

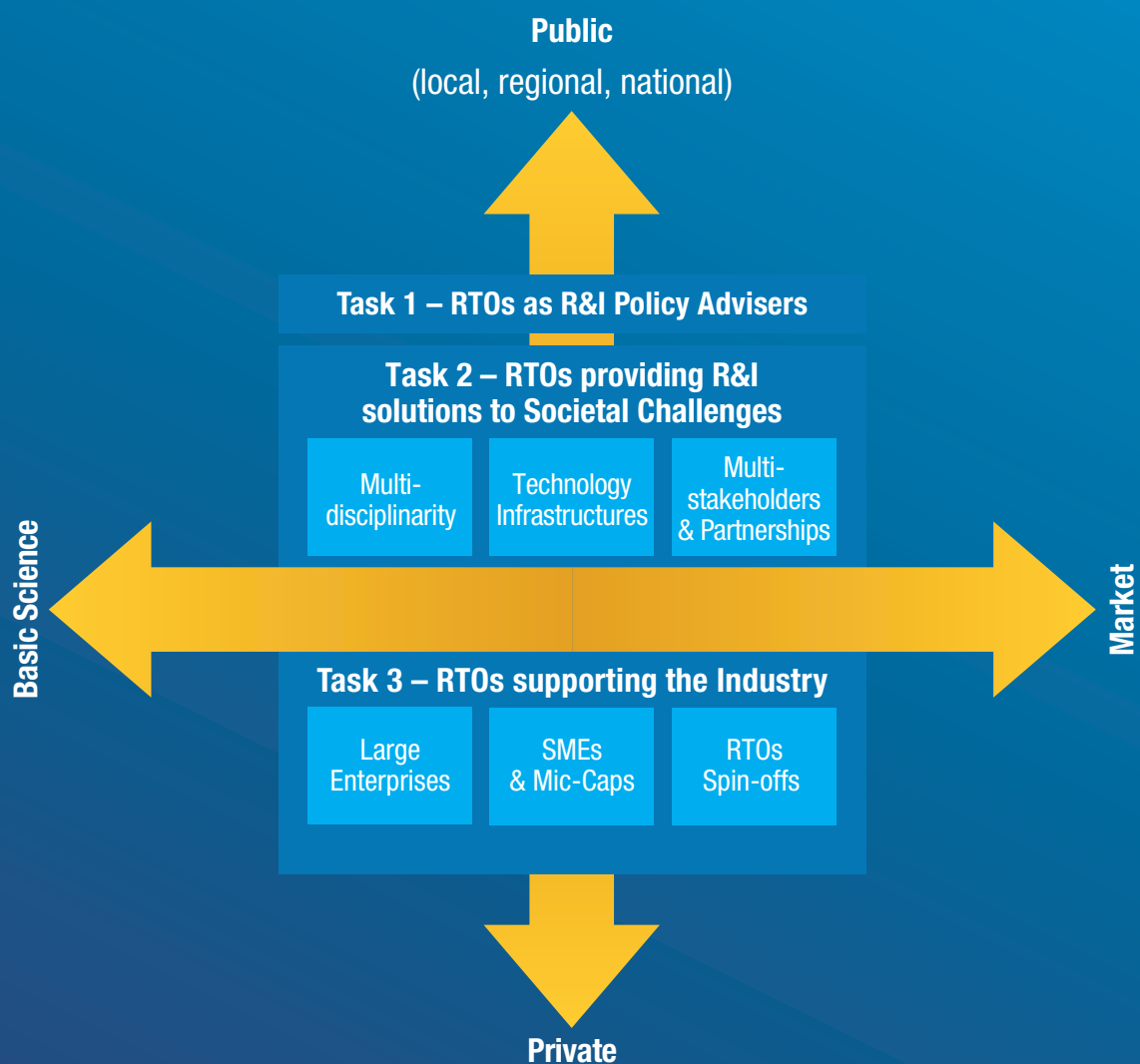


ECONOMIC FOOTPRINT STUDY

Impact of 15 RTOs in 2024

The primary mission of Research and Technology Organisations (RTOs) is to produce, combine and bridge various types of knowledge, skills and infrastructures to deliver a range of research and development activities in collaboration with public and industrial partners of all size. Positioned between the public and private sectors, RTOs operate as not-for-profit organisations, reinvesting their revenues into new innovation cycles. Their activities aim to result in technological and social innovations and system solutions that contribute to and mutually reinforce their economic, societal and policy impacts¹.

Understanding RTOs' Activities



¹ Larrue P. & Strauka O. (2022). The contribution of RTOs to socio-economic recovery, resilience and transitions. OECD Science, Technology and Industry Policy Papers, No. 129, OECD Publishing, Paris, <https://doi.org/10.1787/ae93dc1d-en>.

² Galindo-Rueda F. & Van Beuzekom B. (2023). The contribution of R&D specialist institutions to R&D performance: Findings from the NESTI 2022 pilot data collection. OECD Science, Technology and Industry Working Papers, No. 2023/04, OECD Publishing, Paris, <https://doi.org/10.1787/d7917b11-en>.

RTOs as key players driving innovation and growth: an economic impact assessment of RTOs business activities

This study specifically aimed to highlight the economic footprint resulting from the business activities of 15 European RTOs, all of whom are members of the European Association of Research and Technology Organisations (EARTO). Collectively, these 15 RTOs represented approximately 20% of EARTO's members in terms of employees. By emphasising this economic dimension, the study offered valuable insights into the broader societal contributions of RTOs beyond their technological and knowledge outputs.

RTOs produce, integrate and transfer science and technology to help resolve the grand challenges of society and support Europe's industrial competitiveness. RTOs are key players in the innovation chain, bridging the gap between basic research and practical application. Demonstrating one's impact is a key issue in today's economical context. Among others, EARTO's work aims at demonstrating and exemplifying the impact of RTOs. In an EU R&I policy environment where data on RTOs from official EU sources is unfortunately lacking, EARTO felt the need to further support the generation of RTOs' impact data and further support the work done at OECD level in NESTI². To this end, EARTO, supported by 15 of its active members, commissioned this third upgraded version of its economic footprint study to IDEA Consult. This time, it focuses on data from 2021-2022. The dimensions covered in this third study are largely the same. Accordingly, this brochure is a synthesis of the complete study's report which is publicly available on EARTO website and which includes full methodology explanations.

In the analysis, we focus on two types of activities that are expected to generate a strong economic impact:

- **The economic leverage of the RTOs' core activities through spending and employment**
- **The economic leverage of the knowledge transfer through contract research, spin-offs and outflow of staff**

It is important to note that the figures presented in this report should be considered as a lower boundary to the total economic impact of RTOs, which can go far beyond the above-mentioned effects with many other types of impact not taken into account in this study (technological, societal, human capital development, etc.). In particular, the economic leverage effects of knowledge transfer should be interpreted as cautious estimates of the real effects which likely extends further through indirect channels, such as innovation diffusion, industry-wide improvements, and long-term societal benefits.

The box below provides some guidance on interpreting the results by highlighting the assumptions that shaped the analysis. More details are provided in the complete study's report.

How to interpret the economic leverage effects of knowledge transfer

- The study did not aim to fully capture the potential value of the knowledge generated by the RTOs. It focused on demonstrating the economic value of RTOs in the European economy using input-output analyses based on the micro-data directly provided by the RTOs.
- Data have been collected for the years 2021 and 2022. Since our data collection covers only a two-year period, it may not fully reflect the long-term impact of all the activities undertaken by RTOs.
- Selected indicators on knowledge transfer have been included to highlight specific channels of knowledge dissemination, but do not fully capture the comprehensive range of impacts, such as the long-term economic growth, innovation diffusion, or the broader societal benefits.
- A technology multiplier has been used to capture the broader value of RTOs' knowledge transfer through contract research. The multiplier value set by Knell (2008) represents a lower boundary for the actual effect. Thus, the results should be seen as illustrative rather than definitive.

Overall, the study provided a conservative estimation of RTOs' economic footprint to avoid double-counting and overestimations. This resulted in objective and robust observations on the economic effect of RTOs onto the European economy.

Economic Footprint of 15 European RTOs: Key Results

RTOs operate with an open-innovation business model, where one of their primary missions is to transfer research and technology to industry, enabling the commercialisation of new products and services that can significantly benefit society. RTOs utilise their knowledge and infrastructure across a wide range of research projects. **These include competitively funded public research projects, often in collaboration with other research and industrial partners, as well as specific research topics pursued together with individual public or private Organisations through bilateral or multilateral contract research.** In this study, the economic effects of knowledge transfer and conversion through some channels is examined:

- **Outflow of staff:** RTOs transfer highly-educated staff to the private sector along with the valuable knowledge and know-how acquired by working within the RTOs, strongly contributing to the availability and absorption of high-value knowledge by companies and their related industries.
- **Contract research:** RTOs carry out contract research in collaboration with their industrial partners, from large companies to SMEs, supporting them to bring technology to the market and increase their competitiveness while creating high impact for society.
- **Publicly funded research projects:** RTOs attract each year significant amount of public funds for research thanks to their scientific focus and available resources (staff, infrastructure). Publicly funded research are considered separately from contract research in this study as they tend to support broader knowledge creation, serving as fundamental investments in research and innovation.
- **Spin-offs:** RTOs nurture and create deep-tech start-ups with great life expectancy and low rate of failure. RTOs' spin-offs have great chances of scaling-up in the deep-tech area, creating new industrial champions in Europe and a high number of high-quality jobs.

It should be noted that the focus of this study was not on trying to identify the full impact, which would be primarily scientific and/or technological but on demonstrating the economic value of RTOs in the European economy – a dimension much less known.

The results of this economic footprint study clearly demonstrated RTOs' crucial role in the European economy.

These results were only a lower boundary of the full economic impact of RTOs, which did not take into account the technological and social value of the research and technology they produced. The analysis showed that in 2022, around 245 000 jobs (measured in headcounts, hereafter HC) have been created in the European economy that could be linked to the activities (core activities, contract research, spin-off activities) of the RTOs included in this footprint, corresponding to a total turnover of 37.7 billion euro and a total value added of 16.5 billion euro. The total fiscal return added up to 6.6 billion euro of which 3.0 billion euro stemmed from the RTOs' core activities. For each job in RTOs, almost 5 jobs were created elsewhere in the European economy (on top of the 1 direct job in the RTO) either at the suppliers of the RTOs and further upstream, or in the broader economy thanks to the economic activity of the employees of both the RTOs and their suppliers, and especially thanks to the effects of knowledge transfer through contract research and spin-offs. The operational grants³ received by RTOs, have been earned back by national governments through fiscal return mechanisms. For each euro invested in the form of operational grants, more than 2 euro flew back to the national governments. In other words, 228% of the amount spent on operational grants for RTOs returned to governments through fiscal revenues which signifies that the investments made by national governments in RTOs are generating additional economic benefits beyond the initial expenditure, contributing positively to the broader economy.

European policymakers should clearly define strategies that further utilise and enhance RTOs' capabilities to carry out RD&I. RTOs' impact is evident, and EU policies should focus on leveraging this impact to drive job creation and economic growth in Europe.

³ Operational grants are defined as the revenue received directly from government in the form of (non-competed) block or base funding which can be flexibly used by the RTO.

In 2022, the aggregated economic effect of those 15 RTOs from their core activities and generated through contract research and spin-offs resulted in:



245,000
jobs



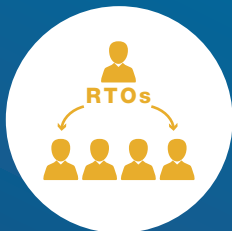
€ 37.7 billion
turnover



€ 16.5 billion
value added



€ 6.6 billion
fiscal and
parafiscal return
to governments



For each
1 job
in these RTOs, almost
5 jobs
have been created
elsewhere in Europe



For each
€ 1 invested
in these RTOs operational
grants, more than
€ 2 return
flew back to
governments staff

Methodology

Our study methodology was based on an input-output approach, combined with micro-data collected by and from the 15 participating RTOs. The advantage of such approach was that direct economic effects quoted here were then exact. In addition, the quantification of the indirect effects was based on the RTO-specific data and not on sector averages. Those two elements ensured higher accuracy of the results presented, avoiding overestimations..

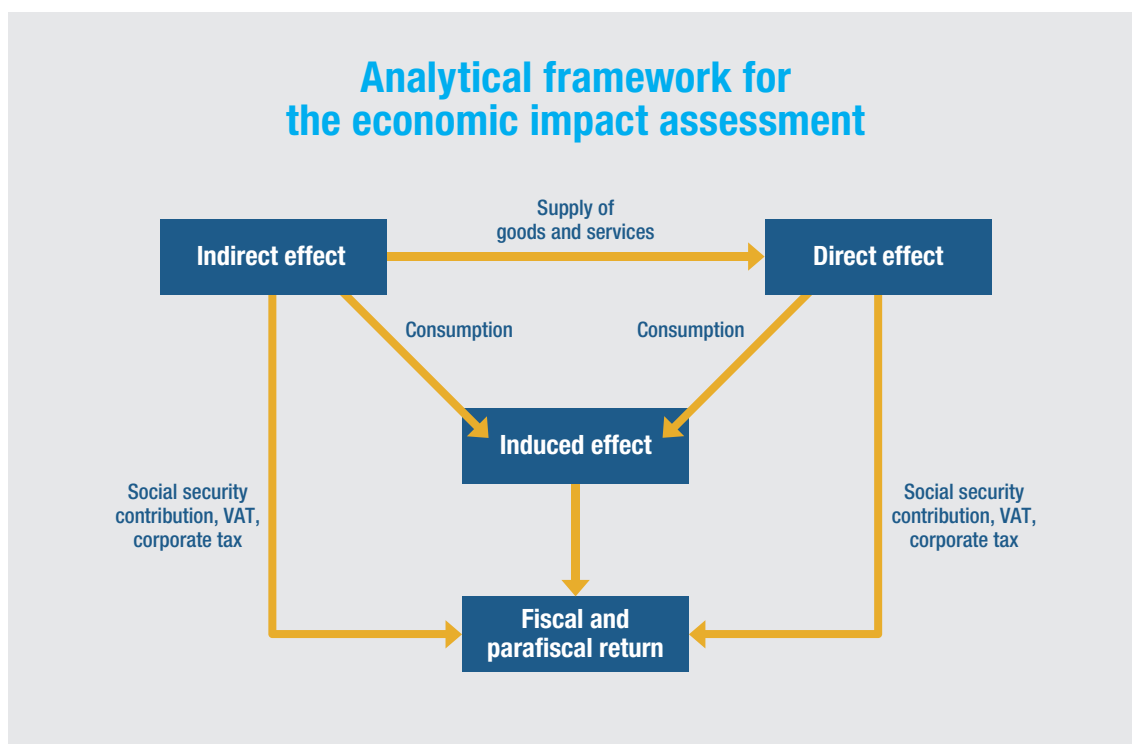
In addition to the direct and indirect economic effect, also the induced impact (the effect of additional direct and indirect employment leading to extra consumption in the local economy) and the fiscal return (the return for the governments via fiscal flows originating from direct, indirect and induced impacts) have been calculated.

Particularly interesting were the leverage effects arising from our economic footprint study:

- What was the additional employment in the European economy that could be related to one person employed at a European RTO?
- If operational grants were received by an RTO, how many euros flew back to the governments for each euro they invested in the RTO?

It is important to note that the impact of RTO's activities may not be immediate. For example, training and developing employees' necessary competences often require several years of investment by the RTO. Consequently, since our data collection spans only two years, this may not fully capture the long-term impact of all the activities undertaken by RTOs.

This economic footprint assessment was further complemented with a number of indicators on the scientific and technological activities of the 15 RTOs studied. Here the focus was on three forms of knowledge transfer and knowledge conversion that are typical of all RTOs and have strong economic impact: contract research, spin-off creation and outflow of staff. Besides, the assessment of the economic impact of contract research with the application of a technology multiplier effect was complemented by an additional input-output approach measuring the (monetary) downward effects, the latter being a lower boundary and benchmark to the first.

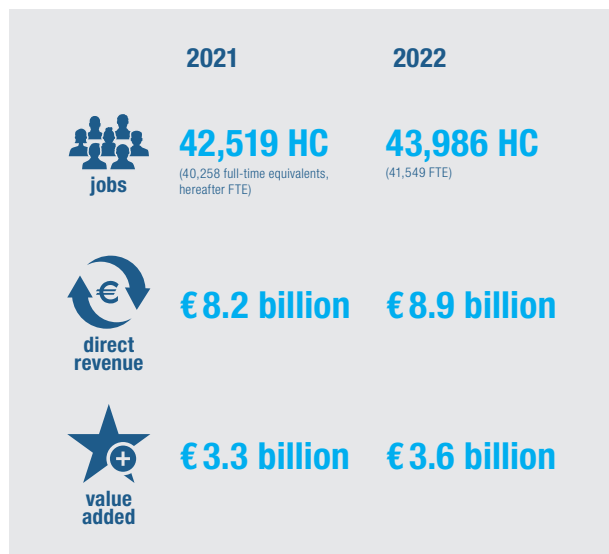


RTOs' Core Activities

2022

Direct Economic Impact

Via their day-to-day activities, the 15 RTOs generated employment and economic added value within Europe. The direct effect of such activities was only a fraction of this added value. Such direct effect of the 15 RTOs' core activities includes the employment, revenue and value added at the organisation itself:



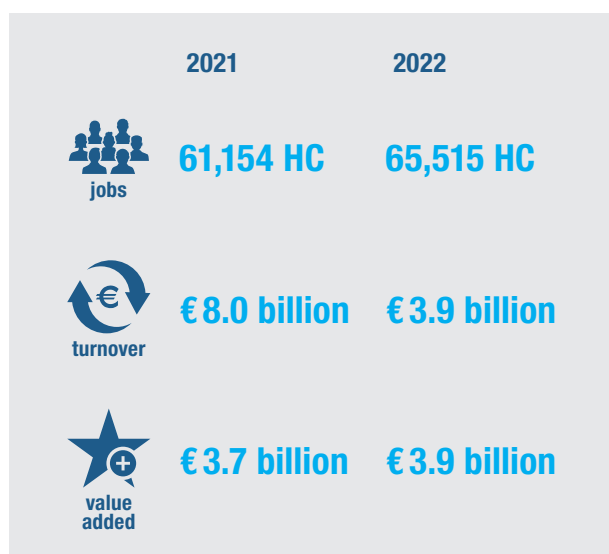
The direct economic effect of an RTO is defined by its in-house activities: the people it employs and the turnover and added value it creates as an organisation. An RTO has a particular profile in this respect: the majority of the staff is highly-educated and/or works as researcher. Their mission is first to develop scientific and technological activities, not to develop an economic activity as such. Generating a direct economic effect is a derivative of the scientific and technological activities.

Each year, the 15 RTOs have generated a total revenue of between 8 and 9 billion euro. This included the operational grants that the RTOs received (5.1 billion euro in 2021 and 5.5 billion euro in 2022). In terms of value added⁴, the RTOs have produced around 3.3 billion euro in 2021 and 3.6 billion euro in 2022. The 15 EARTO members have jointly employed 42 519 knowledge workers (HC) or 40 268 FTE in 2021 and 43 986 knowledge workers (HC) or 41 549 FTE in 2022 in Europe. Science and Technology staff accounted for 82% of the total in 2021 and 83% in 2022. Researchers accounted for 66% of the total in 2021 and 70% in 2022.

2022

Indirect Economic Impact

The 15 RTOs purchased goods and services from suppliers, who then in their turn buy goods and services from their own suppliers, and so on. This way, in consecutive rounds of spending, the suppliers (and their suppliers) generated:



To estimate the indirect economic impact, we first calculated the output⁵, value added, and number of full-time jobs created by RTOs at their own suppliers and service providers in Europe. These are the first-order economic effects, measured through incoming invoices from all European countries to the RTOs. Next, we estimated the higher-order economic effects, including output, value added, and employment further upstream in the value chain at the suppliers' suppliers of the RTOs and even further upstream in the chain.

In consecutive rounds of spending, a total turnover of around 8.0 billion euro in 2021 and of around 8.4 billion euro in 2022 has been generated in the European economy. It can be noted that around half of this indirect turnover was created at the direct suppliers of the RTOs (1st order). The other half was created further up in the value chain. In total, the value added created throughout the economy as a result of the purchases of goods and services by the RTOs amounted to about 3.7 billion euro in 2021 and about 3.9 billion euro in 2022, of which around half has been created at the direct suppliers of the RTOs.

⁴ Direct value added is defined as direct revenue, including the operational grant, minus the costs which include the costs for commodities, raw materials, consumables, services. Salaries are not taken into account.

⁵ I.e. the share of turnover at the suppliers that is attributable to the RTOs' invoices.

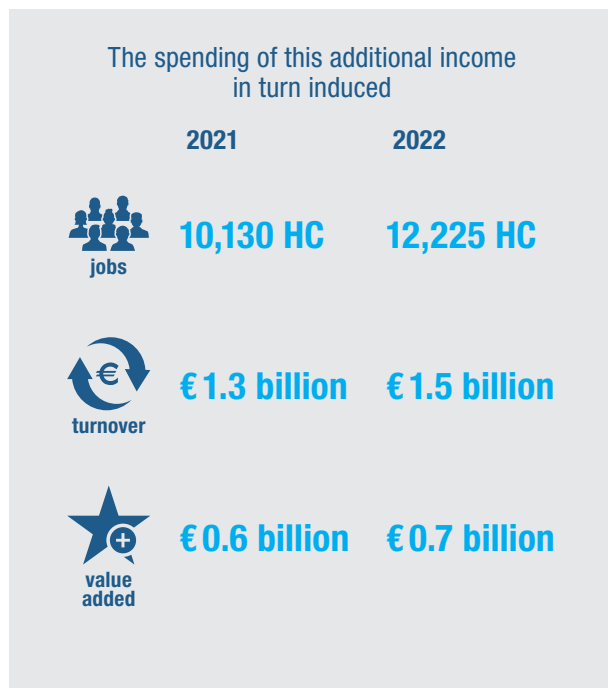
The total indirect employment created in the European economy through the purchases of the RTOs amounted to 57 915 FTE or 61 154 HC jobs in 2021 and of 61 883 FTE or 65 515 HC jobs in 2022. More than half of the indirect employment creation happened at the direct suppliers of the RTOs (1st order indirect employment effect). 31 228 FTE or 32 974 HC jobs in 2021 and

33 728 FTE or 35 707 HC jobs in 2022 have been created there thanks to the purchases of the RTOs. Another 26 688 FTE or 28 180 HC jobs in 2021 and 28 156 FTE or 29 808 HC jobs in 2022 have been created further upstream in the value chain, with the suppliers of the RTOs' suppliers (higher order indirect employment effect).

2022

Induced Economic Impact

RTOs activities generated income for their employees (direct effect) and for the additional employees of their suppliers and further upstream in the value chain (indirect effect).



The induced economic effect was created through the RTOs' directly and indirectly created employment. These direct and indirect employed people received a wage which was higher than an unemployment benefit. They spent part of their additional income in the European economy through consumption of goods and services, and in turn this spending generated additional turnover and value added in the European economy.

The turnover generated at companies who benefitted from the extra household expenditures from the direct and indirect employees linked to the RTOs, amounted to approximately 1.3 billion euro in 2021 and 1.5 billion euro in 2022. The corresponding value added generated by these companies was around 0.6 billion euro in 2021 and around 0.7 billion euro in 2022.

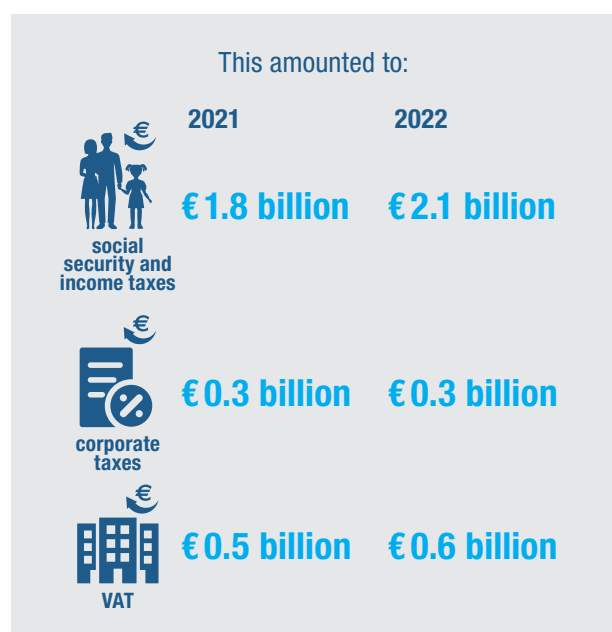
The employment generated at the 15 RTOs directly and indirectly at their suppliers, resulted in additional household expenditures in the European economy, which in turn created new employment. In 2021, 9 594 FTE or 10 130 HC jobs existed in Europe as a result of this consumption. In 2022, these numbers have increased to 11 547 FTE or 12 225 HC jobs. In both years, around half this induced employment has been generated by the household expenditures of the employees of the RTOs while the rest has been generated by the indirect employees linked to the RTOs' purchases.

2022

Fiscal & Parafiscal Impact

The economic activities of RTOs generated major fiscal and parafiscal returns for governments, essentially through 3 main channels: the additional employment (direct, indirect and induced) led to additional social security contributions in different EU countries; the additional production and turnover led to additional corporate taxes; the additional value-added led to additional VAT.





The direct, indirect, and induced economic activities generated by the RTOs significantly contributed to fiscal and parafiscal revenues for European governments, totalling around 2.7 billion euro in 2021 and 3.0 billion euro in 2022. These revenues stemmed from social security and income taxes, VAT, and corporate taxes paid by the RTOs, their suppliers across the value chain, and through the induced effect. The primary component of these revenues were the taxes levied on the income of employees whose jobs are directly or indirectly linked to the RTOs (social security contributions and income taxes).



2022

Total Impact of RTOs' Core Economic Activities

To gain a comprehensive understanding of the economic impact of the RTOs, we have combined the results from direct, indirect, and induced effects, as well as fiscal returns. It is important to note that not all results can be directly aggregated.

			
Direct	Turnover (in €)	Value added (in €)	Employment (FTE/HC)
Indirect	Turnover (in €)	Value added (in €)	Employment (FTE/HC)
Induced	Turnover (in €)	Value added (in €)	Employment (FTE/HC)
Total	Total Revenue	Total Value Added	Total Employment
			
Fiscal and parafiscal return = Total return (in €)	Corporate tax (in €)	+	VAT revenues (in €)
			+
			Wage Tax & Social Security Contributions (in €)

In 2022, the aggregated economic effect of those 15 RTOs from their core activities result in:



122,000
jobs



€ 18.8 billion
revenue



€ 8.2 billion
value added



€ 6.6 billion
fiscal and parafiscal return
to governments



For each
1 employee working
in an RTO, another additional
1.8 jobs
were created elsewhere in t
he European economy due to RTOs'
core economic activities in 2022



For each
€ 1 invested
by governments in the form of
operational grants in 2022,
€ 1 flew back
to those governments due to RTOs'
core economic activities in 2022

The employment created by the direct, indirect, and induced effects can be summed (horizontally). This approach also applies to the realised turnover and value added creation. However, we cannot sum turnover, value added, and employment (vertically) because they represent the same effect in different terms, leading to duplication. The various components of fiscal and parafiscal return to national governments, generated by the total turnover, employment, and value added creation, can be summed as they represent actual fiscal flows.

Aggregating the individual economic effects created by the 15 RTOs (direct, indirect and induced), results in an estimate of the total effect of the 15 RTOs' core-activities in the economy. In 2022, almost 122 000 jobs (HC) or 115 000 FTEs in Europe stemmed from the core activities of 15 RTOs, corresponding to a total additional turnover of 18.8 billion euro and a value added of around 8.2 billion. This also led to 3 billion euro of fiscal and parafiscal return to governments.

Through indirect and induced effects, the total impact of the 15 RTOs' core-activities in terms of employment almost tripled. For each employee working in an RTO, an additional 1.8 jobs were created elsewhere in the economy (on top of the one direct job in the RTO itself) due to RTOs' core economic activities in 2022.

The grants that the RTOs receive from national governments trigger economic activity directly at the RTOs as well as indirectly at their suppliers. As a result, a financial flow-back is generated thanks to RTOs' core activities. For every euro invested in the RTOs, there was a return of 1 euro for governments due to RTOs' core economic activities in 2022.

Technological Spillover Effects

Impact in the European Economy

The technological spillover effects of the RTOs also create an economic leverage effect with their knowledge receivers through the valorisation of the technological knowledge into commercially viable activities. Knowledge transformation and transfer at an RTO includes many aspects: its industry intimacy and cooperation strategy, sharing research and technological facilities, staff outflow, scientific transfers through publications, presentations, mandates in universities, PhD or master supervision, academic cooperation, professional education and training etc.

In this study, the focus was put on only three specific forms of knowledge transfer that typically have a substantial economic effect: outflow of staff, contract research and the creation of spin-offs. All three have an important economic impact and illustrate that also the scientific and technological activities have positive economic effects on the European economy.

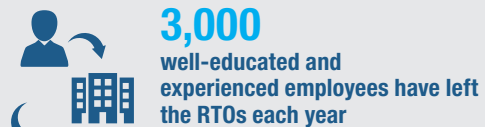
2022 Knowledge Transfer Through Outflow of Research Staff

The number and share of Science and Technology staff working in the RTO is a good indication of the knowledge input and absorptive capacity in an RTO.

When these employees with a unique combination of knowledge and knowhow leave the RTO to work in another environment, in particular in private industry, they take their knowledge and knowhow with them to apply in their new position.

The outflow of highly-qualified staff towards industry contributes strongly to the availability and absorption of highly-valued knowledge enterprises and their related industries. Many of the outflowing employees go to industry, not rarely taking up positions with high levels of responsibility (management, product development, strategic business development, etc.). As such, very well-educated people flow from the RTOs to industry and their number is an indicator of an important form of knowledge transfer from the RTOs.

The analysis showed that:

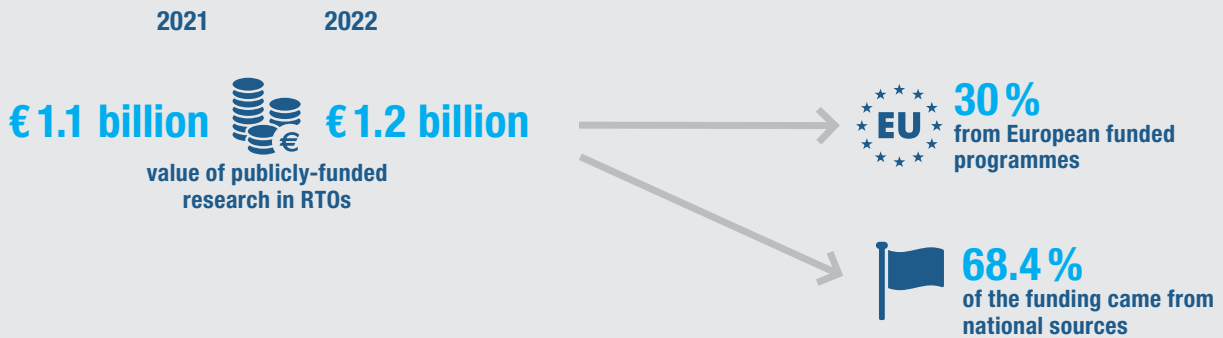


Knowledge Transformation & Transfer Through Contract Research

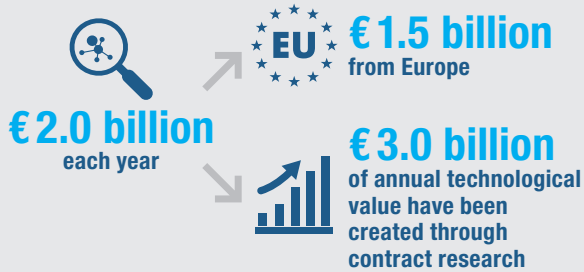
RTOs utilise their knowledge and infrastructure across a wide range of research projects. These include competitively funded public research projects, often in collaboration with other research and industrial partners, as well as specific research topics pursued together with individual public or private organisations through bilateral or multilateral contract research.

Both Types of Projects Significantly Promote Knowledge Transfer

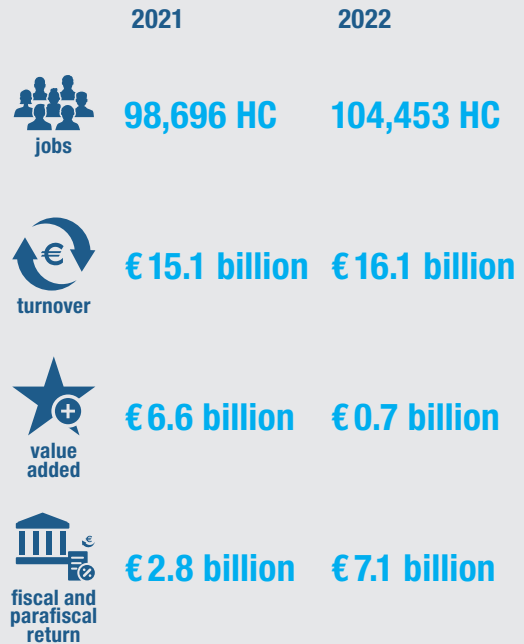
RTOs' publicly funded research was worth:



RTOs' contract research was worth:



Through contract research, the impact on the economy resulted in:



Knowledge conversion through deep-tech spin-offs

With their open-innovation business model, one of the core missions of RTOs is to transfer research and technology to the market with high impact for society.

RTOs have many ways of doing so, one of which being the incubation, creation and development of deep-tech spin-off companies.

RTOs' spin-offs are nurtured and created by RTOs. They are based on RTOs' unique and differentiated knowledge and technology, often protected with strong IP, and they have a strong industry focus. They are an important instrument to translate their RTOs' R&I activities into commercial or industrial applications and leverage the economic added value of this knowledge. In this context, RTOs can be seen as facilitators of business development. They enhance the incubation of business opportunities by transforming innovative technological assets into investment-ready ventures with the potential of creating societal value. Many RTOs have their own ventures' strategy to support this process.

Technology Impact of RTOs' spin-offs

Spin-offs not only have an important potential value added in terms of translating research and technology into commercial applications. They also create new jobs and have a positive impact on economic growth, just like any other new company, and even more.

This aspect was considered in the economic impact assessment of the spin-offs.

The analysis showed that:







393 deep-tech spin-offs

have been created by the RTOs and were still active or were active at some point during the period 2021-2022

Considering all spin-offs whether or not still active in 2021 or 2022 (636), the survival rate in the first year was 98%.

The Eurostat indicator on the survival rates of companies at EU27 level in 2018 was 81% after 1 year and 45% after 5 years⁶. Similar values can be observed in the US, with a survival rate of 81% after 1 year and 54% after 5 years⁷. On average, the spin-offs of the RTOs were active for 9.7 years before they stopped or merged their activities.

The activities of the deep-tech spin-offs led to:

	2021	2022
 jobs	16,940 HC	18,917 HC
 turnover	€ 2.5 billion	€ 2.8 billion
 value added	€ 6.6 billion	€ 0.7 billion
 fiscal and parafiscal return	Over € 0.5 billion	Over € 0.5 billion

⁶ Eurostat (online data code: bd_9bd_sz_cl_r2).

⁷ Bureau of Labor Statistics (https://www.bls.gov/bdm/us_age_naics_00_table7.txt).



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The full report of this Economic Footprint Study 2023-2024 is available on EARTO website.