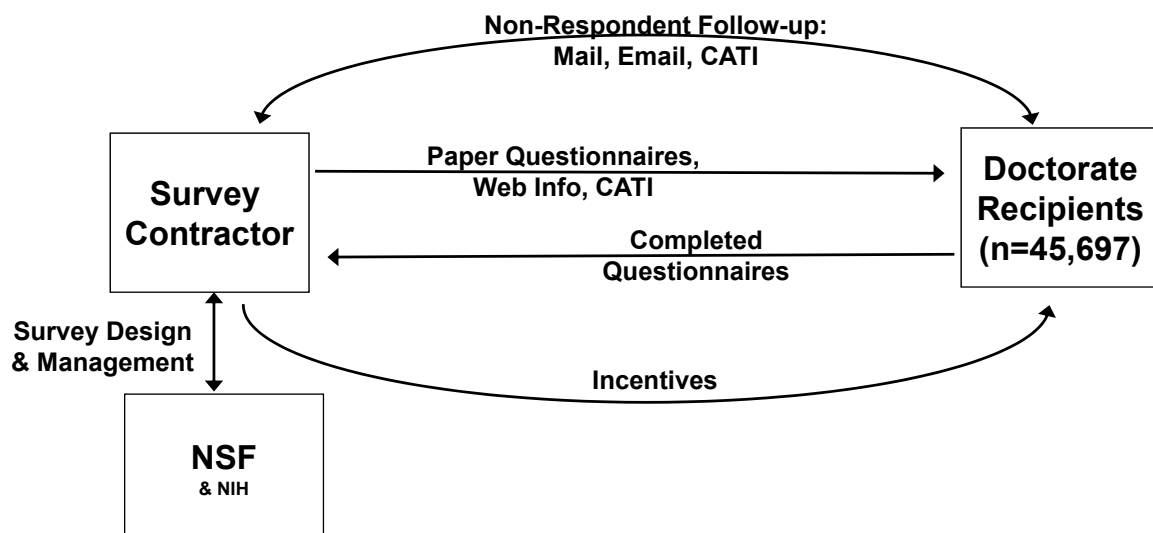
13

National/International SDR (NSDR/ISDR)

- 20th-Century NSDR: Exclusion of non-U.S. residents and undercoverage of non-U.S. citizens

- 2003 SDR tested the feasibility of obtaining surveys from sample members who were living outside the U.S.

- ISDR sample size has been increased each cycle

- 2010 response rate – NSDR: 80%; ISDR: 75%

- Completions by mode

Mode	2008 SDR	2010 SDR
Paper questionnaire	30.9%	26.4%
Online survey	57.5%	62.6%
Telephone (CATI)	11.6%	10.9%

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2008 SDR = NSDR + ISDR
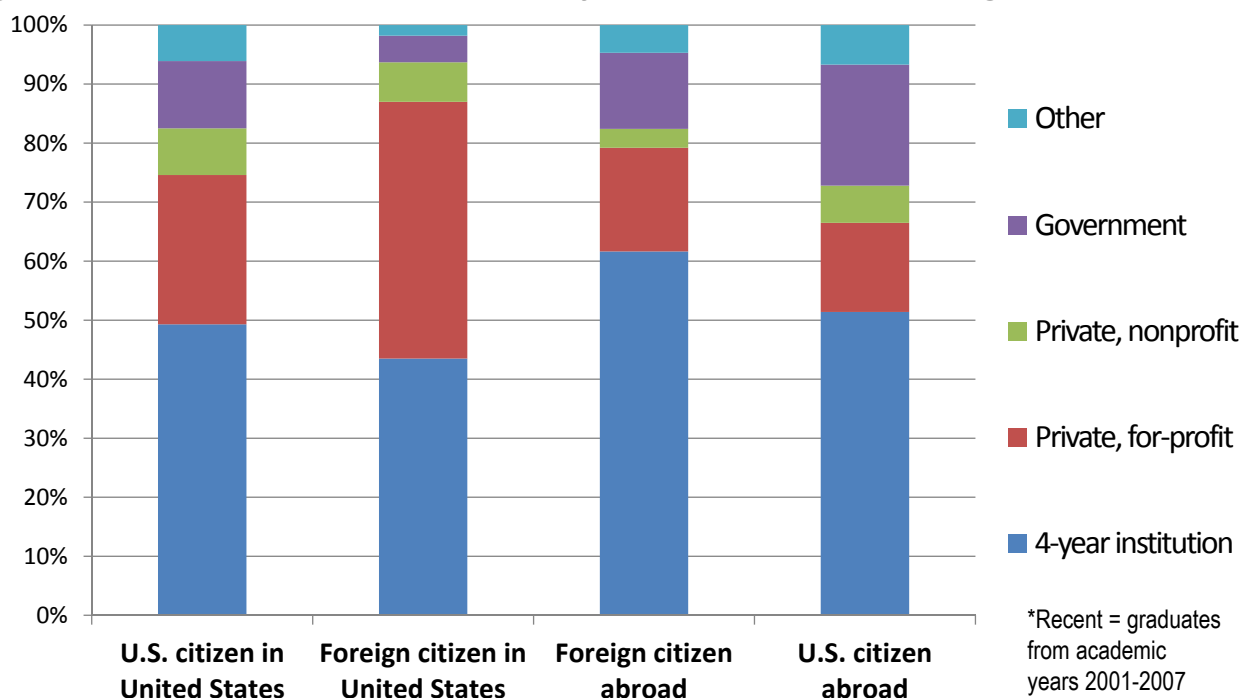
- For the first time provides data on all U.S.-earned doctorate recipients in SEH, whether they resided in or outside of the U.S. on the survey reference date

- Complete coverage exists only for 21st-century doctoral graduates

- Analytic comparisons
  - Popular international destinations
  - Relationship between degree field and emigration
  - Differences in employment characteristics

15

Distribution of employment sector, by citizenship at time of graduation and current residency for recent* doctoral graduates: 2008

Other

Government

Private, nonprofit

Private, for-profit

4-year institution

*Recent = graduates from academic years 2001-2007

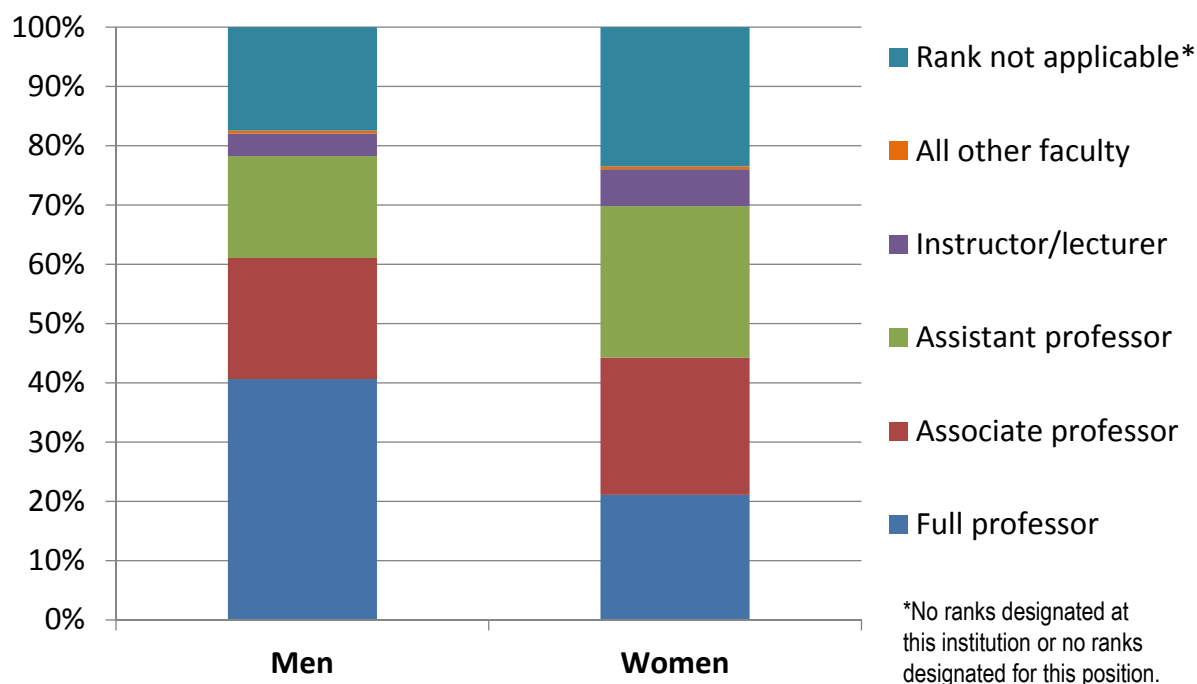Source: NSF/NCSES, Survey of Doctorate Recipients, 2008.

16

Research Uses of SDR Data

SDR data items	Recent studies using SDR data
• Demographics • Recent training, education • **Employment at time of survey:** – Employer type; change since last survey – Occupation; change since last survey – Faculty rank, tenure status – Postdoc status, reasons for holding postdoc – Work activities (primary/secondary) – Relation between job and degree – Job satisfaction – Salary and earned income • **Special Topic Modules** – Number of papers, articles, books authored – Number of patents – Satisfaction with job characteristics (e.g., salary, benefits, intellectual challenge, contribution to society)	• Career choices: – Employment sector (academe vs. industry) – Occupation (research vs. management) • Gender differences: – Career choices – Research productivity – Job satisfaction, salary • U.S.-born vs. foreign-born differences: – Career choices – Research productivity – Job satisfaction, salary • Research productivity differences between doctorate holders with and without postdoc experience

17

Employed doctoral scientists and engineers in 4-year educational institutions, by sex and faculty rank: 2010

Legend:
- Rank not applicable*
- All other faculty
- Instructor/lecturer
- Assistant professor
- Associate professor
- Full professor

*No ranks designated at this institution or no ranks designated for this position.

18

SOURCE: Survey of Doctorate Recipients, 2010.

Median annual salaries of full-time employed doctoral scientists and engineers by employment sector and broad field of doctorate: 2010
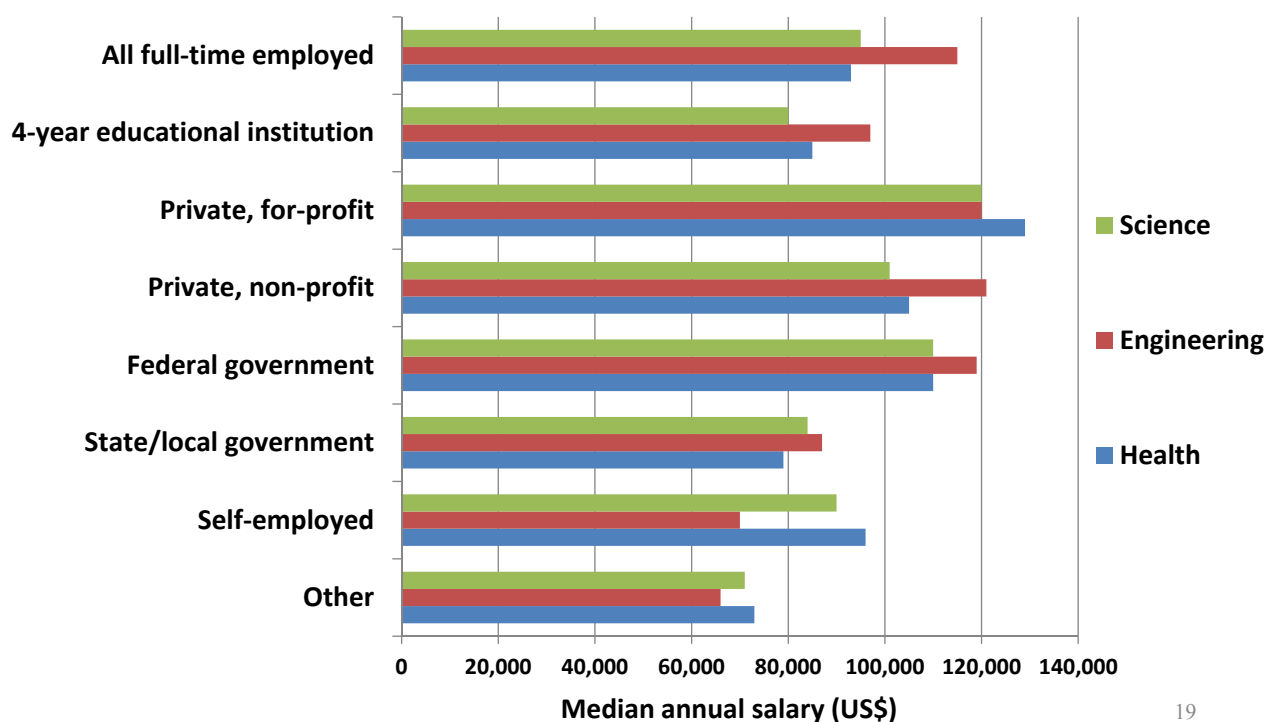
Categories (y-axis):
- All full-time employed
- 4-year educational institution
- Private, for-profit
- Private, non-profit
- Federal government
- State/local government
- Self-employed
- Other

Legend:
- Science
- Engineering
- Health

Median annual salary (US$)

19

SOURCE: Survey of Doctorate Recipients, 2010.

Employed doctoral scientists and engineers engaged in patent-related activities, by broad field of doctorate and employment sector: 2008

Field	4-year educational institution	Other educational institution	Private, for-profit	Private, non-profit	Federal gov't	State/ local gov't	Self-employed
All fields	23.9%	0.5%	**63.7%**	4.0%	4.6%	0.7%	2.8%
Science	26.2%	0.8%	**59.0%**	5.2%	5.4%	0.9%	2.3%
Engineering	19.3%	D	**71.6%**	1.8%	3.4%	D	3.6%
Health	37.5%	D	**62.5%**	D	D	D	D

D = suppressed for confidentiality.

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SOURCE: Survey of Doctorate Recipients, 2008.

Employed doctoral scientists and engineers engaged in publication-related activities, by broad field of doctorate and employment sector: 2008

Field	4-year educ. institution	Other educ. institution	Private for-profit	Private non-profit	Federal gov't	State/ local gov't	Self-employed	Other
All fields	**51.1%**	2.1%	27.0%	6.6%	7.3%	2.2%	3.5%	0.2%
Science	**54.3%**	2.5%	22.5%	7.1%	7.4%	2.3%	3.7%	0.3%
Engineering	33.6%	0.5%	**50.3%**	3.5%	7.0%	1.7%	3.1%	D
Health	**60.7%**	2.1%	16.5%	9.5%	6.2%	2.9%	1.7%	D

D = suppressed for confidentiality.

21

SOURCE: Survey of Doctorate Recipients, 2008.

Importance of and satisfaction with job factors by doctoral scientists and engineers: 2010

Job Factors	% Very Important	% Very Satisfied		
		Job closely related to degree	Job somewhat related to degree	Job not related to degree
Intellectual challenge	**74.9%**	**58.9%**	**44.9%**	**39.3%**
Degree of independence	69.0%			
Contribution to society	56.1%	58.2%	45.6%	42.2%
Job location	55.6%			
Job security	55.0%	48.7%	38.9%	39.6%
Benefits	54.3%			
Salary	**49.1%**	**30.6%**	**31.5%**	**36.1%**
Level of responsibility	46.5%			
Opportunities for advancement	40.6%	28.2%	23.1%	26.1%

SOURCE: Survey of Doctorate Recipients, 2010.

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SED & SDR Data Dissemination

- Congressionally mandated reports – *Science and Engineering Indicators*; *Women, Minorities, and Persons with Disabilities in Science and Engineering*

- InfoBriefs - highlight results from recent surveys or analyses

- Detailed Statistical Tables (DSTs) - standard tabulations (electronic only)

- Online databases: SED Tabulation Engine, WebCASPAR, SESTAT Data Tool table generator

- Downloadable public-use data files

- Restricted-use data files with a license

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SDR Future Steps: Flow Processing
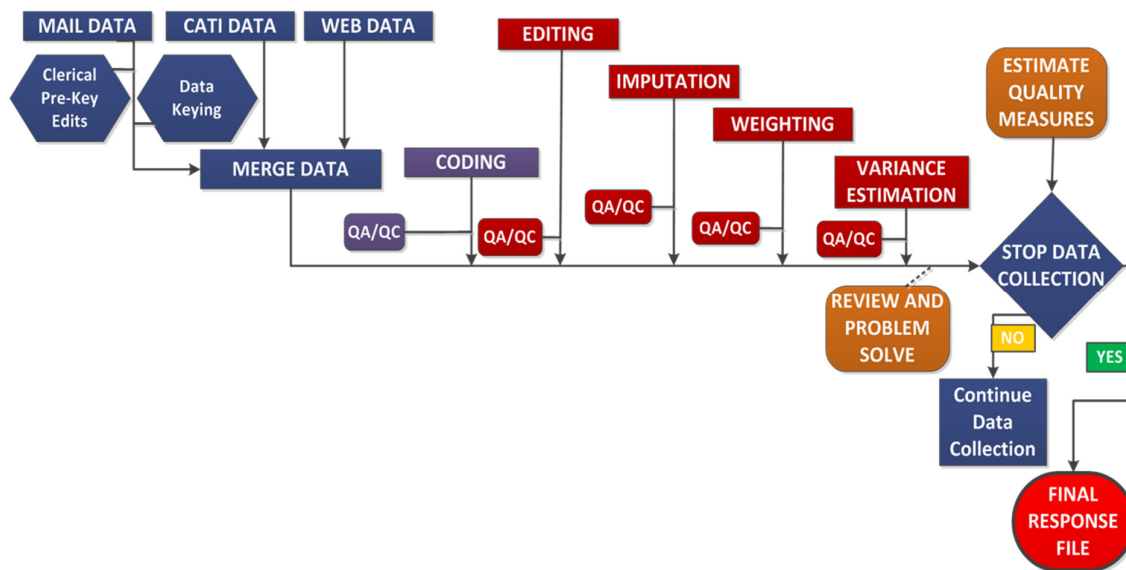
For further information,

Visit http://www.nsf.gov/statistics/

Or contact:

Lynn Milan, Ph.D.
SDR Project Officer
Email: **lmilan@nsf.gov**

International Symposium on Tracking Careers of Doctoral Graduates

Revealing the landscape and impact of researchers' careers

Janet Metcalfe, Chair and Head, Vitae

www.vitae.ac.uk

Vitae is supported by Research Councils UK (RCUK),
managed by CRAC: The Career Development Organisation
and delivered in partnership with regional Hub host universities

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- Vitae
- Why track researcher careers
- Career motivations of researchers
- Career destinations and pathways
- Impact of doctoral training and doctoral graduates
- Prospective researcher career projects

www.vitae.ac.uk

Vitae vision and aims

'to lead world-class professional and career development of researchers'

- **Build human capital** by influencing the development and implementation of effective policy relating to researcher development
- **Enhance higher education provision** to train and develop researchers
- **Empower researchers** to make an impact in their careers
- **Evidence the impact** of professional and career development support for researchers

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Why track careers?

- Information
  - Career paths and trends
  - Inform career choices
  - Attract potential researchers and promote institution
- Evaluation and enhancement
  - Inform provision of research degrees
  - Understand career choices and transitions
  - Employability and preparedness for careers
- Value and impact of doctoral training
  - Supply and demand
  - Review funding models
  - Role in innovation, knowledge exchange and organisations

UK researcher career data

- **Destinations of leavers in higher education (DLHE)**
  - Annual census 6 months after graduation
  - UK and EU domiciled
  - Surveyed by HEIs, collated on UK level
- **Longitudinal DLHE**
  - Annual 3 year follow-up of DLHE respondents
  - Surveyed at UK level
- **RCUK cohort study**
  - 3 year follow-up of L DLHE to explore impact further (6 years)
 - Gathering career stories
  - Employer and researcher interviews

Understanding researchers' careers

- **What do researchers do?**
  - What do researchers want to do?
  - First destinations by subject
  - Career profiles and video narratives
  - Destinations and impact three years on
  - Career paths of doctoral graduates
  - Career and salary progression
- **Researcher experience**
  - Postgraduate Research Experience Survey (PRES)
  - Careers in Research Online Survey (CROS)
- **Understanding employers' needs**
  - Employers' views of researchers' skills
  - targeting the postgraduate and researcher market
  - researchers' skills and competencies

Career motivations:
What do researchers want to do?

- One-off survey of current researchers: 4,500 responses
- Motivation for undertaking doctorate
- Strength of career ideas
- Occupational intentions
- Need for doctoral qualification
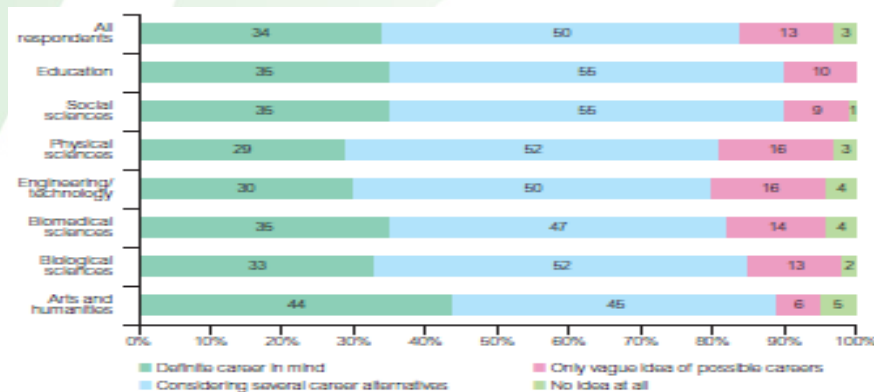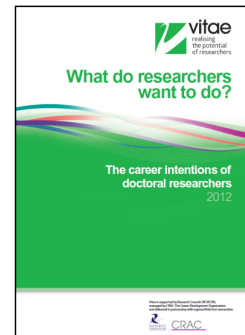
- Definite idea
- Considering several options
- Only vague idea
- No idea

Main motivation for research degree

My interest in the subject	36.9%
Improving my career prospects for an academic/research career	30.5%
It felt like a natural step for me	12.7%
Improving my career prospects outside of an academic/research career	8.4%
I was encouraged by a former academic tutor/supervisor	4.5%
The funding was available	3.1%
Other	2.6%
I felt inspired to work with a particular academic	1.4%

Anticipated career

Career	Percentage
Academic career in higher education ...	44.3%
Research career outside higher education ...	14.7%
Research career in higher education	13.4%
Any other professional career	10.7%
Other	7.9%
Returning to or remaining with your employer who is sponsoring your degree	4.2%
Self-employment (including setting up own business)	3.5%
Teaching (at a level below higher education)	1.2%

What do researchers do?
First destinations by subject

Subject	Percentage
Education	47.8%
Finance, business and IT	9.1%
Health & Social Work	15.5%
Manufacturing	16.3%
Public administration	5.7%
Other Sectors	5.7%

- 2003 - 2007 doctoral graduates
- 24,780 respondents
- 65-70% response rate
- 30 subjects and 6 combined 'others'

What do researchers do?
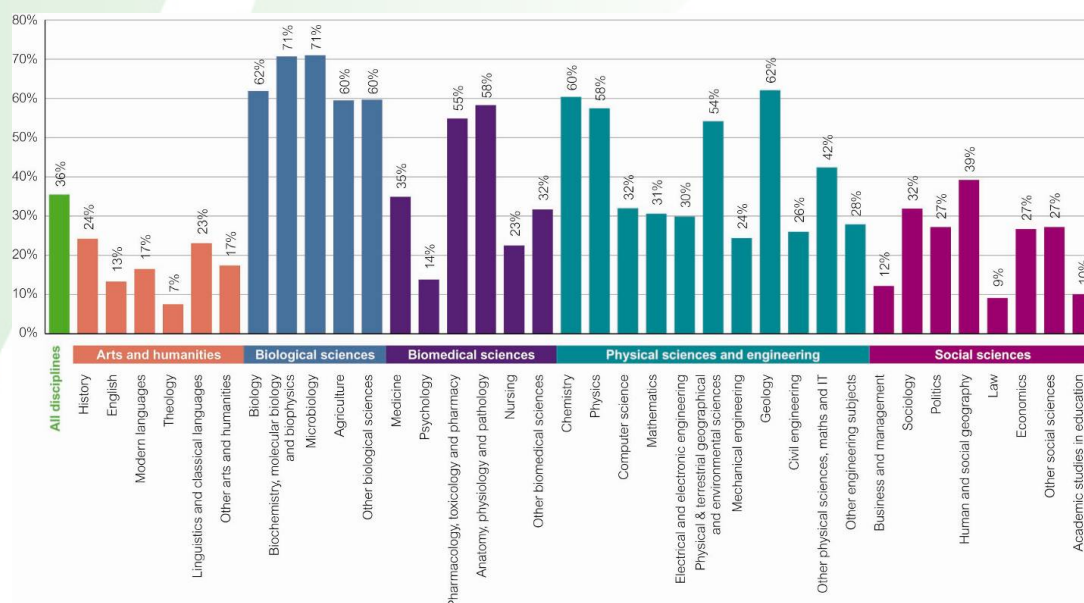
First destinations of doctoral graduates by subject

Analysis of first employment destinations of doctoral graduates 2003-2007 from UK universities by discipline and subject

Doctoral destinations by occupation

- Information Technology Professionals 2.7%
- Arts, Design, Culture and Sports Professionals 2.0%
- Business and Financial Professionals 5.0%
- Social & Welfare Professionals 8.6%
- Education Professionals 21.1%
- Other Professionals 23.7%
- Health Professionals 6.1%
- Engineering Professional 3.5%
- Other Occupations 3.3%
- Scientific Professionals 17.4%
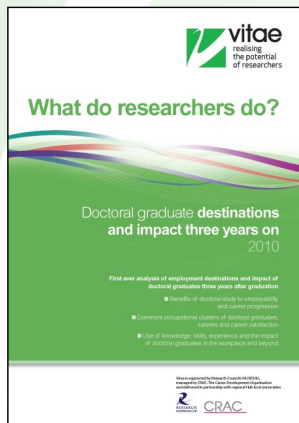- Commercial, Industrial and Public Sector Managers 6.4%

Employed in research roles: 35% overall

Varies from 7% (theology) to 71% (some biological subjects)

WDRD? Destinations and impact three years on

- 2004/05 doctoral graduates
- Surveyed Nov 2008
- UK and EU domiciled
- 51% female
- 45% response rate (L DLHE)
- 5 disciplinary groups

- Experience of research degree programme
- Employability
- Career satisfaction
- Value and impact of the doctorate

---

WDRD? Destinations and impact three years on

Employability

- Employment circumstances (2% unemployed)
- Value of the doctorate (82% requirement or important)
- Contract/mode of work (54% have changed jobs)
- Median annual salary (£34,000 cf £25,000 B)
- Satisfaction with career to date (93%)
- Unique doctoral occupations (86% in 5 clusters)
  - HE research
  - Research not in HE sector
  - Teaching and lecturing in HE
  - Other teaching occupations
  - Other common doctoral occupations
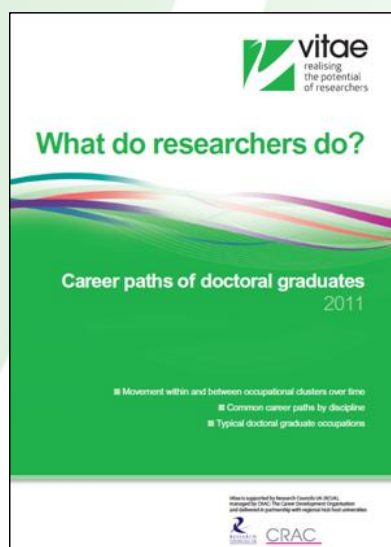 - Other occupations

WDRD? Destinations and impact three years on
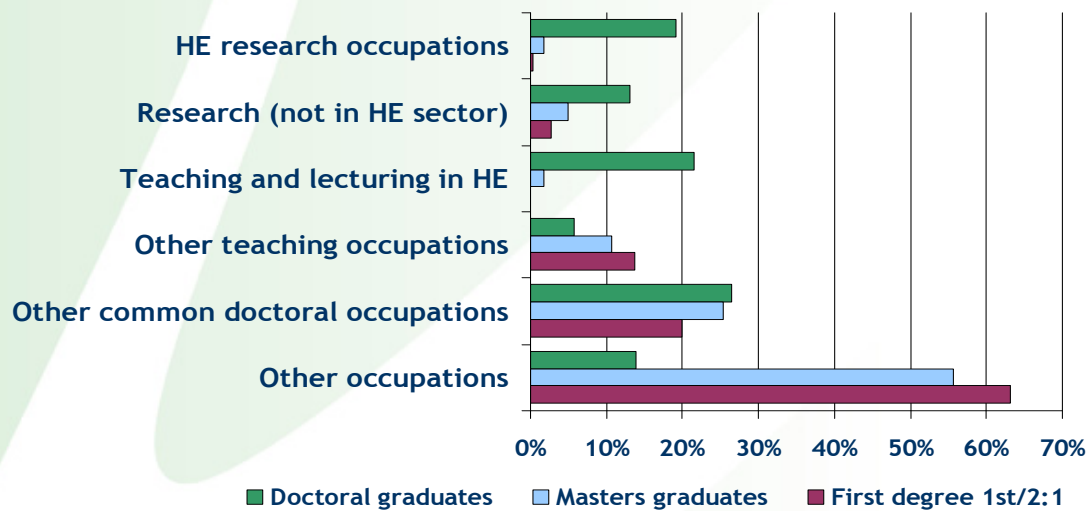
'My doctorate changed my life. It opened doors, and it also opened my mind. I take on challenges now, in my life and my career, because I have faith in my own abilities.'

Cora Beth Knowles (Latin literature), Open University

What do researchers do?
Career pathways of doctoral graduates

- 2008 L DLHE data
- Career progression over 3 years
- Mobility within and between occupational clusters
- Common career paths by discipline
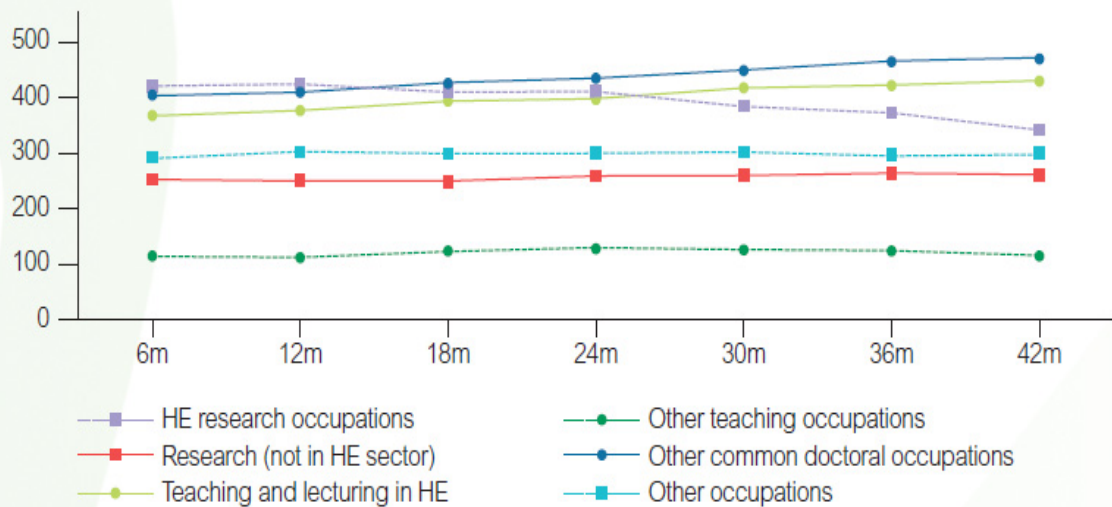- Typical occupations

Overall cluster movement

Figure 2.1 Occupational clusters over time for all employed respondents (N=1855)

Doctoral graduate career pathways

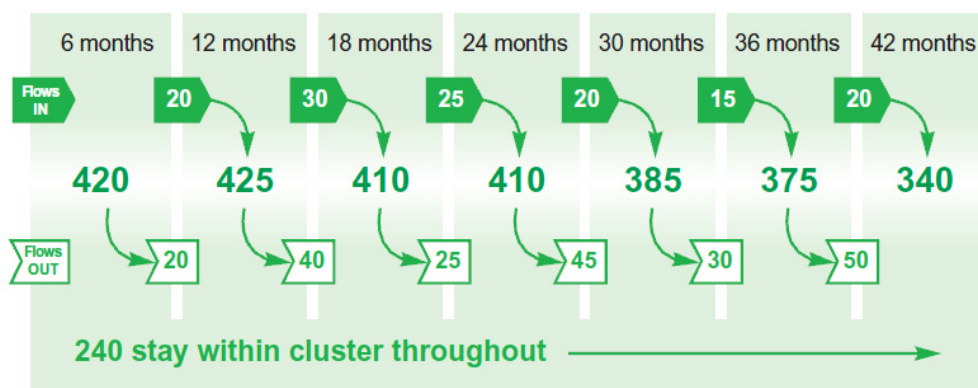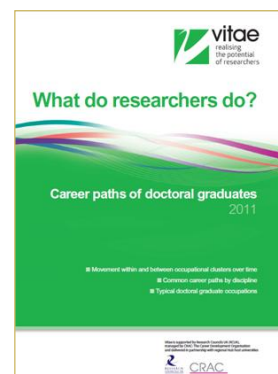## Mobility of researchers in higher education

Figure 2.3 HE research occupations: movements in and out of cluster
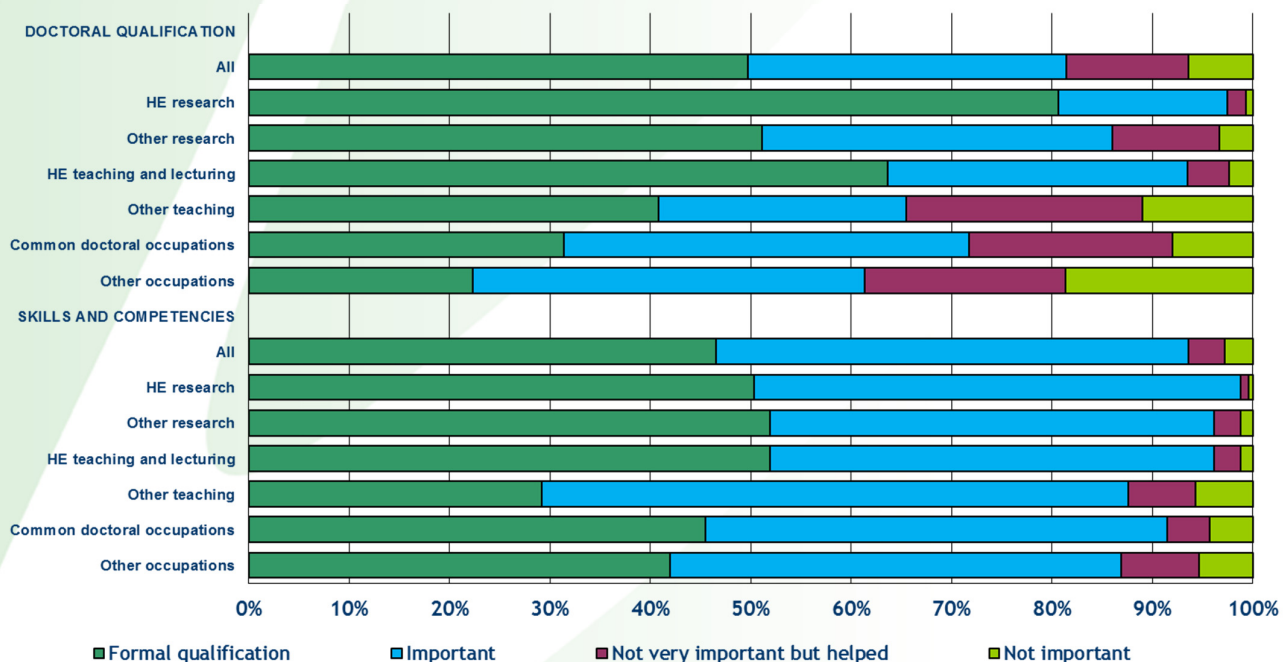
40% move out; 26% move in

Value and impact of the doctorate

- ## Impact of the doctorate
  - Use of knowledge, skills and experience (research skills 82%; generic skills (91%)
  - Make a difference in the workplace / innovation (94%)
  - Access to, and progress, towards long term career aspirations (87%)
  - Enhance social and intellectual capabilities and quality of life (89%)

- Undertaking research (40% most of the time)
- Use of research (82%) and generic skills (91%)
- Impact on employment (94%) and beyond (89%)
- Unique doctoral occupations

Importance of doctorate, skills and competencies for current employment

DOCTORAL QUALIFICATION
All
HE research
Other research
HE teaching and lecturing
Other teaching
Common doctoral occupations
Other occupations
SKILLS AND COMPETENCIES
All
HE research
Other research
HE teaching and lecturing
Other teaching
Common doctoral occupations
Other occupations

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

■ Formal qualification ■ Important ■ Not very important but helped ■ Not important

ies

Conducting research and use of generic skills
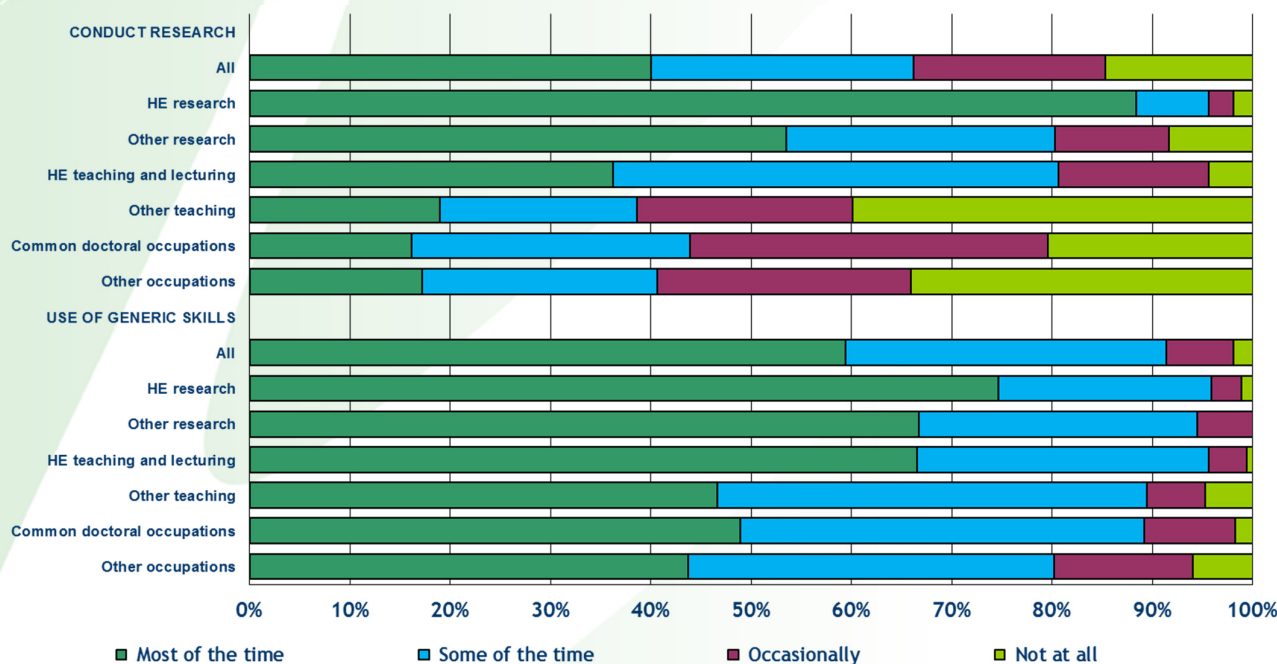
Use of knowledge, skills and experience
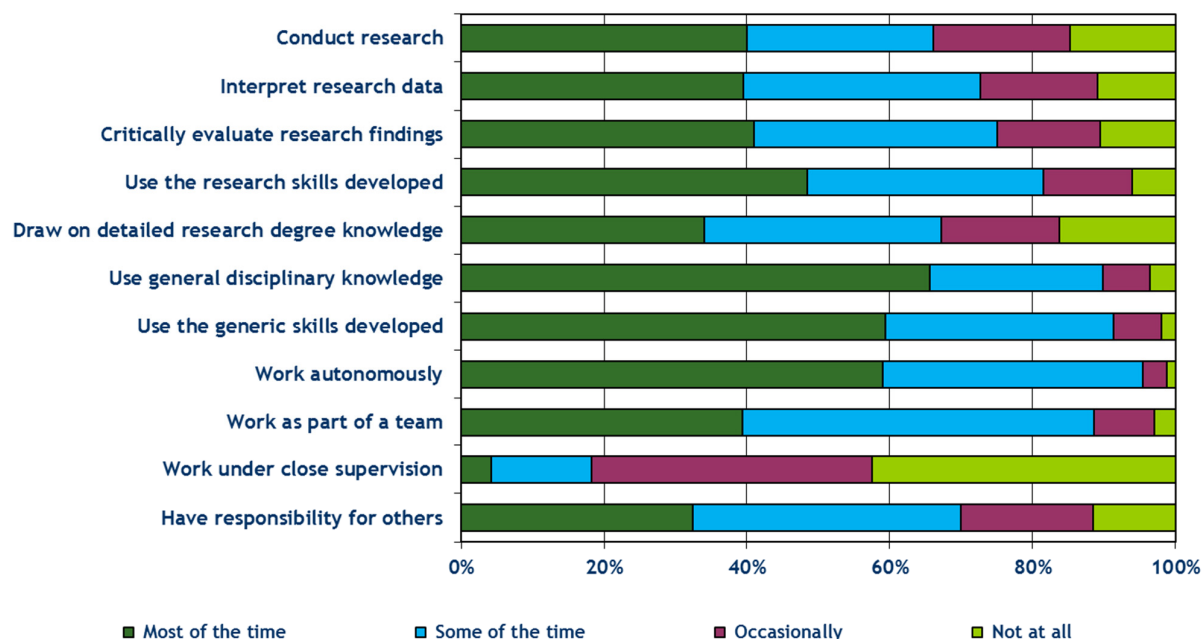
Benefits and wider impact of doctoral experience in work and lives

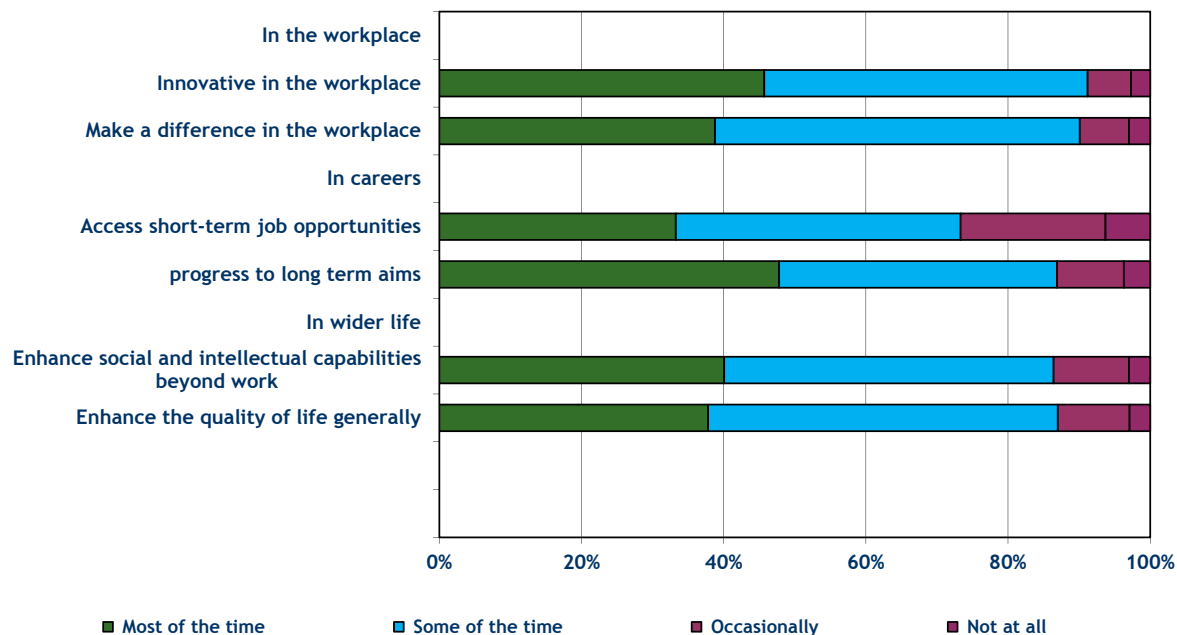Chart categories (y-axis):
- In the workplace
- Innovative in the workplace
- Make a difference in the workplace
- In careers
- Access short-term job opportunities
- progress to long term aims
- In wider life
- Enhance social and intellectual capabilities beyond work
- Enhance the quality of life generally

X-axis: 0% 20% 40% 60% 80% 100%

Legend: ■ Most of the time ■ Some of the time ■ Occasionally ■ Not at all

---

What do researchers do? 2013
Early career progression and salaries compared to other degree qualifications

vitae
realising the potential of researchers

Incorporating the UK GRAD Programme and UKHERD

What do researchers do?
2013

Vitae is supported by Research Councils UK (RCUK), managed by CRAC: The Career Development Organisation and delivered in partnership with regional Hub host universities

- Comparison of 2008 and 2010 L DLHE
- Comparison of doctoral, masters and good first degrees

- Doctoral graduates more recession proof than masters and first degree
- Arts and humanities most affected
- HE research better paid than non-HE research
- Strong consistent evidence of impact of the doctorate

RCUK Cohort study
Doctoral impact and career tracking study

- Objectives
  - Difference doctoral graduates are making to the workplace
  - Extent doctoral graduates drive innovation and growth, particularly outside academia
  - Career information for researchers
- Methodology
  - Three cohorts ~7 years after graduation (2004 - 2006)
  - Link back to Student Record, DLHE and L DLHE
  - Track through institutional alumni offices and supervisors
  - Survey in 2013
  - 200 qualitative interviews with doctoral graduates and employers
  - Develop impact framework
  - Maintain researcher panel for future tracking

EPSRC impact model

86 research-intensive organisations

Improved competitiveness: 83%

Integral to commercial success: 60%

Impact on organisation
- Individuals' skills 87%
- Technical expertise 83%
- innovative/creative thinking 75%
- Problem solving/ trouble shooting 68%
-

Most highly rated skills
- Problem solving 75%
- Research skills/methods 63%
- Communication 59%
- Data analysis 56%

Employers' expectation of researchers performance (high and very high)

	Group 1	Group 2	Group 3	Group 4
Data analysis	100%	100%	91%	91%
Problem Solving	100%	88%	89%	83%
Drive and Motivation	100%	84%	59%	74%
Project Management	83%	36%	70%	39%
Interpersonal Skills	67%	56%	39%	26%
Leadership	67%	28%	24%	17%
Commercial awareness	50%	20%	28%	22%
Overall	**81%**	**59%**	**57%**	**50%**

Employer categories

Group 1: actively target doctorates

Group 2: strong interest

Group 3: some interest, occasionally recruit

Group 4: no interest
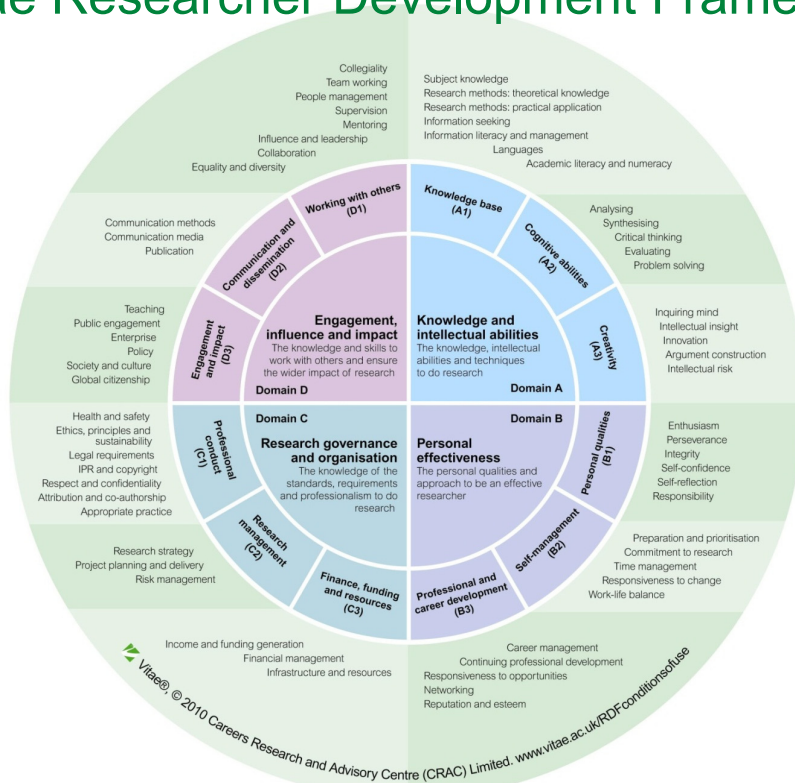
Recruiting researchers, Vitae 2009,

104 employers

www.vitae.ac.uk

Labour market information and career stories

Vitae Researcher Development Framework

- Framework of the knowledge, behaviour and attributes of successful researchers
- Enables self-assessment of strengths and areas for further development
- Common language for researchers capabilities
- Endorsed by 33 UK organisations
- Trialled in US, Europe

www.vitae.ac.uk

Employability lens on the RDF

Team working
People management
Influence and leadership
Collaboration

Communication

Enterprise

Project planning and delivery

Financial management

Subject knowledge
Research methods
Languages

Analysing
Critical thinking
Problem solving

Inquiring mind
Intellectual insight
Innovation

Time management
Responsiveness to change

Enthusiasm
Perseverance
Self confidence
Responsibility

Continuing professional development
Networking

www.vitae.ac.uk

Understanding researcher careers

www.vitae.ac.uk

Useful links

Vitae: www.vitae.ac.uk

What do researchers do? www.vitae.ac.uk/wdrd

Labour market information www.vitae.ac.uk/lmi

Impact and evaluation www.vitae.ac.uk/impact

Courses for researchers www.vitae.ac.uk/courses

Researcher Development Framework www.vitae.ac.uk/rdf

Vitae employers www.vitae.ac.uk/employers

janet.metcalfe@vitae.ac.uk

International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

Panel Discussion:
Evidence-Based Human Resource Policies and International Cooperation

Moderator

Toshiyuki (Max) Misu [NISTEP (Japan): Senior Research Fellow]

Presentation

Enhancing Quality of Doctoral Education

Fostering Innovative Leaders for Sustainable Development

Ayao Tsuge [The Japan Federation of Engineering Societies: President]

International Symposium on Tracking Careers of Doctorial Graduates,
Ministry of Education, Japan, 2013.2.27,

Enhancing Quality of Doctoral Education
–Fostering Innovative Leaders for Sustainable Development–
博士課程教育の質の向上を目指して
～持続可能な発展を牽引するイノベーションリーダーの育成を～

Dr. Ayao Tsuge

President, The Japan Federation of Engineering Societies

Member of Science Council of Japan

1

Innovation: Creation of new socio-economic value <u>combining new discovery and inventions coupled with social systems.</u>

The Innovation every country should pursue in the 21st Century

1. National & Regional Sustainable Innovation
2. Global Sustainable Innovation

2

Issue1: To nurture human resources for the sustainable innovation eco-system

Need to enhance higher education including doctorial course based on the design concept of "Integrating education, research and innovation"

Issue2: To build up global sustainable innovation networks

Need to enhance the competence of post-graduates with " Meta-national capability " in higher education including doctorial education

Tracking Careers of Doctorial Graduates should be conducted coupled with these issues and competence the doctorial graduate has.

3

Learning from the Innovation of the Solar Battery

Contribution to the World   **Renewable Energy**

砂漠での発電   地下水の汲み上げ   海水の真水化   ソーラータウン   太陽光発電所   携帯用電源

Creation of Innovation in 21st C.

Application R&D with integration of wide range of science and technology knowledge creation (Sun-shine Pj Japan, 1979)

Incubation of diversified seeds & technologies

Basic Research   Chemical   Knowledge Creation   **Basic Tehnologies**

Nano-Science   Material   Electical Engineering   Micro Machining

Invented at Bell Laboratory USA,1954

4

Lesson learned from the innovation history

___"Science & Technological evolution" and "Integration of various knowledge through Innovation Pipeline Network" connecting academia, industry & government are the key to the sustainable innovation eco-system.

Innovation needs multi-disciplinary PhDs with the base of own speciality!

"Their social mission is to form the Innovation Pipeline Network domestically and globally"

5

Innovation Pipeline Network

Socio-economic Value Creation

Product & Service A

Product C

Product B

Product A'

Service D

Standard

Deregulation

Field Test

Market& Commercial

S&E Value

Derivative Tech.

StageGate 3

R&D

New Project.

Reevaluation of seeds

Application R&D

S&E Value

Open to Other Tech.

Derivative Tech.

StageGate 2

Seeds

Objective Basic Research

Project A

New Project Creation

Project B

Back to Science

S&E Needs

StageGate 1

Acad.Value

Targetting

Fusion

Knowledge Creation

Research Area A

R-Area B

Academic Disciplinary Diversity

Non-linear & Stochastic value creation

Stages of Value Creation

6

By A.Tsuge 2006.11

Difficulty of the Innovation in 21st Century

21st Century: Front Runner

20th Century : Catch up type

Tech. Level

Own Tech.

License

Spectrum of Tech.

Own Tech.

Higher Performance Reliability Mental Satisfaction

Wider Spectrum of Tech.
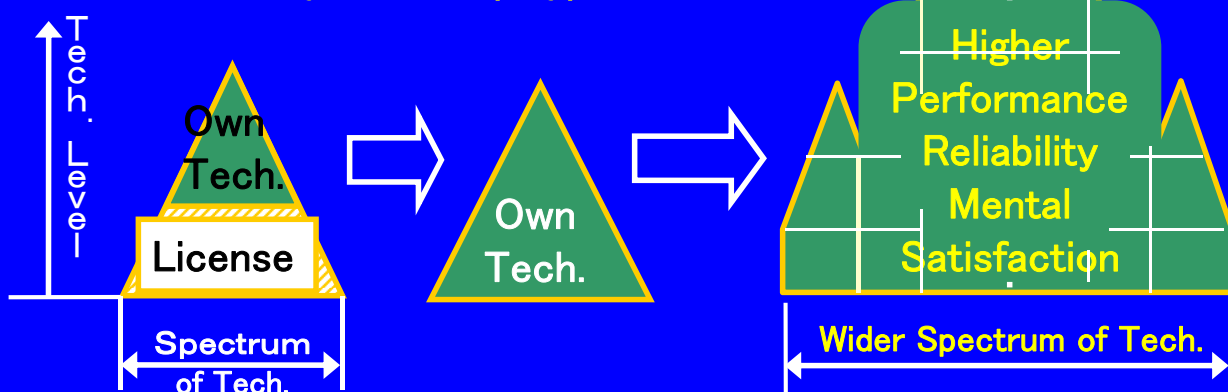
Required Capabilities for Innovation
1.Creation of Knowledge and Core Technology
2. Integration of the knowledge and technologies Creating Socio-economic new Value

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Human Resources Required for the Innovation

Innovation

Required Level of Tech.

Differentiator

Enabler Technologies

Basic Science & Technologies

Required Spectrum of Science & Technology
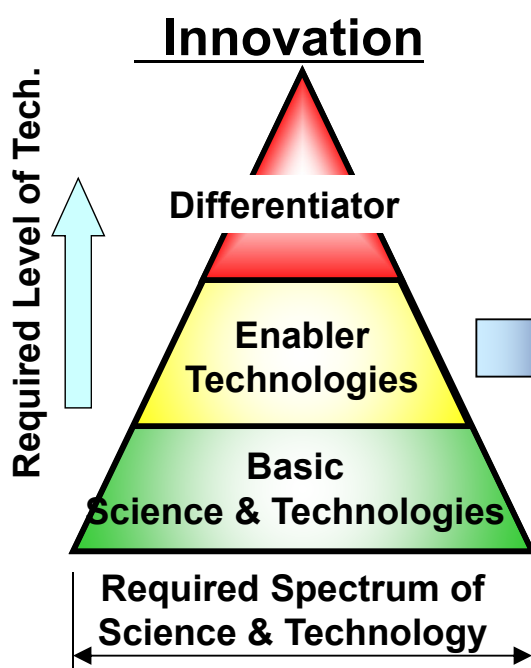
Human Resources should be nurtured

Type-D : Creation of differentiator technology

Type-E : Creation of enabler tech.

Type-B : Basic tech. & skill for high value added manufacturing and services

Type-Σ : Integrator of Innovation structure vertically & horizontally creating socio-economic value

A. TSUGE

Human Resources Creating Innovation Pipeline Network

Socio-economic Value Creation

Stages of Value Creation

Product & Service A
Product A'
Product C
Service D
Product B
Standard
Field Test
Deregulation
Derivative Tech.

Market& Commercial

StageGate 3
S&E Value
R&D
New Project.
S&E Value
StageGate 2
Seeds

Applicat ion R&D

Objective Basic Research

StageGate 1
S&E Needs
Acad.Value
Targetting
Fusion
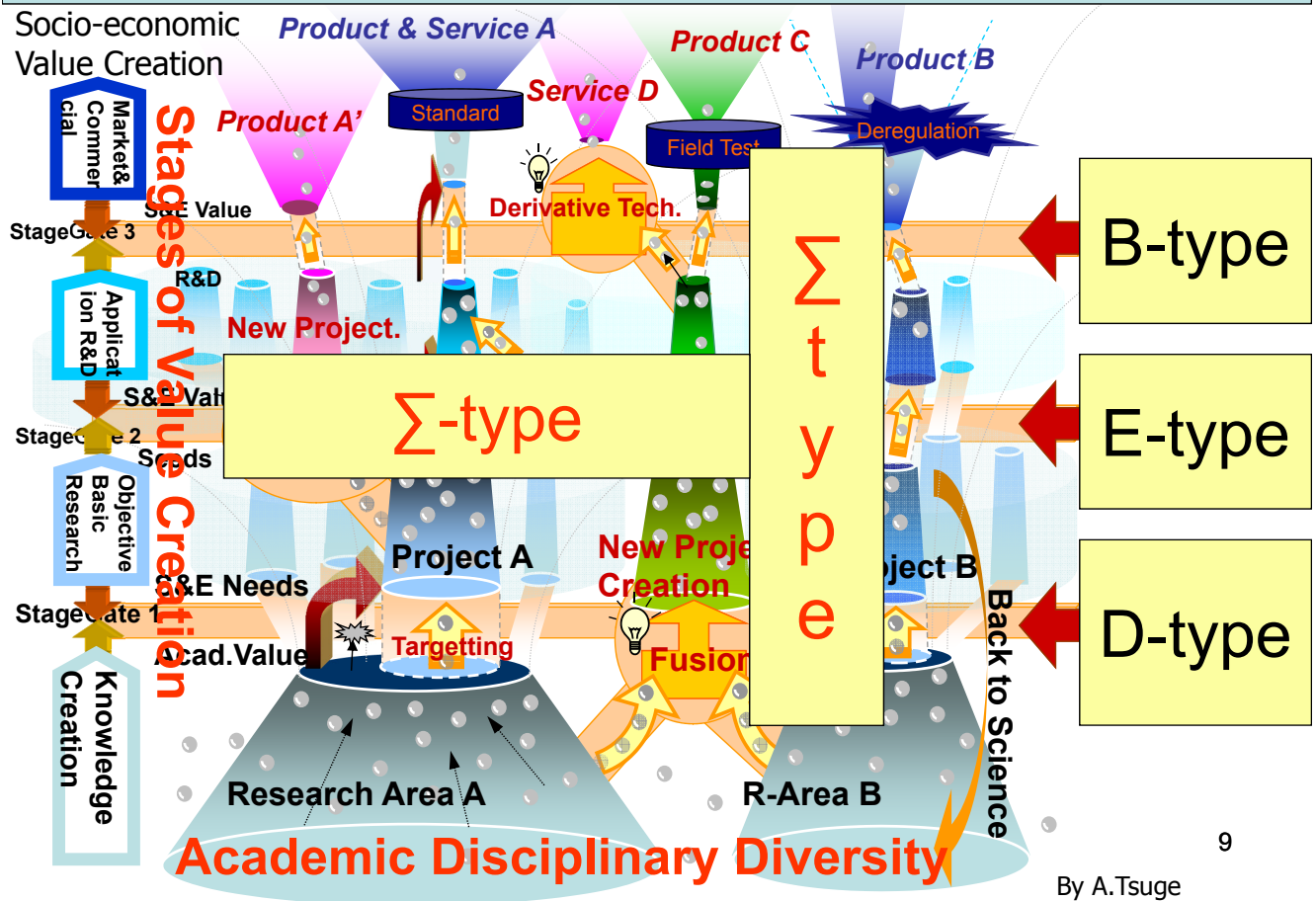New Project Creation
Project A
Project B
Back to Science

Knowledge Creation

Σ-type
Σ t y p e
B-type
E-type
D-type

Research Area A
R-Area B
Academic Disciplinary Diversity

By A.Tsuge
9

Building up Innovation Networks

Socio-economic Value Creation

Stages of Value Creation

Product & Service A
Product A'
Product C
Service D
Product B
Standard
Deregulation
Derivative Tech.

Market& Commercial

StageGate 3
S&E Value
R&D
S&E Value
StageGate 2
Seeds

Applicat ion R&D

Objective Basic Research

StageGate 1
S&E Needs
Acad.Value
Targetting
Fu
New P Crea
Project A
ject B
Back to Science

Knowledge Creation

Network of Trans-disciplinary Value Combination

Network of Academic Value and Socio-economic Value Combination

Σ-Type PhDs have the Mission to be Leader for National & Global Innovation Network

Research Area A
R-Area B
Academic Disciplinary Diversity

By A.Tsuge
10

Σ-type Human Resource is indispensable for the Innovation

Meta-national Capability

(The capability of thinking & acting globally keeping the based on his/her nationality)

Liberal Arts

Σ-Type

Management Capability

Wide Range of S&T competency with own Speciality

Direction of enhancing doctorial education!
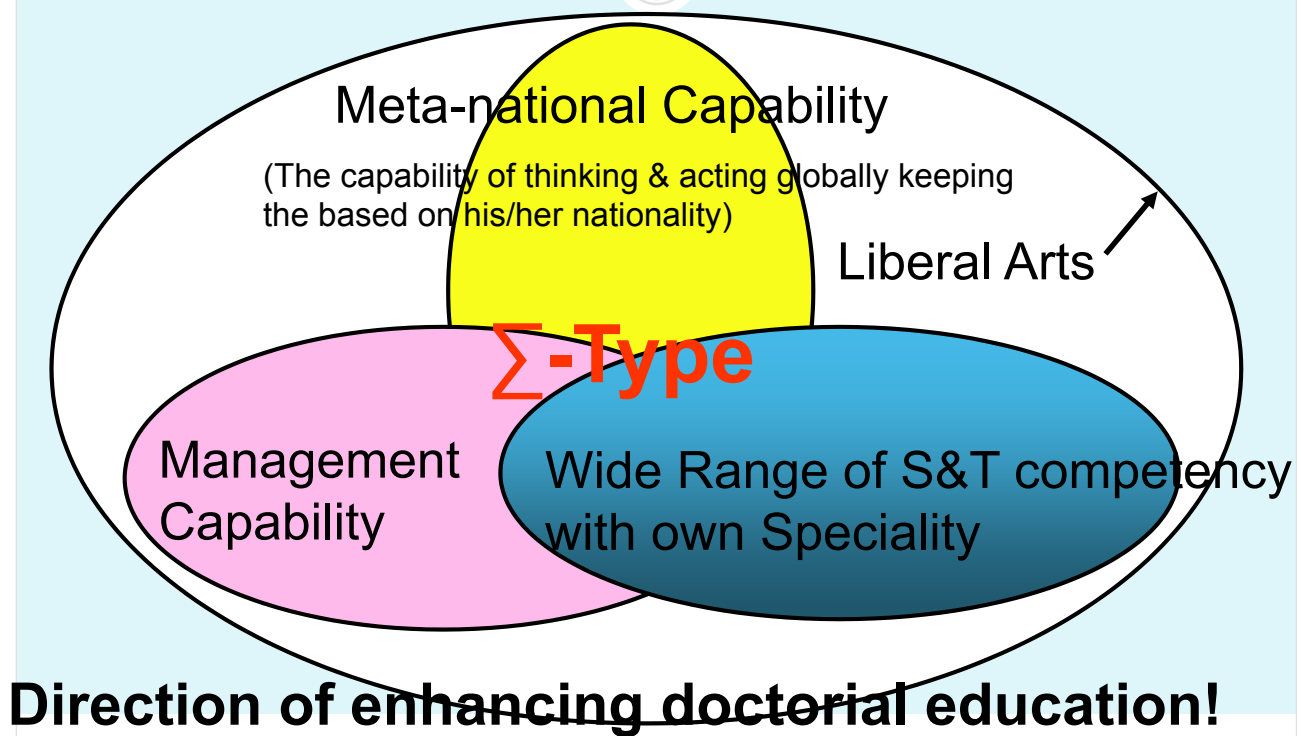
By A. Tsuge

Nurturing Σ-type Capability

PhD has mission to be leader of innovation

Leader of University/Government

Leader of Innovative Industry and Business world

Base-4:Strong commitment to take Leadership either in Academic, Education or Industry
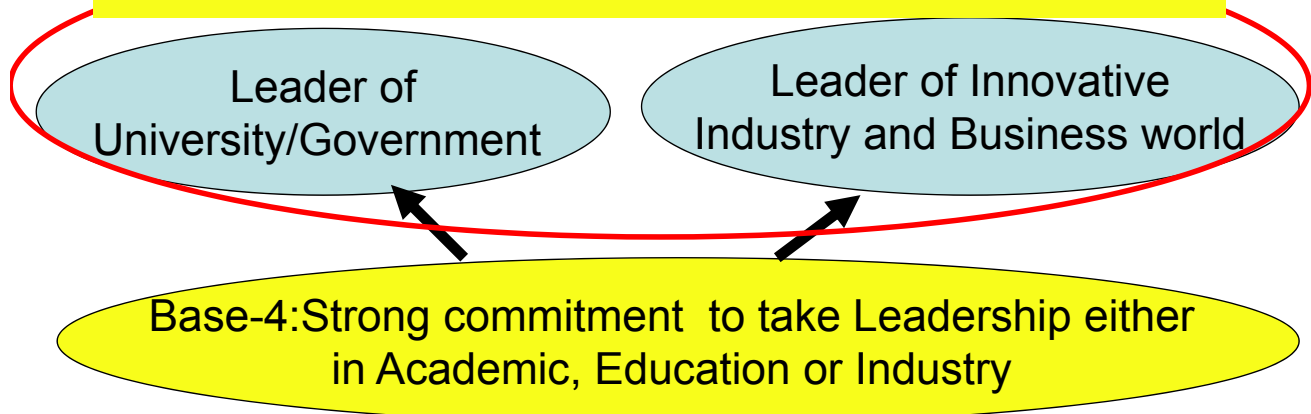
Base-3:The Capability of Global Communication, Team Working and Collaboration

Base-2:The Capability of Defining the Issues and Designing Approach for the Solution

Base-1:Wide Spectral Knowledge with One or More Specialtis (Natural, Social Science)

Enhancing Quality of Doctorial Education
−Fostering Innovative Leaders for Sustainable Development−

Summary

1. Innovation is not a simple technological revolution, but the creation of socio-economic value <u>with the new combination of technological & social breakthrough</u>

2. Learning from INNOVATION case studies
   (1)<u>Non linear & Multi-disciplinary Uncertain & Stochastic</u> process   (2)10-30 years incubation

3. Importance of <u>National & Global innovation pipeline network, being integrated by Σ-type human resources</u>

4. <u>Importance of nurturing Σ-type human resources </u>for the innovation eco-system with the base competency Type-D or Type-E or Type-B

Tracking Careers of Doctorial Graduates must cover these aspects <u>with eyes what are missing!</u>

13

International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

Profiles of International Guests
(Order of the Presentation)

Laudeline Auriol

Administrator, OECD DSTI/EAS

Laudeline Auriol is analyst at the OECD Directorate for Science, Technology and Industry where she is responsible for the measurement of human resources for science and technology and project manager of the international (OECD/UNESCO/Eurostat) survey on careers of doctorate holders (CDH).

She has twenty years of experience in the field of science and technology indicators, is responsible for the biannual publication of the Main Science and Technology Indicators (MSTI) and is the author of articles in specialized and academic journals. She has also been a Member of the Scientific and Prospective Committee at the French Observatory for Science and Techniques for 2 successive mandates. She holds a Master Degree in statistics and demographics.

Responsibilities as an Administrator:
- Analyst on human resources in science and technology
- Project manager for the international (OECD/European Commission/UNESCO) survey on careers of doctorate holders
- Responsible for the biannual publication of the "Main Science and Technology Indicators"

Other work Experience at OECD
- 1993-2000: Responsible for cooperation with non OECD countries in the field of science and technology indicators
- 1986-1993: In charge of database developments for patent data, technology balance of payments and previously of the statistical annex of the OECD Economic Outlook

Other Responsibilities
- 2002- 2007: Member of the Scientific and Prospective Committee at the French Observatory for Science and Techniques (2 successive mandates)
- 2003-2005: Member of the Project Group «Attractiveness of the French territory for research, development and innovation activities» at the French Commissariat Général du Plan
- 2000-2001: Member of the steering group for renovating the French survey on R&D expenditure in the public sector

About OECD-DSTI

The Directorate for Science, Technology and Industry (DSTI) develops evidence-based policy advice on the contribution of science, technology and industry to societal well-being and economic growth. In particular, **DSTI** leads **OECD** work on the translation of science, technology and knowledge into innovation. **DSTI** also manages internationally comparable databases on the links between R&D, industry, technology, competitiveness and globalization to inform research and the policy debate.
[http://www.oecd.org/sti/]

Laura Marin

Senior Manager Member, European Science Foundation

Laura Marin is a senior manager for Member Relations and Partnerships at the European Science Foundation. In this role she has facilitated numerous fora on science governance issues such as the one dedicated to research careers development and career tracking.

Previously she was team leader of the European Science Open Forum in 2008 in Barcelona (ESOF2008) and Director of Operations at the Catalan Foundation for Research and Innovation. She has several years of experience in managing research and innovation projects at the European Foundation for Quality Management in Brussels and at the Institute for Research and Development at the Fachhochschule Bielefeld in Germany. She holds a M.Litt in Management, Economics and International Relations from the University of St. Andrews (UK) as well as a degree in Political Science from the Universitat Autonoma de Barcelona (ES).

About ESF

The establishment of **the European Science Foundation (ESF)** in Strasbourg in 1974 was one of the earliest milestones on the road to achieving real cooperation in European research. **The ESF** began life with a membership of 42 academies and research councils in 15 countries; in 2012 it counts 72 Member Organizations (MOs), including research funding organizations, research performing organizations, academies and learned societies, in 30 countries.

As an independent, non-governmental organisation dedicated to pan-European scientific networking and collaboration, the **ESF** has had a key role to play in mediating between a multitude of heterogeneous research cultures and agencies. The **ESF** hosts an array of instruments to accommodate various types and levels of international collaboration, within Europe and beyond.

The **ESF's** unique characteristic in this area is its responsiveness to the scientific community, in contrast with the more targeted approaches taken by the European Commission. Many of the instruments operated by the **ESF**, e.g. Exploratory Workshops, EUROCORES (European Collaborative Research scheme), Research Networking Programmes (RNPs) and **ESF** Research Conferences, are designed to respond to needs articulated by the research community. Open calls for proposals are published on an annual basis, so that the themes for programmes, networks and workshops are gathered from the research community, in line with the **ESF's** bottom-up principles. This is particularly welcome in research areas which might not otherwise be prioritised for funding on an international level.

In recent years, the **ESF's** profile has shifted from being mainly a facilitator of collaborative research and networking to also providing a platform for Member Organisations to develop joint strategic operations and synergy among themselves. By influencing the strategic agendas of MOs in this way, greater leverage over a much larger European budget and agenda is achieved. In other words, the **ESF** maximises the impact of its support to the research community by combining bottom-up and topdown approaches to scientific cooperation.

[http://www.esf.org/]

Luis Sanz-Menéndez

Director of the IPP from the CSIC (Spanish National Research Council)
Chair of the OECD Committee for Scientific and Technological Policy (CSTP).

Luis Sanz-Menéndez, a Spanish national, is CSIC Research Professor and Director of the Institute of Public Goods and Policies (IPP) from the CSIC (National Research Council) in Madrid and chair of the OECD Committee for Scientific and Technological Policy (CSTP).

He also has worked in a variety of advisory roles to the Spanish authorities at the Ministries of Education and Science; Science and Innovation; and Economy and Competitiveness since 2004. He has been member of the GRENCYT, where it was elaborated the National Strategy for Science and Technology (2007-2015), which was approved by The Conference of Government Presidents (National and Regionals) and the 6th. National R&D and Innovation Plan (2008-2011). Previously he was Deputy Director General for Research Planning and Monitoring at the Ministry of Science and Technology and responsible of the Spanish National Research, Technology and Innovation Plan.

He was also involved in several international S&T policy advisory activities (among others: the European Commission (Directorate General for Research); OCDE; UNESCO; Interamerican Development Bank (IDB); UNIDO, COST, etc.) and he has also been engaged with developing analysis and advising for science and innovation policy making entities for science and technology in several countries, especially in Latin American countries.

Luis received his PhD at the Complutense University in Madrid in Political Sciences and Sociology and he has been postdoctoral fellow and visiting researcher in various universities such as UC Berkeley, CSI-École des Mines in Paris, University of Twente in The Netherlands, School of Public Policy at GeorgiaTech in Atlanta, School of Public and International Affairs at the University of Georgia in Athens, School of Public Affairs at the University of Colorado in Denver; etc.

About CSIC, IPP, and OECD-CSTP

The **Spanish National Research Council (CSIC)** is the largest public institution dedicated to research in Spain and the third largest in Europe. Belonging to the Spanish Ministry of Economy and Competitiveness through the Secretary of State for Research, Development and Innovation, its main objective is to develop and promote research that will help bring about scientific and technological progress, and it is prepared to collaborate with Spanish and foreign entities in order to achieve this aim. [http://www.csic.es/]

The mission of **the CSIC Institute of Public Goods and Policies (IPP)** is to advance knowledge in a specific domain of the relationship between the society, the market and the state. The objective will be to go deeply into the comparative analysis and understanding of the nature of a singular type of goods, public and collective goods, as well as the processes of definition and implementation of public policies and their mutual interactions. It is a major goal of the Institute to produce knowledge that can be used and evaluated by the scientific community, as well as knowledge relevant for social actors, institutions and governments. [http://www.ipp.csic.es]

The strategic objectives of **the Committee for Scientific and Technological Policy** as defined in its Mandate and by the work priorities agreed by the Member countries' Ministers responsible for science and technology provide the framework for the Secretariat's proposals for activities to be developed or initiated under the aegis of the Committee itself or its subsidiary bodies (NESTI, TIP, GSF and WPB).
[http://www.oecd.org/sti/scienceandtechnologypolicy/committeeforscientificandtechnologicalpolicy.htm]

Lynn Milan

Project Officer, National Science Foundation, National Center for Science and Engineering Statistics (the U.S.)

Lynn Milan is a project officer in the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation in the U.S. She manages the Survey of Doctorate Recipients (SDR), a biennial longitudinal study of individuals who earned a research doctoral degree in science, engineering, or health from a U.S. academic institution. Her current efforts have focused on the international component of the SDR, operational changes to improve timeliness of data, and plans for redesigning survey content. Results from the SDR are used to inform policies related to the S&E enterprise and are published regularly in two NCSES Congressionally mandated reports: *Science and Engineering Indicators* and *Women, Minorities, and Persons with Disabilities in Science and Engineering*.

The SDR is one of three surveys (along with the National Survey of College Graduates and the National Survey of Recent College Graduates) that combine to form the Scientists and Engineers Statistical Data System (SESTAT). As a member of the SESTAT team, Dr. Milan coordinates regularly with the other SESTAT survey managers to ensure consistency in procedures and decisions implemented across the SESTAT surveys.

Prior to starting at NSF, Dr. Milan was a survey statistician at the U.S. Army Research Institute for the Behavioral and Social Sciences and a data analyst at the U.S. Government Accountability Office. She received her PhD in psychology from the Graduate Center of the City University of New York.

About NSF and NCSES

The National Science Foundation (NSF) is an independent federal agency created by the U.S. Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense." With an annual budget of about $6.9 billion (FY 2010), **NSF** is the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities. In many fields such as mathematics, computer science and the social sciences, **NSF** is the major source of federal backing.
[http://www.nsf.gov/]

Within **the NSF** is **the National Center for Science and Engineering Statistics (NCSES)**, one of 13 U.S. federal statistical agencies. The mission of **NCSES** is to serve as a central federal clearinghouse for the collection, interpretation, analysis, and dissemination of objective data on science, engineering, technology, and research and development. To accomplish this mission, **NCSES** designs, supports, and directs periodic national surveys and performs a variety of other data collections and research related to the science and engineering enterprise in the United States and other nations that is useful to practitioners, researchers, policymakers, and the public. In particular, **NCSES** is responsible for statistical data on the following:

- research and development;
- the science and engineering workforce;
- U.S. competitiveness in science, engineering, technology, and R&D; and
- the condition and progress of STEM education in the U.S.

[http://www.nsf.gov/statistics/]

Janet Metcalfe

Chair and Head, Vitae (the U.K.)

Dr Janet Metcalfe is Chair and Head of Vitae, committed to enhancing the quality and output of the UK research base through supporting the training and development of world-class researchers. She is responsible for the strategic direction of Vitae and leads on the implementation of the UK Concordat to Support the Career Development of Researchers.

As part of Vitae's implementation of the Concordat, she is a member of the CROS/PIRLS Steering Group, responsible for developing and managing the Careers in Research Online Survey (CROS) and the Principal Investigators and Research Leaders Survey (PIRLS). She is a founder member of the Impact and Evaluation Group, exploring the impact of researchers and researcher development and sits on the Postgraduate Research Experience Survey (PRES) Steering Group. She chaired the Vitae Researcher Development Framework project team, which developed the professional development planner based on the knowledge, skills and attributes of highly effective researchers.

In Europe Janet is a member of the European Commission's Steering Group for Human Resources and Mobility working group on skills and the European Science Foundation Member Organisation forum: the European Alliance for Research Careers Development. She chaired the European Universities Association working group reviewing existing practice on the systematic collection of data on doctoral candidates' career paths, part of the DOC-CAREERS project.

Her publications include the 'What Do PhDs Do?' and 'What do researchers do?' series of publications exploring the landscape of researchers' careers and impact, including 'Doctoral graduate destinations and impact three years on'. She is co-author of the Universities UK research report 'Promoting the UK doctorate: opportunities and challenges', 2009 and the Impact and Evaluation Group report 'Impact of researcher training and development: two years on', 2010.

About Vitae

Vitae is the UK organisation championing the personal, professional and career development of postgraduate researchers and research staff in higher education institutions and research institutes. We play a major role in the drive for high-level skills and innovation and in the UK's goal to produce world class researchers. Our vision is for the UK to be world-class in supporting the personal, professional and career development of researchers. **Vitae** is supported by Research Councils UK (RCUK), managed by CRAC: The Career Development Organisation and delivered in partnership with regional Hub host universities.
[http://www.vitae.ac.uk/]

International Symposium on Tracking Careers of Doctoral Graduates
-International Frameworks and Surveys in Each Country-

Profiles of Japanese Participants
(Order of the First Name)

Ayao Tsuge

President, The Japan Federation of Engineering Societies

Dr. Tsuge is President of the Japan Federation of Engineering Society and President of Japan International Science and Technology Exchange Center. He is also Member of the Science Council of Japan and Vice President of the Engineering Academy of Japan. He was President of Shibaura Institute of Technology and Executive Member of Council for Science and Technology Policy, Cabinet Office of Japan. He received his BA, MA and doctorate in engineering from the University of Tokyo. His areas of expertise include energy, environment and economy, innovation, the management of technology and international relations.

Education:

BA (Engineering)   University of Tokyo, 1967
MA (Engineering)   University of Tokyo, 1969
Dr. of Engineering   University of Tokyo, 1973
Harvard Business School, the Advanced Management Program101, 1987

Experience:

1969	Joined Mitsubishi Heavy Industries, Ltd.
1997	General Manager, Takasago R&D Center, Technical Headquarters
2000	Managing Director & General Manager of Technical Headquarters
2002.4-2005.1	Representative Director & Managing Director, General Manager of Technical Headquarters , Mitsubishi Heavy Industries, Ltd
2005.1-2007.1	Executive Member, Council for Science and Technology Policy, Cabinet Office of Japan
2005.1-2011.12	Executive Science & Technology Adviser, Mitsubishi Heavy Industries,
2012.3	President of Shibaura Institute of Technology
2011.4-	President of The Japan Federation of Engineering Societies
2011.4-	Chairman, Japan International Science and Technology Exchange Center

Current Affiliation:

President, The Japan Federation of Engineering Societies
Chairman, Japan International Science and Technology Exchange Center
Vice President of Engineering Academy of Japan
Member of Science Council of Japan

Fields of Interest:

Energy
Environment and Economy
Innovation Management of Technology
International Relation

About The Japan Federation of Engineering Societies

The Japan Federation of Engineering Societies (JFES) was founded in 1879 as the first engineering organization in Japan and is the only incorporated organization consisting of over 100 engineering societies (including several scientific societies). Its mission is to foster the advancement of engineering technology and industry through cooperation of membership organizations.
[http://www.jfes.or.jp/index-en.html]

Hiroshi Matsuzaka

Director, Office for University Reform
Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Hiroshi Matsuzaka is a director for university reform at Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT). He is responsible for and leads university reform programs such as GP programs, FDs, university consortiums and networks as well as Graduate School Leading Programs.

He joined MEXT in 1995 after several years of experience of as a marketing consultant at a member firm of Coopers & Lybrand and other consulting firms. In MEXT, he has seventeen years of experience mainly in the field of higher education. He also worked at Technical and Vocational Education section/UNESCO as an associate expert and at Kanazawa University as director for general affairs in Japan. He is a doctoral degree candidate of Nagoya University.

About MEXT and the Office for University Reform

The role of **MEXT** is to aim for a hopeful future through the promotion of education, science and technology, sports and culture. Following governmental reforms in 2001, the Ministry of Education, Science, Sports and Culture (Monbusho) became **the Ministry of Education, Culture, Sports, Science and Technology (MEXT or Monbukagakusho)**. Following this change, The Science and Technology Agency (STA) which mostly supported large science projects, was merged into **MEXT** combining these aspects of major science activity.

The Office for University Reform of MEXT supports a variety of efforts to reform universities in a competitive environment through national, public and private universities, with the objective of invigorating higher education and encouraging excellent education and research activities which utilize each university's individuality and particular characteristics.
[http://www.mext.go.jp/english/]

Keiji Saito

Research Fellow
National Institute of Science and Technology Policy (NISTEP)

Keiji Saito is a research fellow in National Institute of Science and Technology Policy (NISTEP). He joined NISTEP in 2008. He has conducted surveys and analyses on human resources for research such as doctoral students, postdoctoral fellows, and researchers.

NISTEP has considered tracking the careers of doctoral graduates important for policy-making. The view has become the project of a database of doctoral graduates as a part of its data infrastructure programs in "Science for RE-designing Science, Technology and Innovation Policy (SciREX)" since 2011. He works on the project of database doctoral graduates by applying experience and knowledge of the surveys and analyses on human resources.

He has a background in economics. After he obtained a bachelor's degree in economics from Osaka University, he took a master's and doctoral course at the University of Tokyo. He has worked on various empirical analyses as well as analyses on human resources. In recent years, he has published research papers on empirical analyses of rice farming and mobile phone use.

Toshiyuki (Max) Misu

Senior Research Fellow
National Institute of Science and Technology Policy (NISTEP)

Dr Toshiyuki "Max" Misu received his PhD degree in physics from the University of Tennessee in 1997. As a senior researcher with over 20 years of experience in a wide variety of R&D activities ranging from industrial telecommunication technology, academic theoretical/computational physics, applied physics for cancer therapy, and S&T human resource policy, he is currently working at National Institute of Science and Technology Policy, the Ministry of Education, Culture, Sports, Science and Technology, Japan.

He developed the survey methodology and implemented the full-scale surveys for the first time to fill out some of the missing fundamental HRST indicators, including employment conditions and career paths of postdoctoral fellows, career path diversity and international mobility of recent doctoral graduates in Japan. He also worked as a senior analyst at OECD to carry out comparative studies on careers of doctorate holders (CDH) using micro data from October 2010 until January 2013.

About NISTEP

The National Institute of Science and Technology Policy (NISTEP) is a national research institution that was established in accordance with the National Government Organization Law under the direct jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to be engaged in the Japanese government's science and technology policy-planning process. It is expected to ascertain government needs, to collaborate and cooperate with government agencies, and to participate in the decision-making process. **NISTEP** has three missions:

(1) To forecast future policy issues and investigate them through autonomous research
(2) To carry out research in response to requests from government agencies
(3) As a core institution in the science and technology policy research field, to provide data that forms the basis of research by other institutions and researchers in order to contribute to the accumulation and expansion of knowledge

[http://www.nistep.go.jp/en/]

International Symposium on Tracking Careers of Doctoral Graduates
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Pictures of the Symposium

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Senior Research Fellow
National Institute of Science
and Technology Policy
(NISTEP)

Ayao Tsuge

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Japan Federation of
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Janet Me

Chair and
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Lynn Milan

Project Officer
National Science
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Luis Sanz-Menéndez

Director IPP CSIC
(Spanish National Research Council)
Chair
OECD Committee
for S&T Policy

Laura Marin

Senior Manager Member
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Laudeline Auriol

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Receiver Channels

Ch.1 日本語

Ch.2 English

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