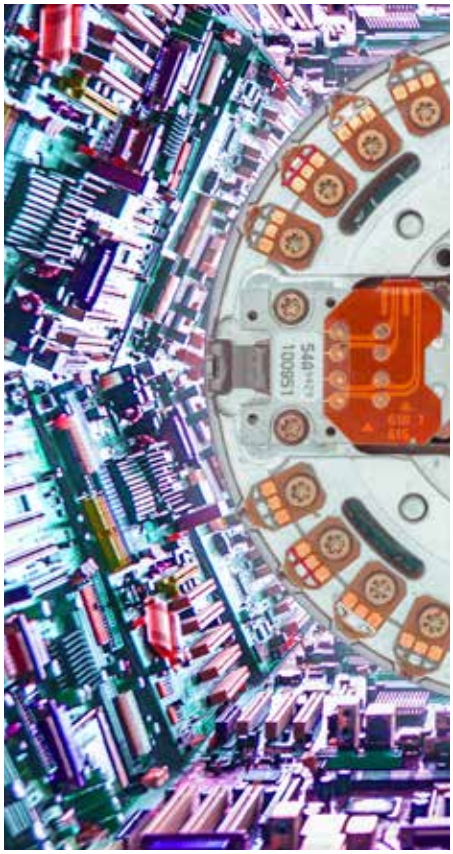
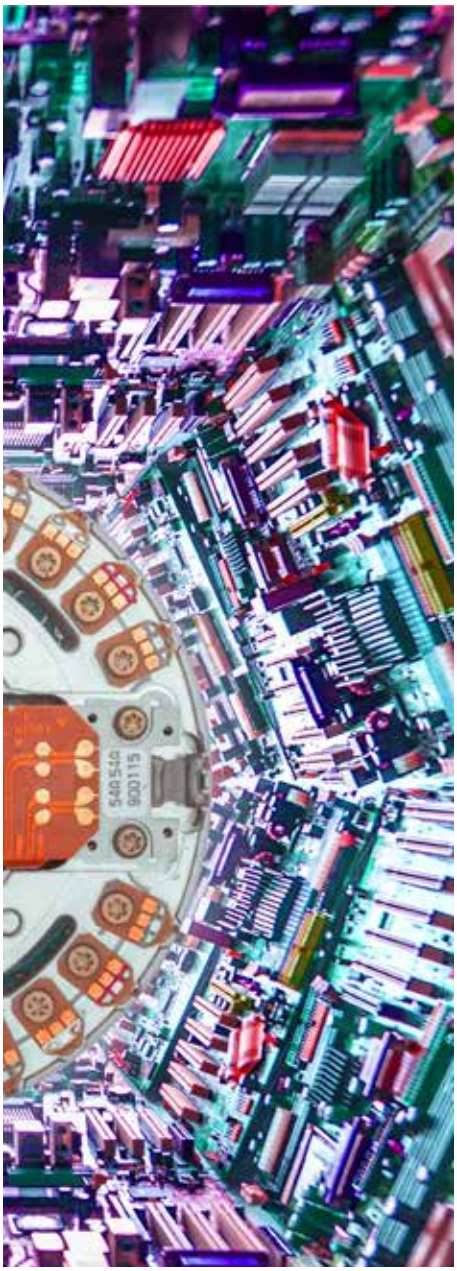
TECHNOLOGICAL INNOVATION

Sectoral Strategic Guidelines





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CONTENTS

KEY MESSAGES

- Technological innovation is **one of the essential drivers of competitiveness for sustainable business growth**, but also for achieving green and digital transition goals.

- Innovation develops within an **ecosystem of multiple actors**, each playing a key role: **private** actors, such as start-ups, innovative SMEs and companies operating along the country's strategic industrial supply chains; **public institutions**, such as research centres and university spin-offs; and, lastly, public and private **financing entities**.

- However, these actors often operate with different goals and objectives in mind, limiting the potential for innovation at country level.

- In this context, we can identify three areas of focus:

  - **supporting the development of technological innovation,** by incentivising projects by "innovators", with a focus on the area of "deep technology" and on supporting the twin digital and green transition; by creating tools to accompany innovation from conception to scalability; by fostering the consolidation of operators in the market for the most advanced technologies; by providing advice to the relevant public institutions on the management of R&D funds;

  - **supporting technology transfer and strengthening the innovation ecosystem,** by upgrading the national research infrastructures for technology transfer, facilitating the creation of new vertical technology transfer hubs specialised in deep-tech research areas with strong potential for industrial application and investing in specialised venture capital players;

  - **supporting the deployment of technological innovation,** by helping enterprises, including SMEs, to acquire innovative technologies in the form of tangible and intangible capital goods and specialist and managerial skills in the context of technological transformation and business innovation processes.

- The effective pursuit of the strategic priorities outlined above is linked to at least **four enabling contextual factors** cutting across the above focus areas, namely: adequate **protection of intellectual property**; the acquisition of **specialist and managerial skills** by ecosystem players; the implementation of **regulatory sandboxes** to test innovation in specific areas, such as Fintech; and the adoption of a **comprehensive national strategy for advanced digital technologies**.

- In this context, CDP can step in, according to **additionality and complementarity criteria, helping to fill the investment gaps in innovative sectors and technologies** in which market operators are unable to mobilise adequate resources and which require **long-term commitment capacity**.

- To ensure transparency and accountability of decision-making processes, CDP measures the quality and impact of the projects it supports. To do this, CDP uses a **set of monitoring and assessment KPIs** designed for each area of action.

1. Context

1. CONTEXT

1.1 EUROPEAN REFERENCE FRAMEWORK FOR TECHNOLOGICAL INNOVATION

In a global environment undergoing **deep transformations in production systems and consumption patterns**, the economic and social resilience of a country, as well as its prospects for sustainable development, **require the capacity to look ahead and adapt**. That is, the capacity to innovate.

Developing and deploying **technological innovation**[1] is **one of the key drivers of competitiveness for sustainable business growth**. In combination with other elements, such as more flexible organisational models and specialist and managerial skills, technological innovation can stimulate productivity at both business and country level[2]. In this field, it has been observed in particular that **technological innovation has been increasingly and significantly supported by the development of the Venture Capital ecosystem**, also through collaborations with corporations (Corporate Venture Capital)[3].

The development of technological solutions offered on the market to meet the demand for innovation by businesses and households, combined with improvements in **production efficiency generated by technology deployment** (e.g. production automation, supply chain monitoring) **facilitate better positioning within global value chains**, increasing the competitiveness of companies along strategic industrial supply chains[4].

Awareness of the importance of an **integrated approach to innovation policies**, which aims to support both the development and deployment of innovation, **is a relatively recent breakthrough in Europe**, accelerated by the current geo-political context. This need has been brought to light by the EU's increasing difficulty in keeping up with historically high-tech economies (e.g. USA, Japan), but also with technologically emerging economies (e.g. China), and by Europe's struggle to regain a sufficient degree of technological autonomy.

This has resulted in a significant effort in recent years to update EU policies in the area of R&D and around the definition of innovation.

In the field of R&D, the focus of EU policymakers has shifted **from supporting fundamental scientific and academic research to applied research, including that developed in the industrial sphere**. Clear evidence of this is the introduction of dedicated EU R&D funds. Specifically, under Horizon Europe 2021-2027[5] two of the three pillars of the seven-year programme are reserved respectively for European industrial competitiveness and the strengthening of European partnerships to create a coherent and integrated innovation ecosystem[6].

On the other hand, **in the field of business-driven innovation, alongside support for "intramural" initiatives**[7] to improve business productivity and competitiveness, EU policymakers have increasingly turned to **innovation as a key driver to promote**:

- the **achievement of the goals related to the green and digital transition**, where technological innovation is seen as the key tool for the pursuit of the UN's Sustainable Development Goals (SDGs) and of the EU's green and digital transition goals[8];

- the **development and application of "deep tech"**[9], discarding the old concept of the "simple" use of technology, predominantly digital, to transform processes and services from off-line to on-line, but also to take advantage of innovations in the more advanced sciences not only and not so much to develop finished products for industrial use, but rather to find solutions to complex problems, global and societal challenges and to achieve sustainability goals;

[1] In the field of technology, capacity for innovation has two dimensions. The development of new technologies, through scientific exploration of the frontier of knowledge, and the deployment of new technologies. Fostering both dimensions of technological innovation within an economic system is crucial to maximise the returns on public and private investments in each area.

[2] For example, the OECD estimates that a 10% increase in the deployment of certain digital technologies (e.g. cloud computing) could generate a productivity increase of almost 6% in the 5 years after their adoption. Source: OECD, "Digitalisation and productivity: in search of the holy grail – Firm-level empirical evidence from EU countries", WP No. 1533, 2019.

[3] For further information on the role of Venture Capital, see the document Sectoral Strategic Guidelines for the Capital Market.

[4] For aspects related to the competitiveness of strategic industrial supply chains, see the document Sectoral Strategic Guidelines for Support to the Strategic Supply Chains.

[5] Horizon Europe is allocating 95.5 billion euro for the 2021-2027 European research and innovation programme, under its direct management.

[6] European Commission, Horizon Europe. The EU research and innovation programme for the period 2021-2027, 2021.

[7] In technical jargon, intramural R&D expenditure consists of R&D activities financed by companies and carried out directly with their own staff and equipment. For more information, see: https://www.istat.it/ws/fascicoloSidi/259/Glossario.pdf

[8] European Investment Bank, Innovation for inclusive Green and Digital Transition, 2021.

[9] "Deep-tech" innovation refers to innovation stemming from science, technology and engineering, often combining advances in physics, biology and the digital technologies.

- the **consolidation of "open innovation"**[10] through the development of clusters for innovative companies within strategic industrial supply chains, capable of creating, commercialising and industrialising deep-tech innovations[11].

The European Commission has marked this step change by promoting a series of strategies – including the **New European Innovation Agenda**[12] approved in July 2022 – to define a common approach for the Member States' technological innovation actions.

While Europe has made significant progress in recent decades in terms of number of innovative start-ups and SMEs[13], the **efforts of the innovation ecosystem** must now move along two lines: **the "content" and application areas of technological innovations** to align them with the strategic objectives defined at European level; and **the growth (also in size) of innovators** (scale-up).

This second issue is significantly linked to the **public and private sectors' ability to invest and attract an increasing flow of capital** to initiatives with a relatively higher degree of risk.

This is because designing advanced solutions in innovation, and even more so in deep tech, requires the development and consolidation of a capital market geared towards medium- to long-term investment plans, given the longer timeframes needed to industrialise innovation and bring it to market[14].

The joint commitment of EU countries to research and innovation was made in the framework of the **European Research Area** (ERA)[15], a strategy that was renewed in 2018 and again in 2021, and which is continuously updated to respond to the most urgent challenges, such as technologies for the energy transition, the creation of innovation ecosystems at European level and the development of **"Open Science"**[16].

The birth of the ERA in the early 2000s was flanked by the announcement of **the first macro-objective for research at EU level**, i.e. to raise **overall R&D expenditure to 3% of GDP**. In 2020, this indicator ("R&D intensity") reached a value of 2.3% (over 310 billion euro), slightly higher than the 2.0% recorded in 2010. The largest share of the expenditure comes from the private sector, whose contribution has increased by more than 25% over the last ten years and accounts for 58% of the total[17]. Despite this growth, only about 16% of the new leading R&D companies globally are based in Europe[18].

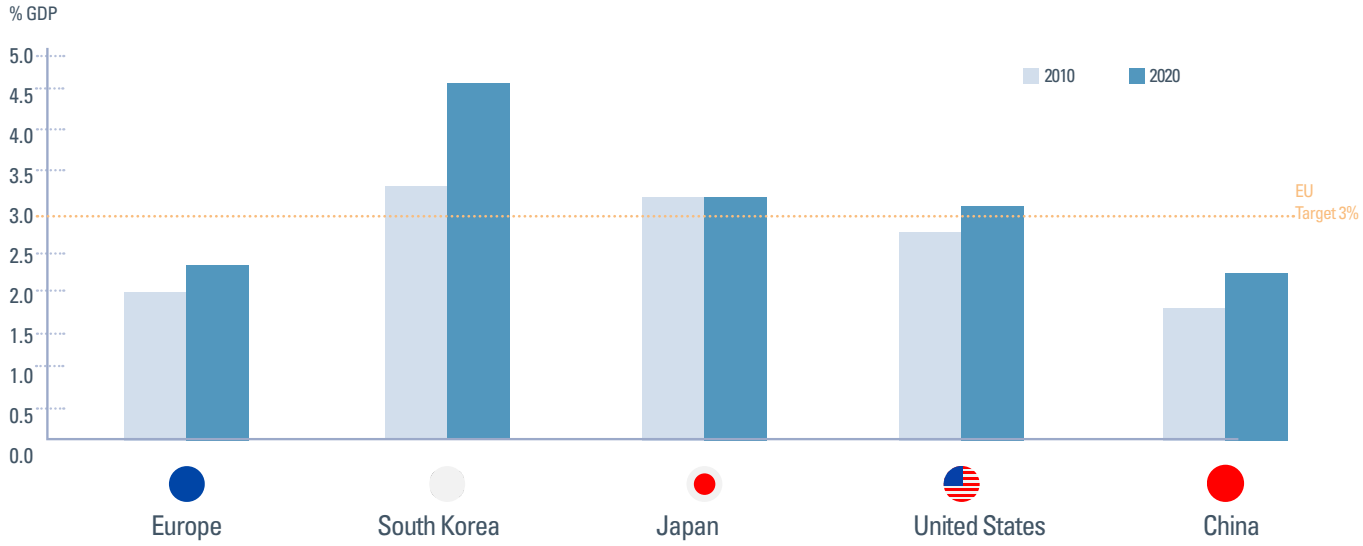
The failure to reach the target set by the European Research Area places the EU significantly behind world leaders with a much higher R&D intensity, such as South Korea (4.6%), Japan (3.2%) and the United States (3.1%) (Chart 1)[19].

With regard to investment in advanced digital technologies, the EU is also lagging behind other countries. For example, the investment gap in AI and digital technologies is estimated at between 5 and 10 billion euro annually[20].

In recent years, and even more so with the **Next Generation EU Programme and the subsequent European Recovery and Resilience Plans**, the European Commission has identified **more specific goals** better tailored to the features of European economies, businesses and research environments (Figure 2).

[10] "Open innovation" refers to an innovation paradigm based on the exchange of knowledge and ideas between public and private organisations, thereby generating positive spill-overs. For more information, see: Henry Chesbrough, "Il futuro della open innovation – Creare valore dall'innovazione aperta nell'era della tecnologia esponenziale", LUISS University Press 2021.
[11] COM(2022)332 final, 2022 New European innovation Agenda.
[12] At the European level, the main strategies referred to in these sectoral strategic guidelines are the Digital Compass (COM(2021) 118 final), the New Industrial Strategy for Europe (COM(2020) 102 final), updated in 2021; the EU SME Strategy (COM(2020) 103 final); the New European Innovation Agenda (COM(2022)332 final).
[13] Unless otherwise specified, this document adopts the definition of "innovative" start-up set out in Article 25 of Decree-Law no. 179/2012.
[14] For more details, see the Sectoral Strategic Guidelines for the Capital Market.
[15] For a summary of the new ERA Policy Agenda for the period 2022-24, see European Research Area (europa.eu).
[16] European Commission, DG RTD, European Research Area Policy Agenda. Overview of actions for the period 2022-2024, 2021.
[17] Eurostat and OECD, 2022.
[18] Eurostat and OECD, 2022.
[19] See footnote 16.
[20] European Investment Bank, Artificial intelligence, blockchain and the future of Europe: How disruptive technologies create opportunities for a green and digital economy, 2021.

CHART 1 - R&D INTENSITY, EU VS. OTHER MAJOR GEOGRAPHICAL AREAS, 2010 AND 2020



Source: CDP calculations based on European Commission data, 2021

These goals concern **the entire development cycle of technological and digital innovation** and revolve around three fundamental pillars: **development, technology transfer** and **deployment**[21]. More specifically:

- **Innovation development**. The EU strategy focuses on supporting public and private innovators, in particular in the following areas:
  - **supporting the growth of start-ups, innovative SMEs, university spin-offs** to foster scale-up initiatives, supporting the rapid development of innovators in line with the evolution of technology, which is typically subject to equally rapid obsolescence;
  - **doubling the number of "unicorn" start-ups in Europe by 2030**[22], equal to 122 in 2022[23];
  - **strengthening specialised skills**, by attracting and retaining talent in advanced applied technologies[24];
  - **disseminating**, within Member States, **"regulatory sandboxes"**[25] to experiment and test the effectiveness of innovative technological solutions in specific sectors, especially regulated ones such as Fintech, in a "controlled" environment[26].
- **Technology transfer.** The main objective in this area is to help build, develop and strengthen **collaboration between key innovation players** also by providing them with appropriate physical and/or digital infrastructure, in the form of "Regional Innovation Valleys"[27]. Creating environments that promote the dissemination of cutting-edge ideas, the sharing of expertise and the meeting of complementary business needs is indeed crucial not only to develop innovation, but also to industrialise and bring to market innovative products and services.

[21] The definition of the "innovation life cycle" and the related development, transfer and adoption phases are described in detail in Section 2, "Areas of focus and strategic priorities".
[22] "Unicorn" start-ups are those organisations that have achieved a valuation of USD 1 billion or higher, even though they are not yet listed on the stock exchange.
[23] For information and data on the Digital Compass, including the KPIs and the objectives mentioned in this document, see: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en; for the Communication from the European Commission to the Parliament and the Council, see: COM(2021) 118 final, 2030 Digital Compass: the European way for the Digital Decade.
[24] COM(2022)332 final, 2022 New European innovation Agenda.
[25] "Regulatory Sandboxes" are one of the tools developed by the European Commission within the framework of the "Better regulations guidelines", the ultimate aim of which is to provide a common toolbox of methodologies for Member States to interpret the regulatory initiatives promoted at European level, adopt them internally and assess their impacts. Among the available tools, sandboxes allow national regulators to grant exemptions from existing national rules in a controlled context and for limited periods of time. The goal is to enable market players to experiment with highly innovative business models and/or services and/or products that would otherwise not be feasible under the current national rules. This is a fundamental tool, as innovations often create completely new markets with distinctive dynamics that cannot be likened to existing ones. In Italy, a regulatory sandbox for the testing of innovative financial products and services (fintech) is currently being implemented by banking, financial and insurance operators, within the Bank of Italy (Bank of Italy Sandbox). Other European initiatives are also planned in the context of the EU's Renewable Energy Directive, which envisages the use of sandboxes to support innovation in the field of renewable sources. For the most up-to-date European framework on the topic, see: COM(2022) final, 2022 New European innovation Agenda.
[26] See footnote 24.
[27] See footnote 24.

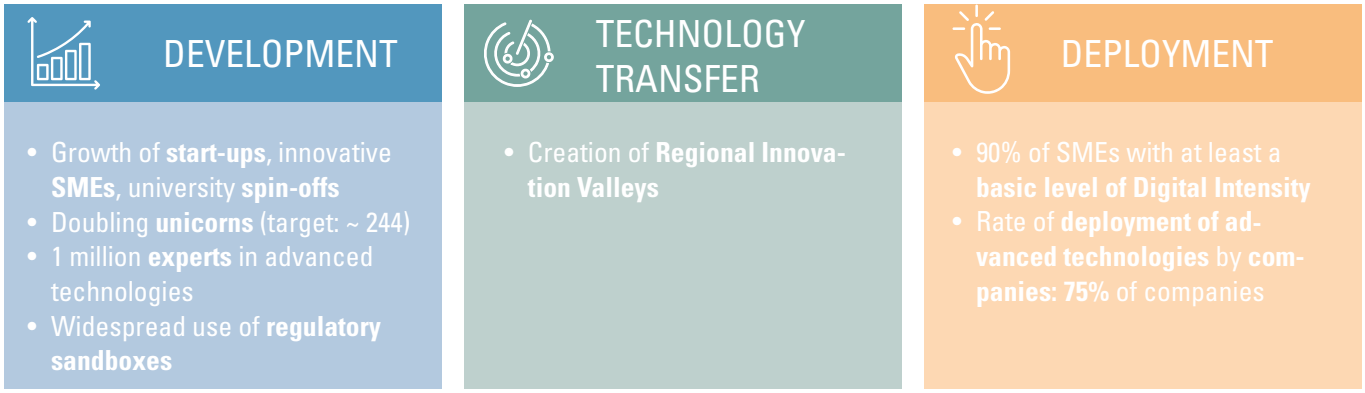
- **Deployment of innovative technologies by companies**, including SMEs. The goal is to provide companies with the necessary tools to transform their processes and products, thus improving their overall technological and digital intensity[28]. Relying on more than 200 Digital Innovation Hubs, the European Commission has set a number of specific targets to be met by 2030[29]:

  - **improving the rate of SMEs' digital intensity,** with more than 90% possessing at least a basic level of digital intensity in 2030 (compared to 60% in 2021);

  - **increasing the uptake of the most advanced technologies by companies**, increasing to 75%[30] the share of those using cloud computing, big data and AI services by 2030.

In response to the European needs, as well as the pandemic crisis, through the PNRR (National Recovery and Resilience Plan), **Italy has already launched numerous initiatives to support technological innovation**[31]. In addition to about 27% of the available resources allocated to the digital transition alone, the PNRR has measures specifically devoted to innovation, both at the business level and in support of public research[32]. For business innovation, the most significant action line is the **Transition Plan 4.0**, accompanied by a complementary line for high-tech investments (13.4 billion euro)[33]. In terms of support for **R&D**, there are as many as **10 action lines**, totalling approximately 10 billion euro[34].

FIG. 1 - THE MAIN EUROPEAN GOALS FOR TECHNOLOGICAL AND DIGITAL INNOVATION



Source: CDP calculations based on European Commission data

[28] COM (2020)103 final, An SME Strategy for a sustainable and digital Europe.
[29] COM(2021)118 final, 2030 Digital Compass: the European way for the Digital Decade.
[30] In 2021, the share of companies using cloud computing services was 26%; the share for big data was 14% and for AI 25% (COM(2021)118 final, 2030 Digital Compass: the European way for the Digital Decade).
[31] For more details, see the specific references in the following sections of this Document.
[32] Presidency of the Council of Ministers, National Recovery and Resilience Plan (PNRR), 2021.
[33] For an overview of the measures to support business innovation in the PNRR, see [in Italian only]: https://lineaamica.gov.it/docs/default-source/pnrr/4_il_pnrr_per_le_imprese.pdf?sfvrsn=5df1a7de_7
[34] For an overview of the measures to support R&D in the PNRR, see [in Italian only]: https://lineaamica.gov.it/docs/default-source/pnrr/7_il_pnrr_per_la_ricerca_e_innovazione.pdf?sfvrsn=1c2fcec3_11

1.2 ITALY'S POSITIONING: STRENGTHS AND GAPS

Strengths

High **propensity for** process and product innovation

Efficiency of processes and **quality** of productions

Good level of **investment in process technologies, including advanced digital ones**

Fundamental scientific research of worldwide excellence

Gaps

Relatively low **investment in R&D**

Untapped **patent capacity**

Limited **collaboration between ecosystem players**

Limited **technical and managerial skills** within companies

Low rate of establishment of new companies and **growth in the advanced tertiary sector**

Italy's **innovation performance is highly uneven** according to the metric used to assess it: it is excellent in some areas, but shows significant weaknesses in others. This unevenness is captured by the European Commission's assessment in the European Innovation Scoreboard, which ranks Italy as a moderate innovator, with a score still below the EU average in 2022, although clearly improving in recent years[35].

Indeed, Italy is able to face global competitive changes by leveraging a production system characterised by a **strong propensity for change, as demonstrated by the share of companies active in innovation projects each year**, covering not only technological innovation.

In the three-year period 2018-2020, **more than one in two Italian companies** (56% compared to the EU average of 51%), among those with at least ten employees, launched projects to innovate their business. A similar percentage is found in the SME group, while, among large companies (with at least 250 employees), eight out of ten are ranked as innovators, in line with the European average for their category.

Innovations tend to be mostly related to the **corporate processes** which affect 47% of Italian companies (70% of larger ones). In 30% of cases (53% among larger companies) the innovation project also involved the **product**, good or service, generating a turnover of approximately 268 billion euro, 13.5% of the total in 2020.

On the one hand, the strong focus on process improvement, which historically characterises innovation paths (whether or not technological) in Italy, has made it possible to contain production costs and hence maintain the competitiveness of of Italian goods and services sold. The high efficiency achieved by Italian companies is reflected today in levels of **productivity in the use of raw materials and energy** which place our country at the **top of the ranking of environmentally sustainable production models**. In particular, despite the strong manufacturing base – which structurally requires more raw materials and energy than the services sector – the level of efficiency in the use of resources achieved by the Italian economy is 47% higher than the EU average (2021); in the use of energy, the difference in efficiency is almost 20% (2020)[36].

On the other hand, product innovation has been the drive that, in sectors exposed to strong competition such as such as manufacturing and financial services, has enabled a significant proportion of Italian companies over the last two decades to **reposition themselves towards higher value-added production**, moving away from the unsustainable logic of price-based competition and instead focusing on increasing the quality of their products[37].

The innovation focus of the Italian businesses is often linked to their ability to grow and share the know-how built within their organisation, through **informal and experienced-based learning processes** (learning by doing). To best leverage these

[35] For more details, see: https://ec.europa.eu/assets/rtd/eis/2022/ec_rtd_eis-country-profile-it.pdf. This unevenness is partly associated with geographical differences. The regional data of the Innovation index place much of the Centre-North (Lombardy, the Autonomous Province of Trento, Friuli-Venezia Giulia, Veneto, Emilia-Romagna, Tuscany and Lazio) in the leading group of European innovators; in contrast, Valle d'Aosta and Calabria are included in the lowest group as emerging innovators. The remaining regions are classified as moderate innovators.

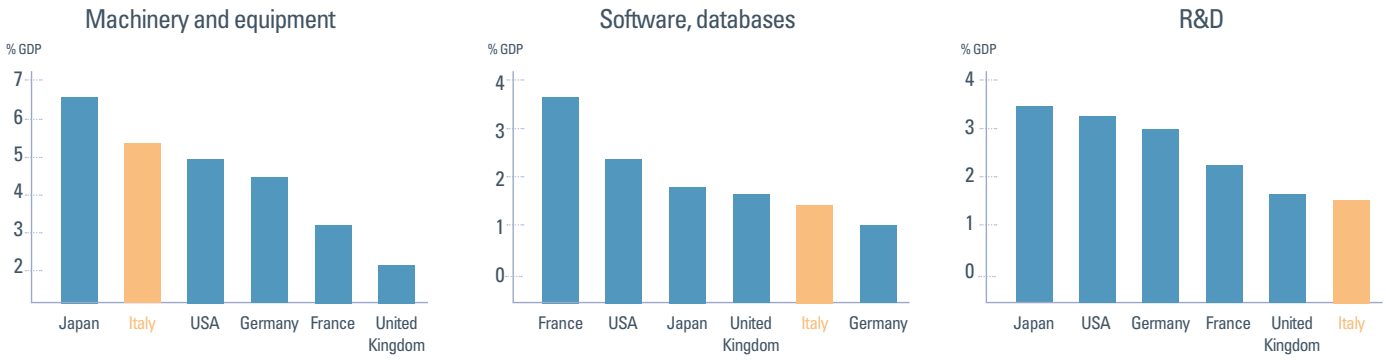
[36] For more information on this topic, see the Sectoral Strategic Guidelines for the Energy Transition.

[37] See, in this regard, Romano L. and Traù F. (2020), Italian industry and productivity: Going beyond the mainstream view, L'Industria no. 4: 655-6734.

informal innovation strategies, Italian companies make significant **investments in machinery and equipment** through which new process technologies are progressively integrated within organisations.

In this context, Italy has **one of the highest investment rates in tangible assets globally**. On average in 2019-2020, as a share of GDP, the value of gross fixed capital formation in this type of asset was 5.3%, compared to 4.5% in Germany and 3.4% in France (Chart 2)[38].

CHART 2 - RATE OF INVESTMENT IN CAPITAL GOODS AND R&D, 2019-20 AVERAGE, % OF GDP



Source: CDP calculations based on OECD data

Investments in recent years have also concerned **tangible capital goods incorporating advanced digital technologies** known as 4.0 technologies, also thanks to the incentive policies introduced by the Italian government in 2017. It is estimated that the weight of this type of capital goods as a share of the total amount of new machinery and industrial equipment purchased by Italian companies was 15.8% in 2018, reaching almost 30% in the manufacturing sector[39].

In contrast, as regards innovation through investment in intangible assets, Italy is still **significantly lagging behind, despite the progress made in recent years. In the case of software and database purchases**, the value of gross fixed capital formation as a share of GDP was 1.6% in the 2019-2020 average, higher than the German figure (0.8%), but lower than all the other major advanced economies, led by France (3.5%). The delay in deploying digital technologies is particularly evident in SMEs[40].

As to formal R&D activities, [41]investment amounted to 1.6% of GDP in the 2019-2020 average, almost half of the German figure (3.1%) and two-thirds of the French figure (2.3%). **What is missing is first and foremost the private contribution**, which in all advanced economies accounts for the majority of total national R&D expenditure (on average 60% in the OECD area). In 2020, 15 billion euro of R&D investments originated from the Italian business world, compared to 35 billion euro in France and 71 billion euro in Germany. Nevertheless, public expenditure by research centres and universities is also limited: 9 billion euro invested in Italy, compared to 17 billion euro in France and 35 billion euro in Germany[42].

The lower propensity for private R&D expenditure in Italy compared to its peers is strongly influenced by **lower production specialisation in high-tech sectors** and, within these sectors, lower control of the upstream stages of the value chain, covering design, research and development[43]. Thus, strengthening the propensity to invest in scientific research activities in Italy will require strengthening the direct control, through well-structured companies, of supply chains with a high technological knowledge content[44].

[38] Source: CDP calculations based on OECD data.
[39] These data are taken from the Forecast Report of the Centro Studi Confindustria, Autumn 2020, chapter 3, which also contains an analysis of the policy measures implemented.
[40] For further details, see the Sectoral Strategic Guidelines for Digitisation.
[41] For further analysis see Assoconsult - Centro Studi Confindustria (2021), Rapporto sull'innovazione in Italia.
[42] Source: CDP calculations based on OECD and World Bank data.
[43] The weight of medium-high technology manufacturing industries as a share of total national manufacturing is 43% in Italy, compared to 61% in Germany and 52% in France. At the same time, the R&D expenditure of these sectors as a share of the added value produced is 7.5%, compared to 12.9% in Germany and 13.7% in France. The greater presence of SMEs in Italy is not, in itself, a significant factor to explain the lower intensity of R&D spending: large Italian companies allocate, on average, 1.3% of their turnover to R&D investment (against 2.6% in Germany and 2.5% in France), compared with 1.2% for SMEs (against 1.1% in Germany and 1.9% in France). The calculations are for 2018 and based on Eurostat data.
[44] For more details on this aspect, see the Sectoral Strategic Guidelines for Support to the Strategic Supply Chains.

Another challenge that Italy must address is to **strengthen the connection** within the innovation ecosystem **between the world of public research** (universities and research centres) **and the production system**.

The ability of Italian businesses on the one hand and universities and research centres on the other to take up each other's contribution is limited, unlike in other European countries. For example, data show that the share of Italian innovative companies that consider the public sector's contribution to scientific exploration and experimentation in industry to be significant is 17%, the lowest in the EU and far lower than in France (30%) and Germany (43%)[45].

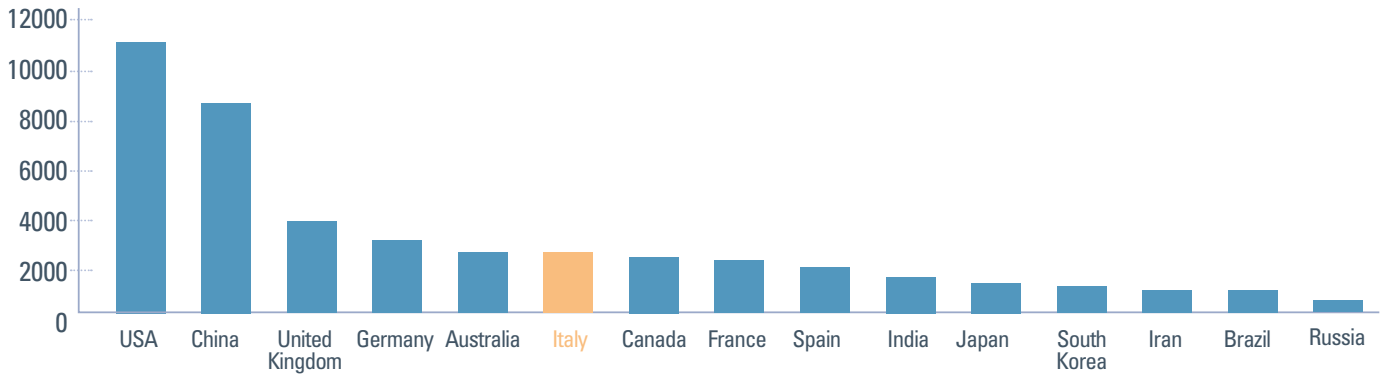
The latest Permanent Census of Enterprises by the Italian Institute of Statistics confirms **the insufficient aptitude in Italy to join forces in technological innovation projects**, not only between companies and the public research world, but **even within the same production sector**. This is a subset of a broader difficulty by the various players of national value chains to coordinate development strategies in a structured and standardised manner. For example, in 2018, only 3% of Italian companies with at least ten employees (9% of medium-large-sized companies) had entered into formal collaboration agreements with third parties specifically aimed at R&D and technological innovation projects[46].

The poor connection between public research and production contrasts with the data on the fundamental research produced in the country, which are evidence of **a vibrant national scientific community**, which is a potential reservoir of technical-scientific knowledge transferable to applied research and technological innovation.

Indeed, Italy has one of the most prolific scientific communities in the world: the seventh globally according to data from the National Science Foundation, and the second among the European countries (after Germany) in terms of **Science & Engineering** publications, with over 119,000 papers by researchers affiliated to Italian institutions in 2020 alone. Of these papers, half stem from international collaborations, testifying to the Italian research community's strong links with their foreign peers[47].

An indicator of the quality of Italy's scientific contribution is the **number of papers published in the world's most cited journals**: Italy is sixth in the international ranking with almost 2,400 papers in 2020 (Chart 3). Moreover, 11% of Italian scientific papers are in the world's top 10% (compared to a European average of 9.9%). To give another example, Italy ranks second in the world in the field of Robotics for average number of citations per publication between 2014 and 2018. The quality of Italian research is also reflected in the funding allocated and disbursed by the European Research Council (ERC)[48] to young Italian researchers for innovation projects, with Italy coming second in 2021, behind Germany.

CHART 3 - SCIENCE & ENGINEERING PAPERS PUBLISHED IN THE WORLD'S MOST CITED JOURNALS, 2020



Note: The most cited journals in the world are defined here as the 1% most cited journals in the Scopus database.
Source: CDP calculations based on National Science Foundation data

[45] Eurostat, Community Innovation Survey (2016).
[46] CDP calculation based on Istat data.
[47] The case of research on the Covid-19 pandemic is a case in point: in 2020 Italy was the third country globally as to scientific publications on the topic, after the United States and China, with over 4,000 papers published, 7% of the total, more than a third of which in collaboration with foreign institutions. Data from: NSF (2022), Publications Output: U.S. Trends and International Comparisons.
[48] The European Research Council (ERC) is the EU body responsible for funding projects proposed by researchers in the Member States, especially under the first pillar of the Horizon Europe programme, concerning excellence in scientific research.

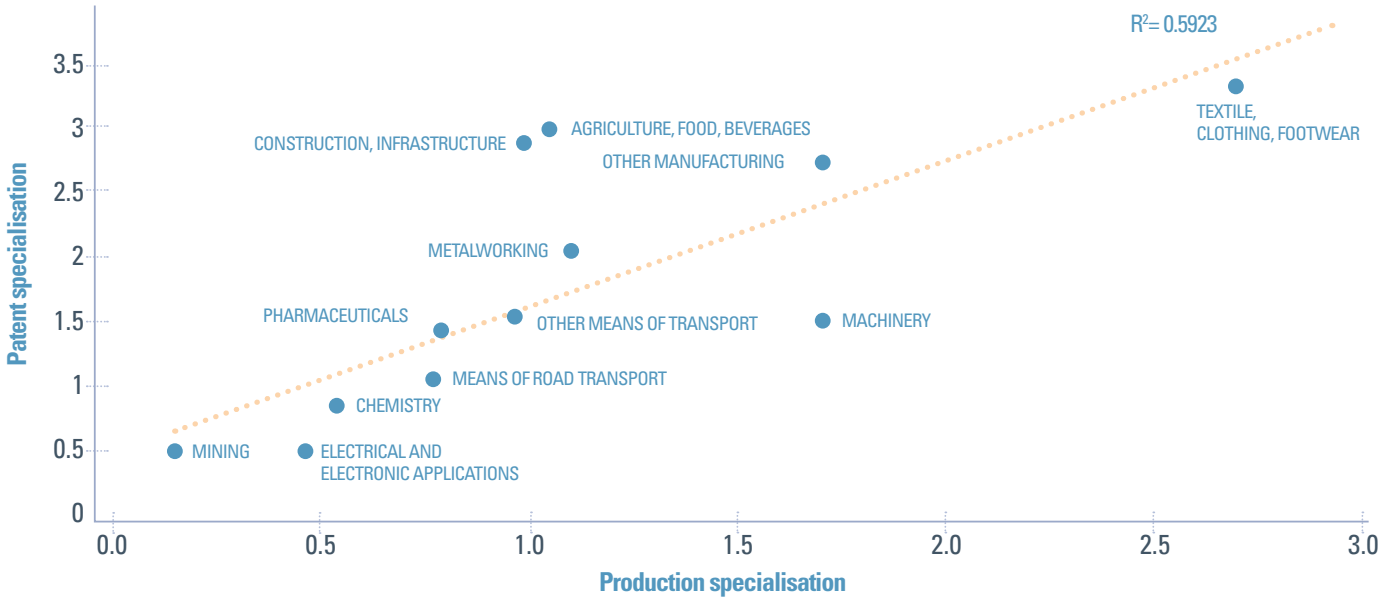
Connecting public research and businesses in a stable and structured manner would thus make it possible to bring out a still untapped innovation potential, increasing in turn **patent intensity in Italy**. According to the latest available data from the European Patent Office (EPO), 8.3 inventions are patented for every 100,000 inhabitants in Italy (against an average of more than 13 in OECD countries), almost half the number recorded in France (15.6) and a quarter of that in Germany (31.2)[49].

Nonetheless, in 2021 the number of patent applications filed with the EPO from Italy increased by 6.5% compared to the previous year, the highest increase since 2015 and 2 percentage points above the growth recorded at European level (4.5%).

In the last year, of the almost 5,000 patent applications filed with the EPO from Italy, **the top two application sectors were transport and material handling** (i.e. all the activities related to logistics management and goods storage), closely related to the development of the "smart factory" for Transition 4.0 and to sustainable mobility.

On the other hand, **as regards Italy's patent specialisation with respect to its international competitors,** a strong **positive correlation** can be noted with the country's production specialisation: the major role of the textile, clothing and leather industries, as well as mechanical engineering, is reflected in the higher share of patents for applications in these industries. The opposite is observed in the electronics and chemicals sectors, among others (Chart 4).

CHART 4 - ITALY'S PRODUCTIVE AND PATENT SPECIALISATION, 2018



Note: specialisation is calculated based on sectoral shares in Italy compared to the average of the following countries: China, South Korea, France, Germany, Japan, United Kingdom, United States.
For production specialisation, the ISIC Rev. 4 classification was used, while for patent specialisation a reclassification of the International Patent Classification (IPC) was used.
Source: CDP calculations and estimates based on OECD data

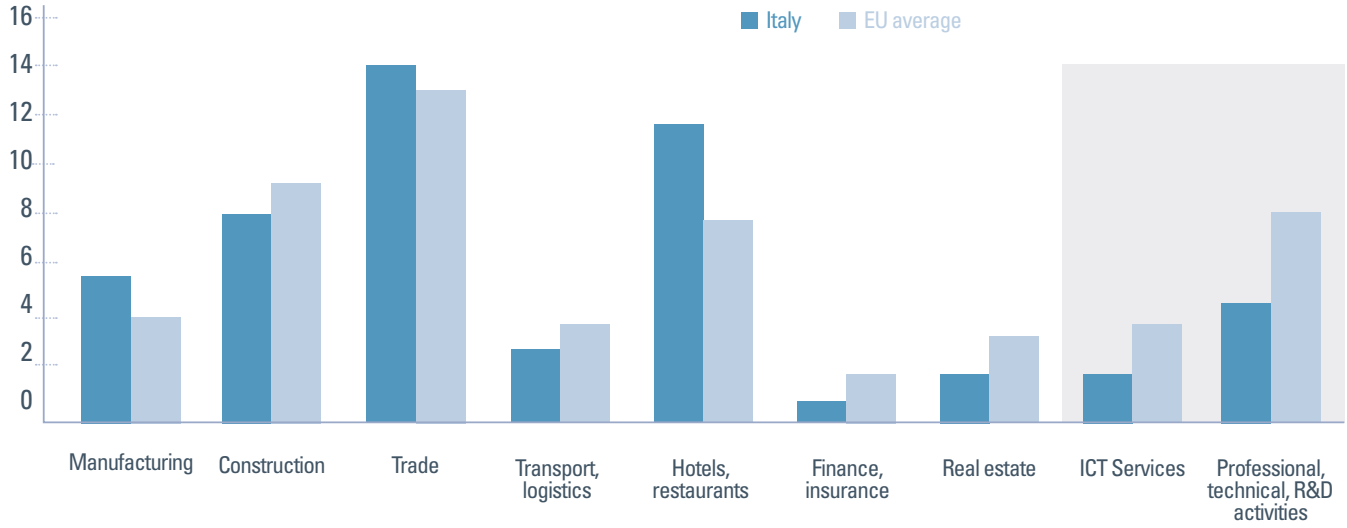
A further constraint on the technological development of the Italian economy is the **lack of qualified human capital across the production system**, which is a complementary asset to technological capital[50]. In this regard, Italy ranks second to last in Europe in terms of the share of graduates in technical-scientific occupations (STEM occupations), i.e. among the managers of technological change within corporate organisations: only 53% in 2021, compared to 85% in France, 64% in Germany, and an EU average of 73%[51]. Italy also presents a significant gap in digital skills of the workforce: only 41% of ICT specialists have a tertiary education qualification, compared to 81% in France, 52% in Germany, and an EU average of 65%[52]. This gap requires greater investment on the part of companies, but also a significant strengthening of vocational training programmes: in Italy today less than 20,000 students are enrolled in Vocational Schools (Istituti Tecnici Superiori - ITS)[53] compared to 900,000 in Germany and 380,000 in France[54].

[49] For an in-depth discussion of this topic, see CED (2019), Il ruolo dell'innovazione e dell'alta tecnologia in Italia nel confronto con il contesto internazionale, edited by R. Cerra and F. Crespi, Rome.
[50] On this topic see, among others, Visco I. (2020), Economic growth and productivity: Italy and the role of knowledge, PSL Quarterly Review, 73(294): 205-224.
[51] Source: CDP calculations based on Eurostat data
[52] Source: Eurostat. For further details, see the Sectoral Strategic Guidelines for Digitisation.
[53] Source: https://www.indire.it/progetto/its-istituti-tecnici-superiori/
[54] Source: https://www.itssi.it/formazione-professionale-modelli-europei-di-istruzione-superiore-specializzata/

Lastly, to support the technological innovation of the Italian economic system, it is crucial that **new business ideas brought to the market by innovative start-ups can find room within it to grow**. In the context of a progressive increase in the intangible component of production, which is part of the more general "tertiarisation" of advanced economies, a fundamental part of the innovation drive comes from companies specialising in Knowledge Intensive Business Services (KIBS) which, also with an open innovation approach, support and stimulate the innovative component of the already existing manufacturing companies. Data from the register of innovative start-ups at the Ministry of Economic Development (MISE) confirm this trend: of the almost 15,000 companies registered between 2013 and the second half of 2022, 76% belong to the KIBS category; the second most represented sector is manufacturing, with 16%[55].

Comparison with international peers, however, **shows that Italy is lagging behind in terms of both establishment and growth rates of KIBS companies**. For example, the number of start-ups[56] per capita in the digital services sector in the two-year period 2018-2019 was half the EU average: 1.4 per 10,000 inhabitants against 2.7; even lower compared to other European countries was Italy's rate of establishment of new companies in the support services sector in professional, scientific and technical fields: 3.6 against 7.6 per 10,000 inhabitants (Chart 5).

CHART 5 - NUMBER OF START-UPS PER 10,000 INHABITANTS, 2018-2019 AVERAGE



Note: The most cited journals in the world are defined here as the 1% most cited journals in the Scopus database.
Source: CDP calculations based on National Science Foundation data

Recent statistics released by the European Innovation Council (EIC) on high-tech potential start-ups and SMEs funded between 2018 and 2020 also **see Italy in a relatively weak position compared to its European partners**. The value of Italian assets in the EIC portfolio is currently estimated at around 1.4% of the total, a figure similar to that of Portugal. As a comparison, the value of French assets is estimated at over 10%, that of UK assets at 8%, that of German assets at 6%, and that of Spanish assets at 5%[57].

[55] Source: https://www.mise.gov.it/images/stories/documenti/Infocamere_2_trimestre_2022.pdf
[56] This includes all companies established for less than three years, not just innovative ones.
[57] EIC (2021), Deep Tech Europe. Impact Report.

2. Areas of focus and strategic priorities

2. AREAS OF FOCUS AND STRATEGIC PRIORITIES

1 SUPPORTING THE DEVELOPMENT OF TECHNOLOGICAL INNOVATION

2 SUPPORTING THE INNOVATION ECOSYSTEM AND TECHNOLOGY TRANSFER

3 SUPPORTING THE DEPLOYMENT OF TECHNOLOGICAL INNOVATION

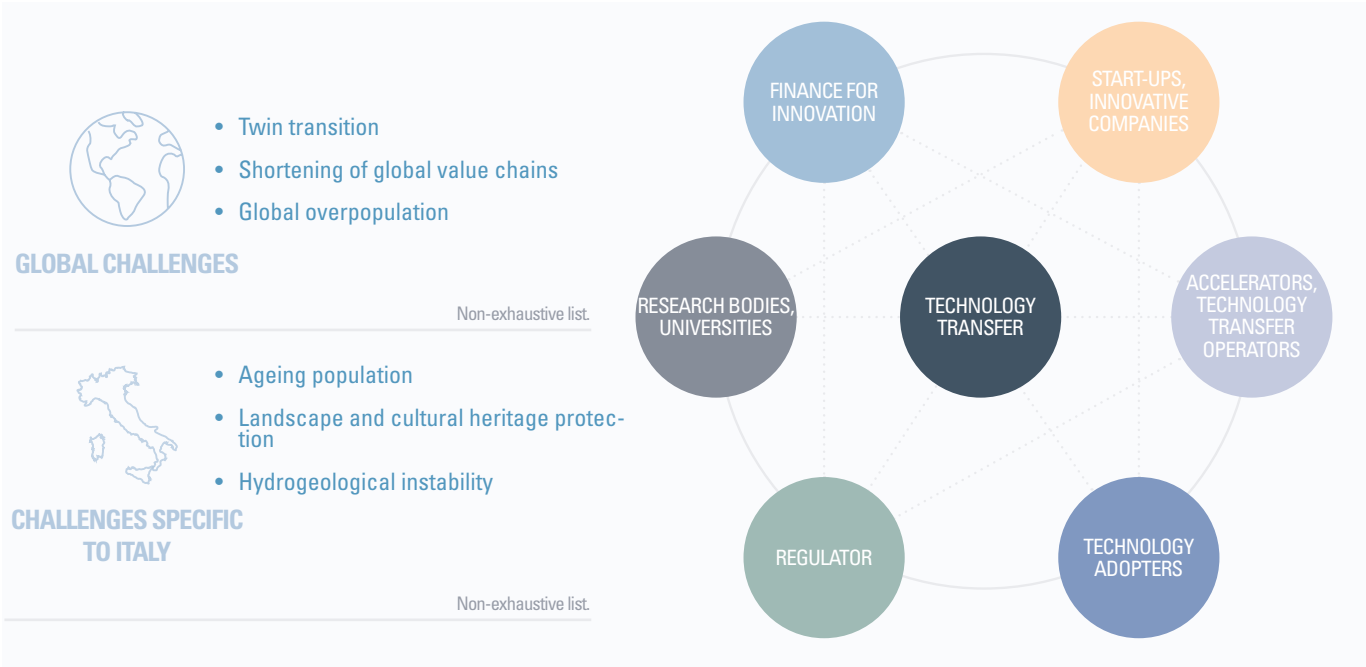
- As proven by the growing EU policy focus and by the resources allocated by the PNRR, **technological innovation is the key** both to promote business productivity and competitiveness, and **to accelerate the green and digital transitions**, thanks to its potential to deploy innovative solutions to the most pressing challenges such as climate change and cyber security.

- By way of example, it is estimated that roughly two-thirds of the CO2 emission reductions needed to achieve net-zero targets will come from the deployment of technologies only some of which are "mature" (25%) while others are recently adopted (41%). The remaining 34%, on the other hand, will need to come from advanced technologies that are currently still in the testing phase[58].

- As underlined in the previous sections, the strengths of the Italian innovation system are manifold, as are the efforts of the institutions to support the dynamism of the players in the field.
  However, **the search for excellence, the propensity of entrepreneurs to innovate and the investments made by institutions alone are not enough**. The untapped potential is still high and can be traced to the **lack of a true "ecosystem" approach** spanning the entire innovation cycle.

- **The innovation ecosystem is composed of multiple actors**, each playing a key role: **private** actors, such as start-ups, innovative SMEs and companies operating along the country's strategic industrial supply chains; **public institutions**, such as research centres and university spin-offs; and, lastly, public and private**financing entities**, (Fig. 2).

FIG. 2 - TECHNOLOGICAL INNOVATION ECOSYSTEM AND MAIN CHALLENGES



Source: CDP calculations

[58] International Energy Agency, Energy Technology Perspectives 2020, 2021.

- Active collaboration between these actors is necessary for innovation products to leave the laboratories, become scalable, and then be industrialised and reach the market.
  However, these actors often operate according to different logics and purposes, thus limiting the potential for innovation at ecosystem level, as well as the achievement of national and European goals. In this regard, CDP can play an important role **by working with and helping to connect actors**.

- In particular, we can identify **three priority areas**:

  - supporting the development of technological innovation;
  - supporting the innovation ecosystem and technology transfer;
  - supporting the deployment of technological innovation.

2.1. SUPPORTING THE DEVELOPMENT OF TECHNOLOGICAL INNOVATION

- Although support for public and private innovators has grown over time in Italy, **investment needs still remain high**.

- On the one hand, **companies have had to rapidly redesign processes and products**, recognising the value of innovation more than in the past, primarily as a tool for business resilience. On the other hand, **innovative start-ups and SMEs themselves have redefined their own business and market positioning**, strengthening their mission to respond to and propose solutions for the changing needs arising from the challenges associated with the energy and digital transition, as well as in the fields of tele-medicine and broader sustainability. This change of pace has been rewarded by investors, as the latest available data show.

- By way of example, the Venture Capital market in Italy saw an increase in investments in Italian start-ups of +221% in 2021 compared to the previous year, almost reaching the 2-billion-euro mark.

- However, **the funding of Italian start-ups is still relatively low compared to the country's European peers** like Germany (17 billion euro invested by VC funds in 2021) and France (11 billion euro)[59].

- On the other hand, as regards **investment by Italian companies in intramural research**, despite an increase in recent years and the companies' propensity to innovate, **Italy's performance remains behind that of other countries**[60].

- To partially bridge these gaps, including the lack of public and private capital, Italy has already made several efforts in recent years, starting with the allocation of 2.5 billion to CDP Venture Capital SGR, as well as the measures provided directly by the PNRR, including tax relief and tax credits[61].

- Furthermore, **in addition to capital, state-of-the-art "mentoring" instruments are needed to act as "third parties"** by assessing needs, providing expertise, including managerial expertise, and guiding innovative companies and projects within the relevant ecosystem.

- Nevertheless, **these instruments still lag behind the main European peers**[62], not so much in numbers, but in their ability to respond effectively to the needs of innovative companies. By way of example, only about 20% of start-ups in Italy join acceleration programmes, suggesting that companies consider the support services provided by the programmes to be ineffective or not responsive to their needs.

- Four strategic priorities have been identified:

[59] For a comprehensive discussion of the VC market in Italy, as well as other financial instruments available to support innovative companies, see the Sectoral Strategic Guidelines for the Capital Market.
[60] Istat, Census of Italian enterprises, 2021.
[61] For a detailed discussion of the measures included in the PNRR for innovation, see, among others: Centro Economia Digitale, Next Generation Italia Execution, 2021.
[62] Social Innovation Monitor, Report on the impact of incubators and accelerators in Italy, 2021.

- **further strengthen support for innovation initiatives and projects of innovative start-ups and SMEs**[63], with a focus on innovation in the areas of "deep technology", serving the country's strategic industrial sectors and the energy and digital transition. This support takes the following forms:
  - the injection of direct and indirect capital into the market (e.g. Venture Capital),
  - instruments to accompany start-ups, in order to assess their needs, including managerial ones, and then integrate the set of skills useful for business growth and the scalability of the innovative product, also through collaboration with other players in the system (e.g. acceleration programmes[64]);
- **support research and innovation initiatives by companies, not necessarily start-ups or SMEs**, strengthening intramural research investments, in particular for companies that:
  - operate along the **strategic supply chains in the country**[65];
  - provide, by exploiting the most advanced technologies, **innovative services for the country's strategic supply chains** e.g. in the fields of financial services (e.g. Fintech), logistics (e.g. intelligent warehousing), and medicine (e.g. telemedicine);
  - or aim to develop **solutions advancing the goals of the energy and digital transitions**, including the development of Industry 4.0 technologies, along two lines: digitisation (i.e. IoT, Big Data, Cloud Computing) and automation (i.e. Advanced Automation, Advanced Human-Machine Interface - HMI, Additive Manufacturing)[66];
- **encourage consolidation of players active along the supply chain of advanced digital technologies** (e.g. blockchain, cloud, IoT, big data)[67], by supporting the identification of "national champions" in each technology area. Around 70% of Italian start-ups and innovative SMEs operate in the software and IT consulting sector[68]. While this indicates the strong innovative drive in the sector, it also suggests the need to pave a path of market consolidation, in order to reach the size necessary to compete with large international players[69];
- **provide support**, on the one hand, **to the Public Administration in the management of European funds for research and innovation**[70], as well as the PNRR funds dedicated to innovation[71]; on the other hand, **to the companies themselves, also through awareness-raising and collaboration initiatives within the framework of European funds** (e.g. in the form of blending) under the Horizon Europe programme[72] and managed directly by the European Innovation Council (EIC), limited to the 2nd and 3rd pillars of the programme[73].

[63] Support for public "innovators", such as universities and research centres. This type of support does not fall within CDP's mission, but is provided indirectly as part of the strategic strands under the macro-priority "Support for the innovation ecosystem and technology transfer".
[64] The instruments applicable under this heading also include financial instruments to supplement the public resources available (e.g. blending), or even guarantees or ad-hoc vehicles.
[65] For further details, see the Sectoral Strategic Guidelines for Support to the Strategic Supply Chains.
[66] Osservatorio Transizione Industria 4.0, Politecnico di Milano, Research Report 2020-2021, 2021.
[67] For further details, see the Sectoral Strategic Guidelines for Digitisation.
[68] Infocamere, 2022.
[69] For more information on the characteristics and trends of the technology market in Italy, see the Sectoral Strategic Guidelines for Digitisation.
[70] European Regional Development Funds: https://ec.europa.eu/regional_policy/en/funding/erdf/
[71] By way of example, the call for funding for 27 innovation ecosystems in southern Italy, under the PNRR: https://www.ministroperilsud.gov.it/it/comunicazione/notizie/ecosiste-mi-innovazione-sud-graduatoria-pnrr/
[72] Source: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
[73] Pillar 2 relates to the development of thematic clusters on key global challenges and European industrial competitiveness. Pillar 3 focuses instead on the creation of an "Innovative Europe" through the creation of European innovation ecosystems. For more information, see: https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/presentations/horizon_europe_it_investire_per_plasmare_il_nostro_future.pdf

2.2. SUPPORTING THE INNOVATION ECOSYSTEM AND TECHNOLOGICAL TRANSFER

- **Italian businesses have a long tradition of developing cutting-edge solutions in-house**, as shown by the strong correlation between Italian production specialisation and patent specialisation. **At the same time, fundamental research shows us that Italy is in a prestigious position** worldwide in terms of research quality, **even in industrial sectors in which the country's economy is relatively less specialised**.

- Take, for example, the case of pharmaceuticals and chemicals. Although in Italy these sectors feature low industrial specialisation, Italian research in life sciences ranks first in the world in terms of the number of publications relative to the number of researchers.

- **Research centres of excellence, embedded in mature markets and innovation ecosystems,** like, for example, in Germany and the US, **tend to produce more patents**. In Italy, on average, in the last two years (2019-2021), the top five research bodies of excellence produced 96 patents, about six times less than those produced by the German Fraunhofer[74], the largest organisation for research excellence in Europe[75]. This suggests that the ability to translate innovation into marketable products is hampered by the inadequate support for technology transfer and, more generally, innovation.

- In this context, it is imperative that the various actors **set aside the inertia that is holding back the development of a fully-fledged Italian innovation ecosystem.** It is necessary to **strengthen open innovation**, especially through technology transfer infrastructures, i.e. those infrastructures, including physical ones, which, in the logic of "valleys" (referring to the European Innovation Agenda), facilitate collaboration between complementary players within the ecosystem.

- In this context, placing innovation players within an ecosystem, including a physical one, means **stimulating the dissemination of skills, both specialist and managerial**, bridging the current gaps, **by strengthening and modernising the skills of new generations** (e.g. professionalisation programmes) **and those of companies and institutions**, creating an advanced skill set shared by all players[76].

- On this front, two main strategic directions can be identified:

  - **support existing national research infrastructures dedicated to technology transfer**, such as those on robotics and environmental sustainability[77], directly managed by CDP Venture Capital SGR. Players such as Human Technopole, the Italian Institute of Technology and, in the coming years, the Innovation Infrastructures and National Research Centres financed with PNRR resources – such as, for example, the Agritech Hub, which will be built in Naples – act and will act as generators of innovative ideas that will, however, need adequate financial and managerial support[78];

  - **facilitate the creation of new technology transfer infrastructures, with the same logic as "valleys"** but on a national scale, capable of steering all bodies of excellence **through both "vertical" and "horizontal" application areas** and inserted in the context of the broader interchange network of the Regional Innovation Valleys coordinated by the EU. The emerging technology transfer Hubs, whose geographical location will also have to take into account territorial considerations[79] in support of the local communities and supply chain, will aim to identify potential innovations that can generate value not only for investors, but that also have a high social and economic impact. The Hubs must:

    - be specialised in deep-tech research areas with "vertical" (e.g. robotics, automation, agrifood, biotech, aerospace) or "horizontal" (e.g. advanced digital technologies, such as blockchain, Internet of Things, quantum, metaverse) application, with broad potential for development and industrial application;

    - bring together all the skills necessary for the development, commercialisation and industrialisation of innovation, including managerial and patent protection skills, linking together all the players in the ecosystem, including through coordination by a "third party" acting as facilitator between innovators, financiers, companies and experts on specific issues.

[74] Data refer to the period 2019-2020, as data for 2021 are not available.
[75] Netval, 17th report, "Investire sulla valorizzazione della ricerca per una resilienza generativa", 2021.
[76] For further details, see section 3.1 "Enabling Factors".
[77] Respectively, RoboIT and Tech4Planet.
[78] By way of example, CDP could play a key role in the "managerialisation" of existing hubs, also in filling certain skills gaps in the management of the innovation process.
[79] By way of example, the most recent Infocamere data for Q2 2022 show that, after Lombardy and Lazio, Campania ranks third in Italy as the region with the highest concentration of start-ups (1,350 start-ups, or just over 9% of the national number).

2.3. SUPPORTING THE DEPLOYMENT OF TECHNOLOGICAL INNOVATION

- In order to complete the Italian market for technological innovation, in addition to measures aimed at strengthening supply, it is a priority to **provide an adequate stimulus to the demand for innovation by those companies, including SMEs, that do not possess the** financial and human capital levers to embark on intramural research and development paths.

- The innovation needs of these companies must be met, **both by providing them with the tools to acquire the products of innovation** (including tangible and intangible capital goods), **and by accompanying them in managing the impacts of innovation on business operations** (e.g. processes, company culture).

- A prime example concerns the deployment of the most advanced digital technologies by companies[80]. Most Italian companies that invest in these technologies do so in "access" technologies, such as connectivity, while only 16.6% of companies have adopted at least one technology among the Internet of Things, augmented or virtual reality, Big Data, advanced automation, simulation and 3D printing;[81].

- In this context, it is essential to act along two lines:

  - **support the acquisition by companies of innovative technologies developed by third parties, in the form of tangible capital goods**[82] (e.g. production machinery, goods handling machinery, advanced tools), and **intangible capital goods** (e.g. advanced digital technologies, software, system integration, advanced platforms and business applications) especially in areas related to the development of Industry 4.0 or functional to processes such as energy efficiency and digitisation;

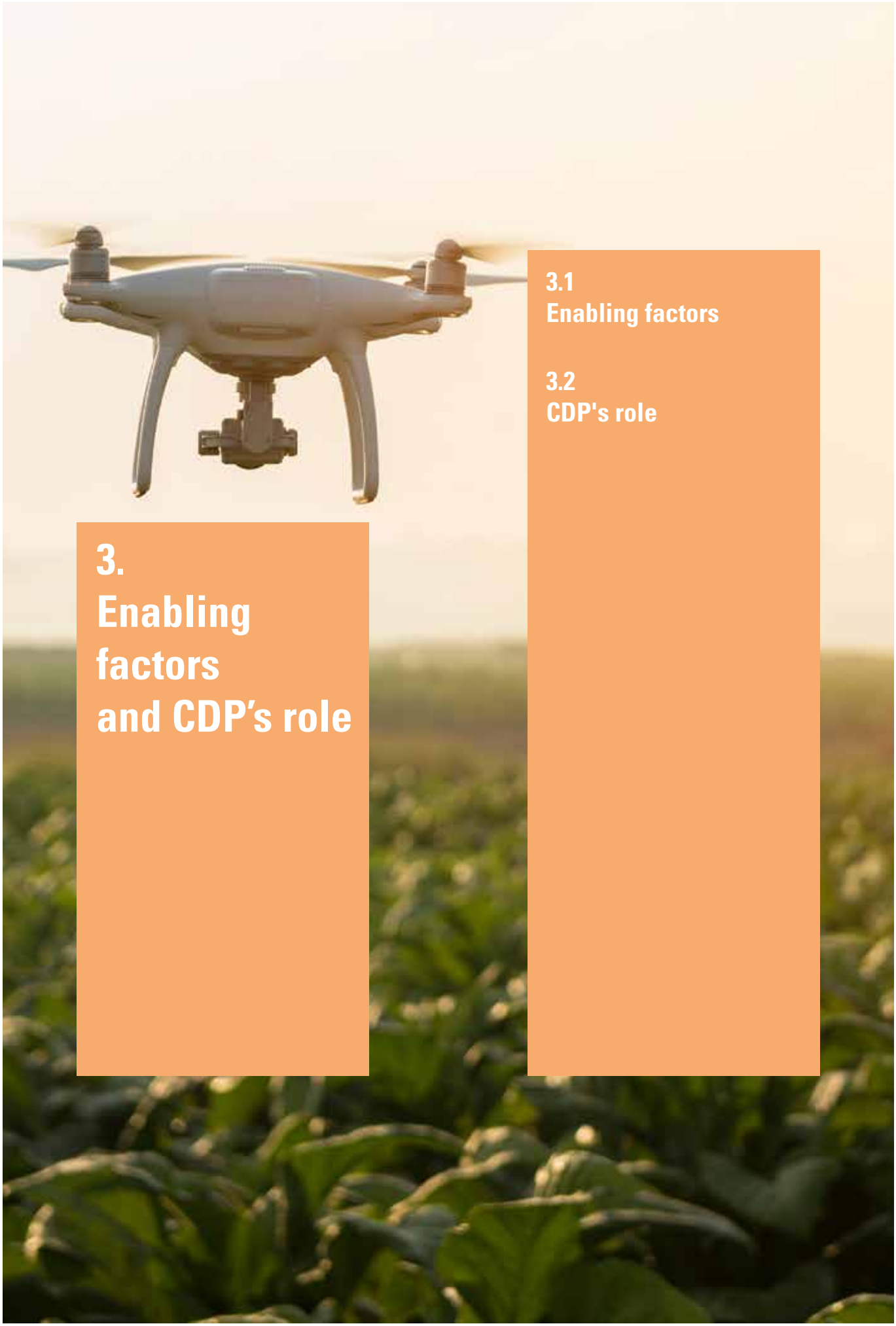
  - **support the acquisition of specialist and managerial skills**, as well as the development of **initiatives for the dissemination of a corporate culture of innovation**, for example through:

    - professional up-skilling and/or re-skilling and management training courses;

    - promotion of initiatives related to the training of the younger generation, encouraging investments by companies operating in strategic supply chains aimed at increasing skills in STEM disciplines and directing them towards the "jobs of the future";

    - promotion of business accelerators offering specialised consultancy services (also by third parties), capable of identifying the needs of companies with regard to internal innovation processes and helping them recognise and "formalise" business innovation.

[80] For a detailed discussion on the deployment of digitisation tools by companies, see the Sectoral Strategic Guidelines for Digitisation.
[81] Istat, Census of Enterprises, 2021.
[82] The tangible goods for Industry 4.0 are considered to be those that are included in the Transition Plan 4.0.



3. Enabling factors and CDP's role

3. ENABLING FACTORS AND CDP'S ROLE

3.1. ENABLING FACTORS

- The effective pursuit of the strategic priorities outlined above and the achievement of the objectives at national and European level are linked to at least four enabling factors:

  - the dissemination of **specialised and managerial skills**, also through the promotion of a **national Innovation Excellence Programme** which, also **leveraging** the role of existing or future **technology hubs at local and/or supply chain level,** is able to:

    - strengthen the training of the **new generations** who will have to lead the change brought by innovation in companies and institutions, through, for example, the rethinking and ehnancing of training and professionalisation pathways, starting with STEM programmes in school education;

    - support the training within **companies and institutions** to create an advanced skill set shared among the players within the innovation ecosystem, not only for the development of innovation, but also for the management of the impact that innovation brings within organisations;

    - the adequate **protection (and defence) of intellectual property rights on innovations** as a necessary requirement for the go-to-market of such innovations, in order to generate an adequate return on investment in research and development for innovators and investors, as well as for the creation of subsequent innovations. In this regard, the PNRR envisages implementing a **reform of the intellectual property system**[83], with the aim of overcoming certain regulatory and administrative constraints, such as, respectively, the updating of sector regulations to take into account the specific characteristics of emerging innovations, as well as the application of fast, effective and efficient procedures. Furthermore, companies, especially SMEs, must be made aware of the importance of intellectually protecting their innovations, including by helping them recognise innovation potential;

    - the effective development of "**regulatory sandboxes**"[84] to improve the conditions within which innovators test their innovations, especially in heavily regulated markets such as fintech[85]. High-tech innovation tends not only to change existing markets, but to create new ones with their own dynamics. The **opportunity to test, in a controlled environment and for a limited period of time, innovative products, services and processes in the real economy** provides a privileged insight for both market participants and regulators, enabling faster regulatory compliance, accelerating the commercialisation of innovative solutions and, consequently, limiting the risks of rapid obsolescence of the technology and lower returns on investment[86];

    - the adoption, from a public policy perspective, of **a comprehensive national strategy for the most advanced digital technologies** to steer the market towards shared goals, thereby increasing the competitiveness of the sector, along the lines of the path already taken with the Italian AI Strategy[87]. The implementation of the strategy, guided by an operational coordination body, could support the consolidation processes of a market that, although growing, is still very fragmented, with small operators.

3.2. CDP'S ROLE

- In this context, CDP can contribute to bridging the gaps highlighted, playing a role of **additionality and complementarity** with respect to the market, focusing on the **weaknesses** affecting the market incentives to finance technological innovation which tend to generate **suboptimal investment rates**. In particular, these weaknesses include:

  - high **risk level of technological innovation projects**, which require large investments, not only in the research and development phase, but also in the subsequent testing and scale-up ones, as well as returns on investments collected only in the

[83] For more information on this aspect, see: MISE, Linee di intervento strategiche sulla proprietà industriale per il triennio 2021-2023, 2021.
[84] For European guidelines on regulatory experimentation, see: COM(2022)332 final, 2022 New European innovation Agenda; COM(2020) 103 final, An SME Strategy for a sustainable and digital Europe.
[85] In this regard, see the Regulatory Sandbox that the Bank of Italy is developing: https://www.bancaditalia.it/focus/sandbox/index.html
[86] It is also worth mentioning, in this context, the initiative promoted by the Ministry for Technological Innovation and Digital Transition (MITD) within the "Italia 2025" strategy, called "Sperimentazione Italia". For more information, see: https://assets.innovazio-ne.gov.it/1646832422-sperimentazione-italia_digital_ita_stampa.pdf
[87] Ministry for Technological Innovation and Digital Transition, Programma strategico Intelligenza Artificiale 2022-2024, 2021.

medium to long term. Moreover, these projects often result in the creation of completely new markets, exposing investors to greater risks and irreversible industrial change;

- **misalignment between private and public incentives.** Technological innovations often bring about significant social benefits, which tend to be greater than "private" benefits, thus limiting the propensity for private actors to invest and requiring greater intervention by the public sector;

- **incomplete markets (and asymmetric information), in terms of both financial and human resources**. As far as financing is concerned, the failure is mainly related to the low "bankability" of projects, which tend not to meet the requirements for financing through more traditional channels. As for human resources, given the scarcity of highly qualified professionals, they tend to be employed mainly in innovation development activities rather than in the dissemination of innovation products;

- **winner-takes-all markets** such as those on the frontier of technology, where companies producing a dominant technology model will tend to influence the market, discouraging other players from generating additional innovations from the new technology model, thus limiting the growth potential of the market;

- **lack of coordination**: complex technological innovation projects require large-scale and simultaneous investments by a plurality of players in the ecosystem if they are to become profitable. The absence of coordination in strategic choices between these players increases the likelihood that projects with a high economic and social return will not be undertaken or completed.

- In particular, CDP can take action – also depending on the degree of autonomy it enjoys in the various markets/sectors and on the specific characteristics of the different counterparties – in order to:

  - **contribute to bridging investment gaps** in sectors, territories and technologies in which market players are unable to mobilise adequate resources and which require a **long-term commitment**, high capacity for **crowding-in of private resources,** or even recourse to **blended finance;**

  - **help develop technology transfer infrastructures** as a basis for the creation and growth of high-tech start-ups, **enhancing excellence in areas and technologies that are strategic for the country;**

  - **support companies in their technological transformation**, especially in the acquisition of so-called "intangibles" and in the dissemination of a widespread corporate innovation culture;

  - **provide support to both Public Administrations**, in the management of innovation funds, **and companies, in particular innovative start-ups and SMEs**, in the management of innovation projects and processes.

- To specifically assess the relevance, priority and strategic coherence of actions in the areas of focus identified, CDP applies **additionality and complementarity** criteria, picking the most appropriate operational tools according to counterparty characteristics (type, geographical location, etc.) and market features (e.g. degree of maturity, profitability).

4. Recommenda-tions

4. RECOMMENDATIONS

For each area of focus, we provide below a non-exhaustive summary of the **specific strategic guidelines** spelling out CDP's **priorities** for **Technological Innovation** actions.

AREAS OF FOCUS

SUPPORTING THE DEVELOPMENT OF TECHNOLOGICAL INNOVATION

STRATEGIC PRIORITIES

A.1	Support **innovative start-ups and SMEs** in **the development of high-tech projects**, particularly in areas related to the twin transition and in the strategic industrial sectors
A.2	Create **tools** (e.g. accelerators) **to accompany start-ups and innovative SMEs** from inception to improve the scalability of the innovative product
A.3	Support **companies for the intramural development** of high-tech projects, in particular those **operating in strategic supply chains**, which **develop services downstream or upstream of the supply chains** or that develop **solutions for the twin transition**
A.4	Support the **consolidation processes of operators in the supply chain of advanced digital technologies** (e.g. AI, Big Data, blockchain, IoT)
A.5	Support Public Administrations in the **management of public funds** for the development of innovation initiatives

AREAS OF FOCUS

SUPPORTING THE INNOVATION ECOSYSTEM AND TECHNOLOGY TRANSFER

STRATEGIC PRIORITIES

B.1	Strengthen **existing national research infrastructures** dedicated to technology transfer
B.2	Facilitate the creation of **new technology transfer hubs** in strategic territories (from an industrial and/or socioeconomic point of view), for deep-tech, for the twin transition, and/or with a high social impact, based on the "Innovation Valley" model

AREAS OF FOCUS

SUPPORTING THE DEPLOYMENT OF TECHNOLOGICAL INNOVATION

STRATEGIC PRIORITIES

C.1 Facilitate the **acquisition of innovative technologies in the form of tangible capital goods** (e.g. production and goods handling machinery, advanced tools) and **intangible assets** (e.g. advanced digital technologies, software, system integration, platforms and advanced business applications) by companies, especially related to the development of Industry 4.0

C.2 Promote the **acquisition of specialised and managerial skills** within **technological transformation and business innovation** processes


cdp