Revisiting the Haldane Principle – Promoting the *best practice* of the "European way" to govern research and innovation by scientists and innovators:

Implications for MFF 2028-34[1]

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> *Our European Research Council is run not by politicians, but **by scientists, for scientists**. Our Horizon Europe programme is a magnet for global cooperation. […] We see scientists from across the world collaborating here in Europe […]*
>
> *Commission President von der Leyen's speech at Chose Europe event, 2025*[2]

1. Science for democracy: a European value

We live a "***Schuman Moment***" in which Europe need "**creative efforts and solutions that can meet the dangers which threaten them**".

The European Union must leverage on its strengths turning confused uncertainty into clear strategic options. **Research and innovation have a strong role for Europe to create the choices to shape its future**. But if the world is changing and is facing so many challenges with different characteristics – political, economic, technological, environmental, demographic – so is research and innovation in its expectations, processes and governance. New developments affect also the research and innovation communities, such as the use of artificial intelligence, or perspectives for younger generations. This requires an **increased *role of expertise* in research and innovation programming.**

The political discussions developed in the last 100 years around the ***Haldane Principle***[3] are important historical sources to address key questions on how science should be governed in the current context of rising uncertainty worldwide. Examples from last century's devastating World Wars show that even science, characterized by its robust methods to ensure adherence to facts, is not immune to malicious propaganda, false pseudo-scientific claims, disinformation, or unethical practices[4].

The historical context of Lord Haldane's 1918 report, in the aftermath of the First World War, is very relevant and its core message should be revisited: "***decisions about what to spend research funds on should be made by researchers rather than politicians***"[5]. This was gradually adopted in Europe through the *Framework Program for Research Innovation*, since 1984[6], but with a decreasing level of consideration in the last two decades. Nevertheless, it was strongly considered in 2007 with the creation of the ***European Research Council*, ERC**[7], under the 7th framework program, and should again be used and strongly revisited to promote research and innovation in times of increased uncertainty under the upcoming 10th framework program and

[1] Based on European Commission (2024) - Heitor Report, "Align, Act, Accelerate to boost European Competitiveness", https://op.europa.eu/en/publication-detail/-/publication/2f9fc221-86bb-11ef-a67d-01aa75ed71a1/language-en; released in October 2024.

[2] Closing speech by President von der Leyen at the 'Choose Europe for Science' event at La Sorbonne, May 2025 - https://ec.europa.eu/commission/presscorner/detail/da/speech_25_1130.

[3] https://publications.parliament.uk/pa/cm200809/cmselect/cmdius/168/16807.htm.

[4] See, for example, the Nuremberg Code - a set of ethical research principles for human experimentation created by the court in U.S. v Brandt, one of the Subsequent Nuremberg trials that were held after the Second World War; https://en.wikipedia.org/wiki/Nuremberg_Code.

[5] The Haldane Principle is popularly used to describe the notion that "decisions about what to spend research funds on should be made by researchers rather than politicians". It is supposedly derived from Lord Haldane's 1918 report on the machinery of Government (hereafter called the Haldane Report), which was written against the backdrop of the First World War; https://en.wikipedia.org/wiki/Haldane_principle.

[6] See, for details, Ruberti, A. and Andre, M. (1995), French edition, Un espace européen de la science, PUF, Paris, 1995. Also, Guzzetti, L. (1995), "A brief history of European Union Research Policy", European Commission DG XII, October 1995.

[7] See, for details, Celis, J. and Gago, J.M. (2014), "Shaping science policy in Europe", Mol. Oncology, 8, pp.447–457.

the next MFF 2028-2034. Overall, it represents the **best practice** of the "***European way***" **to govern research and innovation**.

A robust democratic governance embeds pluralism in its organization with the **separation of responsibilities**. It defines perimeters of complementary roles of the different stakeholders which together ensure **checks and balances to safeguard democracy and freedom**.

Europe's choice cannot be other than leading the way, as an internationally trusted partner, to defend democracy and freedom, distinguishing itself from autocratic, government-led prescriptive governance of science, like in China, Russia and lately in the US.

Advancement of science requires **intellectual freedom, work ethics and agreed ethical boundaries**. It must be supported by a high-quality base of **well-trained program managers and institutions in continuous dialogue with policy makers, namely through parliamentary committees and government-based decision makers**. Deep tech-based innovation can significantly contribute to economic competitiveness and geopolitical strength, and as such EU research and innovation funders require adequate governance schemes.

2. Building on lessons learned about innovation-driven economic growth: *impact for EU R&I governance*

Philippe Aghion won the 2025 Nobel Prize in Economics with Peter Howitt and Joel Mokyr for explaining innovation-driven economic growth, with their theory of "sustained growth through creative destruction"[8].

They have modeled how new innovations replace old ones, driving progress but requiring supportive policies to manage the resulting conflicts and encourage new talent. Aghion's work emphasizes innovation's central role in prosperity and the need for flexible, inclusive economies with strong education and competition to foster this process. Their research established **innovation, not just capital accumulation, as the fundamental driver of long-term economic progress**.

One year before, the Nobel laureates in Economics 2024, Daron Acemoglu and Simon Johnson[9], have shown that **choices about incentives, the relative bargaining power of different social actors, and institutions shape how technological innovation either benefits elites while worsening conditions for workers, or can be used for broader shared prosperity and sustainable development**. It challenges the common view that technology alone determines social outcomes, either in positive ways or leading to dystopian futures where humans have no role or, worse, become extinct, as in the discourse around existential risks associated with artificial intelligence (AI).

Governance, broadly understood as the process of using incentives and rules to shape collective action, determines whether and how technological advances benefit society. These challenges are being heightened in the context of rapid changes induced by AI, challenging regulators across multiple jurisdictions to assess the harms and benefits of this rapidly changing technology. It should be noted that the uncertainty associated with the evolution and deployment of AI is superimposed on societies facing increasingly widespread and deepening social and political polarization, resulting in the dangerous gridlock that is making collective action within and across countries more difficult.

In an era of abundance of information, rapid technological advancement and increasing societal inequalities and polarization, fostering the influence of scientists and of scientific institutions on society and ensuring the relevance of science and technology to societal needs are paramount. This includes the fight against fake news.

Europe, with its emphasis on democratic values and public engagement, faces the challenge of demonstrating how scientific and technological progress can contribute to a more secure, sustainable, and inclusive future for all its citizens, addressing concerns about misinformation and ensuring equitable access to innovation[10].

[8] See, for example, Aghion, P., Bunel, S. and Antonin, C. (2023), "The Power Of Creative Destruction Economic Upheaval And The Wealth Of Nations", Harvard Univ. Press, New York.
[9] Acemoglu, D. and Johnson, S. (2024), "Power and Progress", Public affairs, New York.
[10] https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/do-europeans-trust-science-new-survey-says-yes

Today's world witnesses the rising of new obstacles to discovery and dissemination of knowledge, threatening basic freedoms. **The same way democracy cannot be taken for granted and we must fight for it, freedom of research is at risk.**

Europe is at a critical and pivotal moment to differentiate from global geopolitical powers, including US and China.

Strengthening the **Haldane conclusion of 1918** should guide and stimulate the debate at the European Commission, the European Parliament and the European Council about the definition of the next MFF 2028-2034, as follows[11]:

> […] *we may briefly summarize the main principles to which we have drawn attention as follows:*
>
> *a)* ***Further provision is needed in the sphere of civil government for the continuous acquisition of knowledge and the prosecution of research****, to furnish a proper basis for policy.*
>
> *b) The distribution of business between administrative Departments should be* ***governed by the nature of the service*** *which is assigned to each Department. But close regard should be paid to the necessity for* ***co-operation between Departments*** *in dealing with business of common interest.*
>
> *c) In the organisation of individual Departments special importance should be attached to securing proper consideration of proposals for expenditure, unimpaired Ministerial responsibility, co-operation with advisory bodies in matters which* ***bring Departments into contact with the public****, and the extended* ***employment of qualified women****.*
>
> *d) A more efficient public service may* ***expose the State to the evils of bureaucracy unless the reality of Parliamentary control is so enforced as to keep pace with any improvement in departmental methods****.*
>
> *In making these suggestions we are aware that an efficient departmental system working in satisfactory relations with Parliament cannot be established or maintained on lines laid down in advance by any Committee of enquiry.*
>
> *Whatever validity may attach in the abstract to the principles which we have ventured to suggest, their practical efficacy will* ***depend upon the zeal and discretion with which they are applied from day to day by Parliament, by Ministers, and by the officers of Departments****, the living forces whose spirit is essential to any form of government that is more than a machine[12].*

3. European R&I programmes governance: current state and problems

ERC - the exception of the rule: *to be preserved and leveraged*

European leadership should be inspirational and operational as Commission's President put it in her speech at the launch of the Chose Europe for science initiative[1]. She used **the example of the European Research Council (ERC), which is totally governed by its scientific council, providing guarantees of knowledge-based independent decisions**.

However, Horizon Europe, the world's largest and longest (2021-2027) R&I programme, is gradually losing proximity with its constituency. The need to "flush out" more than EUR 15 Billion every year requires a big effort, and it became the main operational goal. The understandable 'time-to-contract' pressure has relegated important issues such as strategic oversight, debate on substance matters and **dialogue between programme managers and the research community to a secondary background.**

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[11] Ministry of Reconstruction Report of the Machinery. of Government Committee a.k.a Haldane Report, 1918 https://www.civilservant.org.uk/library/1918_Haldane_Report.pdf.

[12] The principle has been debated since it was first introduced by Lord Haldane and was inserted in UK law in several moments and recently inserted in the 2017's Higher Education and Research Act (one hundred years from Lord Haldane's report). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/594554/HERB_Lords_report_government_amendments.pdf.

EIC and the experience of R&I Programs adequately managed by Program Managers/Directors

It is difficult to manage a large programme in an efficient way while meeting the expectations of the research community (researchers, academics and their institutions), industrial stakeholders (innovative entrepreneurs, industry in different sectors), funding organizations (public and private funding actors), and national and regional governments pursuing social and economic development policies. In the case of European R&I programmes, one must add the multi-state dimension with different national and regional experiences, cultures and interests.

The European Innovation Council - EIC, as established under the 9th framework program in 2021, is the first ever European Agency/institution that recruited senior experts to work in-house to develop and manage innovative portfolios across a variety of thematic sectors/scientific areas[13]. This experience must be further enlarged and leverage throughout the full framework program.

Effective simplification is required

The request for simplification to overcome complexity and bureaucracy has been discussed every 7 years throughout European Institutions and the research communities, whenever a new framework program is being planned. However, **an effective simplification has never been accomplished**. The attempts to simplify have been merely focused on improving the "processing speed" from the EC perspective, not necessarily from the "proponents" perspective. For example, the EC services have imposed limits to the total number of pages of the proposals but have increased the number and complexity of the forms and, above all, have reduced dramatically the fraction of each proposal devoted to technical questions and technical innovations. This is becoming unacceptable and have had the consequence of increasing the role of consultants in the preparation of applications, with a large increase in transaction costs (on the top of relatively low administrative costs by the EC services).

These processes are the consequence of **outdated governance and gaps in resources** which did not match the increase in funding volumes since the past two framework programmes. There is a need to identify and deepen the understanding of the causes of problems and **design comprehensive approaches** to eliminate (or minimize) the lack of "brain time" dedicated to the essential mutual learning dialogue between the funded and the funder (avoiding consultants and intermediaries). Again, this requires an **increased *role of expertise* in research and innovation programming,** including in the preparation of the "Calls for Applications" and related forms.

A one-size-fits-all approach in governance should not apply

Given its broad range, from fundamental to mature research and innovation, **a one-size-fits-all approach, including any type of a "common rule" would not be effective and should not be implemented across the full Horizon Europe programme.**

A fresh look at the Haldane principle is very timely and pertinent for the preparation of the next R&I framework programme for 2028-2034 (ie, FP10). It should inform the debate about the governance in the context of the lessons learned and experts' advice on how to move to FP10. Following the Haldane report of 1918[14]:

> *[…] Advisory Committees: But the preservation of the full responsibility of Ministers for executive action will not, in our opinion, ensure that the course of administration which they adopt ill secure and retain*

[13] See, for example: https://sciencebusiness.net/node/58892/preview/NfXsDHkd2Q3FoZf5wCAeSxkL8wLKk3LHt01bLmDGtfg.

[14] Ministry of Reconstruction Report of the Machinery. of Government Committee a.k.a Haldane Report, 1918 https://www.civilservant.org.uk/library/1918_Haldane_Report.pdf.

public confidence, unless it is recognised as an obligation upon Departments to avail themselves of the advice and assistance of advisory bodies so constituted as to make available the knowledge and experience of all sections of the community affected by the activities of the Department.

4. Quality of governance must be improved - The experts' views: the AAA report, CEPS, ERT

There are already lessons to be learned from Horizon Europe on what went well and what needs to be improved. The AAA report[15] recommends a structural change of architecture, and governance, looking forward to FP10:

[…] improve FP10 means ***improving the autonomy and the quality of governance*** *through new structures, using lessons learned from previous FPs. It is important to avoid the trend since FP7, and dominant in FP9, to use Horizon Europe just to distribute funding. Critical issues include:*

- ***strengthening the European Research Council (ERC) autonomy, guaranteeing leadership and autonomy*** *[…] ERC program should continue to be* ***entirely "bottom up", science-driven and only governed through a totally independent S&T Board***

- ***strengthening the European Innovation Council (EIC) autonomy and funding, improve assessment methods***[16]

- ***create two new independent Councils (Competitiveness & Technology and Societal Challenges) fostering collaborative research****, using lessons learned from ERC and expand its governance to the full FP10 […] consider funding longer projects, and reduce job insecurity by promoting better research careers in Europe, together with the quality of jobs for young researchers and innovators. The new Councils should include the full autonomous governance of Partnerships and Missions. […]*

These views are well aligned with the *Haldane Principle* on the importance of strong involvement of the research community to share responsibilities on the governance. They follow recommendations issued since 2024 by the ***ERT-European Round Table of Industry***[17], **Science Europe**[18], major **University stakeholders**[19] and, more recently (in November 2025), by ***CEPS – Centre of European Policy Studies***[20]***.***

There is a need to build a fit-for-purpose, adequately resourced (in terms of competence and numbers) system balancing the roles of the actors to involve in the governance through transparent merit-based representative institutions i.e. research and innovation community, industry, funding agencies and governments.

The principle highlights the need to involve the research community in the governance of science, namely in the aspects related to priorities' setting, which relate to budgetary decisions. It entails, inter alia, leading strategic debates on scientific priorities, being a key interlocutor of governments and funders on social and economic aspects (e.g. funding decisions, industrial investments, competitiveness policies).

A renewed governance must overcome the mismatch of competences. Funded and funders, with the support of third-party experts, should engage in substantive dialogue throughout the life cycle of a project. It should consider that:

- researchers are well placed to define general areas for funding (avoiding too narrow focus, to leave room for creative thinking)

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[15] European Commission (2024) - Heitor Report, "Align, Act, Accelerate to boost European Competitiveness", https://op.europa.eu/en/publication-detail/-/publication/2f9fc221-86bb-11ef-a67d-01aa75ed71a1/language-en; released in October 2024.

[16] See, for example: https://sciencebusiness.net/node/58892/preview/NfXsDHkd2Q3FoZf5wCAeSxkL8wLKk3LHt01bLmDGtfg.

[17] https://ert.eu/documents/ert-recommendations-for-fp10-the-new-european-competitiveness-fund/.

[18] https://www.scienceeurope.org/our-resources/se-statement-on-fp10-and-ecf/.

[19] https://www.europen-packaging.eu/wp-content/uploads/2024/10/Joint-Statement-for-an-Ambitious-FP10-Final.pdf; see also https://www.cesaer.org/news/shared-vision-unified-voice-universities-and-research-institutes-in-europe-propose-joint-fp10-amendments-2076/.

[20] Renda, A. (2025), "DESIGNING HORIZON EUROPE FOR THE POST2028 WORLD HOW SHARPER GOVERNANCE CAN BOOST EUROPE'S IMPACT ", CEPS, November 2025; https://cdn.ceps.eu/2025/11/251030-Operationalising-the-governance-of-Horizon-Europe-formatted-1.pdf.

- government representatives are well placed to define policy priorities (economic, social, regional development) and areas requiring R&I investment
- industry is well placed to define industrial roadmaps requiring R&I investment
- researchers are best placed to evaluate scientific quality of the proposals through "peer review"
- research and innovation funding authorities (competent civil servants with R&I background) are best placed to ensure balanced participation of researchers (knowledge background, geography, gender)

5. The need to improve the Commission´s proposal of July 2025

Overall, **Europe needs a strong FP10/HEU to align MS and ensure future European autonomy and strength**. We must build our existing and future economy through research and innovation, and we must educate our young people and be an attractive partner and place to relocate, with better jobs and careers.

The proposal for FP10/HEU presented by Commission President Ursula von der Leyen (VdL) in mid-July 2025 is **an important step towards FP10 as a "standalone programme"** – that's a signal of support for research and innovation, but **requires critically relevant changes**, including the following aspects:

1. **A substantial budget increase is necessary for FP10**: The overall proposed envelope (i.e., 175 bi €) **remains smaller than the recommendations** of **Mario Draghi (i.e. 200 bi €)** and that of **the AAA report "Align, Act, Accelerate" (i.e., 220 bi €)**, and it could end up being lower, following the discussion 7 years ago for the preparation of the current FP9 (which started with 120 billion and end up with 96 billion, being further reduced to about 90 billion). It is critically important to **consider** and **guarantee at least 220 bi € for FP10, 2028-2034**[21]. Research is a full "**European Public Good**" (Annex A) and should be adequately funded. In addition, Europe needs additional **"EU Own Resources"** to guarantee adequate investment levels for research and innovation in time of increasing geopolitical threats and to **face the "investment gap"** of last decades. A **Capital market** and a ***Savings Union*** are required to ensure adequate funding for research and innovation but require adequate **alignment and action across Member States** (MS) **through the role of expertise**. Additionally, a ***Single Market*** and ***European Innovation Procurement*** are essential for ensuring European Readiness

2. **Governance – *"by scientists and innovators for scientists and innovators*": ** there is a clear critical need to clarify and continuously **improve the governance of FP10** towards a "**standalone programme**", making use of **lessons learned from the *role of expertise in* HEU programming.** It requires clear implementation procedures to **avoid "any type of common" rules under Horizon Europe (HE)**, or even under the proposed "European Competitiveness Fund, ECF", because ***framework programming*** **for research and innovation is totally different from other subsidies, grants or funding schemes**. Any type of "**common rule" will never simplify procedures**, and it would be against the goal of a programme being "***governed by scientists and innovators for scientists and innovators***" either in the public or private sectors, as expressed by President VdL. Following the AAA Report of October 2024, FP10 should be considered as program targeted to **4 distinct *spheres of action***,: i) ***competitive excellence*** (i.e., mono-beneficiaries, including ERC, EIC, MSCA); ii) ***collaborative research addressing industrial competitiveness***; iii) ***collaborative research addressing societal challenges***; and iv) ***European R&I ecosystems building*** (e.g., research and technology infrastructures; widening) and governed by independent Councils promoting an increased role of experts. To sum up, it is critically important to change the current text and avoid any misunderstanding of the concept of FP10 as a "**standalone programme**", **avoiding all references to a "common rule" across HE** (see Annex B)

3. **Institutional readiness – "improved autonomy and quality of governance":** There is a need for continuously **improvement the governance of FP10** towards more **autonomy of main programme components,** such as ERC and EIC, and based on experiences gained from previous FPs. It is becoming increasingly

[21] As clearly justified in the AAA report, the "Heitor Report" (EC, 2024).

important to **abandon** DG Budget's funding principle, increasingly adopted since FP7 and dominant in FP9, consisting of **distributing small levels of HE funding across many institutions** (Annex B). EC data for H2020 (2014-2020) and the first 3 years of HEU (2021-2024) shows that 78% of the funding is associated with collaborative projects, involving consortia with an average of 11 participants and with an average funding level per partner of (only) 127 Keuros for about 3 years, with the notable exception of the remaining 22% of the budget, as it is associated with ERC, EIC and MSCA. This may look a "democratic way" to distribute funding, but it is **not adequate to boost research and innovation** to properly address new emerging scientific or societal challenges and/or enhance EU's industrial competitiveness. It is the **result of lack of adequate *expertise in the programming*** combined with different kind of "pressures" applied by national delegations on the EC services. Therefore, main changes to be considered for FP10/HEU include:

- **ERC: strengthen further its autonomy and leadership**: More specifically: i) Guarantee adequate leadership and autonomy by **preserving the current role of ERC´s President**, with at least 4 years mandate and employed by the European Commission as a "special advisor". The proposed new system of the ERC president mandates of two years, as included in the EC proposal of July 2025, should be **abandoned**; ii) Guarantee full governance by **a totally independent S&T Council**, with rotating memberships (i.e., "*governed by scientists for scientists*"); and iii) avoid the need to introduce "EC priorities" in the ERC programming and in its implementation, as explicitly included in the draft EC´s proposal of July 2025. The **ERC programme should continue to be entirely "bottom up", science-driven and only governed by a totally independent S&T Council** and under the **leadership of a President residing in Brussels and employed by the European Commission as a "special advisor"**, as it is now. Its budget should, at least, be doubled, to a minimum of **35 bi€** (2028-2034).
- **EIC: strengthen its own autonomy and guarantee reforms**, such as new funding and assessment methods through an '**experimental unit'**, as detailed described in the AAA Report of October 2024. **Triple its budget to, at least, 30bi€** (2028-2034) and **guarantee** leveraging the recently established "**Scaleup Europe Fund**"[22];
- **Create two new independent councils to govern collaborative research *addressing industrial competitiveness*** and ***societal challenges***, respectively, **leveraging lessons learned from ERC and EIC and expand their governance to the full FP10**. Following recommendations from ***ERT-European Round Table of Industry***, major **University stakeholders** and, more recently, ***CEPS – Centre of European Policy Studies***, the goal should consider **increasing the role of expertise in HEU programming** towards more agility & faster, larger funding for fewer partners - under direction of new Councils. Funding projects longer, with real independence, and reduce job insecurity, by promoting better research careers in Europe, together with the quality of jobs for young researchers and innovators. The new Councils should include the full autonomous governance of ***Partnerships and Missions***.

4. **People and research careers – "MSCA expansion to an effective European brain gain tool/platform":** Europe is facing a unique challenge but also opportunity to **turn the "European Brain drain" of the last two decades into an "European Brain gain".** MSCA expansion in conjunction with the recently launched tool "**Choose Europe"** can make the difference in achieving the overarching goal of promoting adequate conditions for leading European and worldwide researchers to work in Europe (Annex C). It requires considerably expanding the existing **MSCA- Marie Sklodowska-Curie Actions co-fund mechanisms** to attract young talented researchers to work in European public and private institutions. It should complement ERC and target, above all, researchers 2 to 8 years after concluding their PhDs in all thematic areas/domains, as detailed assessed in the *CESAER´s Research Careers Survey 2024*. To achieve this goal **MSCA budget should increase, at least, three times, from the current 9bi€** (2020-2027) **to about 30bi€** (2028-2034), as clearly suggested in the AAA report of October 2024. In addition, MSCA should be governed efficiently, keeping a **fully bottom-up nature** with experts on the "driver's seat", avoiding any type of

[22] See, for example, Viewpoint: Commission must not interfere with the European Innovation Council's success | Science|Business.

directionality and leveraging lessons learned from ERC. Finally, misunderstanding and frictions resulting from a complex interaction between the responsible DGs for this program (DG RTD and DG EAC) should be avoided. Thus, we recommend MSCA's full reintegration in DG RTD.

5. **A strong Europe with a revisited European-driven "knowledge-based global order" – IN-OUT commitments in articulation across MFF** (i.e., Cohesion Policy; ECF; Space and Defense program; Global Europe):

   ○ **IN Europe**: Strengthening the ***European RD&I ecosystem***, in terms of public and private institutions, infrastructure, researchers, innovators, entrepreneurs, companies and their surrounding communities requires a **close articulation of FP10 with a revisited *Cohesion Policy* and funding** (Annex D), **as well as an adequate coordination with the ECF and EU Space and Defense program, including the necessary *role of expertise* in European and national/regional co-funding** for:

   - Strengthening and focusing the "**Widening**" program in the" TEAMING" action, promoting high quality scientific institutions throughout Europe in close articulation with those in mature regions;
   - Strengthening **Research infrastructures** and launching a new program of **Technology infrastructures** across Europe, together with strengthening and focusing ***University Alliances***.
   - Monitoring adequately **research expenditures** across MS, together with the use of "**European Seals of Excellence**", through the "**European Semester**" procedure.

   ○ **OUT Europe**: Strengthening a **nuanced, granular and revised global cooperation in science and technology** (Annex E), as suggested in the AAA Report of October 2024, requires a **close articulation of FP10 with a revisited "Global Europe" policy and funding.** The new **emerging "geography of science", requires strengthening specific global partnerships** and including actions with US and Chinese institutions, but also Latin America, India, Africa, and the Emirates. It should aim to foster R&I strategic global partnerships across Europe necessary with a revised research security framework. In addition, beyond the absolute **need to engage with China** and understand the **rise of Chinese Science**, among other global players, it is paramount to **increase the investment in the cooperation** with **Africa** (e.g., through ***ARISE – African Research Initiative for Scientific Excellence***) and with **Latin America**, particularly in terms of the new potential ***Europe-Mercosul agreement*** (under discussion at EP).

Annexes:

Annex A: Investment in Research as a full “European Public Good” and the need for additional “New EU Own Resources”

Annex B: Improving governance of FP10: an effective “standalone program”, leveraging lessons learned from ERC, and the need for two new Councils to govern collaborative research, including Partnerships and Missions – towards a full autonomous governance

Annex C: *Choose Europe* to turn the “European Brain drain” into an “European Brain gain” - strengthening MSCA with a co-fund mechanism promoting research careers across Europe

Annex D: Strengthening the *European RD&I ecosystem* in close articulation with a revisited *Cohesion Policy*, ECF, Space and Defence program and funding

Annex E: Promoting a nuanced, granular and revised global cooperation in science and technology in close articulation with “Global Europe” policy and funding

Annex A: Investment in Research as a full "European Public Good" and the need for additional "New EU Own Resources"

Research as a full "European Public Good"

Research is highlighted as a full *European Public Good* (EPG) and recent analysis of the Bruegel Institute recommends prioritizing genuine EPGs, like research and security, in the MFF 2028-2034. EPGs are broadly defined as "*policies and initiatives whose value to the citizens are higher when conducted at EU rather than at national level*".

EPGs built on the idea of European inclusive learning, entailing a process of shared prosperity following specific local conditions by emphasizing the relative importance of *people*, *institutions* and *incentives*, although it has been recognized the increasingly important role of other non-formal and non-hierarchical processes. These include science education and culture in increasing polarized societies, together with science diplomacy and global cooperation in research and innovation to face increasing geopolitical threats. This is because emerging "learning societies" increasingly rely on "distributed knowledge bases", as a systematically coherent set of knowledge, maintained across an economically and/or socially integrated set of agents and institutions.

The mere fact that in the economics literature "knowledge diffusion" processes have largely been explained in terms of externalities and *spillovers,* shows that "knowledge sharing" processes are largely an unintended consequence and, in fact, a disincentive for private agents to invest in knowledge creation. Thus, the logic of public intervention, namely in terms of research, innovation and foreign policies that tackle these market deficiencies, has been to provide incentives to enhance knowledge production, namely through formal mechanisms promoting infrastructures, incentives, and institutions. The right incentive structure builds on the science and technology infrastructures and enables the generation of virtuous learning cycles that foster the production of new knowledge that ultimately lead to long-term growth. Learning, in this context, reflects the idea of sustainable knowledge creation and diffusion.

New European Own Resources

The initial version for MFF (2028-34) released in July 2025 includes a very positive package of "New European Own Resources", which will be critical for the future of Europe. It is known this package is very controversial among many leaders and political movements in Europe, but it will be the only way to further increase public investment throughout Europe.

That is a must and, personally, I would like to see an increased and expanded set of "New European Own Resources", also to foster innovation across many areas. Following President von der Leyen at the Annual EU Budget Conference in May 2025[23]: *[…] We need new sources of financing. We must finance new priorities, and we must start repaying the loans raised for Next Generation EU. It is clear that national budgets alone cannot bear the brunt of it. So we need new own resources.*

Analysis clearly suggests that the need to spur public investment Europe will require a new and revisited approach to *new European Own Resources*, considering:

i. Take on debt to significantly increase public investment in research and innovation towards *Prevention, Preparedness and Readiness*, using the experience of "Next Generation EU" (2022-2027), through *Recovery and Resilience Funds*. This should build on the unique opportunity given by the new European Commission, since December 2024, to bring together SPACE and DEFENCE, in a single political portfolio.
ii. Take on debt to significantly promote an effective public procurement system at European level, for "designed and made in Europe", similar to the purchase of vaccines for Covid, for a set of absolutely strategic areas of great added value for civilian Prevention, Preparedness and Readiness. This includes advanced information systems, aero-robotics and space systems, that should be designed and manufactured in Europe;

[23] see at https://op.europa.eu/en/publication-detail/-/publication/d3e77637-a963-11eb-9585-01aa75ed71a1/language-en.

Despite efforts and incremental improvements, **Europe exhibits an "investment gap" when compared to the US and China, leading to an "innovation gap" especially in critical and complex technologies**. Turning research outcomes into business opportunities and the scaling up of innovative companies remains a challenge. It should be noted that:

- Research, Development and Innovation Framework Programmes (i.e., FP6, FP7, H2020, HE) have represented less than 8% of overall, centralised and decentralised, European investment funds included in the *Multiannual Financial Frameworks (MFF) of the European Union* over the last decades and this relatively low fraction was maintained for 2021-2027[24]. Comparatively larger investment levels were used for the *Common Agriculture Policy* and the *Cohesion Funds*.
- Research, Development and Innovation Framework Programmes over the last decades (i.e., FP6, FP7, H2020, HE) represent only about 4 to 6% of overall RD&I funding in Europe, but they have been critically relevant for building-up European scientific foundations and a unique research, development and innovation collaborative landscape through the *European Research and Innovation Ecosystem"*[25].
- About 66% of R&D expenditure was performed in the business enterprise sector, and its RD&I expenditure increased 12.1 % over the last decade, from 1.32 % of GDP in 2012 to 1.48 % of GDP by 2022.

Following the European Round Table of Industry[26], "with EU economic growth on a downwards slope, the next framework programme in Research and innovation (FP10) may be the last chance for Member States to think bigger when deciding on budget allocation for science and technology."
In addition to the need to increase research and innovation expenditure, our analysis also shows three additional critical aspects for the benefit of European citizens at large. First, that a new active European governance role in public procurement would help mobilize more funding:

- Governmental institutions and agencies need to participate actively, not as developers, but as buyers of systems like cybersecurity, thus leading the charge to stimulate public-private investments in research and innovation;
- We all must understand the slow EU bureaucracy, where a research proposal may wait two years for approval. To compete with global powers like the US and China, we must be willing to fail. Research and innovation institutions should be able to take and encourage risks, even investing in "useless knowledge" and in research that might not succeed in the short term.

Second, Europeans require a fresh perspective in ***European Innovation Procurement***, **capital markets union** and a ***Savings Union***. Innovations originating in Europe could be much better utilized and we note that:

- Many start-ups gain knowledge in Europe but then seek opportunities in the US for scale-up, drawn by venture capital[27].
- Public funds attract private funds. We all need new large financing instruments to improve the investment climate in Europe. We need to approach venture capital and risk investments differently. Radical changes aren't immediately necessary; we can start with pragmatic interim solutions, such as adjusting the mandate of the European Investment Bank to allow participation in companies. The need for higher capitalization of scale-ups is urgent. We must be able to issue larger financing rounds for research and innovation. All options should be considered.

Third, a crucial junction on the European roadmap should consider the essence of investing in innovation ecosystems. They consider the articulation of educational and research institutions, businesses, and governments as vital hubs that attract young talent and effectively mobilize public-private financing. Today, we focus on AI and quantum technology; tomorrow, it may change. It is therefore especially important that Europeans access financing models for research and innovation thar are broad and flexible, including continuous support for social and natural sciences research.

[24] See EC (2024), "H2020 post assessment"; also EC (2023), *Horizon Europe Strategic Plan 2025-2027 Analysis* .
[25] ERT (2024).
[26] See, for example Scale-up Report (2024); Atomico (2024).
[27] Soete, L., Serger, S.S, Stierna, J. and Landabaso, M. (2025), eds., "Capitalism, Sustainability and Democracy – Future proofing the European model", Joint Research Centre, European Commission.

Following our Report (EC 2024), it should be clear that the European Semester process should include detailed reporting and analysis of public and private expenditure in RD&I across Member States, including not only public and private expenditure on RD&I but also synergies with European structural funds and funding European Seals of Excellence projects.

To make the RD&I investments impactful, many regional and national RD&I systems need modernisation, as already pointed out in the European Semester process, but not effectively tackled in most of the cases. While there are measures in Horizon Europe that aim to raise access to excellence, there are currently no financial incentive measures that could facilitate the adoption of reforms with long-lasting effects in regional and national ecosystems throughout Europe. Consideration should be given to implementing such incentivisation programmes through national investments and European Structural Funds, in potential interaction with the *Framework Programme in Research and Innovation* (e.g., through Seals of Excellence). But a main recommendation of the Heitor Report (EC 2024) is about the absolute need to revise the reporting procedure associated with the European Semester to include a critical reflection of national RD&I plans and related expenditure. This should include a stronger dialog-based process between Member States and the European Commission, involving Heads of State and Finance Ministers.

Annex B: Improving governance of European Research and Innovation and the critical role of FP10 as an effective "standalone program" – towards a full autonomous governance

Overall European Research and Innovation Governance

A recent publication from the EC´s Joint Research Council[28] argue for radical changes in the governance of European, multi-level cooperation and financial instruments for ***research and defence*** towards a **harmonized centralized European effort together with the decentralization of innovation funds to the regional level.** Following Serger and Soete (2025) and Kattel and Soete (2024), the goal should consider enlarging the current ERC-European Research Council in close articulation (and their potential future merger) with national science and technology agencies/foundations together with R&D expenditure to be considered **beyond budget control**. They argue this should be complemented with a **revised cohesion and security framework**, with innovation funds to be implemented at regional level and in a rather decentralized path with a clear "regionalization" of current innovation agencies throughout Europe. Both will require continuous monitoring, assessment and review efforts throughout all Europe[29].

Specific governance of FP10

To better understand the situation about the current governance of the *Framework Programme in Research and Innovation* and related articulation with national administrations, it should be noted that collaborative projects accounted for 78% of the funding under the *European Framework Program 9*, Horizon 2020 (2014-2020), involving an average of 11 participants in nearly 15 thousand projects, with an average funding level per partner of (only) 127 kEuros for about 3 years (with some projects running between 2 to 5 years).

Single beneficiary grants accounted for 22% of the funding but 59% of all grants, primarily for ERC, MSCA and SME instrument[30]. It is under this contact that the Heitor Report (EC, 2024) recommends that: "To enhance European competitiveness the criteria of excellence in RD&I must be reinforced throughout Horizon Europe and FP10. ERC, EIC and MSCA are globally respected programmes that work, deploy highly professional procedures, and have enthusiastic widespread support from the evaluations and consultations, including from industry who are often indirect beneficiaries[31]. Their outputs show a multiple return on investment and address the wake-up call to Europe in terms of our slipping global positions in new scaled tech companies, as well as publication and patent quantity and quality".

A *new governance model* should be considered for the *European Framework Program of Research and Innovation*, including establishing two new *independent councils*.

Analysis has shown that Europe requires MUCH more disruptive innovation together with frontier research to face an accelerated rate of technical change[32]. First and foremost, it should be acknowledged that the *European Research Council* -ERC, the *European Innovation Council* -EIC and *Marie Skłodowska-Curie Actions* - MSCA are globally respected programmes that work, deploy highly professional procedures, and have enthusiastic widespread support from the evaluations and consultations, including from industry which are often indirect beneficiaries[33]. Their outputs show a multiple return on investment and address the wake-up call to Europe in terms of our slipping global positions in new scaled tech companies, as well as publication and patent quantity and quality. For example:

[28] Serger and Soete (2025). See also, Kattel and Soete (2024).
[29] EC (2024).
[30] See ERT (2024): also, Analog Devices (2024).
[31] See, for details, Heitor (2024) and Draghi (2024).
[32] See ERT (2024): also, Analog Devices (2024).
[33] See, for example, ERC Brochure describing 16 EIC Accelerator funded companies linked to previous ERC funded researchers in quantum and biotech and in the career paths of individuals; EC (2024), Examples of ERC-supported research contributing to the creation of companies awarded an EIC Accelerator, ERC, European Commission. Also EIC (2023) and EIC (2024).

- more than half (71 projects) of the funded EIC Transition projects were won by ERC grantees, and with other framework programmes. The EIC leverages EUR 3.8 of private VC investment for every EUR1 of EIC investment[34]. This synergy is evident in the many published case studies.
- Both Draghi and Heitor reports (EC, 2024; EC 2024) recommend doubling the ERC budget and this should be effectively accomplished in the coming decade. Additionally, we note that the ERC grants have not been adjusted for inflation since 2007. Given the uncontested value of the ERC programme for European RD&I this lack of budget needs to be addressed with a significant and much needed increase to fund all proposals ranked as competitively excellent.
- To address the challenges of scaling and critical technologies the *European Innovation Council* (EIC) was established as a pilot in the closing years of Horizon 2020 and fully in Horizon Europe with a modest budget of 10B Euros (approximately 9% of the HE budgets). The EIC Impact Reports for 2022, 2023 and 2024 highlight the achievements and case studies of this young agency which is serving an acute need and establishing an international reputation[35].

We certainly need to build on the experience of the *European Research Council*- ERC (following its creation since 2007) and the *European Innovation Council*- EIC (following its creation since 2021), together with strong "mission oriented collaborative research". And this requires preserving and reinforcing the structure and independence governance of the ERC and EIC. Specifically ensure the independence, authority and quality of the ERC *Scientific Council* and EIC *Board*, who represent eminent practitioners in appropriate fields and who play a critical role in steering the agencies programmes and ensuring they are at the cutting edge of best practice internationally and in the private sector.

But, in addition, analysis shows the absolute need to ***experiment*** new ways to assess and fund R&D, with decreased time to funding, decreased transaction costs, and increased risk taking. And the action should start by creating an "Experimental Unit" under EIC[36]. This must include:

i. assess, compare, experiment and foster new initiatives, such as SPRIN_D[37] in Germany and ARIA[38] in UK, use advanced information systems and test new methods as those being experimented by many private foundations and listed below[39];
ii. increase public expenditure on biomedical research and innovation to counterbalance the large increase in private expenditure and the resulting very high price of pharmaceutical;
iii. guarantee more private expenditure with co-fund mechanisms in many other areas, including for greening of industry, together with new ways to guarantee food security at global level;
iv. promote technology monitoring, by promoting related new tools and actors, as well as strongly engaging the private sector.

Some examples of diverse soliciting and reviewing procedures currently being tested in many public and private funding agencies[40], many outside the EU, include:

- High divergent reviewer values – Howard Hughes Foundation, USA
- Targetted solicitation – DARPA; NSF; BARDA - USA
- Heilmeier's catechism – DARPA - USA
- Research with no/little precedent – Israel OCS
- Adversarial collaboration – Templeton Foundation, USA
- Randomized selection/"lotteries" for the selection of high risk/high gain projects. Currently experimenting "distributed peer review" – Volkswagen Foundation, D
- Merit review for excellence followed by independent impact ranking of excellent proposals – Science Foundation Ireland Centers, IR; Research Institutions Assessment - (FCT), Portugal

[34] See EIC (2023) and EIC (2024).
[35] https://op.europa.eu/en/publication-detail/-/publication/2f9fc221-86bb-11ef-a67d-01aa75ed71a1/language-en
[36] https://www.sprind.org/en.
[37] https://www.aria.org.uk/.
[38] See details in the Align, Act, Accelerate Report, Recommendation 4, https://op.europa.eu/en/publication-detail/-/publication/2f9fc221-86bb-11ef-a67d-01aa75ed71a1/language-en.
[39] See, for example, Philea´s research Forum "Funding for Research – *Innovative* Approaches to *Assessment* and Selection", 2024.
[40] See, for details, Heitor (2024).

- Sandpit – Ideas factory EPSRC, UK; Takeda-Techno Entrepreneurship, JP
- Proactive call – BP Venture Research, UK
- Unconstrained creativity – Mac Arthur Fellows, USA
- Target Prize Competition – X Prize Foundation, USA
- Ongoing Target Prize Competition – Methuselah Foundation, USA

Two new councils to govern collaborative research, including Partnerships and Missions – towards a full autonomous governance

The legal framework of FP10 should consider establishing **two new *independent councils***, governed by independent boards to address **industrial competitiveness** and emerging **societal changes**, respectively. They should follow lessons learned from the ERC and the EIC Boards. They should be prepared in the period 2026-2027 and **engage recognized experts** from public and private sectors, including philanthropic institutions, ensuring adequate expertise, as follows (see also recommendations from ERT and CEPS):

1. **Stimulate industrial RD&I investment** in Europe by **creating an Industrial Competitiveness and Technology Council** to effectively engage eminent practitioners and experts who will ensure the framework programme's attractiveness and relevance to industry by:
   a. *identifying and **monitoring technologies** and value chains critical for European strategic autonomy & long-term competitiveness.*
   b. *supporting pan-European **collaborative research** that has a clear European added value and cannot be achieved by a single country, including for the implementation of the current thematic clusters (energy, climate, transport, food, safe and secure societies) and related partnerships with industrial relevance*
   c. *strengthening appropriate and **user-friendly instruments**: this implies revisiting **partnerships,** as well as **creating and governing a more open, less prescriptive programme** to attract new partners for collaborative research.*
   d. *linking to relevant European policies, regulations and framework conditions.*
2. Address **societal challenges** more effectively by **creating a Societal Challenges Council** with the purpose of:
   a. *Effectively engaging eminent practitioners and other experts in identifying priorities that align with the European Strategic Agenda (a **free & democratic Europe**, a **strong & secure Europe**, a **prosperous & competitive Europe**), as well as societal challenges that are currently not sufficiently addressed (e.g., **climate change, biodiversity loss**, **planetary boundaries**, **mental health**).*
   b. *Linking up with **philanthropy** and **civil society**.*
   c. *Identifying and funding the RD&I components of relevant current or future **missions** while elevating their governance, policy and regulatory elements out of the Framework Programme.*

It should also be noted that analysis throughout Europe has shown that "**societal challenges** represent an opportunity to empower citizens and regions, increase European well-being, resilience, inclusiveness, and competitiveness. In many cases, they must engage industry, to address challenges effectively and because they provide significant business opportunities. For example, by improving mental health, together with preventing cancer, cardiovascular and metabolic diseases, private and public sectors will benefit from healthy citizens, boosting economic productivity and wellbeing. Research and innovation are a fundamental part of the European fabric and society and as such have a fundamental responsibility to address societal challenges. Addressing societal challenges through research and innovation is essential both for the ability to tackle these challenges and for safeguarding societal acceptance and democratizing science."[41]

While some societal challenges (e.g., climate change and the loss of biodiversity, an ageing society, the erosion of democracy) are of a more long-term and pervasive nature, others can appear (and disappear)

[41] See, for example, Mallapaty, S. (2024), "The pathogens that could spark the next pandemic", *Nature*, https://www.nature.com/articles/d41586-024-02513-3

rather abruptly (eg. pandemics[42] or certain threats to national security or specific applications of disruptive technologies). The degree of consensus as to what constitutes a societal challenge (and its potential solution) can also differ or diverge among citizens, experts and policymakers. This has led Heitor (2024) to recommend that the *European Framework Programme* should **differentiate** research towards industrial competitiveness form that to address emerging societal challenges. In addition, it should consider the challenges of implementing a transformative agenda with adequate resources and instruments, together with a favourable regulatory environment, enabling the creation of new knowledge-based markets through a holistic view of the full research and innovation continuum[43].

But it also requires ***social innovations***[44] to address the complex and multi-dimensional translation of research results into policy formulation, regulation and implementation in a wide variety of areas, including civil protection, urban development, agrifood, climate and defence, and public service, to name a few. In turn, this requires better links with other deployment instruments and the key role of philanthropy[45].

An improved Horizon Europe for 2028-2023 should consider the **critical role of philanthropy**, which is increasingly specialized and needs to be understood as **complementary to traditional industrial engagement** and collaboration (Table 1). For example, "European Partnerships", as considered in Horizon Europe (2021-2027), consider co funding with industry, particularly oriented towards industrial competitiveness. Following Heitor (2024), *European Partnerships and Missions*, which are key instruments in Horizon Europe's toolbox, consider up to 59.9% of HE Pillar II's global budget. Until mid 2024, almost EUR 65 billion has been committed to European Partnerships launched between 2021-2024: EUR 24.8 billion from Horizon Europe and EUR 35.6 billion from the partners other than Union, out of which almost 65% come from industry. Areas for improvement for *European Partnerships* include their complexity and fragmentation, limited flexibility, the need for further leverage of cash and in-kind contributions, the need for the deployment and use of results, and the need for transparency and reinforced openness to new players, in terms of sectors, scientific disciplines and geographies[46].

Table 1. "Spheres of Action" (Align, Act, Accelerate; Heitor, 2024) towards a *transformative research agenda*

Spheres of action (Align, Act, Accelerate; Heitor, 2024)	Pillars in initial draft proposal for FP10, MFF (2028-2034), July 2025	Structural changes towards a transformative agenda for FP10	**Critical engagement of philanthropy[47]**
1.**Excellence in research and innovation**	Pillar 1: Research excellence	Competitively select the most excellent proposals for funding by using appropriate criteria (i.e., ERC, MSCA, EIC);	**Assess and co-fund frontier research, together with Choose Europe initiative to foster research careers**
	Pillar 3: Innovation		**Assess and co-fund disruptive innovation**
2. Collaborative research and innovation towards **industrial**	Pillar 2: Industrial Competitiveness	Provide state-of-the-art products, services and technology-based solutions which contribute positively to overall sustainability (economic, environmental and social) for which there is a market demand or that create new markets	---

[42] See European Commission (2023), "The transformative nature of the European framework programme for research and innovation – Analysis of its evolution between 2002-2023". Also, OECD (2023), "Agenda for Transformative Science, Technology and Innovation Policies" and OECD (2024) "DEClaration on Transformative Science, Technology and Innovation Policies for a Sustainable and Inclusive Future".

[43] See, for example, OECD (n.d.), Social Economy and social innovation, https://www.oecd.org/regional/leed/social-innovation.htm

[44] A specific task force should be promoted by Philea and philantroci institutions to discuss a new generation of European Partnerships and Missions.

[45] The mid-term evaluation of the partnerships is expected before the end of 2025, and its results should be taken into account when revisiting the partnerships.

[46] Details are not considered in this text and should be developed by specific task forces, which should consider issues such as: "How? Which co-funding instruments? Which Possibilities to co-shape instruments and programmes? Which involvement levels in selection / monitoring and evaluation?"

[47] See https://www.cesaer.org/news/research-careers-a-critical-choice-for-europe-1850/.

competitive-ness			
3. Collaborative research and innovation to address **societal challenges**	Pillar 2: Societal challenges	Consider complex and interrelated issues that significantly impact the well-being and development of societies. These challenges are typically multi-level and multi-dimensional, often coexisting and requiring innovative solutions, transdisciplinary approaches and coordinated efforts from various actors including government, industry, research, and civil society to be effectively addressed. There is usually disagreement about their nature, causes or solutions	**Assess and co-fund collaborative research and innovation to address societal challenges**, including **mental health, inequality in access to innovative biomedical treatments (especially for "non-curable diseases"), as well as the destabilizing planetary pressures and inequalities of the Anthropocene**
4.Promoting the **European research and innovation ecosystem**	Pillar 4: ERA – European Research Area	Consider a supportive, productive and interconnected interplay between institutions both public and private, infrastructure, researchers, innovators, entrepreneurs, companies and their surrounding communities to foster the creation of breakthrough discoveries and innovations and their rapid translation and scaling to global markets and applications	**Assess and co-fund Research infrastructures**

Annex C: *Choose Europe* to turn the "European Brain drain" into an "European Brain gain" - strengthening MSCA with a co-fund mechanism promoting research careers across MS

Engaging young generations and guarantee better opportunities and working conditions in Europe is critically relevant for our common near future. It will be the best way to face the rise of "populist" movements in Europe (and the world, as particularly stimulated by the new US administration and the Russian autocrats), including the support of many young adults. In addition, there is an opportunity for Europe to invest more on young generations and to **turn the "European Brain drain" of the last decade into an "European Brain gain".** This should consider launching "**Choose Europe"**, as a "pilot program" already in 2026-27, making use of the existing MSCA- Marie Skłodowska-Curie Actions co-fund mechanisms to attract young talent researchers for European public and private institutions, through better research careers. **The recent CESAER survey on Research Careers is very clear in this regard**[48].

Analysis shows the need "to add to the current portfolio of excellent MSCA and ERC programmes by establishing a new *Choose Europe* instrument specifically focused on outstanding young researchers in, or following, their first postdoctoral position to enable them to rapidly become independent researchers. We believe that by giving outstanding young researchers an early opportunity to pursue their creative ideas, Europe will be internationally attractive and benefit from their presence and results". During the period from 2001 to 2010, some member states including Italy, France, Poland, Spain, Sweden, Finland and Germany experienced significant brain drain, mostly to the USA or UK. In the subsequent decade from 2011 to 2020, Sweden and Germany have improved.

It should be noted that the *European brain drain* over the last two decades has occurred at the same time as an increase of the number of researchers in Europe. There were 2.08 million researchers (in Full Time Equivalents - FTE) employed in the EU in 2022, which marked an increase of 648 000 when compared with 2012. They represent about 2 % of the European labour force. The number of researchers (FTE) more than doubled in Poland, Sweden and Greece between 2012 and 2022. Most researchers (57%) are employed in the business sector, about one third of them (32%) in the academic sector, and 10% in the government sector. For comparison, in 2021, South Korea had the largest number of scientists and researchers per 1,000 FTE's, with 17.3 people working in research or science field per 1,000 employees. Sweden was second , with 16.6. The European average was 9.4.

However, the growth in the number of researchers in Europe has **not** been matched by an increase in the quality of research jobs and this has also driven brain drain. The need to address the ***precarity*** many researchers now face was explicitly addressed in the European Council conclusions of May 2021[49] on research careers and in the 'Pact for Research and Innovation' agreed in November 2021. The Manifesto on early research careers, published in September 2022 by the *Initiative for Science in Europe*, calls for urgent action[50].

[48] https://www.consilium.europa.eu/en/press/press-releases/2021/05/28/improving-conditions-for-research-careers-in-europe-council-adopts-conclusions/

[49] https://initiative-se.eu/2022/09/25/press-release-a-manifesto-for-early-career-researchers/

[50] See related discussion in EC (2024), "Heitor Report".

Annex D: Strengthening the *European RD&I ecosystem* in **close articulation with a revisited *Cohesion Policy*, ECF; EU Space and Defence Programme and funding**

A revised Horizon Europe programme should seek to boost **Europe's competitiveness**, defined as **the ability to provide state-of-the-art products, services and technology-based solutions which contribute positively to overall sustainability (economic, environmental and social) for which there is a market demand or that create new markets**[51].

Above all, a revised Horizon Europe programme **should align** and **mobilize efforts across public and private** sectors towards a **common and transformative research and innovation agenda to address *prevention, preparedness and readiness*** through **high added value product and systems. It should** mobilize current investments, including those under execution through **NextGenerationEU** (ie, **recovery funds…, from 2021-22 and until 2026**), as well as, SAFE, EDA, to guarantee a "**whole government" approach and further promote and attract a diversified portfolio of incentives** under **MFF 2028-2034**:

- **Horizon Europe, FP10,** under discussion at the EP and member states, to guarantee and adequate **"Bottom-up" research and innovation strategy** mobilizing public and private institutions across Europe;
- **ECF - competitiveness fund** , still to be defined and unknown governance, including a **top-down industrial policy**;
- **EU Space Program**. Together with defense, it will increase some 5 times…, but still to be defined and unknown governance;
- A **revised cohesion policy**, also in complement and in parallel to the *Framework Program for Research and Innovation*, oriented to build supply chains of the defense and security industries throughout Europe, under discussion at EP and member states, including the Common Agriculture Policy and subject to many political pressures and movements.

For most of the widening countries, the challenge is not only to continue **increasing the amount of RD&I expenditure as a function of GDP**, but also increase the **intensity of expenditure per researcher**. These are **two different issues**. Analysis has systemically shown a large disparity of values of "R&D expenditure per researcher" across Europe, when corrected for *purchasing power parity* (PPP), ranging from maximum European values of around 220 thousand euros per researcher in Germany, Austria and Belgium to values between 65 and 82 thousand euros per researcher in Bulgaria, SK, LV, PT and LT, respectively, with European average values around 161 thousand euros.

Two critically relevant aspects should be understood:

- First, the **European average RD&I expenditure per researcher is about half of the US average**, which is over 400 thousand euros per researcher per year[52]. This difference can only be effectively dealt with by increasing **European competitiveness and fostering high quality business RD&I**.
- Second, there is ***persistent inequality*** across Europe. The total RD&I expenditure per full time researcher **is too low in many European MS, particularly in widening countries**, but also in some of the large European countries. Reducing inequalities requires improving the **quality of jobs/employment and salary levels** in the public and private sectors, as well as improving **research career pathways,** together with **technical careers supporting research**.

Many MS must simultaneously increase **RD&I expenditure as a function of GDP**, as well as the **intensity of RD&I expenditure per researcher** - a **critical issue in European research and industrial policies**.

This requires a new structuring and social valorization of scientific and technical careers in the public and private sectors, which require an adequate implementation of a revisited European Cohesion Policy, together with National funding (ie tax payer contributions). This is important because the OECD has associated low research expenditure per researcher with constraints that affect research activities and their results[53].
Two critical issues should be noted:

[51] Details in OECD, Main S&T indicators, with values in PPP, corrected for 2020.
[52] OECD (2023).
[53] EC 2023: Widening in Horizon Europe: state of play of the implementation. Brussels

- Existing widening instruments – such as teaming, twinning, ERA chairs, Excellence Hubs, European Excellence Initiative, Hop-on, ERA fellowships and talents – should be critically evaluated and streamlined[54]. Our analysis aligns with that of many stakeholders and we recommend that widening instruments should be **focused on excellence building, preserving and reinforcing initiatives that work** (e.g., Teaming, MSCA including Staff exchange, among others) and ensure a clear evolution towards an inclusive European RD&I ecosystem. This also means discontinuing those **instruments that the review of Horizon Europe shows to be of limited effectiveness or efficiency. Equally those instruments that have demonstrated efficiency or good potential should be strengthened. The paradigm of "supporting "schemes for "widening countries" should be transformed to a paradigm of "Advancing Europe" for an inclusive European RD&I ecosystem that emphasises empowerment and strengthening research excellence in all Member States.**
- the **European Semester process should include detailed reporting and analysis of public and private expenditure in RD&I across MS,** including not only public and private expenditure on RD&I but also synergies with European structural funds and funding European Seals of Excellence projects. To make the RD&I investments impactful, **many regional and national RD&I systems need modernisation**, as already pointed out in the European Semester process, but **not** effectively tackled in most of the cases. While there are measures in Horizon Europe that aim to raise access to excellence, there are currently no financial incentive measures that could facilitate the adoption of reforms with long-lasting effects in regional and national ecosystems throughout Europe. Consideration should be given to implementing such incentivisation programmes through national investments and European Structural Funds, in potential interaction with the Framework Programme in RD&I (e.g., through Seals of Excellence; see Recommendation 5). But our main recommendation is about the absolute need to **revise the reporting procedure associated with the European Semester** to include a critical reflection of **national RD&I plans and related expenditure.** This should include a stronger dialog-based process between MS and the EC, involving Heads of State and Finance Ministers.

The Nobel laureates in Economics 2024, Daron Acemoglu and Simon Johnson[55], have shown recently that choices about incentives, the relative bargaining power of different social actors, and institutions shape how **technological innovation either benefits elites** while **worsening conditions for workers**, or **can be used for broader shared prosperity and sustainable development**. This challenges the common view that technology alone determines social outcomes, either in positive ways (with techno solutionism assuming that technology always improves living standards) or leading to dystopian futures where humans have no role or, worse, become extinct, as in the discourse around existential risks associated with artificial intelligence (AI).

Governance, broadly understood as the process of shaping incentives and rules to shape collective action, determines whether and how technological advances benefit society. These challenges are being heightened in the context of rapid changes in AI, challenging regulators across multiple jurisdictions to assess the harms and benefits of this rapidly changing technology. It should be noted that the uncertainty associated with the evolution and deployment of AI is superimposed on societies facing increasingly widespread and deepening social and political polarization, resulting in the dangerous gridlock that is making collective action within and across countries more difficult.

To sum up, in an era of rapid technological advancement and increasing societal inequalities and polarization, fostering trust in scientific institutions and ensuring the relevance of science and technology to societal needs are paramount. Europe, with its emphasis on democratic values and public engagement, faces the challenge

[54] Daron Acemoglu and Simon Johnson, "**Power and Progress**", 2024, Public affairs, New YorK

[55] Bruegel (2025), "BIGGER, BETTER FUNDED AND FOCUSED ON PUBLIC GOODS: How to revamp the European Union budget", BRUEGEL BLUEPRINT SERIES, Editor: Stephen Gardner, www.bruegel.org. See also, Bruegel (2023), "Sparking Europe's new industrial revolution - A policy for net zero, growth and resilience", edited by Simone Tagliapietra and Reinhilde Veugelers, BRUEGEL BLUEPRINT SERIES, Editor: Stephen Gardner, www.bruegel.org. https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/do-europeans-trust-science-new-survey-says-yes

of demonstrating how scientific and technological progress can contribute to a more secure, sustainable, and inclusive future for all its citizens, addressing concerns about misinformation and ensuring equitable access to innovation[56].

The future can only be built with more knowledge and, therefore, requires learning more and knowing more, involving ALL people and ALL institutions, and following the paths that tolerance demands, with a growing collective effort to combat ignorance and the polarization of our societies. It requires facilitating the social construction of knowledge. It therefore requires broadening the social base and culture of all of us. But learning more and knowing more also requires the specialization that knowledge demands of us. It therefore implies more education and training, better institutions, and more knowledge.

It therefore requires stimulating our collective resilience and capacity for learning and, consequently, understanding the growing polarization and related exclusion of many communities of our societies. It requires understanding the "times" of collectives and daily combating the cultural, social, and economic isolation of some communities, cooperating with everyone and always accepting the most readily available criticisms about the development of our societies, exploring new paths and combating "populism."

It also requires everyone's involvement, fostering informed debate among scientists and non-scientists, women and men of all religions and backgrounds. It requires the humility necessary to act with the necessary effort to understand the growing complexity of change processes, which are certainly influenced by the "mutilating mode of organizing knowledge, incapable of recognizing and learning the complexity of reality," as consistently recognized by Edgar Morin.

It is also in this context that a new policy framework and investment on *prevention, preparedness and readiness* requires modernizing and strengthening our systems to promote science culture, education and awareness for all. Philanthropic institutions play a critical role in this process to foster the engagement of populations and, in particular, of young adults throughout Europe. This is becoming critically relevant to face the emergence of “populist movements” supported by communities of youngsters in many European regions, including the most vulnerable.

[56] https://commission.europa.eu/eu-budget/annual-eu-budget-conference-2025-local-action-global-influence-next-long-term-union-budget-2025-05-20_en.

Annex E: promoting a nuanced, granular and revised global cooperation in science and technology in close articulation with “Global Europe” policy and funding

An improved FP10 should consider diving into the need for Europe to establish a potential new “knowledge order” to foster a peaceful world and a sustainable future for next generations. In times of increasing knowledge abundance, the fragmentation of multilateralism, and the rise of Chinese science, with scientific publications raising exponentially every year, researchers across the globe face new grand challenges for “scientific activism” to deal with uncertainty. To get a more informed perspective on these topics, we examine the existing and developing collaborations between the worlds’ biggest science powerhouses: China-US, EU-China and EU-US. While formal relations between US and China have been deteriorating over the past years by targeted policies and their increasing ideologically, militarily and technologically rivalry, researchers of these two countries continue to cooperate closely academically and are each other’s largest partners in internationally co-authored papers associated with "critical technologies”.

On the other hand, scientific cooperation in the humanities and social sciences is not reflecting any type of attempt to establish a path towards mutual learning of radically different cultures across the planet in a way to better sustain the UN´s 2024 “Pact for the Future” and effectively raise an opportunity to shape our common future.

Embracing a transformative R&I agenda towards European strategic autonomy should, therefore, consider a new centrality of research and innovation together with accelerating global scientific cooperation across all areas of knowledge. Facing a new complex of uncertainty requires bold reforms in funding systems, risk tolerance, and governance, together with a revisited understanding of global scientific cooperation.