European Deep Science Technologies:

The time for Science Equity is now

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Alberto Diaz / Roberto Ranera

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Dear friend,

We are pleased to share with you the report “European Deep Science Technologies: The time for science equity is now” prepared jointly between BeAble Capital and BBVA Research during the last months and which was presented by Jorge Sicilia, Chief Economist BBVA Group on last 18th January 2024 in the meeting Facing Challenges Summit which took place within the event Science4Industry in La Nave, Madrid.

You may be wondering the reason why this report was elaborated. And for us it is clear: the race to sustainability necessarily needs deep science as main motor engine, so it is necessary to pay attention on how it works the machinery which moves this deep science into technology and then this into solutions and products.
And the result of a deep analysis carried out by several BBVA economists and BeAble team members is clear: a specific way to invest in early stages of Deep Science is necessary. And being so necessary, it already exists, and it is the core of Beable Capital investment work. I refer to the so-called Science Equity.

And it is also necessary to highlight that there are also some features that make so important to boost the development of Deep Science into economy through the method of Science Equity. One of these features is that the European Union needs Deep Science technologies to keep its competitiveness, resilience and sovereignty in certain key technological manufacturing capacities while adapting to climate change. So we have a tool to adapt to climate change and other sustainability risks which can also enhance and boost European economies. The report also shows other relevant findings and analysis on how to strengthen Science Equity, once it is dilucidated its main importance for the future of EU.

So let me suggest you a careful reading of the report to introduce you the possibilities offered by Science Equity. I hope you enjoy and find the report useful, as a lot of effort and intention is behind this document. I would also ask you to please carefully consider its recommendations to the extent possible, as deep changes will come only from the decisions of as many as possible members of the ecosystem.

Best regards

Almudena Trigo Lorenzo

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Index

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01

Innovation: An imperative for the EU

Creating Opportunities

The EU's deploys a three-pillar strategy to today's mounting challenges

TECTONIC SHIFTS

- Geopolitical tensions
- Climate change
- Aging
- Disruptive technologies
- Inequality

CHALLENGES AND UNCERTAINTIES

- International conflict
- Geoeconomic fragmentation
- Rising populism
- Protectionist impulses
- Interventionist impulses

THREE-PILLAR STRATEGY

- SUSTAINABILITY
- COMPETITIVENESS
- RESILIENCE

Innovation plays a pivotal role in the EU´s three-pillar strategy

In 2021, the **EU launched *Horizon Europe***

An effort that **complements a broad range of EU initiatives** geared towards research and innovation

HORIZON EUROPE

Other Union Programmes, including

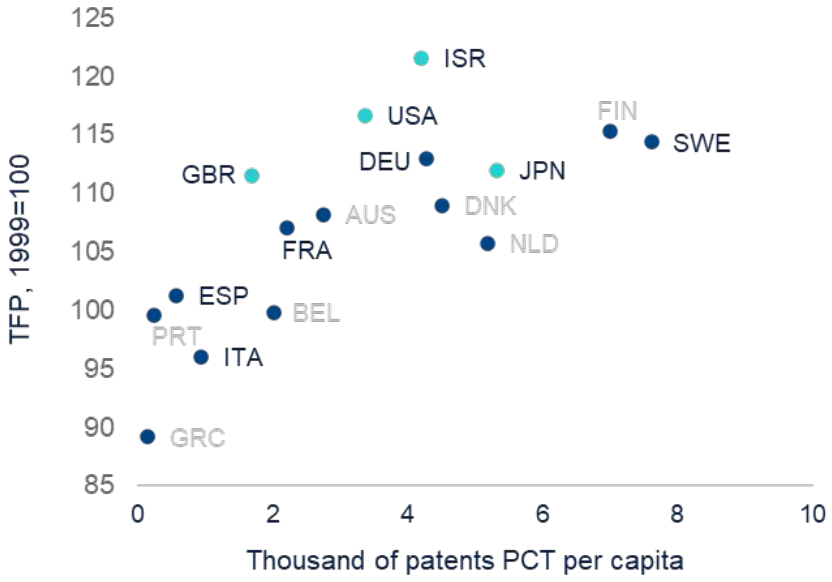
Common Agricultural Policy	Invest EU	ESF+	Innovation Fund
External instrument	LIFE	Digital Europe	Internal Security Fund Instrument for Border Management
Maritime & Fisheries Fund	EU4 Health	Space Programme	
Connection Europe Facility	ERDF	ERASMUS+	Single Market Programme
Just Transition Mechanism		Creative Europe	Recovery and Resilience Facility

Source: Horizon Europe (link)
* €16 bn budget to the ERC plus €10 bn budget to the EIC,

This is an economically sensible approach: Innovation drives productivity and long-term growth

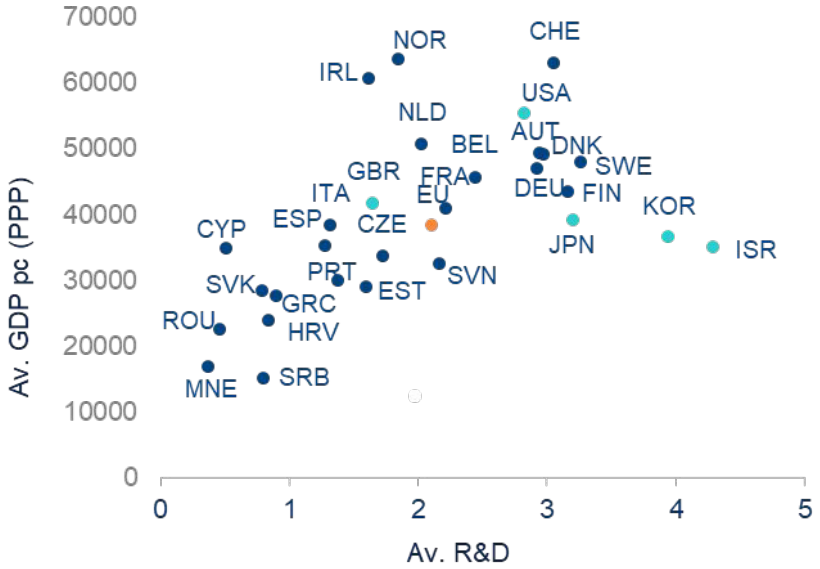
PCT PATENTS AND TOTAL FACTOR PRODUCTIVITY (TFP)

(THOUSAND PATENTS PCT PER CAPITA AND TFP INDEX - 2019)



RESEARCH AND DEVELOPMENT EXPENDITURE AND GDP PER CAPITA - DEVELOPED ECONOMIES

(% GDP AND PER CAPITA PPP TERMS - 2019)



Notes. Gross domestic expenditures on research and development (R&D), expressed as a percent of GDP. They include both capital and current expenditures in the four main sectors: Business enterprise, Government, Higher education and Private non-profit. R&D covers basic research, applied research, and experimental development. The left graph does not include those countries with more than 10% of GDP coming from oil revenues. In the right graph, Luxembourg has been removed.

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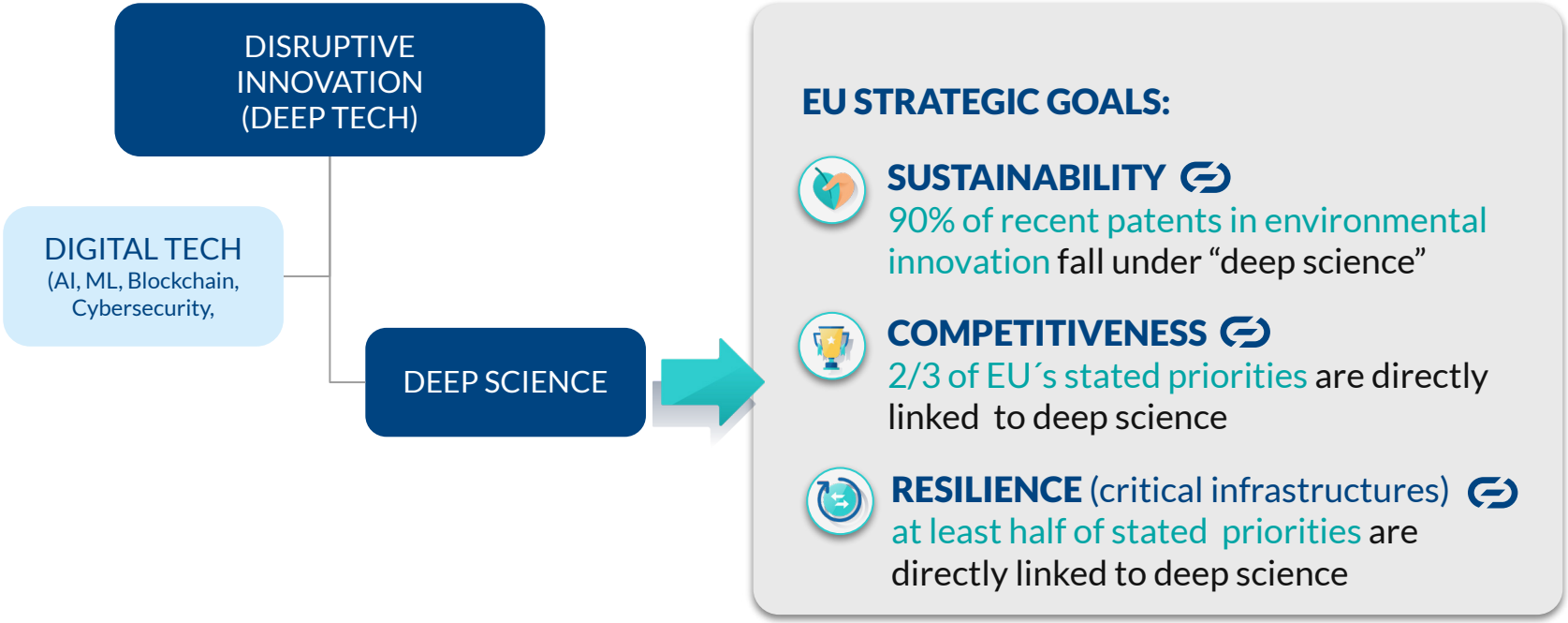
02

Deep science:

A key domain of disruptive innovation, and essential to climate change solutions

Coining a new term for a known concept: Deep science, an innovation domain that is essential for EU strategic goals



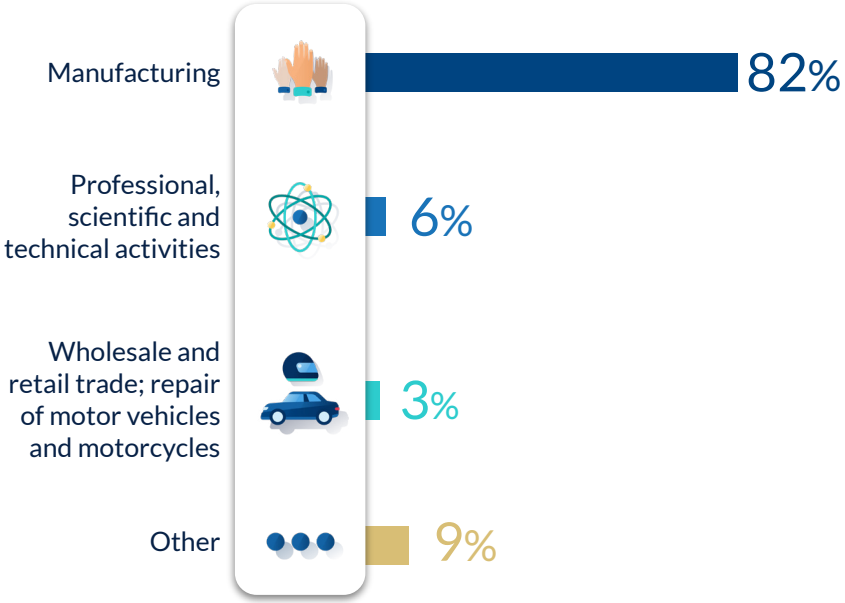
DEEP SCIENCE Disruptive innovation in Physical / tangible / hard technologies

Advanced materials, nanotechnology, industrial biotech, micro and nanoelectronics, photonics.

Deep science is most critical for the EU high-tech manufacturing

DEEP SCIENCE PATENTS: STRUCTURE BY NACE SECTOR*

(%)



- Manufacturing firms remain pivotal in pulling business R&D.
- The European manufacturing sector has historically driven total factor productivity (TFP) growth - outpacing that of the overall economy.
- The EU is one of the world's largest trader of manufactured goods - surpassing the US.
- While the tradability of manufacturing and its role in driving domestic services underscore its significance in enhancing EU competitiveness.

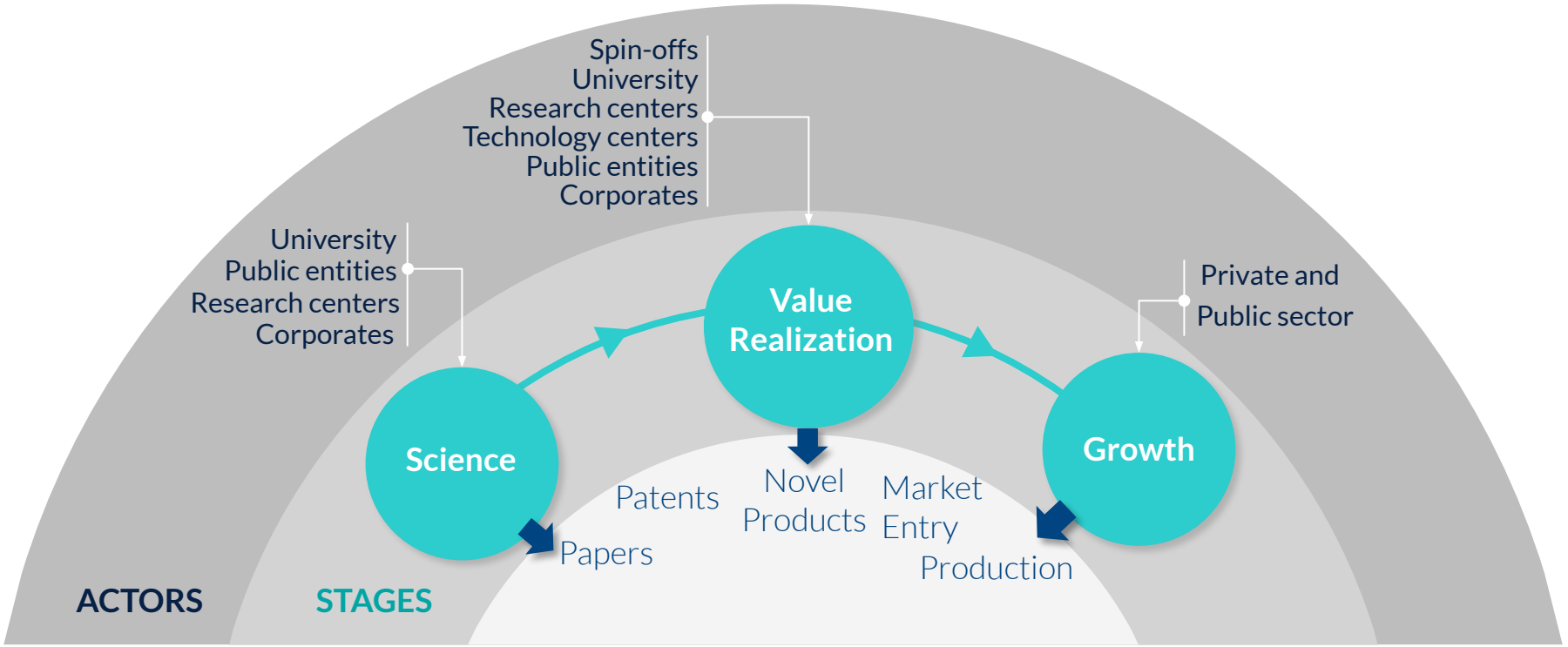
*EU and USA data.

Source: OECD. Patents Statistics. PCT patent applications based on priority date and by applicant's country of residence.

*

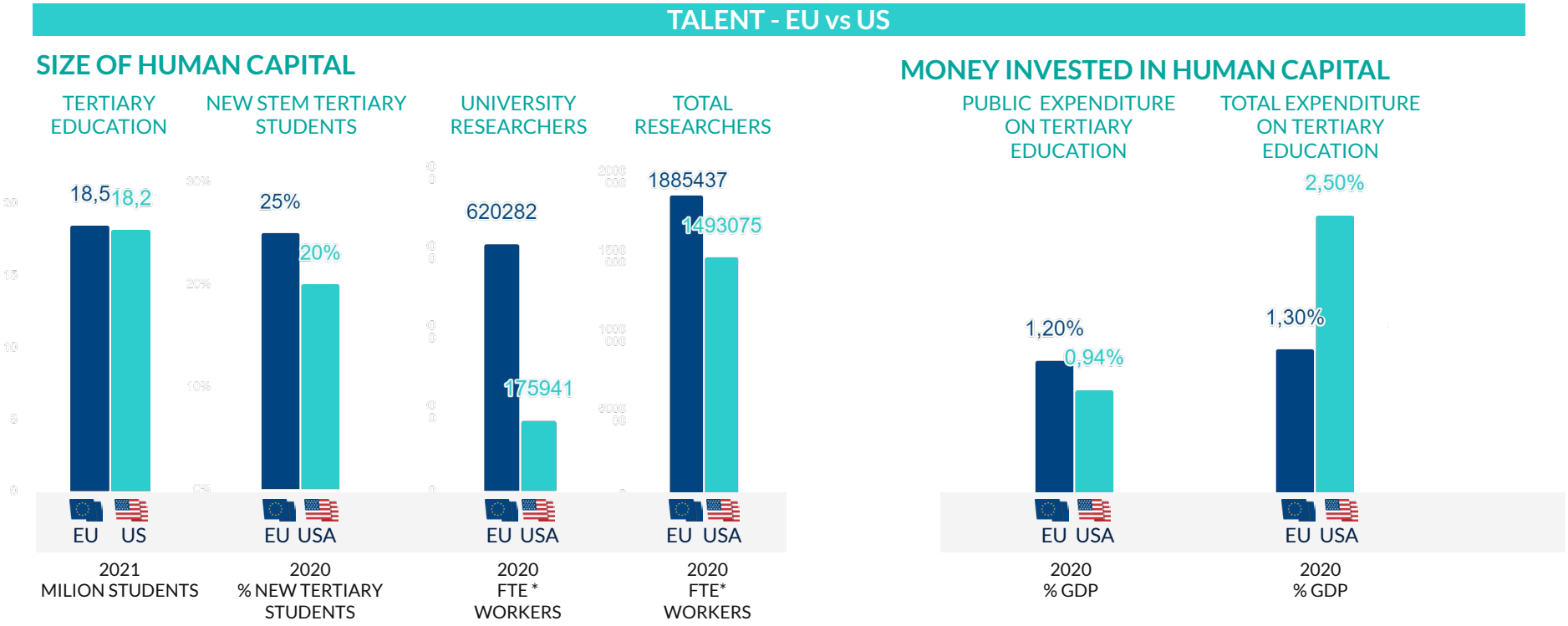
Deep science is a complex process involving many actors and several stages

It starts with scientific research and only succeeds with actual growth



Source: BBVA Research and BeAble Capital

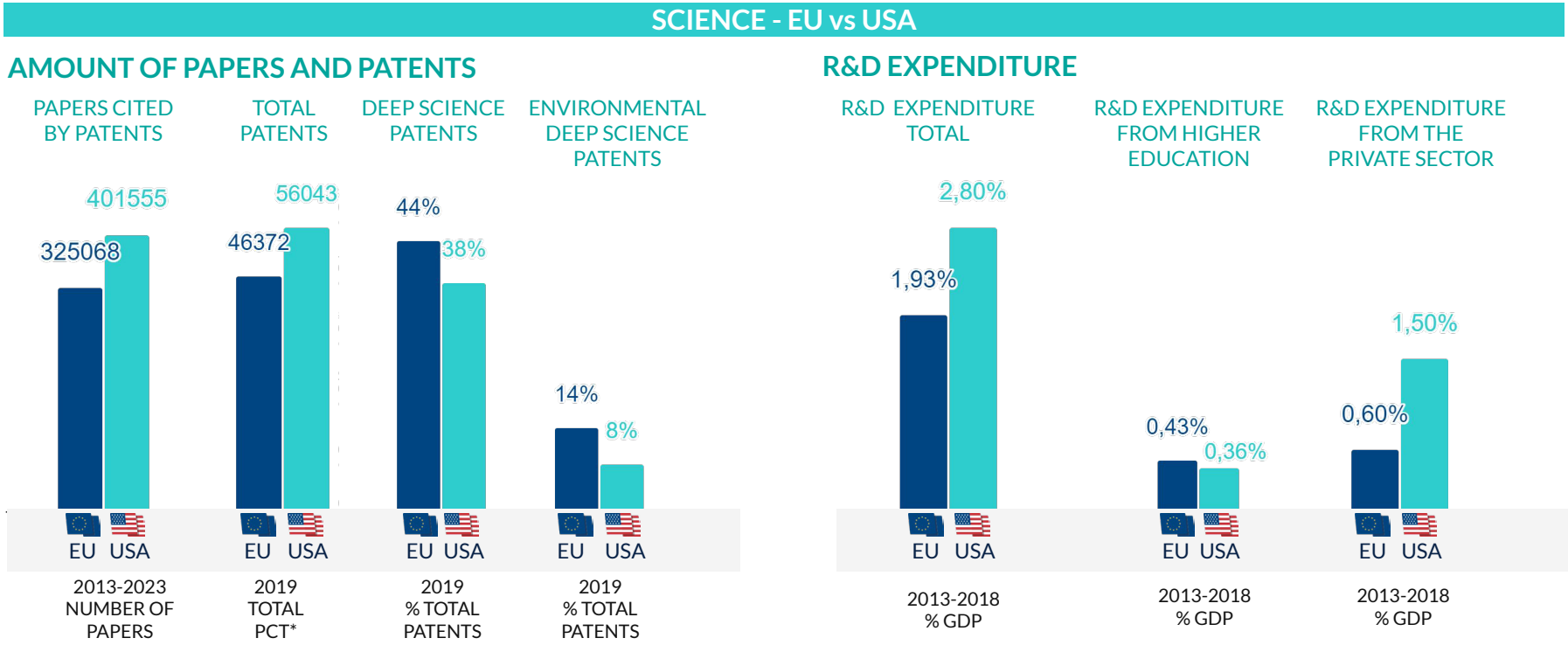
In Science, the EU starts strong, owing to its vast pool of talent



*FTE: Full time equivalent

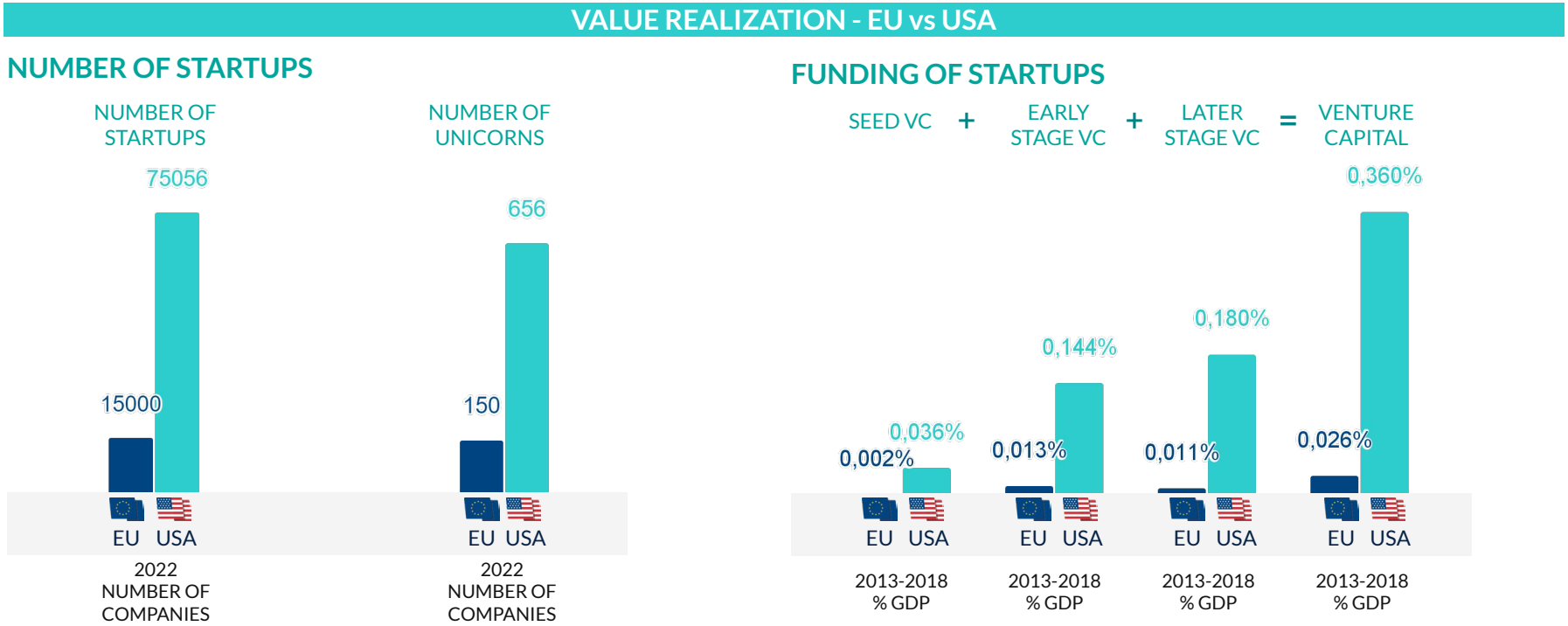
Source: BBVA Research from OECD data.

A pool of talent that consistently delivers cutting-edge scientific advancement



(*) PCT: Patent Cooperation Treaty.
Source: BBVA Research and BeAble Capital from OECD data.

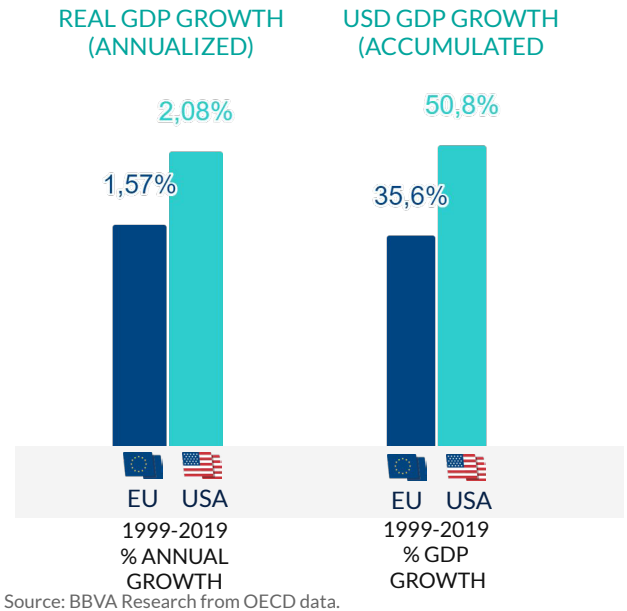
Yet in Value Realization, the process falters



Source: BBVA Research from OECD data.

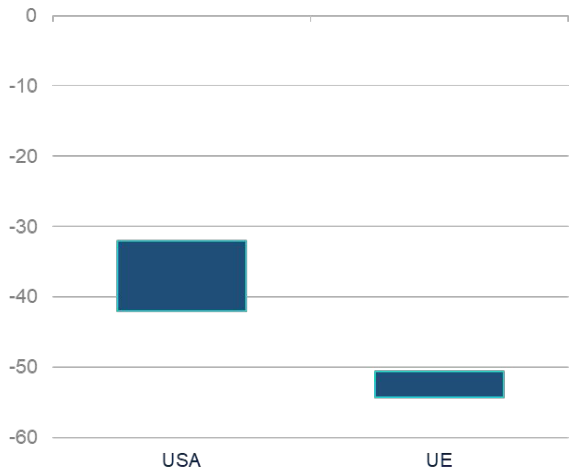
Weak Value Realization hurts Growth … and the EU´s sustainability goals

GROWTH - EU vs USA



Source: BBVA Research from OECD data.

US, EU. FORECAST OF GHG EMISSIONS REDUCTIONS FOR 2030
(PP, RANGE)

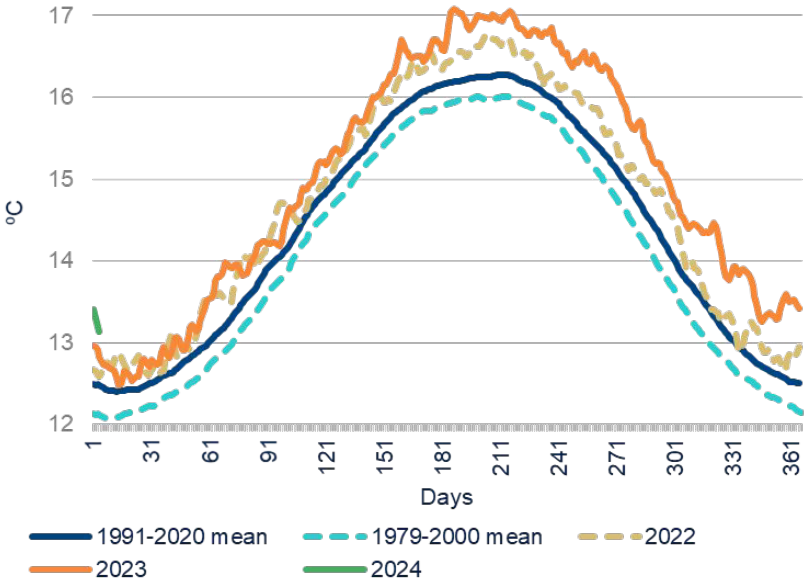


Source: BBVA Research, Rhodium Group, and Climate Action Tracker.

Over the past decades, the EU has lagged behind the US while, looking forward, faces the challenge of climate change.

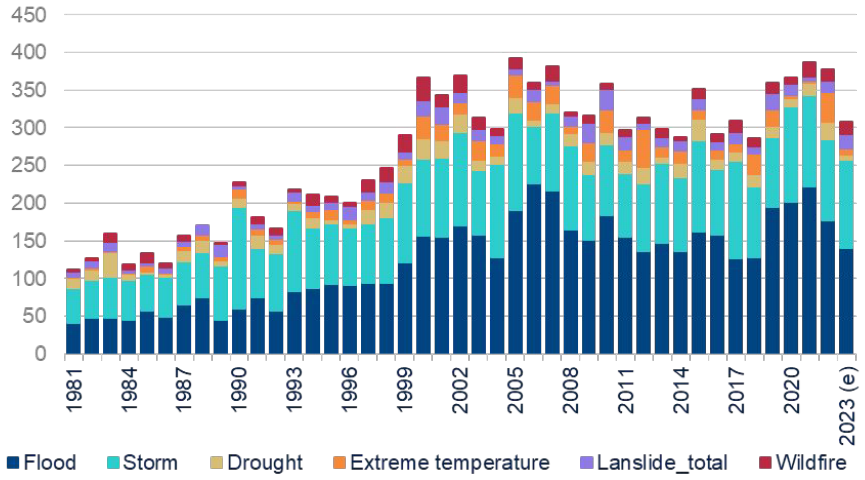
Climate change is an undeniable global challenge that is already unfolding

GLOBAL TEMPERATURE
AVERAGE in ºC



Source: BBVA Research from Daily 2-meter Air Temperature

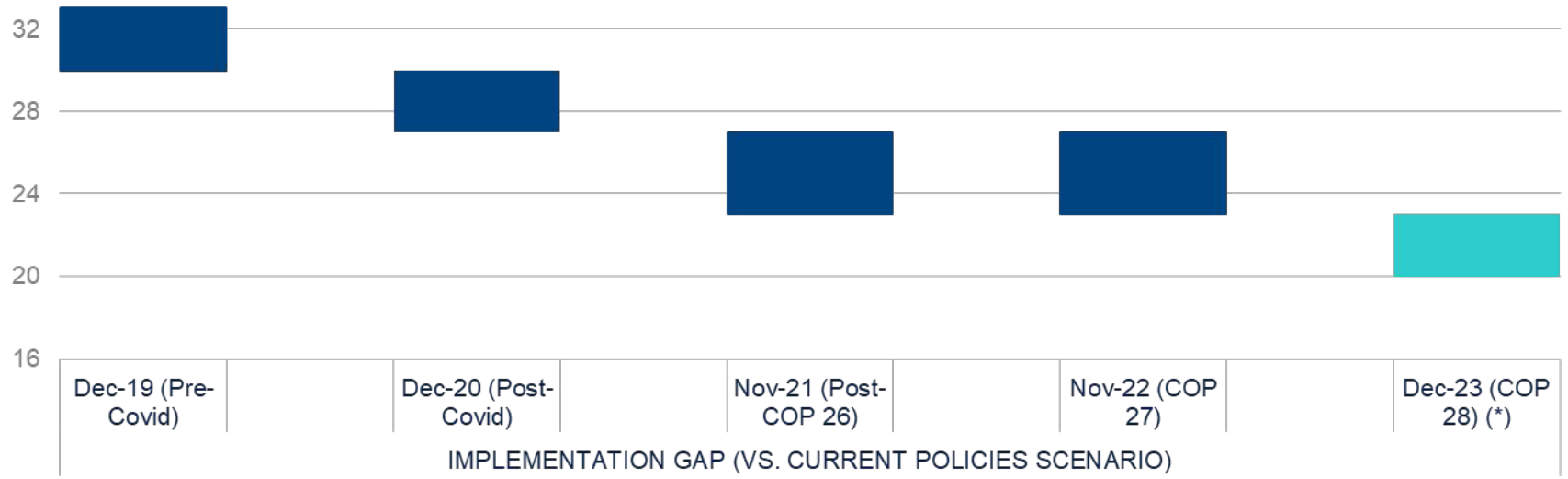
CATASTROPHIC CLIMATE-RELATED EVENTS
GLOBAL COUNT 1980-2023(e)



Source: BBVA Research from EM-DAT

It has been confronted with progressively ambitious policies … that continue to fall short

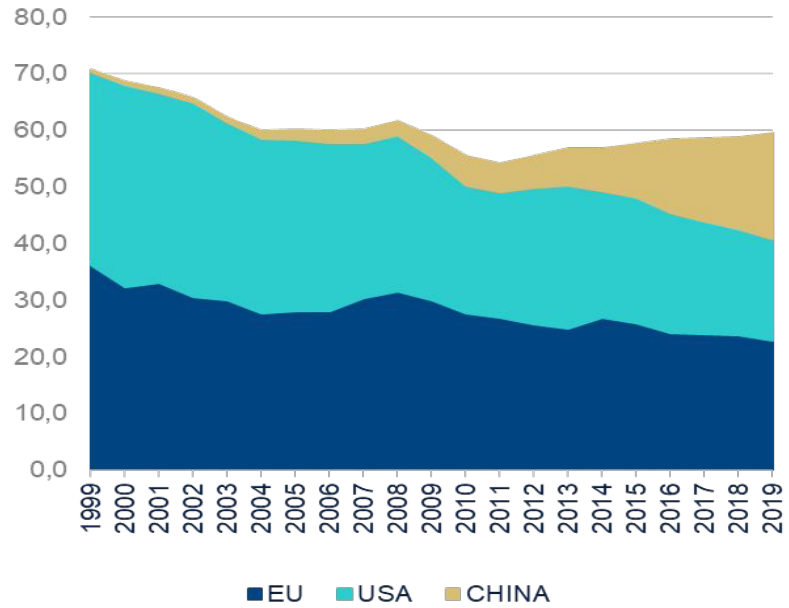
WORLD. IMPLEMENTATION GAP FOR NET-ZERO GOAL
(2030 GAP, GTCO2E). WORLD



Source: BBVA Research from Climate Action Tracker.

Technology and innovation are thus essential, and the EU is a World leader

ENVIRONMENT PATENTS (PCT): EU, USA AND CHINA
% WORLD ENVIRONMENT PATENTS

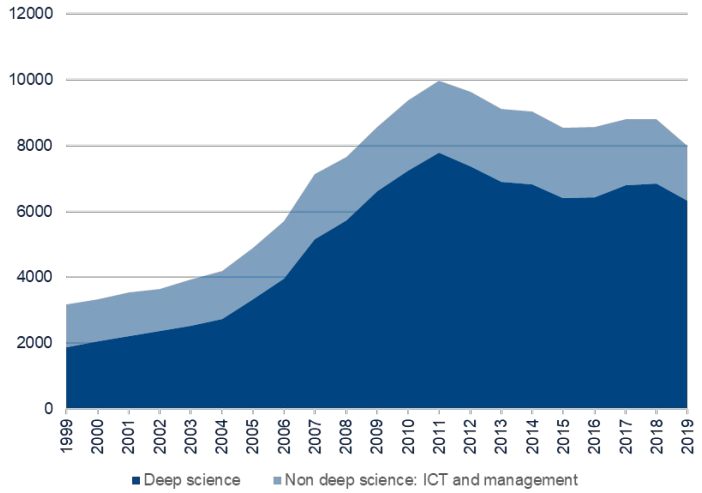


- The EU has been a pioneer in recognizing environmental challenges and conducting research in this area.
- It has consistently held a leading role in environmental patents for decades.
- However, China is making strong inroads into this field, having surpassed the US in recent years.

Source: BBVA Research and BeAble Capital from Patents Statistics. PCT patents based on priority date and applicant's country of residence.

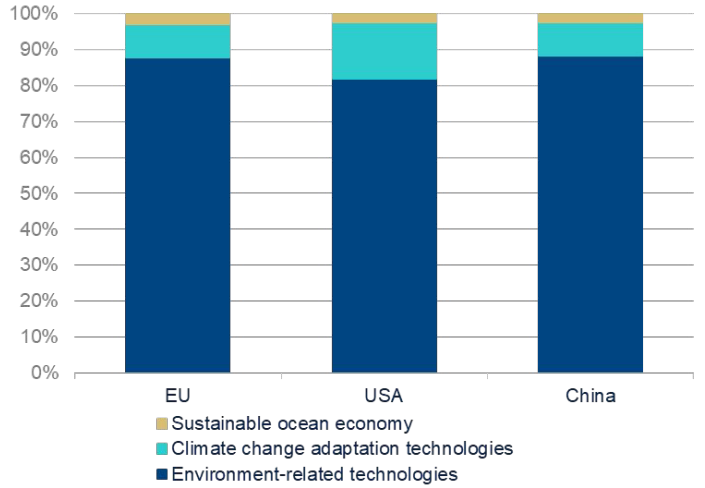
Deep science is thus the key to achieving sustainability goals … without compromising growth

EU ENVIRONMENT PATENTS
NUMBER PCT PATENTS



Source: BBVA Research and BeAble Capital from Patents Statistics. PCT patents based on priority date and applicant's country of residence.

DEEP SCIENCE. ENVIRONMENTAL PATENTS
%, NUMBER PCT PATENTS 1999-2019



Source: BBVA Research and BeAble Capital from Patents Statistics. PCT patents based on priority date and applicant's country of residence.

Environmental innovation fosters growth mainly through cheaper energy and more efficient production processes (medium-long term)

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03

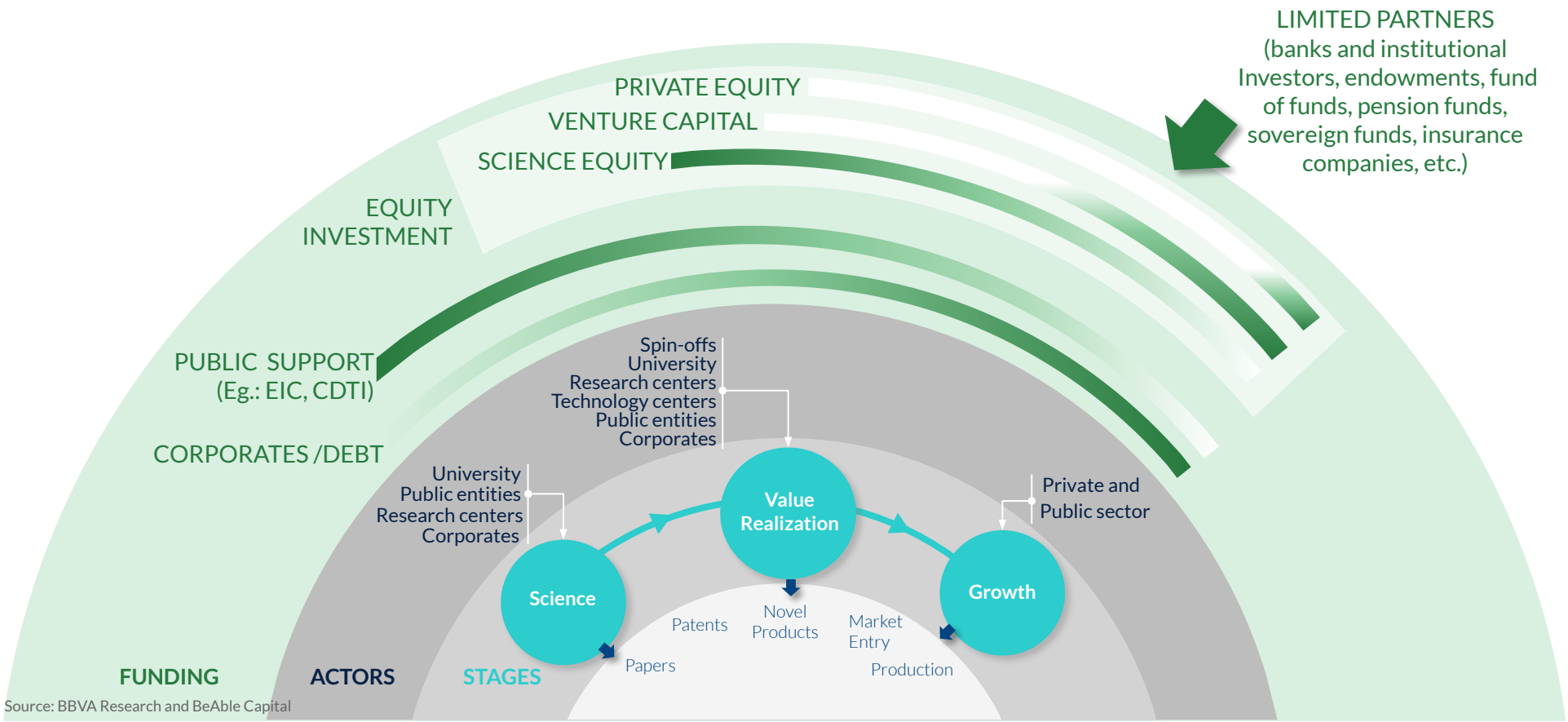
Science Equity:

A critical opportunity for funding deep science

Creating Opportunities

Deep science involves many funding ecosystems, along its three stages

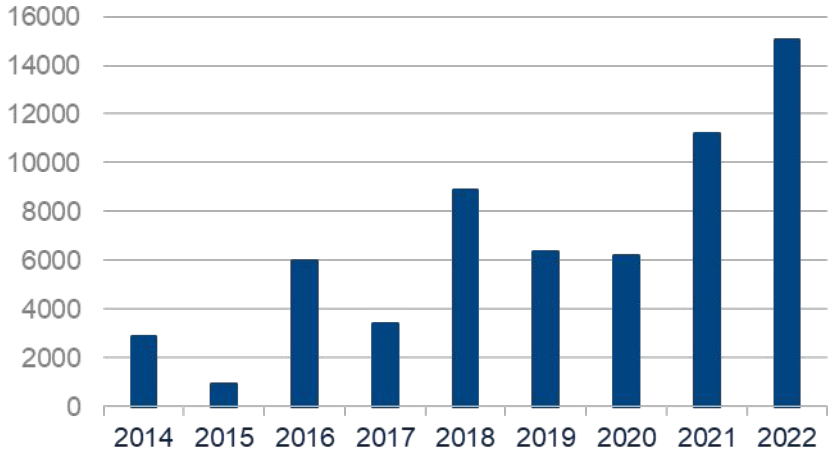
And specialized equity investors play a pivotal role in the success of value realization



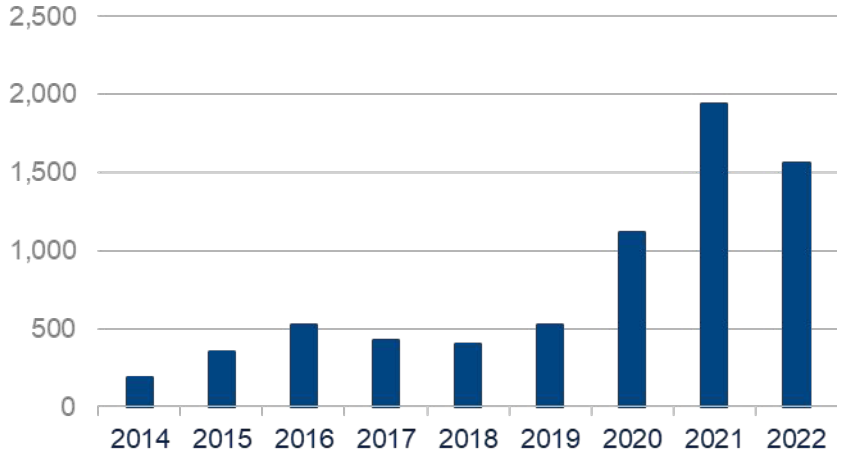
Source: BBVA Research and BeAble Capital

Value realization has surged: attracting funding and spurring job creation

FUNDING OF DEEP SCIENCE SPIN-OFFS
(MILLION DOLLARS RAISED BY DS SPIN-OFFS)



JOBS IN DEEP SCIENCE SPIN-OFFS
(THOUSANDS OF PEOPLE EMPLOYED BY DS SPIN-OFFS)

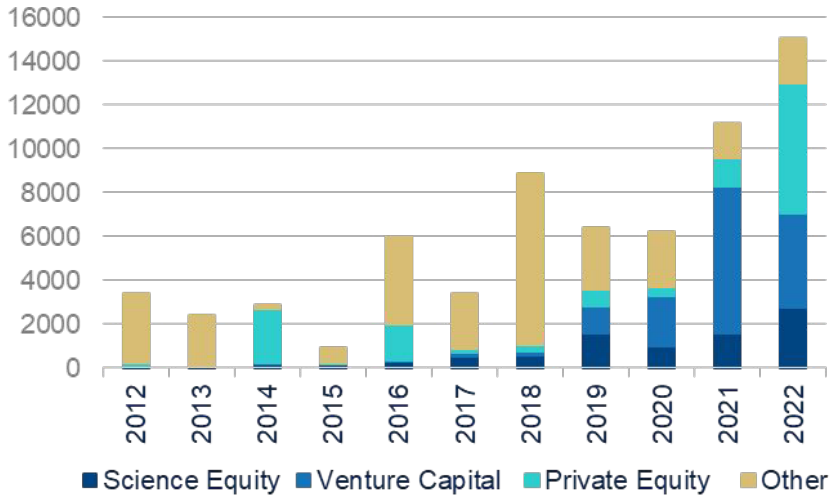


Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.

Annual funding after Covid averaged USD 13 billion (2021-2022), more than doubling pre-Covid funding. This was accompanied by a significant rise in (higher-skill) jobs within the Deep Science ecosystem (representing up to ~1% of EU total jobs).

Equity investment has dominated the recent surge in funding ... especially in the form of venture capital and private equity

EU FUNDING IN DEEP SCIENCE SPIN-OFFS
(2012-2022, MILLION DOLLARS)



Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.

FUNDING

1. EQUITY INVESTMENT (public and private)
   - Science Equity
   - Venture Capital
   - Private Equity
2. GRANT ASSISTANCE
3. DEBT FINANCING
4. NON-INSTITUTIONAL INVESTMENT

Three stages of equity investment:

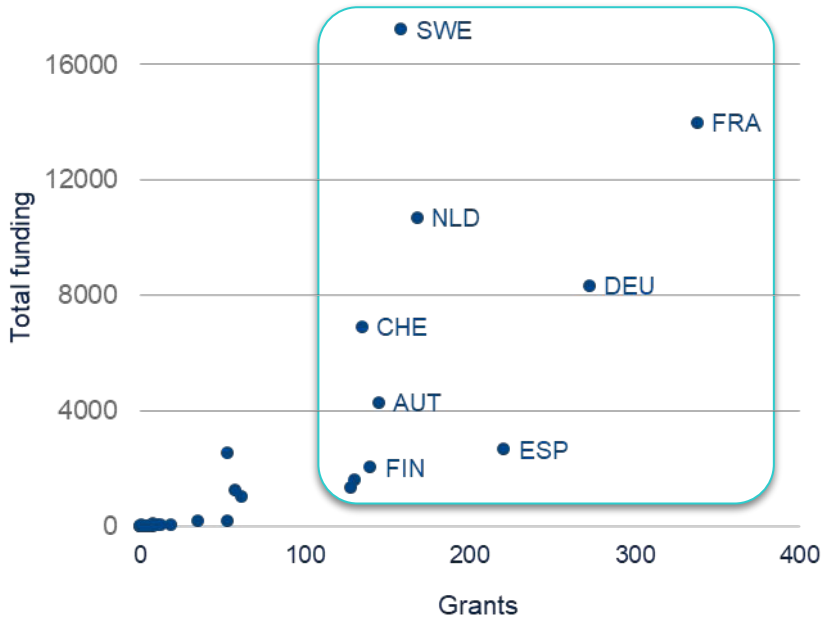
SCIENCE EQUITY › Novel enterprises

VENTURE CAPITAL › Established initiatives

PRIVATE EQUITY › Consolidated initiatives

To sustain deep science, funding early stages of value realization is crucial. Grants are critical but fall short

GRANTS AND EQUITY FUNDING RAISED BY DEEP SCIENCE
2012-2022 (MILLION DOLLARS)

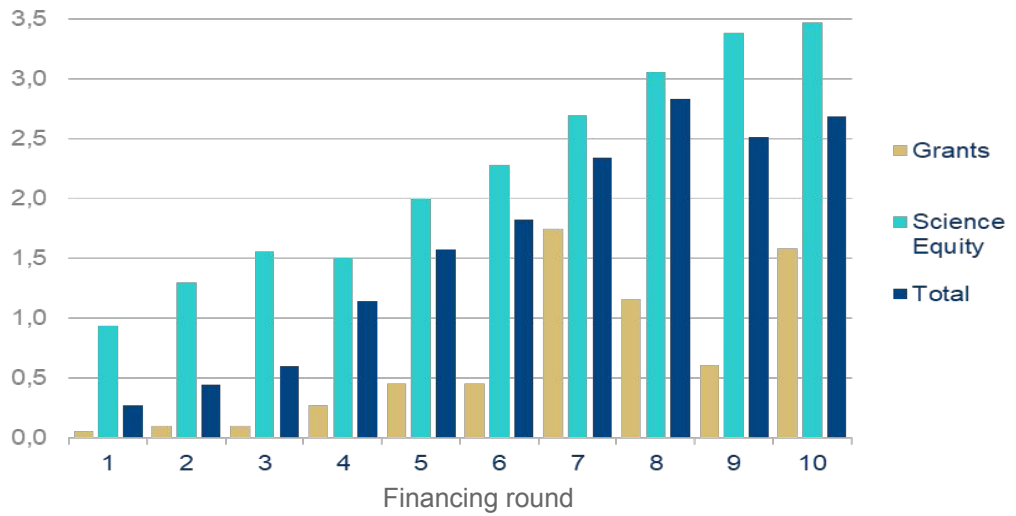


Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.

- Public institutions have traditionally allocated resources to Deep Science through grants.
- But a robust "grant ecosystem" while crucial, is constrained by its smaller scale compared to the “equity ecosystem” … and by its limited direct connection to it.

Science equity emerges as a major and efficient funding source of those early stages

MEDIAN FUNDING RAISED BY ROUND (2012-2022)
(MILLION DOLLARS)



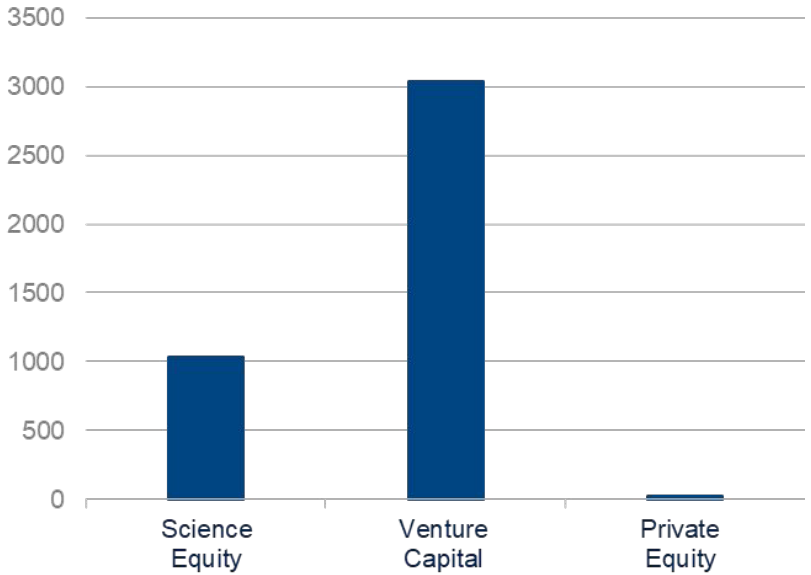
Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts

Grants are a good signaling mechanism, but it is Science Equity that allocates larger and more efficient funds that allow enterprises to focus their early-stage efforts on their projects… rather than on managing recurrent financing needs.

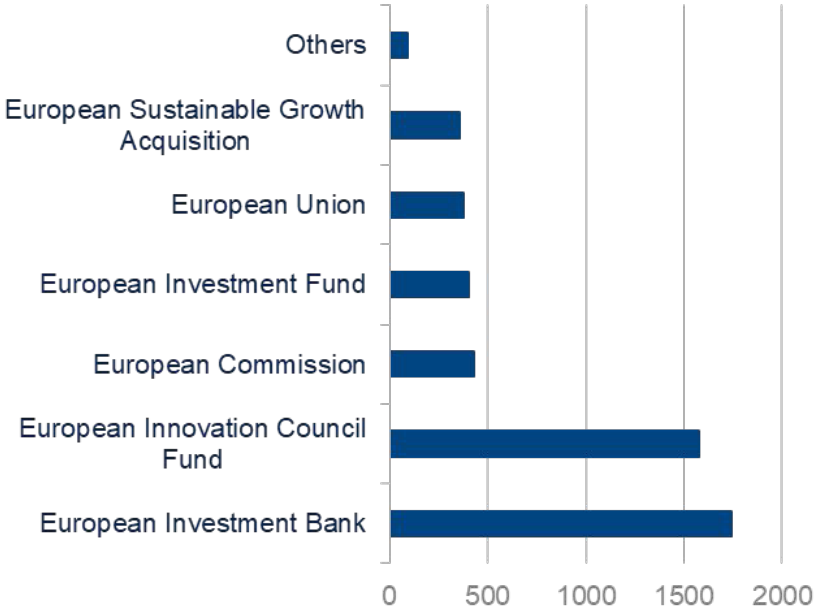
EU institutions are investing in the equity ecosystem of deep science

DEEP SCIENCE EQUITY INVOLVING EU-LEVEL PUBLIC INSTITUTIONS, 2012-2022 (MILLION DOLLARS)

BY TYPE OF EQUITY INVESTMENT



BY EU INSTITUTION INVOLVED

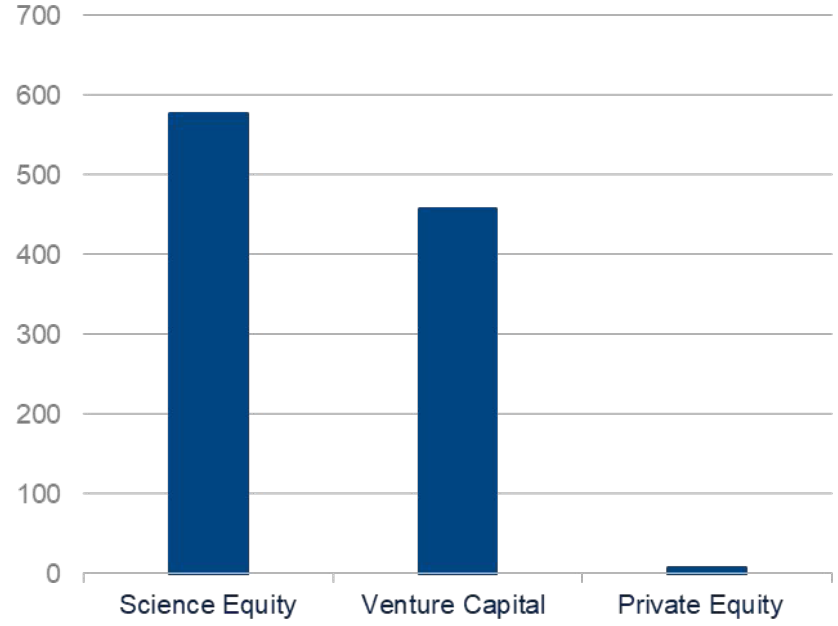


Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.

In particular, the EU launched the EIC fund to bolster science equity funding

DEEP SCIENCE EQUITY TRANSACTIONS INVOLVING THE EIC FUND

(MILLION DOLLARS, TOTAL UNTIL 2022)



Data has not been reviewed by PitchBook analysts.
Source: BBVA Research and BeAble Capital from PitchBook Data, Inc.

EUROPEAN INNOVATION COUNCIL (EIC)

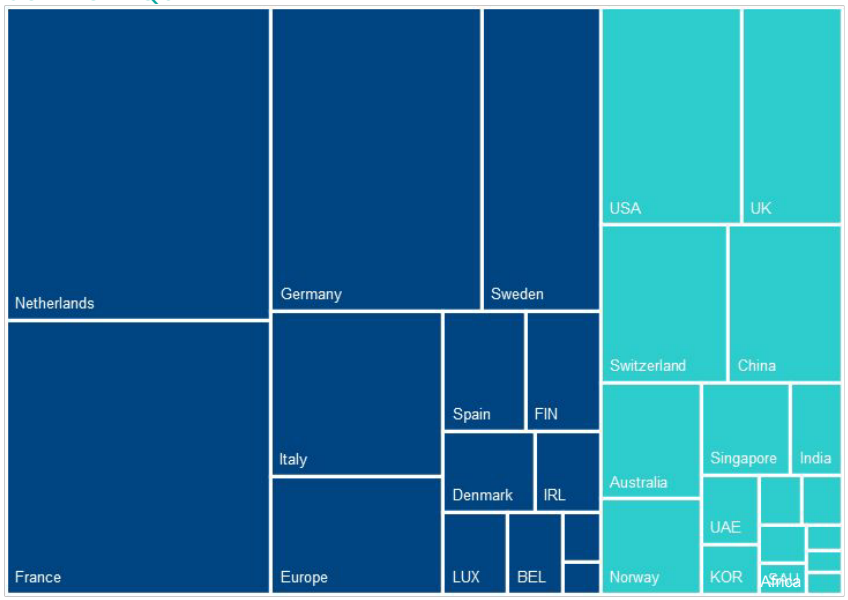
- The EIC has the mandate to be a *risk taker bridging the funding gap and scaling up of breakthrough European innovations while crowding in other investors.*
- It has effectively steered equity investments from EU-level institutions to high-risk Science Equity.
- The portfolio companies of the EIC (and its precursors) have attracted follow-on investments of around € 10 bn (3X EIC´s support to date).

Early-stage public support is crucial, given its limited appeal to foreign funding

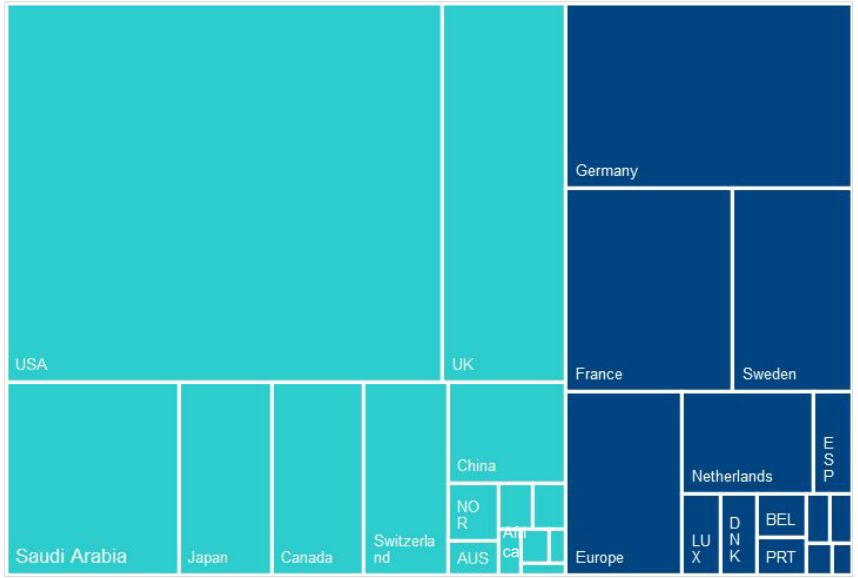
ECOSYSTEM OF EQUITY INVESTORS IN DEEP SCIENCE

(PARTICIPATION IN THE TOP 200 DEALS WITHIN THE DEEP SCIENCE ECOSYSTEM. 2012-2022, COUNTS WEIGHTED BY DEAL SIZE)

SCIENCE EQUITY



TOTAL EQUITY INVESTMENT (SE+VC+PE)



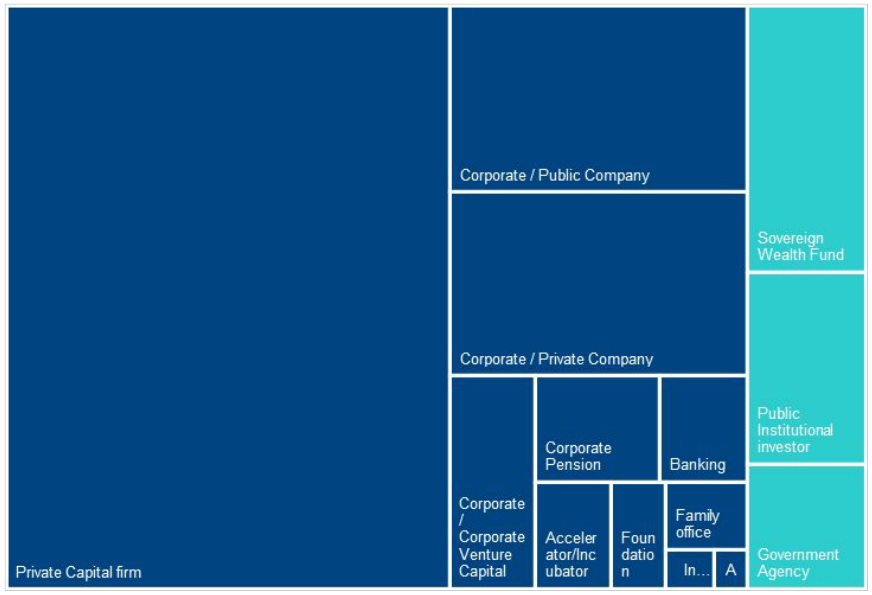
Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.
Notes: European countries: dark blue. Non european countries: light blue. Other include PRT, LTU, MOC, ISR, TWN, RUS and JPN in the left-hand side graph and SGP, BRA, UAE, ISR, IND, FIN, ITA, IRL and AUT in the right-hand side graph.

Public funding must continue complementing private investors comprehensive perspective and their expertise within the ecosystem

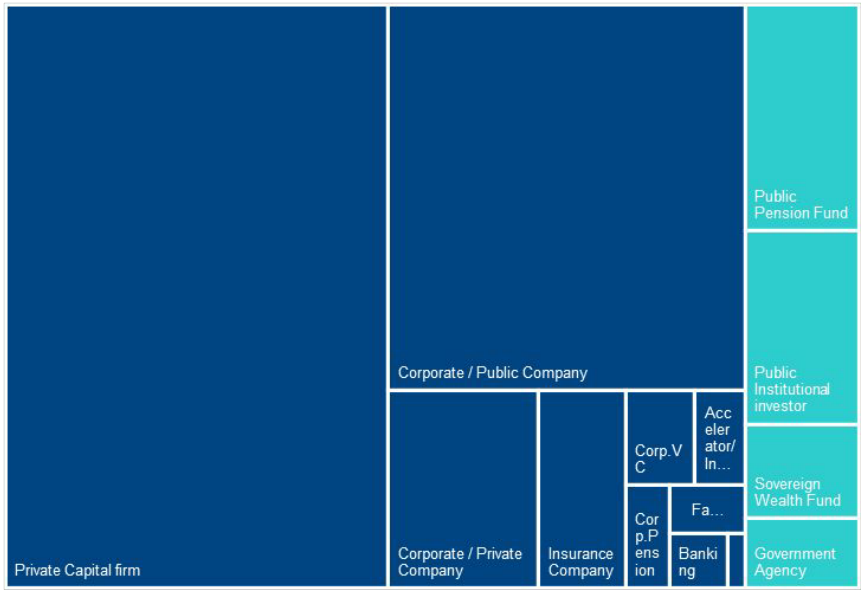
ECOSYSTEM OF EQUITY INVESTORS IN DEEP SCIENCE

(PARTICIPATION IN THE TOP 200 DEALS WITHIN THE DEEP SCIENCE ECOSYSTEM. 2012-2022, COUNTS WEIGHTED BY DEAL SIZE)

SCIENCE EQUITY



DEEP SCIENCE EQUITY INVESTMENT (SE+VC+PE)



Source: BBVA Research and BeAble Capital from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.
Notes: Private investors: dark blue. Public institutional investors: light blue.Other include Investment Bank and Angel Group.

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04

Policy actions for Europe:

A discussion

Creating Opportunities

Two policy strategies to catalyze innovation

1

Direct public funding

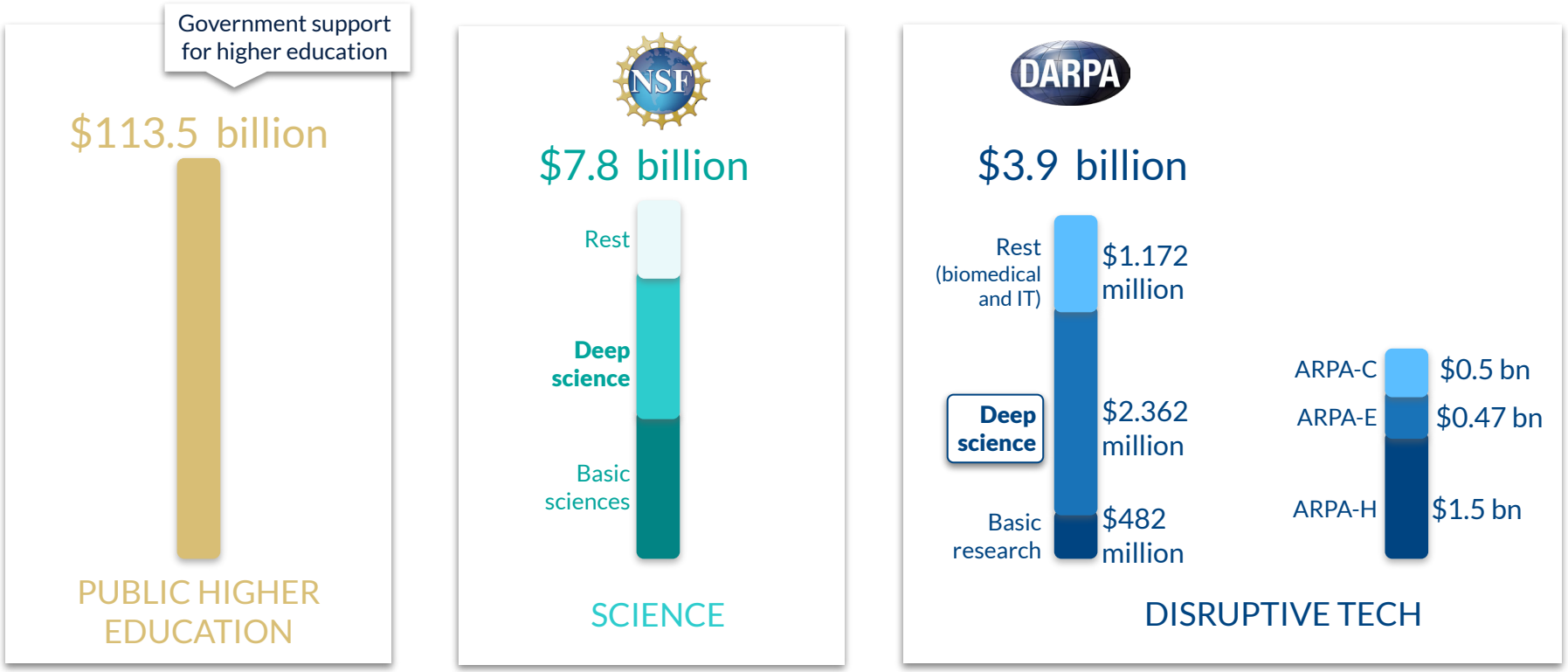
Participating actively in markets, focused on early stages

2

Market enhancement

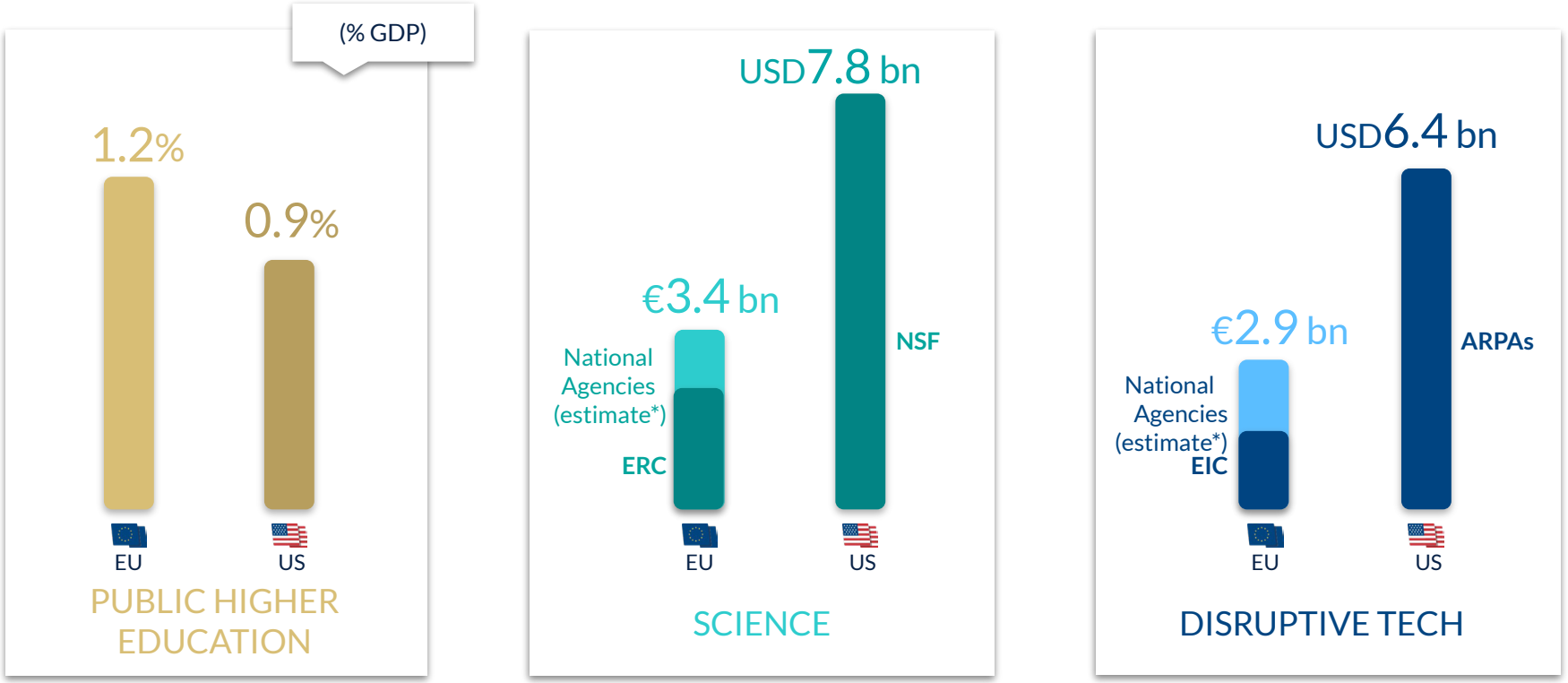
Fostering competition and capital deepening (CMU)

1. Direct funding:
Deep science is central for US successful innovation paradigm



Source: BBVA Research and BeAble Capital from US statistics, 2023 Budget.

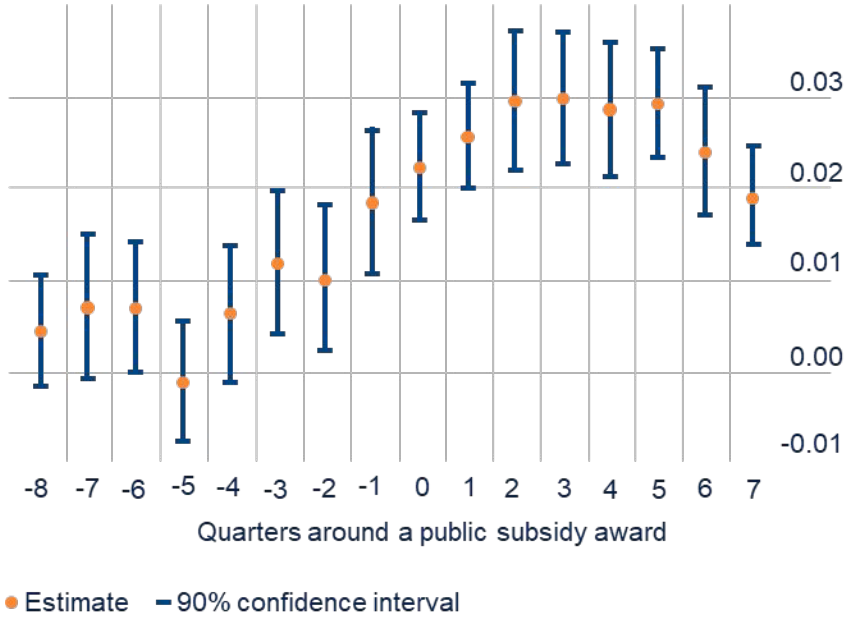
1. Direct funding:
And EU policy is catching up in that regard



* The ERC budget of 16 billion euros is distributed over seven years, and the estimated budget from national coffers assumes Spain's effort (Agencia Nacional de Investigación, as a percentage of GDP) is representative of the EU. Similarly, the EIC budget of 10 billion euros is prorated over seven years, and the estimated budget from national coffers assumed that Spain's multiplying factor of two (CDTI) is representative of the EU .
Source: BBVA Research and BeAble Capital with OECD and national budget data.

1. Direct funding:
Public funding of science equity attracts private investments

EFFECT OF RECEIVING A SUBSIDY ON THE PROBABILITY OF RAISING VC CAPITAL



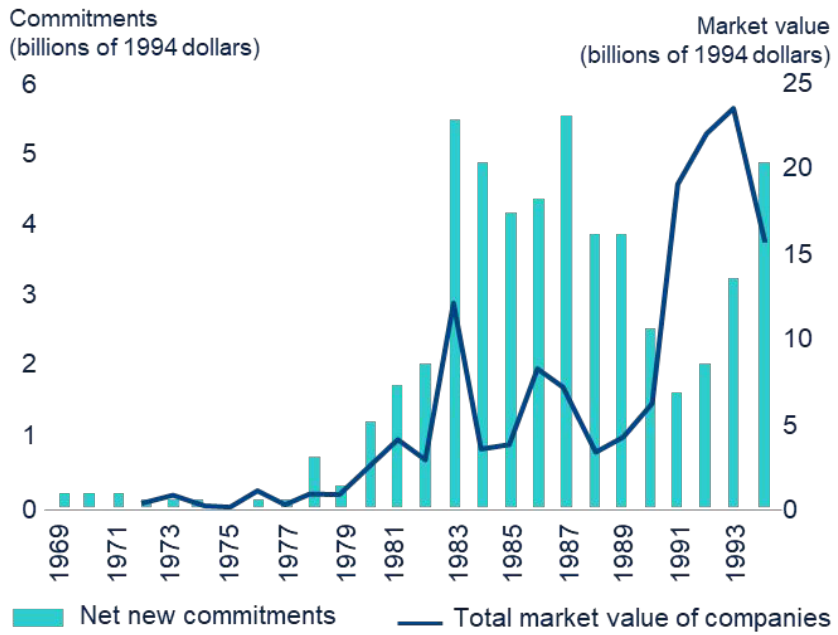
- Analysis shows that **industries benefit strongly from public support in the early stages** of their high-tech innovation projects - raising the probability of obtaining patents and securing additional private capital.
- The benefit fades out when supporting more established projects.
- The leading role that public actors can play in the early stages of the entrepreneurial ecosystem is conferred by their readiness and capability to take on significant risks, irrespective of the business cycle.

Source: Giulio Cornelli, Jon Frost, Leonardo Gambacorta and Ouarda Merrouche. "Climate tech 2.0: social efficiency versus private returns". BIS Working Papers 1072. February 2023
https://www.bis.org/publ/work1072.htm

2. Market enhancement:

Designing regulations and tax structures that promote robust and sustainable equity investments

US: VENTURE CAPITAL, 1969-94
BN OF 1994 USD)

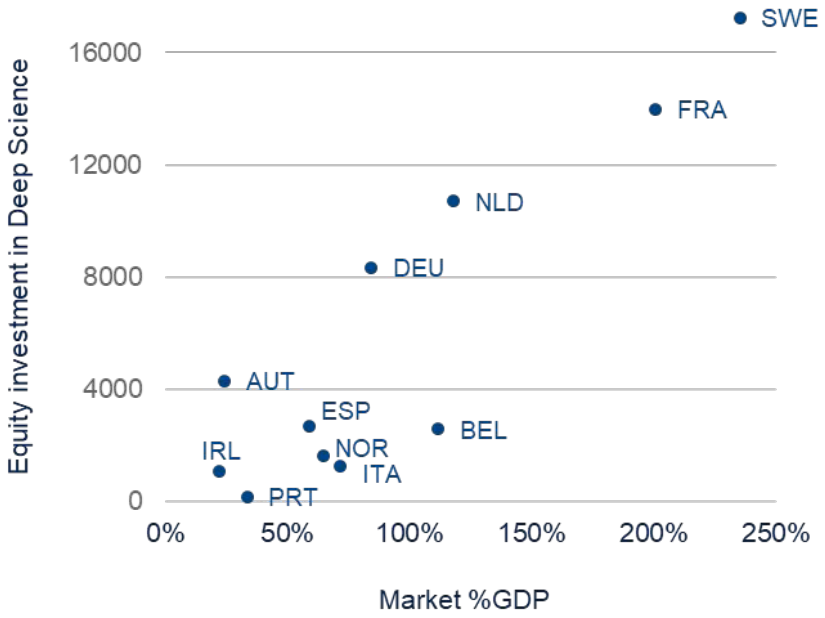


Source: Gompers and Lerner, 2001

- In 1978, the US Department of Labor clarified that **investments in venture capital** funds by pension funds do **not violate the "prudent man rule"** in Employee Retirement Income Security Act (ERISA).
- Leading **institutional investors to "prudently diversify"** into **venture capital funds** - minor quantities for the formers but significant for the latter.
- And there is consensus that "*tax relief for capital gains or the provision of loss relief on a more favourable basis than the baseline tax system could support the derisking of investments in young, growing and innovative businesses*."

2. Market enhancement:
Advancing the CMU is essential

EU: EQUITY INVESTMENT IN DEEP SCIENCE AND CAPITAL MARKETS CAPITALIZATION
(% GDP, MILLION USD; 2023)

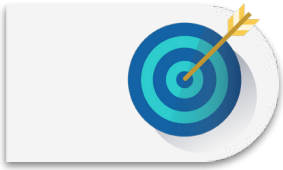


Source: BBVA Research and BeAble CAPITAL from PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts.

EIB REPORTS SUMS UP CONSENSUS

- **One important factor hampering the development of early and growth-stage financing in Europe is the greater difficulty venture capital investors may have in selling** successful investments to outsiders through equity markets.
- **Stock market capitalisation is much higher in the US** than in most European countries, as is IPO activity.
- European exit markets are not only smaller but **also fragmented** along national lines, reducing liquidity and venture capitalists' exit possibilities.

Main Takeaways



Deep science is an innovation domain essential to EU strategic goals, most notably sustainability.

Science equity is essential to adress deep science´s weakest link - value realization.

Two policy levers promote science equity:

- direct investing, particularly in early stages and
- market enhancement (institutional investors and CMU)

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