What Does the Future Hold for Doctoral Graduates in Europe and Beyond?

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Riga, 22 November 2024

What do we know about R&I careers?

Nurturing R&I talent

STI ministers, 2016, Daejeon, Korea:

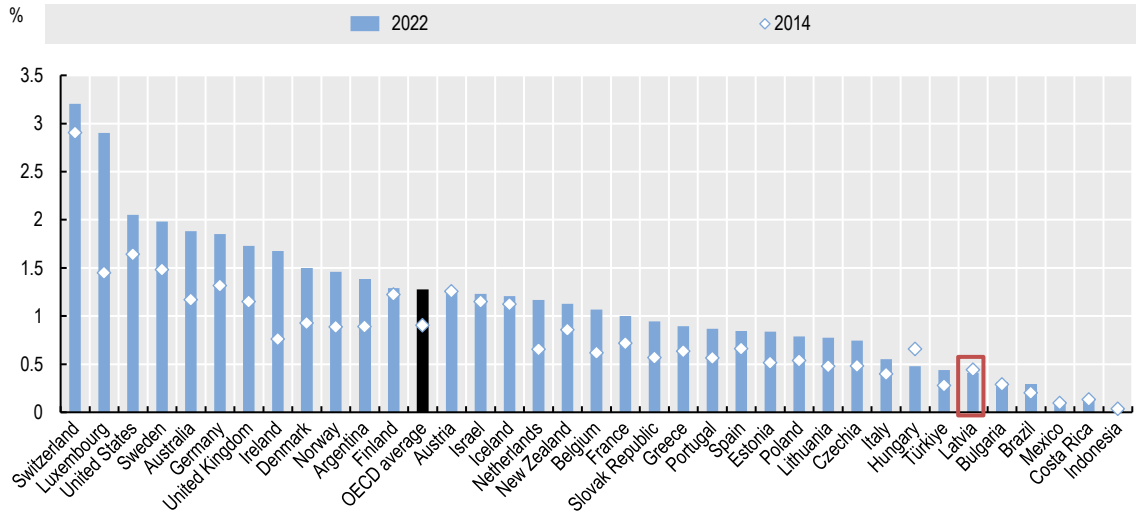
"science advances thanks to the curiosity and creativity of researchers, which needs to be encouraged"

Considerable public resources are being dedicated around the world to the professional development of R&I talent.

The share of the workforce with **research qualifications at PhD level has risen fast** in OECD countries.

The share of doctorate holders in the working-age population climbed to 1.3% by 2022 from 0.9% in 2014, an **increase of 41%**.

Figure 1. Share of doctorate holders in the working age population, 2014-2022
Percent of 25-64 year-olds, 2014-2022 or closest available years



Source: Education at a Glance: Educational attainment and labour-force status; NEAC survey (Last updated: September 2023).

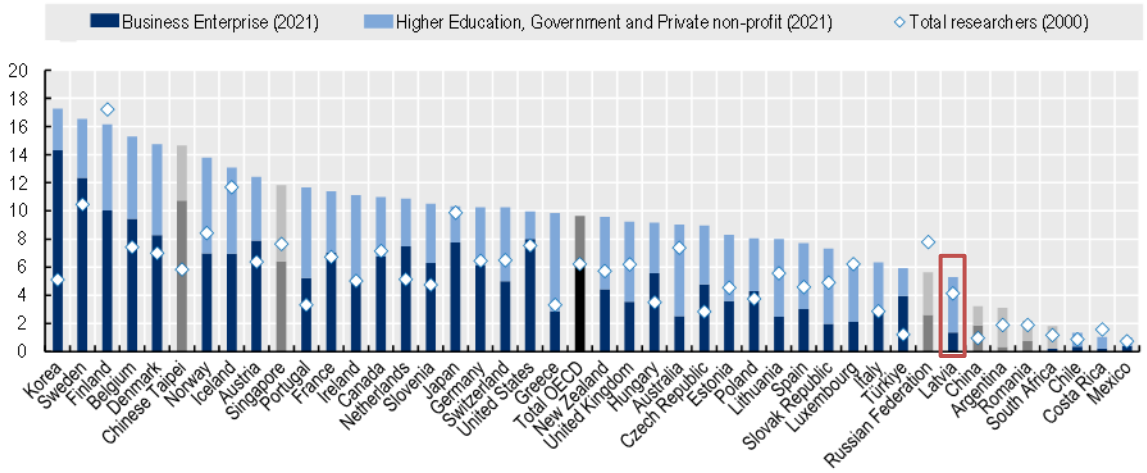
The labour market for R&I careers

The **R&D professional workforce has also rapidly expanded**, particularly beyond academia, boosting the emergence of new knowledge-intensive industries and occupations.

The number of researchers in the OECD has surged from 3.2 million in 2000 to over 5.5 million in 2021, with a significant **shift towards employment in the business sector**.

Figure 2. Researcher workforce trends, 2000-2021

In full time-equivalents, as per thousand of total employment



Source: OECD Main Science and Technology Indicators (September 2023), https://www.oecd.org/sti/msti.htm

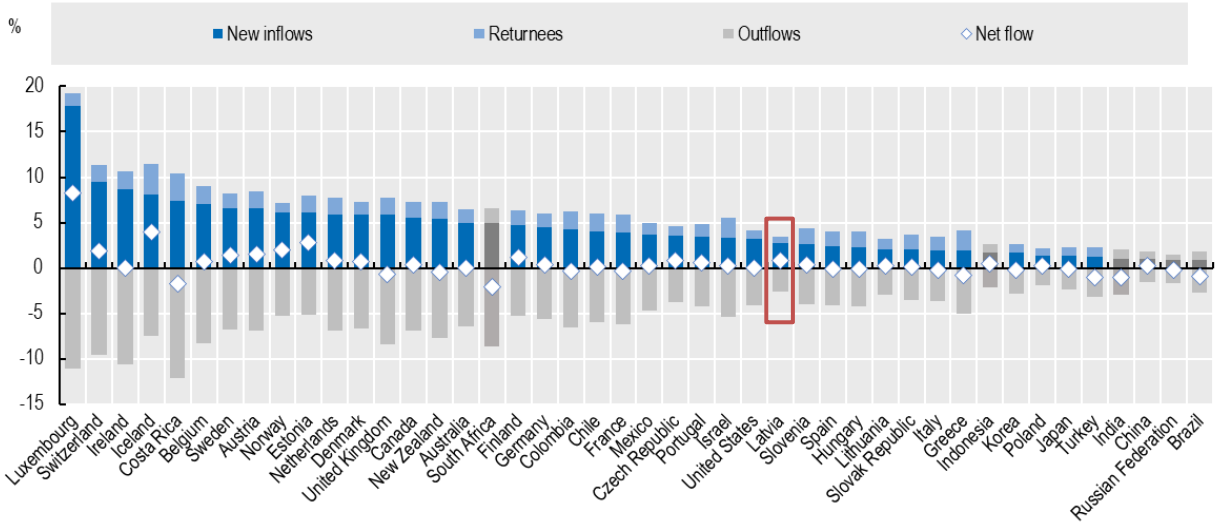
Tension between “brain gain – brain drain” and “brain circulation” paradigms

The **international circulation of talent** is highly visible in OECD statistics of international students, whilst several countries also report workforce related statistics.

> In the United States, for example, 45% of workers with a doctorate in science and engineering occupations are foreign-born

The evidence from proxy measures for OECD countries and other major economies is consistent with the **brain circulation paradigm.**

Figure 4. International mobility of scientific authors, 2021
As a percentage of authors, by last main recorded affiliation in 2021



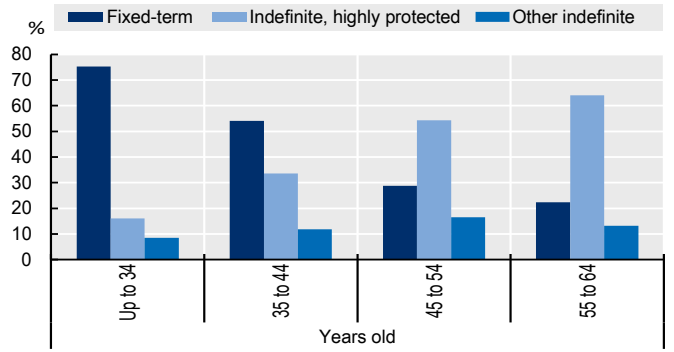
Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 1.2023, March 2023.

Policy concerns

Policy makers have been harbouring increasing concerns about:

- **deterioration of working conditions** of many researchers,
- **lack of diversity** in terms of gender and representation of different groups in society,
- **unequal opportunities** in access and advancement in careers, and
- **declining capacity** of several research and innovation systems to retain and attract talent.

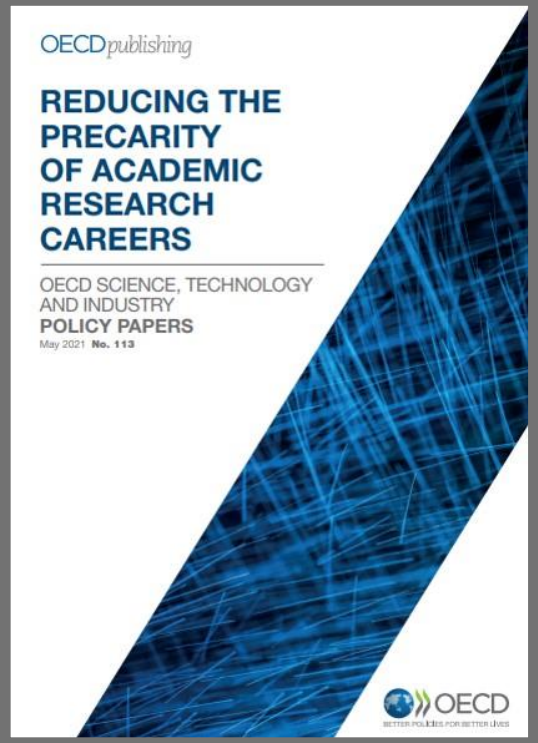
Figure 3. Reported job security among scientific authors not in business, by age group, 2018



Note: Weighted estimates adjusted for nonresponse. Under Indefinite highly protected contracts, the respondent can only be dismissed by the employer for gross misconduct. Other indefinite contracts are open-ended. Fixed-term positions have a set duration.

Source: Insights from the OECD International Survey of Scientific Authors. Calculations based on the OECD International Survey of Scientific Authors, 2018 (June 2020). https://www.oecd.org/sti/science-technology-innovation-outlook/research-precariat/insightsfromtheoecdissa.htm

PRECARITY

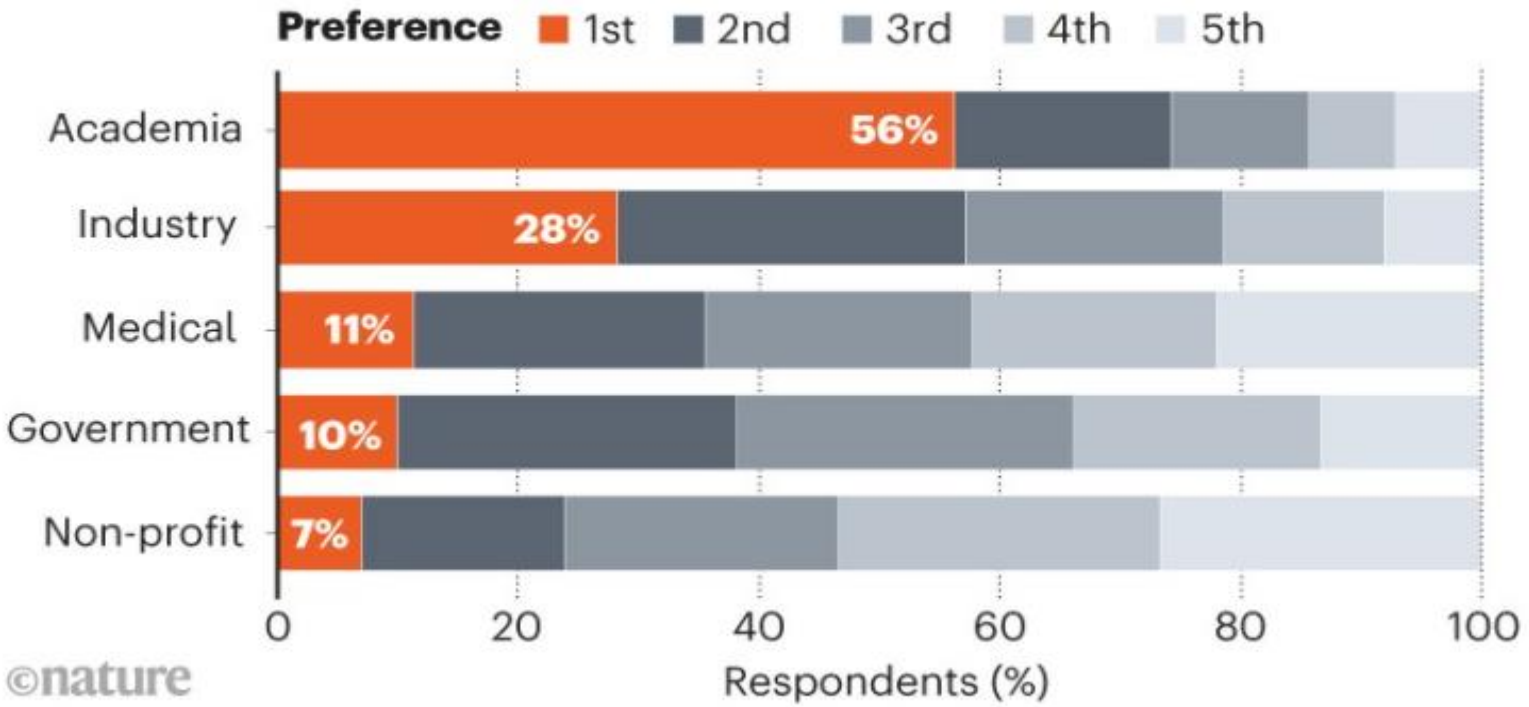


OECD (2021), "Reducing the precarity of academic research careers", *OECD Science, Technology and Industry Policy Papers*, No. 113, OECD Publishing, Paris, https://doi.org/10.1787/0f8bd468-en.

Great expectations?

What doctoral candidates want to do when they have their PhD

Q: Which of the following sectors would you most like to work in (beyond a postdoc) when you complete your degree?



Source: *Nature* PhD Survey 2019

Doctoral researchers want to work in academia – a worldwide pattern

Source: 2019 Nature Survey of PhD Students https://www.nature.com/articles/d41586-019-03459-7

The effects of precarity

Affects the well-being and mental health of researchers

Decreases the attractiveness of research as a career choice

Negates efforts to promote diversity and gender equality

Ultimately affects research choices (safe vs risky) and the quality of science

Overarching policy recommendations

Improve **working conditions** and offer more transparent, predictable and flexible career prospects for postdoctoral researchers

Offer broad **professional development** during postdoctoral training

Promote **equal opportunities, diversity and inclusion** in research careers by identifying and addressing existing biases and challenges

Establish better links between research assessment and funding, and **human resource management policy objectives**

Overarching policy recommendations (cont'd)

Improve institutional practices regarding **human resource management in research**

Promote **inter-sectoral mobility** of researchers

Support the international mobility of researchers

Develop the **evidence base** on research careers

Include all relevant stakeholders in the governance and coordination of research and ensure **concerted, systemic action**

Develop the evidence base on research careers

Policy options

- **Collect, analyse and publish registry data on all researchers**, including those on fixed-term contracts and other forms of non-standard employment via offices for national statistics.
- Follow the guidelines of the Frascati Manual to **make statistics comparable** across countries (OECD, 2015).
- **Track the career trajectories of doctorate holders** through regular surveys (e.g. use the Career of Doctorate Holders (CDH) survey already developed by the OECD Working Party of National Experts on Science and Technology Indicators (NESTI)).
- Implement regular **surveys on the experience of postdoctoral researchers** (e.g. use the module on early-career researchers of CDH (Auriol, Schaaper and Felix, 2012), which will allow for international comparisons).
- **Evaluate the effectiveness of policy implementation** regularly using the developed evidence base (e.g. implement 5-year cyclical reviews with recommendations for the next cycle).

CAREER PATHWAYS

OECD (2023), "Promoting diverse career pathways for doctoral and postdoctoral researchers", *OECD Science, Technology and Industry Policy Papers*, No. 158, OECD Publishing, Paris, https://doi.org/10.1787/dc21227a-en

Policy recommendations

Promote the **engagement** and interaction of institutions and funders with **employers** outside academia

Provide doctoral and postdoctoral researchers with **experience and skills** for diverse careers within and beyond academia

Render more **visible** and encourage **valorisation** of diverse career options within and beyond academia

Offer career development and **guidance** on career options for researchers

Promote **inter-sectoral mobility** with the **business** enterprise sector

Promote **inter-sectoral mobility** with **government** and private not-for-profit sectors

Reconfigure and support careers in **academic research**

Support international **mobility**

Policy toolkit

Render more visible and encourage valorization of diverse career options within and beyond academia

- Quantitative and qualitative tracking of careers in all sectors
- Analyse and publish data
- Publish information on career trajectories on institutional websites.

Main takeaways

Not all doctorate holders will have an academic career, and it may not be appropriate to create more academic positions.

Doctoral and postdoctoral researchers should have a positive and productive experience; and continue to contribute to society within and beyond academia.

The doctorate should prepare for **different paths** that will address societal challenges and bring evidence-based decision-making to all sectors of economic activity.

We need to ensure that the most talented minds continue to be attracted to advanced scientific training.

EQUITY DIVERSITY AND INCLUSION

Current project

Equity, diversity and inclusion in research careers

Certain groups don’t even consider doing a PhD.

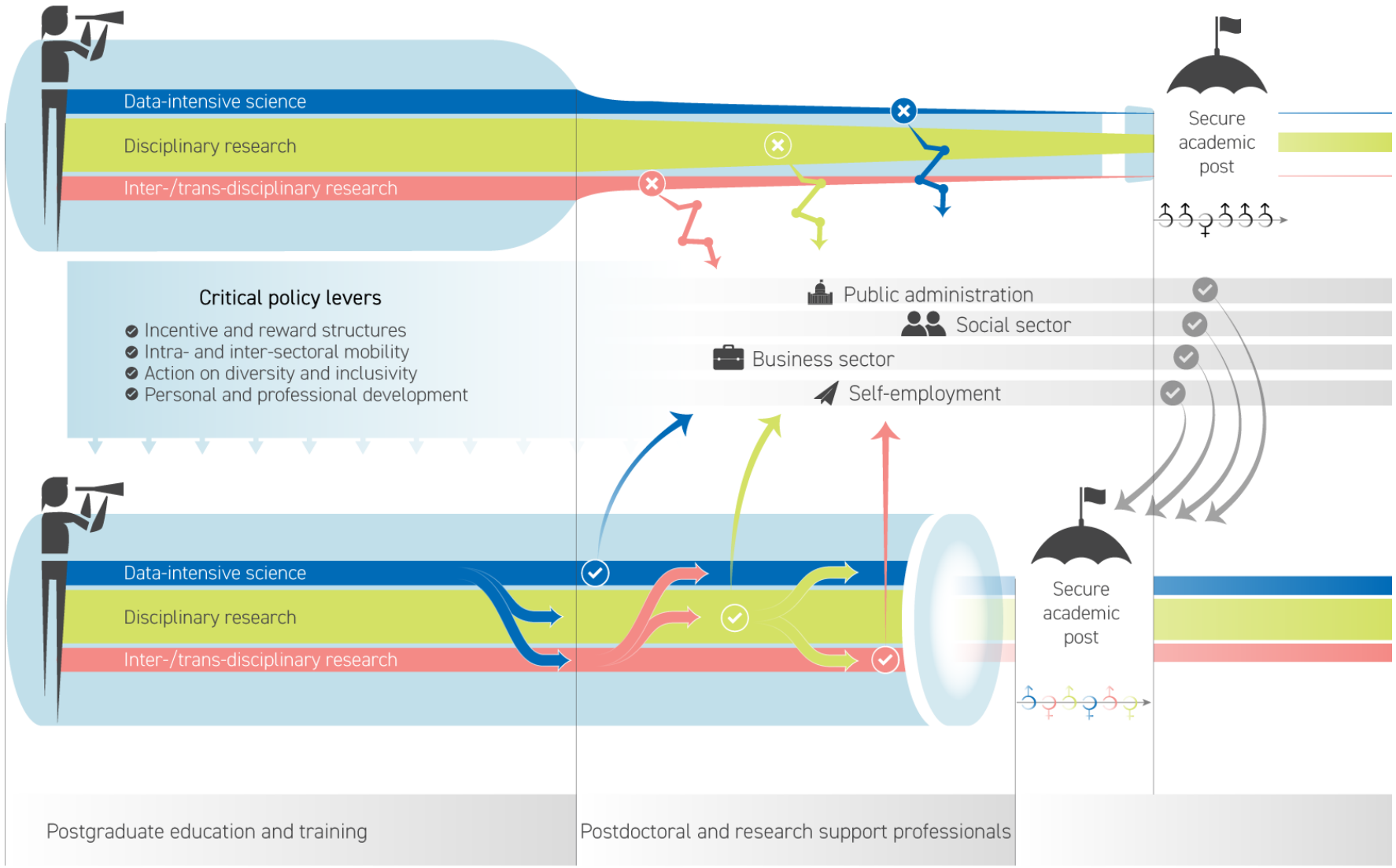
Need for talented people across society to strengthen the future of science.

Doctorate holders and researchers are still an exclusive group.

Importance of people with advanced training in science to bring **different backgrounds and perspectives** to academia and society.

Converging challenges

Relieving the bottleneck



OECD (2021), "Challenges and new demands on the academic research workforce", in OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity, OECD Publishing, Paris, https://doi.org/10.1787/72f6f879-en .

THE RESEARCH AND INNOVATION CAREERS OBSERVATORY (REICO)

Research careers in the policy agenda

The Council of the EU recommendation, 29 December 2023

Recommendation on a European framework to attract and retain research, innovation and entrepreneurial talents in Europe

(40) An observatory on research careers, combining the best of the current Union data in a single place, is needed to monitor the implementation of measures to strengthen research careers and system reforms. It should support the data needs of Member States and research performing organisations relevant for the adaptation and development of policies for research careers. It should equally support researchers to have a better understanding of challenges and opportunities, and promote the attractiveness of Europe's research performing organisations for the best talents. Where relevant, links with the European Higher Education Sector Observatory proposed in the European Strategy for Universities could be considered. Data collected in application of Regulation (EU) 2019/1700 of the European Parliament and of the Council ([17]) could be adapted to respond to the needs of the research careers observatory's users.

Research careers in the policy agenda

OECD Science and Technology Policy Ministerial Meeting, 23-24 April 2024

Declaration on Transformative Science, Technology and Innovation Policies for a Sustainable and Inclusive Future

WE CALL on the OECD, through the CSTP and in collaboration with other relevant OECD committees, to:

- further its work on scientific and digital literacy, participatory science, scientific communication, combatting scientific mis- and disinformation, and on the contributions of science and knowledge, including traditional and Indigenous knowledge, to policymaking, policy-advice, and decision-making;
- provide guidance for advancing rights, diversity, equity, inclusivity, accessibility, and participation in science, technology, and innovation, of all population groups, especially women;
- develop tools for monitoring education and training to promote talent, inclusivity, mobility and careers in research and innovation, including through the launch of a new observatory on research and innovation careers.

Introduction to the Research and Innovation Careers Observatory (ReICO)

Background: ReICO was launched to address evidence gaps in R&I careers, building on OECD's existing work on R&I workforce issues.

Objective: Provide robust data to inform policy-making, helping to shape a sustainable and inclusive R&I workforce.

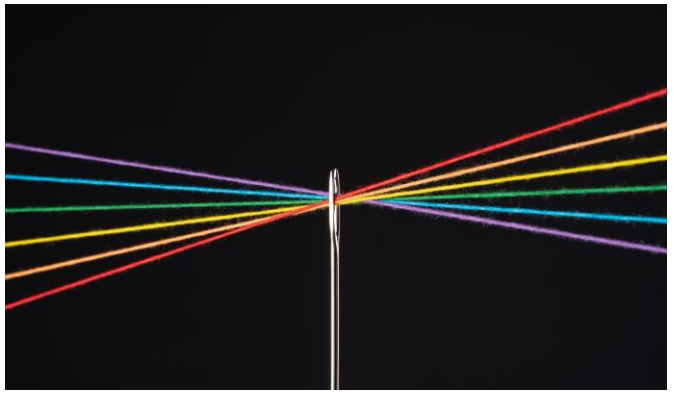
Importance: Effective R&I talent management is key to tackling global challenges and advancing scientific progress.

Some Challenges in R&I Careers

Working Conditions: Concerns over precarious employment and limited career advancement opportunities, especially in academia.

Diversity and Inclusion: Lack of representation and biases impacting R&I careers; need for policies promoting equitable career development.

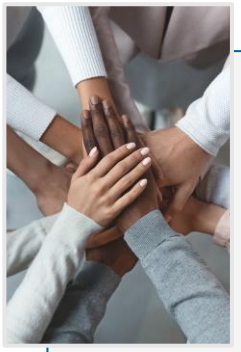
Global Mobility: Issues surrounding talent retention, mobility, and international collaboration, reflecting on brain drain vs. brain circulation dynamics.



ReICO's Role and Actions

Data integration and standardisation: Developing frameworks for consistent data collection on R&I careers across countries.

Monitoring and reporting: Creation of dashboards and analytical tools to track talent development, labour market trends, and mobility.



Collaboration: Engaging with national contact points, expert groups, and stakeholders to ensure comprehensive data coverage and best practices.

Future Directions and Engagement Opportunities

Beta launch in 2025: Initial release of the ReICO platform to provide accessible data and insights.

Long-term goals: Enhance evidence-based policy-making, improve career paths in R&I, and promote international cooperation.

Engagement: Encouraging participation through ReICO networks, including national contact points, expert groups, and the “Friends of ReICO” community.

Contacts

Research and Innovation Careers Observatory (ReICO)
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ReICO website

Explore further

(Click on the images to follow the links)

OECD Science and Technology Policy Ministerial

Multistakeholder High-Level Dialogue, 23/04/2024

Developing talent and promoting diverse research career paths in a world in transition

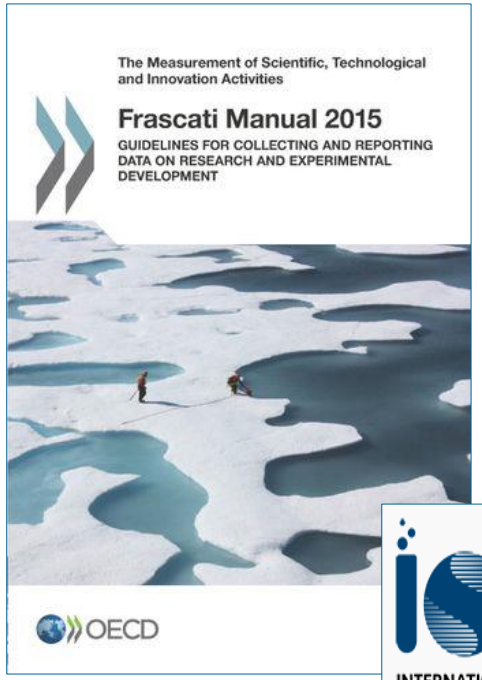
Breakout 2: Equipping society in a fast-changing world

The session will unveil the Research and Innovation Careers Observatory (ReICO), an initiative where the European Commission and the OECD join forces, aimed at addressing key challenges in nurturing and deploying research talent. Discussions will encompass the critical role of scientific and technical capacity in successful green and digital transitions. Emphasis will be placed on supporting both fundamental and solutions-focused academic research, while recognizing the relevance of research competencies beyond academia, particularly in entrepreneurship and policymaking. Digital capacities and skills in research will be highlighted as essential for harnessing vast data resources and AI tools, necessitating expanded training and collaboration across sectors. Furthermore, the session will address the need for revising research assessment criteria to promote equity, diversity, and inclusion, alongside the importance of evidence-based policy interventions for improving research skills and careers. Collaboration among countries and international organizations is essential for developing a sustainable monitoring and policy analysis agenda to meet the diverse needs of stakeholders and facilitate informed research career choices.

Download the Session Information Sheet

Working Party of National Experts of Science and Technology Indicators (NESTI)

Statistical methods, indicators and analysis on STI talent and workforce since the 1960s



OECD Research and Development Statistics

- R&D personnel by sector of employment, function, qualification, field, main activity in the business sector

Human resources devoted to science and technology

- Guidance on S&T workforce data on occupations and educational attainment
- Statistics

OECD Scientometric indicators

- Mobility flows of scientific authors based on trace left by publications and recorded affiliations

OECD Science Technology and Industry Scoreboard

- Human resources for R&D
- International mobility of scientific authors
- Education STI Indicators

OECD International Survey of Science (ISSA)

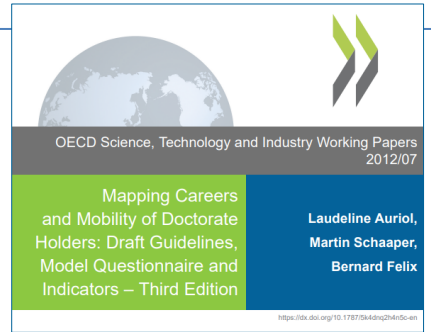
- Open science and digitalisation
- Work conditions of scientists
- Engagement with society

Careers of Doctorate Holders (CDH)

- Career and mobility of doctorate holders – guidance, statistics, analysis
- Entire population of doctorate holders / all sectors

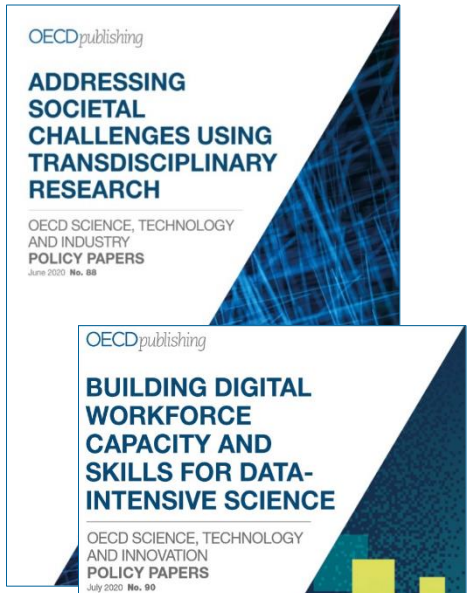
THE MEASUREMENT OF SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

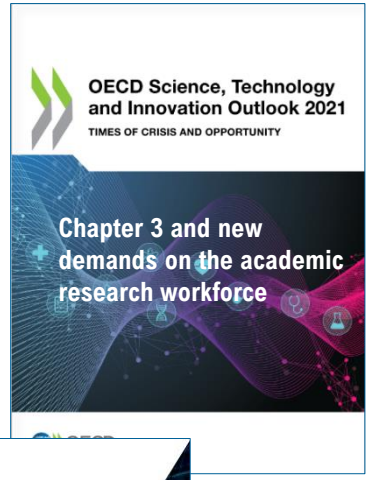
MANUAL ON THE MEASUREMENT OF HUMAN RESOURCES DEVOTED TO S&T
"CANBERRA MANUAL"

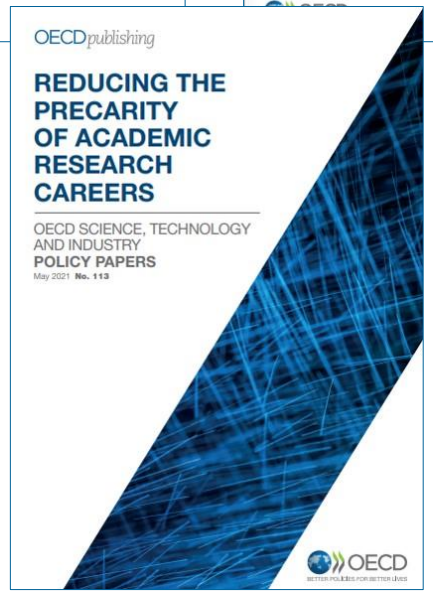


OECD Global Science Forum (GSF)

Analysis on the research workforce (2018 -)







Policies to promote Equity, Diversity and Inclusion (EDI) in the Research workforce

2024-2025