

levels, number of students admitted to the following academic year, etc.).

**Implementation:** The program is managed by the Ministry of University and Research.

**Target population:** Students.

**Timeline:** The intervention will start in 2021 and will last until 2026.

**Costs:** The estimated cost related to the RRF is equal to 0,25 billion euro

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**Investment 3.3:** Universities and territories cooperation for vocational training (code KNOW).

**Challenges:** Reduce the skill mismatch, favouring the alignment between the supply of taught skills and the skills demanded by enterprises: according to the JRC, Italy is among the countries that risk the most to face future imbalances between demand and supply of advanced digital skills; according to the Confindustria forecasts, the ICT, chemical and mechanical sectors are those in which new jobs will be created in the coming years.

Increase graduates with STEM skills: according to Eurostat data, compared to the EU average, Italy reports a lower percentage of graduates in science and engineering - 12,2 % compared to 15,5 % - whereas ICT graduates account for only 1 % of the total number of graduates, compared with 3,6 % at EU level). To this end, it is crucial to break down the barriers that currently limit the percentage of women enrolled and to complete training in technical and scientific disciplines.

**Objectives:** The project aims to implement a vocational training program, which foresees the construction of partnerships on a regional basis with universities' contributions and local branches of professional associations. Increasing the supply of job-oriented degrees is crucial. The gap between our country and the European average is determined by the percentage of the population with tertiary qualifications compared to the total population aged 25-34.

Each region will be able to manage different job-oriented degrees in different classes, according to the specialisation of the local enterprises. Cooperation on a regional basis may include the participation of Vocational Training Institutes and the creation of educational programs in synergy with exchange mechanisms and integrated training courses.

**Implementation:** The program is managed by the Ministry of University and Research.

**Target population:** University.

**Timeline:** The intervention will start in 2021 and will last until 2026.

**Costs:** The estimated cost related to the RRF is equal to 0,5 billion euro.

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**Investment 3.4:** Enabling university degrees - Reform (code KNOW).

**Challenges:** Few young people, having completed their schooling, decide and have the opportunity to continue investing in themselves, pursuing a university degree. In addition to accessibility conditions (see investments 1.1 and 1.2), the barriers are also linked to attractiveness: the perception of the usefulness of acquiring a university degree in terms of better job opportunities and more active participation in social and cultural spheres it is also influenced by the complexity of the process of entering the labour market, making the investment fruitful.

**Objectives:** The reform foresees the simplification of the procedure to activating the exercise of professions, harmonising the final degree examination e national examination, thereby simplifying and speeding up access to the labour market for graduates.

**Implementation:** The program is managed by the Ministry of University and Research.

**Target population:** University.

**Timeline:** The intervention, already applied to some professions, will be completed by 2021 through a legislative provision and extended to interested graduates starting from 2022.

**Costs:** The estimated cost related to the RRF is equal to 0

## 4. Green and digital dimensions of the component

### a) Green Transition:

The Commission Regulation (proposal) No 408/2020 that establishes the Recovery and Resilience Plan sets a binding goal on each Plan, which has to include a minimum of 37% of expenditure related to climate.

The investments in the educational offer of transversal skills, in particular in the environment and sustainable development domain, represent the condition to support the transition process of the economy and the society towards the goal of climate neutrality. The planning of the three pillars on which the component is built shows clear coherence with this goal, above all in the areas concerning teaching enhancement and vocational training reinforcement.

### b) Digital Transition:

The component is built on the awareness that the digital transformation keeps on accelerating through the development of emerging technologies, with the consequent challenges that result from it: disinformation and marginalisation of the most vulnerable groups, because of the strong gap in the technological integration for education purposes, in the provision of infrastructures and in the availability of digital skills registered on the

territory and in the society.

From this perspective, the planning on which the component is structured is focused on the promotion of digital transformation skills development: digital literacy, strengthening of competences, and tools and methods of education are topics that go through and characterise the component.

**Table 1**

Work in progress

**Table 2**

Work in progress

## 6b. Method of estimating costs

### 1.1) Student housing.

The value of the investments is based on an estimation of the average annual cost per assigned sleeping accommodation being equal to 4.000 euro (which corresponds to  $\frac{3}{4}$  of the average annual fee, of 5.500 euro per year, thus assuming that the remaining  $\frac{1}{4}$  is borne by students).

### 1.2) Scholarships and exemption from school tuition fees.

The costs of the first sub-measure are estimated thanks to the distribution of students by the Equivalent Financial Situation Indicator (ISEE) of the family of origin. Extending the no-tax area to 23,500 euro of ISEE and providing a progressive contribution up to 30,000 euro of ISEE, creates an annual cost, caused by the non-payment of the tuition fees to universities, of 195 mln euro even after considering the average increase of students stimulated by this measure, in the first three years. The estimated costs, for a period of three years, is equal to 585mln euro.

The costs of the second and third sub-measures are estimated on the basis of the percentage of regular students who are awarded a scholarship, as well as the average amount of the scholarship. In order to reach the average European level of regular students who are awarded a scholarship (equal to 20%) and to take the average amount of scholarships to 4,000 euro per year (with an increase of 700 euro), it is calculated an annual cost of 252 mln euro, which amount to 756 mln euro in three years.

### 1.3) Nursery Schools and Early Childhood Education and Care (ECEC) services Plan.

The estimated cost is 3.6 billion Euro.

### 1.4) Upgrading kindergartens (3-6 years) and “Spring” classes (from 2 years).

The estimated costs of 1 billion Euro start from the following assumption:

- average cost for a new building: 1,5 mln
- average cost for a reconversion/upgrading of an existing facility: 0,5 mln
- average number of children in a school: 100

Using 50% of resources for new facilities (tot. 333) and the other 50% for upgrading (tot. 625), the total number of interventions achievable is 958, with an impact on 95,800 children.

### 1.5) Extraordinary intervention aimed at the reduction of territorial gaps in lower and upper secondary schools (A). Fight against school dropout (B).

The intervention costs are estimated in the following way:

- Video production, platform for education management and online tutoring: €10,000,000.00
- Online tutor: €2,000,000.00
- 4 additional teachers (on average) for about 2,000 schools (average cost €30,000.00); total annual €240,000,000
- 2 experts for 2,000 schools (average cost €10,000.00); total annual = €40,000,000.00

In addition to these costs, there are others which are specific to the intervention (B), estimated in the following way:

- Equipment and Licences for 6,000 schools: €4,000 per school = €24,000;
- For the target a) additional teaching hours €35 (gross cost State €46.45) + Additional hours functional to teaching €17.5 (State gross cost €23.23) x 120,000 students x 20h of intervention (tutoring learning recovery and learning recovery) of which:
  - 120,000 students x 3h x 23.23 = €8,362,800
  - 120,000 students x 20h x 46.45 = €94,758,000
  - Total for one year = €103,120,800
  - Total for two years = €206,241,600
- For the target b) additional hours functional to teaching €17.5 (State gross cost €23.23). 350,000 youngsters x 10h of intervention (tutoring) x €23.23 = €81,305,000;
- 3,500 post-diploma courses for a maximum of 100 youngsters each (x 200 cad.) . . . . . €70,000,000;

Training intervention for the teaching personnel €1,000,000 Total for 2 years €141,000,000

- Intervention for accessibility (Sign Language, Braille, subtitling): €500,000;
- Operating expenses Territorial Support Centers (Centri Territoriali di Supporto, CTS), with a number of 3 seconded operators (i.e. 6 in partial exemption);

35,000 x 3 = 105,000 euro per year for each CTS

Annual expenses for 106 CTS = 11,130,000

### 1.6) Full-time School Fund

The estimated cost is 1 billion Euro

**2.1) (Reform)** Tertiary advanced school (University – INDIRE) and compulsory training for school managers, teachers, administrative and technical staff.

The estimated costs of the tertiary advanced school have been calculated by considering 100 university professors at the average cost of €50,000. giving a total of €5,000,000 per year for a period of 5 years.

The operating expenses including the offices, fees, utilities, personnel costs of Boards, President, General Manager, and 15 administrative employees amount to €1,000,000 per year.

The first year, besides the €6,000,000 of the necessary costs for the operations, also €4,000,000 for the furniture startup, €2,000,000 for the preparation of educational workshops, and €2,500,000 for other technological equipment (distance learning platforms, computer equipment, etc.).

**2.1)** Integrated digital teaching and life-long learning of school staff.

The estimated total cost is equal to €420 mln, of which 10 mln are intended for the training of school managers, 290 mln for the training of teachers, 127 mln for the training of the administrative and technical staff (Personale Tecnico, Amministrativo e Ausiliario, ATA), and 3 mln for the platform of the professional portfolio and open badges management. These costs, which will allow for the training of 1.000.000 people among school managers, teachers, and administrative staff, are going to be managed by the Central Administration through calls for tenders at public evidence and School-Centers (Scuole Polo) for training, as well as individual scholastic institutions.

**2.2) (Reform)** Teachers recruitment.

The cost is equal to 0.

**2.3) (Reform)** STEM and digital skills in all school cycles.

Reform at 0 cost.

**2.2)** STEM skills and multilingualism for teachers and students.

The estimated total costs include the following costs concerning the STEM domain:

- €40,000,000 for teachers training;
- activation costs of experimental projects on 61,100 classes (€91,650,000);
- costs related to the update of teaching equipment on 309,000 classes (€463,500,000), to the implementation of the digital platform supporting the training of teachers and teaching activities (€8,850,000);
- costs related to promotion and orientation actions intended for upper secondary schools which are oriented towards the STEM domain as well as towards university education and tertiary vocational training, for both students and families (96,000,000).

The reasonings that underlie the costs are mainly linked to:

- the number of classes of lower and upper-secondary school (about 370 thousand)
- the cost of training 100,000 teachers considering 60 hours annually on average (integrated online and in presence) of groups of 30 teachers, with the involvement of universities (€8,000 for 5,000 courses = €40,000,000)
- the budget assigned for the implementation of the compulsory STEM and information technology projects in each class (about €1,800 per project on average)
- the budget assigned for the implementation of projects related to the orientation for the development of STEM and information technology skills in each school, with particular emphasis on the equal opportunity guarantee (about 11,000 euro for each of the 8,000 schools on average).

In terms of the multilingualism scope, it should be noted that the National Institute for Documentation, Innovation and Educational Research (INDIRE) has allocated on the Erasmus 2014-2020 programme a total of 38mln euro for the training in service of the school staff and about 90mln euro for partnership projects between schools with students mobility. This has allowed satisfying about 40% of the request. In addition to the budget necessary to cover 100% of the request, also the budget for curricular and extra-curricular courses for students needs to be considered.

2.3) School 4.0: innovative schools, wiring, new classrooms and workshops.

To be defined.

2.4) Teaching and advanced university skills.

The volume of the total investments of the sub-measures, of which the project is made, is based on the following estimates:

- cost of Ph.D. scholarship equal to €150,000;
- cost of the analytical project for the continuous digital training, the activation of 5 teaching-learning centres and 4 Digital Education Hubs, based on previous or analogous experiences;
- analytical project of enhancement of superior graduate schools equal to 25 mln per year;
- analytical project for 10 initiatives of transnational education 10 mln/initiative = 100 mln;
- analytical project for the support to strategic partnerships to innovate the international dimension of the Italian university system and a programme to support Italian universities that are part of the European University Alliances recognised by the EU: 5 mln/year;
- analytical project for the internationalisation of research, in collaboration with the Conference of Italian Universities Rectors (CRUI) as well as other European institutions: 16 mln/year.

3.1) (*Reform*) of the tertiary vocational training system (ITS) (code KNOW).

The reform costs are equal to 0.

3.1) Development of the tertiary vocational training system (ITS) (code KNOW).

The total estimated cost is composed as follows (to review according to new budget):

- xxx€ to increase the number of enrollments (+ 100% min) and graduates
- xxx€ for instrumental equipment
- xxx€ for the fund for rewarding and monitoring
- xxx€ for training, network management and cross-border mobility

The reasonings that underlie the costs are mainly linked to:

- The current number of Vocational Training Institutes ITS (104), with 3.536 graduates in 2018;
- Confindustria's 2020 analysis, based on Istat and Unioncamere data, estimates that almost 13.000 technicians are required by enterprises graduate from Vocational Training Institutes (ITS);
- Current costs. The standard cost of a Vocational Training Institute (ITS) course is 330,000 euro. The average class of a Vocational Training Institute is formed of 22 students. The average cost of a graduate is therefore around 15,000 euro;
- For the estimate of the costs for infrastructural equipment, it is possible to see the funding already provided by the MISE for the current year aimed at improving the infrastructural equipment of the tertiary vocational training system. The MISE has awarded 15 million euro with an estimate of the minimum cost for each ITS of 400,000 euros (Law no. 160 of 27 December 2019, Article 1, paragraph 412);
- The current Rewarding Fund (Fondo per la premialità) and the relative monitoring (provided by article 1, comma 875, of Law n. 27 of December 2006, n. 296) has at its disposal about 13 mln euro per year to be delivered on the basis of national monitoring actions, and to be increased coherently with the assumed rise of students. In addition, the cost for the implementation of the national monitoring of the Vocational Training Institutes (ITS) (agreement of State-Regions Conference – Conferenza Unificata - of August 5, 2014, and applied for the first time in 2015, with the Agreement in State-Regions Conference n. 133 of December 17, 2015, the appropriate changes have been adopted to the monitoring system as an effect of the indications included in article 1, comma 45, of Law n. 107 of July 13, 2015) for the evaluation of the achieved results and the consequent assignment of the reward need to be considered;
- In the 104 Vocational Training Institute (ITS) there are currently 104 directors, about 200 course coordinators, and 7,000 teachers; the increase in the number of coordinators and teachers will be in line with the expected increase in the number of students. The directors and coordinators of the courses are expected to have 25 hours of training per year equal to the minimum level of training required (for a module in teacher training) to ensure the diffusion of the service innovation and uniformity. The cost of one hour of training is estimated at 60 euros per hour. For teachers, training modules of 9 hours a year are planned. The cost of one hour of training remains unchanged at 60 euros per hour;
- For each of the 104 Vocational Training Institute Foundations, there is a part-time “network animator”;
- It is assumed to offer cross-border mobility for one month to 10% of the total number of students; 6-day mobility is also provided for course directors and coordinators (daily cost €160).

**3.2) (Reform)** of Technical and Professional Institute (code KNOW).

The reform costs are equal to 0.

**3.3) (Reform)** of "Orientamento scolastico" (code KNOW).

The reform costs are equal to 0.

**3.2)** Active orientation in school-university transition (code KNOW).

The value of the investments is estimated by assuming that the courses will be held in presence to groups of 20 students on average. Each course would have a duration of 30 hours, with an hourly cost of €100. Furthermore, specific projects are foreseen to lead female students (250.000) to STEM disciplines with seminars and short meetings (about 4-5 hours).

**3.3)** Cooperation between Universities and territories on vocational training (code KNOW).

The value of the investments is calculated assuming an annual cost per student of €2,000 based on the analysis of previous trials of job-oriented degrees held in universities in recent years.

**3.4) (Reform)** of Ph.D. Programmes (code KNOW).

The reform costs are equal to 0.

**3.5) (Reform)** enabling university degrees (code KNOW).

The reform costs are equal to 0.

**3.6) (Reform)** University degree groups (code KNOW).

The reform costs are equal to 0.

## 2 M4C2 - From research to business

### Summary box

**Policy area:** Promotion and strengthening of basic and applied research, research plans and infrastructures for strategic challenges, technology transfer.

**Objectives:** The objectives of this component, developed with individual proposed projects, are articulated on two axes:

- a) Strengthening the R&D chain and support IPCEI initiatives ("Research is the future") (code RES), raising the growth potential of the economic system, through a systemic use of the leverage of investments in R&D, taking into account the territorial differences and the type and dimensions of enterprises. The expected repercussion is an increase in the volume of public and private investment in research and innovation and the improvement of the resilience and economic and environmental sustainability of the R&D development processes.
- b) Technology transfer and supporting innovation ("For widespread innovation") (code INN), encouraging - with public and private investments - the systemic use of research and innovation results by the economic system. The expected results consist in a more effective level of collaboration between the public scientific base and the business world and in the development of researchers' skills - especially in the field of digital technologies, environmental transition and management models.

#### **Reforms and investments:**

**Outcome 1: Strengthening Research and Development and IPCEI initiatives.**

Reform 1.1: Implementation of R&D support measures;

Investment 1.1: Partnerships extended to universities, research centres, companies and funding of basic research projects;

Investment 1.2: Funding projects presented by young researchers (code RES);

Investment 1.3: Agreements for Innovation (code RES);

Investment 1.4: Initiatives based on the IPCEI model. Partnerships in research and innovation (code RES);

Investment 1.5: New Research Projects of Significant National Interest (code RES);

Investment 1.6: Fund for the National Research Programme (NRP) (code RES);

Investment 1.7: Fund for research infrastructures and buildings (code RES).

**Outcome 2: Transfer of technology and support for innovation.**

Investment 2.1: Strengthening research structures and supporting the creation of "national R&D leaders" on some Key Enabling Technologies (code INN);

Investment 2.2: Strengthening and sectorial/territorial extension of technology transfer centers by industry segments (code INN);

Investment 2.3: Establishing and strengthening of "innovation ecosystems", building "territorial samples of R&D" (code INN);

Investment 2.4: Introduction of innovative doctorates that respond to the needs of innovation and promote hiring of researchers by companies.

**Estimated costs:**

EUR 11,290 million to be covered by RRF (of which 1,380 million are referred to ongoing projects).

	Resources (euro/mln)				
	Existing	New	Total	REACT-EU	TOTAL NGEU
	(a)	(b)	(c) = (a)+(b)	(d)	(e) = (c) + (d)
<b>1. Strengthening R&amp;D, and IPCEI initiatives</b>	<b>1.38</b>	<b>5.91</b>	<b>7.29</b>	<b>-</b>	<b>7.29</b>
- Partnerships extended to universities, research centres, enterprises and funding of research projects	-	1.61	1.61	-	1.61
- Funding projects presented by young researchers	-	0.60	0.60	-	0.60
- Agreements for Innovation	-	0.70	0.70	-	0.70
- Initiatives based on the IPCEI model. Partnerships in research and innovation	-	1.00	1.00	-	1.00
- Fund for the National Research Programme (NRP)	0.45	0.40	0.85	-	0.85
- New Research Projects of Significant National Interest	0.35	0.60	0.95	-	0.95
- Fund for research infrastructures and buildings	0.58	1.00	1.58	-	1.58
<b>2. Transfer of technology and support to innovation</b>	<b>-</b>	<b>4.00</b>	<b>4.00</b>	<b>0.48</b>	<b>4.48</b>
- Establishing and strengthening "innovation ecosystems", building "territorial samples of R&D"	-	1.30	1.30	-	1.30
- Strengthening research structures and supporting the creation of "national R&D leaders" on some Key Enabling Technologies (Agritech, Fintech, IA, Hydrogen, Biomedics)	-	1.60	1.60	-	1.60
- Strengthening and sectorial/territorial extension of technology transfer centers by industry segments	-	0.50	0.50	-	0.50
- Innovative doctorates that respond to the needs of enterprises and promoting hiring of researchers by companies	-	0.60	0.60	-	0.60
- Doctorates and researchers on green and innovation technologies	-	-	-	0.48	0.48
<b>TOTAL</b>	<b>1.38</b>	<b>9.91</b>	<b>11.29</b>	<b>0.48</b>	<b>11.77</b>

## 2. Main challenges and objectives

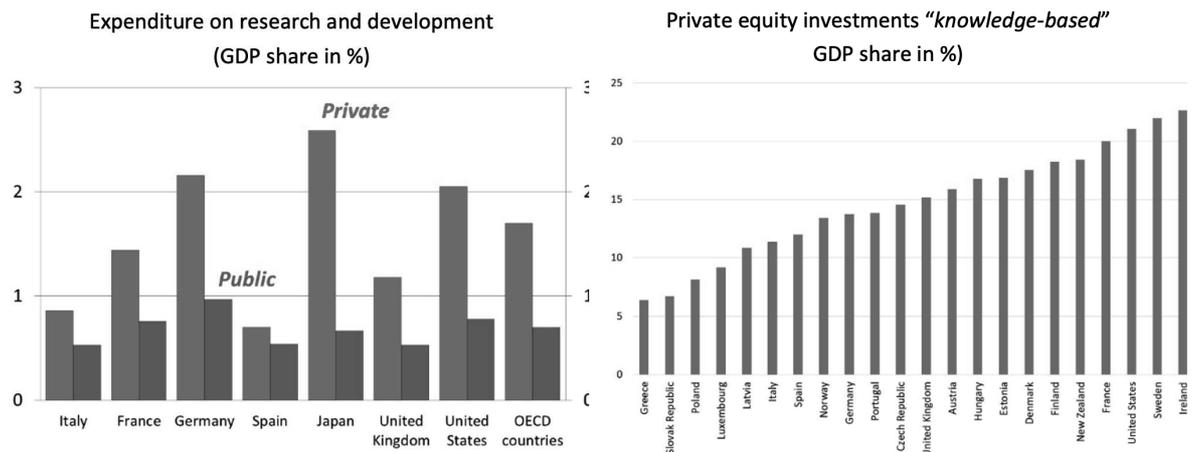
### a) Main challenges

Italy needs to strengthen the conditions to develop a knowledge – based economy, competitive and resilient. The country will act on the basis of a systemic approach that foresees the increase of investment in R&D. This component responds to the main challenges highlighted below:

- Low level of R&D spending. Italy registers a low intensity of R&D expenditure

compared to GDP (in 2018 equal to 1.4%) much lower than the OECD average (2.4%), in both public and private sector. Public R&D spending has declined since 2013 and reached 0.5% of GDP in 2018, the second lowest level among the EU-15 countries. The level of private R&D spending, although increased in recent years, remains significantly below the EU average (1.41%). The increase of public and private investment in R&D is a crucial condition to recover the gaps in productivity levels.

### ITALY SPENDS TOO LITTLE ON R&D AND "KNOWLEDGE BASED" CAPITAL



Source: OCSE.

- Availability of human capital. An important barrier to the development and competitiveness of the Italian economic system is the limited availability of competences: the number of public and private researchers is lower than the average in other advanced countries (the number of researchers per active person employed by companies is only half of the EU average: 2.3% versus 4.3% in 2017). Italy must stop the consistent and lasting loss of scientific and technical national talents, that move abroad to more attractive European and international systems, bringing along the result of investments in higher education made in their country of origin.
- Reduced demand for innovation. In Italy, the reduced demand for innovation and for highly qualified human capital is mainly due to: the prevalent specialization of the productive system in traditional sectors; the typically small or medium size of Italian enterprises, resulting in a greater propensity to contain costs; a limited innovation culture. The use and enhancement of the scientific and technological base available is therefore limited: the volume of research developed in the public R&D system and financed by private companies (as a percentage of GDP) remains distant from the EU average. In 2019 only 2% of Italian publications were public / private co-publications compared to 4% in the EU.
- Integration of research results into the production system. The scarce qualification of skills and the limited resources available to the structures responsible for

technology transfer prevent the successful collaboration between academies and industries. This is another element that limits the potential to use and enhance the scientific and technological base available. Moreover, Italy suffers the absence of a comprehensive network of centres dedicated to technology transfer and a systematic connection of such centres with the frayed production system.

## **b) Objectives**

The component aims at substantially resolving the 2019 and 2020 country-specific recommendations for Italy, which suggest to strengthen and give continuity to R&D policies, through the support of public and private investment, the diffusion of innovative technologies, the strengthening of skills, thus supporting and promoting the transition towards a knowledge-based economy.

The component intends to promote the fundamental levers of research and innovation to develop the country's economic growth potential and shape a more resilient and sustainable development path. The lines of actions foreseen aim at contaminating and enriching the business environment with the results of R&D activities (carried out by public and private research centres, in an integrated way), at facilitating the application of technologies, in particular by SMEs, and at connecting companies to strategic value chains at European and international level.

Italy can count on competitive advantages based on a widespread and consolidated presence of industrial realities and research of excellence on cutting-edge technologies, especially in the areas of robotics and automation, health, materials, design, construction, energy and agro-industry.

However, the propensity to invest in R&D is still limited, and this holds back the competitiveness of the business system and the ability to transform the scientific basis into economic value (so-called "European paradox"). This is particularly evident for some types of enterprises (SMEs) and in some areas of the country.

The approach developed in this component is based on a limited number of priorities, well interlinked projects and the development of skills in line with the needs expressed by different sectors of the economy. This approach should: i) guarantees coherence and critical mass to the interventions, ii) gives continuity to support policies, iii) avoids dispersion of resources and fragmentation of priorities.

The component involves the entire supply chain process, and aims at filling the geographical gaps attributable to the weakness of the business context in the South and its low demand for innovation. The objectives are connected to 2 main axes in which the component is divided:

- funding programs (joint public - private) for basic and applied research projects, (code RES), periodically defined under a unitary governance, with the aim to raise

- the level of competitiveness of companies and of public and private research centres;
- strengthening technology transfer mechanisms (code INN), encouraging a systemic use of R&D and innovation results, acting jointly on the demand and on the supply side (in the sense of a greater qualification of the structures), and developing adequate and new skills, especially in the field of digital technologies, environmental transition and management models.

### 3. Description of the reforms and investments of the component

1) Strengthening Research and Development and IPCEI initiatives.

**Reform 1.1:** Implementation of R&D support measures.

**Challenges:** One of the main challenges concerns the governance mechanisms to support of R&D investment and make its policies effective. It must generate a significant impact on the productive and research fabric, ensure coherence and critical mass to interventions and avoiding dispersion and fragmentation of priorities.

**Objectives:** The systemic approach to support R&D activities will be strengthened with a model based on a few horizontal missions, with aggregated and integrated interventions to support the entire supply chain (technological poles and research infrastructures, scientific and technological skills, companies). This approach will overcome the actual logic of mere redistribution of resources and will ensure continuity in the financing of initiatives. This action will be accompanied by the simplification of process related to the management of funds devoted to public-private research activities. The Ministry of Universities and Research will also introduce new operating models that will be defined on the basis of good practices in other countries (e.g., Fraunhofer Institute in Germany).

**Implementation:** The Ministry for Universities and Research and the Ministry of Economic Development will be responsible for this reform. An Interministerial control room will be established with an Interministerial decree that will set the simplified disciplines for the management joint R&D activities.

**Target population:** Universities, research centres, businesses.

**Timeline:** The intervention will be completed in 2021.

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**Investment 1.1:** Partnerships extended to universities, research centers, companies and funding of basic research projects.

**Challenges:** The new development models require an ever-closer interaction between the world of research and the world of production, and innovations must serve as an opportunity for the development and not as a cause of decline of our companies. Such challenges

requires the evolution of research strategies, the increase of research competitiveness, and the contribution of research to social and economic well-being.

**Objectives:** This line of action, which is closely integrated with the initiatives to support the research supply chain, aims at financing 10 major research and innovation programs carried out by widespread networks of public and private subjects. Such actions will contribute to strengthen national technology chains and promote their participation in European and global strategic value chains. The program will promote the aggregation of small and medium-sized enterprises around large private players and public research centres; it will encourage collaborative and complementary research activities. R&D projects also involve investments by universities in new positions of fixed-term researchers: they will increase their skills while implementing the research activities envisaged by the projects.

In addition, the National Research Plan (NRP) will contribute to strengthen the national country system in the European and global dimension.

**Implementation:** The program is managed by the Ministry of University and Research. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures. The programme is closely integrated with the NRP: once the missions are defined, working groups will be set up to define, for each mission, a roadmap of objectives.

**Target population:** Universities, research centres, enterprises, researchers.

**Timeline:** The intervention will start in 2021 and will last until 2026.

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**Investment 1.2:** Funding projects presented by young researchers(code RES).

**Challenges:** Filling the gap in advanced skills is one of the essential conditions to recover the scarce productivity of the Italian economy: in this perspective contribution of ideas and energy of young researchers becomes crucial.

**Objectives:** The project - strongly inspired by the European ERC starting grant, in the Excellent Science pillar of the Horizon Europe program –finances research activities managed independently for 5 years by young researchers, who will immediately gain a first experience of research responsibility. It also includes a program of short mobility for research or teaching activities in other locations in Italy or abroad.

**Implementation:** The program is managed the Ministry of University and Research. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures.

**Target population:** Researchers.

**Timeline:** The intervention will start in 2021 and will last until 2026.

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**Investment 1.3:** Agreements for Innovation (code RES).

**Challenges:** Italy lacks integration of financial instruments to support investment along the entire research and development chain; it also needs to simplify the procedures to make financial instruments accessible to companies and to invest in capacity building of enterprises in the use of financial resources.

**Objectives:** The intervention will support the implementation of research and development projects and the introduction of high-profile innovative solutions, through the collaboration of technology transfer centres, research and knowledge widespread bodies, in line with the Transition Plan 4.0 and with the National Smart Specialization Strategy (SNSI). The facilities, intended for companies of any size, are aimed at supporting the creation of new products, processes or services and at the significantly improvement of existing ones, through the development of innovative technologies. This intervention strengthens the diffusion of digital technologies in the productive system.

**Implementation:** The program is managed by the Ministry of Economic Development. The intervention is based on a negotiated evaluation procedure and resumes some successful schemes already adopted by the Ministry of Economic Affairs in previous actions. It is closely integrated with the reform indicated in point ii) Implementation of R&D support measures.

**Target population:** Research centres, enterprises.

**Timeline:** The intervention will start in 2021 and will last until 2026.

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**Investment 1.4:** Initiatives based on the IPCEI model. Partnerships in research and innovation code RES).

**Challenges:** The relaunch and recovery, when they have characteristics of economic resilience and sustainability, are linked to the need to position the country on the strategic European value chains, safeguard the knowledge, raise the level of investments and services for research and development of new technologies, contaminate the productive system with the results of R&D activities by facilitating the application of technologies by SMEs.

**Objectives:** The project has a twofold objective. First: to support and strengthen the strategic value chains in Italy, in close synergy with the European strategic planning and agendas. The IPCEIs bring together knowledge, skills, financial resources and economic actors from across the Union, to overcome serious systemic or market failures and respond to social challenges that cannot be met otherwise, in the areas that cover the

digital and green dimensions, showing clear integrations and synergies with the PNRR missions "Digitalization, innovation, competitiveness" and "Green revolution and ecological transition".

It aims at supporting research, development and innovation projects identified with specific calls, in collaboration with EU counterparts. This also promotes the participation of Italian firms in research and innovation partnerships (European Partnerships) within the framework of the Horizon Europe program.

**Implementation:** The program is managed by the Ministry of Economic Development. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures – Reform.

**Target population:** Research centres, enterprises.

**Timeline:** The intervention will start in 2021 and will last until 2026.

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**Investment 1.5:** New Research Projects of Significant National Interest (code RES).

**Challenges:** The national research system lacks interactions between universities and research bodies and this limits the Italian participation in initiatives under the European Union's Framework Programme for Research and Innovation.

**Objectives:** A new lever of Research Projects of Significant National Interest to fund three-year projects that, due to their complexity and nature, require the collaboration of research units belonging to universities and research organizations. These projects - which intend to promote curiosity-driven research activities, both fundamental and oriented - are selected on the basis of the quality of the scientific profile of those responsible, as well as the originality, methodological adequacy, impact and feasibility of the research project.

This type of activity stimulates the development of initiatives promoted by researchers, towards frontier research, and a stronger interaction between universities and research institutions. This should encourage the participation in initiatives under the European Union's Framework Programme for Research and Innovation.

**Implementation:** The program is managed by the Ministry of University and Research.

**Target population:** Universities; Public Research Centres; researchers.

**Timeline:** The new call issued in autumn 2020 provides for the activation of a single funding procedure with annual opening windows for the submission of research projects for the years 2021 and 2022.

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**Investment 1.6:** Fund for the National Research Programme (NRP) (code RES).

**Challenges:** Italy faces the need to strengthen interactions between universities and research bodies and encourage participation in initiatives under the European Union's Framework Programme for Research and Innovation.

**Objectives:** The Fund will support scientific research measures set out in the National Programme for Research (NRP) 2021- 2027 in such a way as to ensure the implementation of the strategic lines in the field of scientific research in coherence with the EU Framework Programme for Research and Innovation. The Fund will finance collaborative projects between public research centres, companies and other institutions, which are coherent with the approach introduced by the new Horizon Europe Research Framework Programme

**Implementation:** The program is managed by the Ministry of University and Research.

**Target population:** Universities, Public research institutions.

**Timeline:** The implementation passes through competitive calls, according to the scheme of European research and innovation projects, or in response to call for proposals setting out the objectives of the projects to be financed, within the framework of the various measures identified.

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**Investment 1.7:** Fund for construction and research infrastructure (code RES).

**Challenges:** The evolution of economic systems towards knowledge-based development paradigms involves the strengthening of research infrastructures, by favouring their integration into the productive and research tissue.

**Objectives:** The Fund is aimed at building research infrastructures in public research institutions or strengthening the existing ones. The Fund will be activated in synergy with measures related to "innovation ecosystems" and national thematic networks (see measure "national R&D leaders"), strengthening them through the provision of research infrastructures. The fund will promote the lever of private investment, thanks to mechanisms that will strengthen the profitability of research infrastructures, especially in the strategic areas of technological innovation.

**Implementation:** The program is managed by the Ministry of University and Research. Implementation phase foresees a strict integration with the programme devoted to the creation and enhancement of "innovation ecosystems".

**Target population:** Research infrastructures.

**Timeline:** to be developed

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2) Transfer of technology and support for innovation.

**Investment 2.1:** Strengthening research structures and supporting the creation of "national R&D leaders" on some Key Enabling Technologies (code INN).

**Challenges:** Italy needs to strengthen research infrastructures, spread an entrepreneurial culture, promote programs at universities and research centres that encourage the creation and development of research spin-offs. Integrating the use of advanced technologies (e.g. robotics and automation) and emerging technologies - such as artificial intelligence, high-performance computing, cyber security - into production processes is an essential condition to strengthen the competitiveness of companies and increase employment opportunities. These technologies can find application in areas where social challenges are growing (digital transition, health, climate change) and are integrated, in a matrix approach, with the missions that inform the strategic system.

**Objectives:** The measure aims at financing the creation of at least seven research centres on as many strategic issues. The investment will also be directed to strengthening the hardware and software infrastructure at the disposal of highly qualified personnel. These centres - which will arise from the collaboration between universities, research institutes and companies - will have a national scope with a technological and/or thematic declination, consistent with the priorities of the European agenda and the contents of the PNRR. In this first phase the following centres have been identified:

- National Centre for Artificial Intelligence for research, innovation and technology transfer of excellence at national and international level. The Institute includes a High-Performance Computing Infrastructure (HPC) focused on edge computing and embedded AI aspects, a priority for the Italian production system.
- National Centre for High Technology Environment and Energy. Development of technologies for environmental management and renewable energy.
- National Centre of High Technology quantum computing. HPC Centre of Excellence for Advanced Simulation and Big Data, aimed at developing a new generation of numerical applications.
- National High Technology Centre for Hydrogen Technology development supporting the energy transition to hydrogen.
- National High Technology Centre for Biopharma for the development of research and applications in the world of Bio engineering and pharmaceuticals, linking intersectoral technologies and multidisciplinary experiences.
- National Agri-Tech Centre, to encourage innovation and development of the Italian agri-food sector to which universities and research centres will contribute, as well as other state structures to promote private investment in research. The Agri-Tech Hub will be based in Naples and will include several cutting-edge laboratories and infrastructures dedicated to research and experimentation of technologies in the agri-food sector.

- National Fintech Centre, to foster innovation and development of the financial and economic market in a digital key, which will be based in Milan. In addition to the Bank of Italy, which will operate through the FinTech channel and as a coordination and direction centre for various activities, universities, research centres and large financial industry operators will contribute to the hub.

The measure will reinforce synergies with the Horizon Europe research program.

**Implementation:** The program is managed by the Ministry of the University of Research and the Ministry of Economic Development. The measure will be accompanied by a reform jointly implemented, to define the governance and management of the centres. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures – Reform and with the programme dedicated to the creation and enhancement of "innovation ecosystems".

**Target population:** Universities, research centres and companies.

**Timeline:** The intervention will start in 2021 and will last until 2026.

**Investment 2.2:** Strengthening and sectorial/territorial extension of technology transfer centres by industry segments (code INN).

**Challenges:** The range of technological skills present in private and public research structures is very broad in Italy; however, the degree of collaboration between companies and the research system is limited, and it is mainly a prerogative of medium-large companies. In this perspective, especially for SMEs, it becomes necessary to rationalize and strengthen the system of specialized centres and structures, and to simplify access and exploitation of skills and technologies.

**Objectives:** The measure foresees a process of reorganization and rationalization of different centres (Competence Centres, Digital Innovation Hubs, Digital Innovation Points) carried out to offer advanced technological services to companies. In detail, investments will be allocated to the following types of structures:

- Competence Centre: on the basis of the national specializations emerging from the National Intelligent Specialization Strategy, it is planned to activate 10 to 15 centres (indicatively on green technologies, “precision agriculture”, technologies for sustainable construction, sectoral applications of artificial intelligence, etc.). The aim is to strengthen the system of competence centres – in the framework of the Transition 4.0 strategy (see Mission 2) - also through the aggregation of existing research, transfer and innovation centres. The centres will be in charge of providing companies with advanced technological services (e.g. test before investing) and innovative services, on the model of the European Digital Innovation Hubs.
- DIH network, Pid and more: the aim is to create a first level connection between

the business system/supply chain and the skills and supply system, through the stimulus and the self-assessment of businesses on their level of digital intensity.

- Local / territorial innovation hubs: technology transfer centres in the cities undergoing 5G trials, namely Turin, Rome, Catania, Cagliari, Genoa, Milan, Prato, Modena, L'Aquila, Bari and Matera. New centres - besides those already financed - could be created on projects presented by municipalities also with the aim to regenerate abandoned industrial areas, or prevent depopulation of "inner areas".

**Implementation:** The program is managed by the Ministry of Economic Development. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures - Reform

**Target population:** Technology transfer structures.

**Timeline:** The intervention will start in 2021 and will last until 2026.

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**Investment 2.3:** Establishing and strengthening of "innovation ecosystems", building "territorial leaders of R&D" (code INN).

**Challenges:** Innovation must be conceived as a real ecosystem that must include advanced training and laboratories, created in partnership with private companies. They must be able to exploit and enhance the skills of researchers, otherwise attracted by appealing employment opportunities abroad. The scarce presence of business incubators in Italy limits the transition of innovation from the research field to that of enterprises. Italy needs to strengthen the training mechanism, through collaboration with the productive world, widening the opportunities to develop initiatives promoted by dynamic young people. The challenge is therefore to be able to count on locations, the ecosystems of innovation, where these components coexist, influence and stimulate each other, fuelling the circulation of ideas, energies and resources to the benefit of research development and its positive effects on business environment and on the society.

**Objectives:** The project, which is inspired by some successful experiences (such as, the university campus of the Federico II University in San Giovanni a Teduccio), is centred on public research bodies.

Innovation ecosystems are physical places of contamination between universities, research institutions, companies and local institutions; their activities are related to higher education, applied research, innovation, on specific technological areas, defined on the basis of the specialization of the territory.

The innovation ecosystems will have a regional or multiregional dimension and their scope will be defined on the basis of:

- 1. Scientific excellence of universities and institutions.

- 2. Specialization of the Region, that will host the initiatives.
- 3. Involvement of large companies as well as SMEs.
- 4. Availability of local institutions to support the initiatives.
- 5. National and international relations with other centres of scientific excellence, which will become available for collaboration.

Planned activities, to be carried out, are related to:

- Training activities
  - Academy in collaboration with companies: training courses built ad hoc for the training needs of companies, in order to bridge the mismatch of skills. The training courses will be characterized by a large flexibility in the definition of: content of training (free from the scientific-disciplinary sectors), teachers (coming from academia or the business world), approach in teaching (innovative teaching, support of digital systems, groupwork, etc.), criteria and method to select students (tests, entry, interviews, etc.), duration of training courses, integration into the companies.
  - Industrial doctorates, with the involvement of companies, aimed at conducting research activities functional to their innovation challenges.
- Applied research activity. Innovation ecosystems will host research infrastructures that can be used by companies and research groups in a stable and continuous way (also hosting operational units of companies) as well as open-labs or joint laboratories with companies. The infrastructure will also support the transfer of research activities to the market, i.e. initiatives to create new spin-offs and innovative start-ups.
- Support to new start-ups, through the incubation of research spin-offs and the contribution of venture capital operators.
- Involvement of communities as well as local institutions, to strengthen the engagement of citizens on issues related to innovation, the sustainability of social and economic development and the importance of skills and scientific culture.

**Implementation:** The program is managed by the Ministry of University and Research. The measure is closely integrated with the reform indicated in point ii) Implementation of R&D support measures. Implementation phase foresees a strict integration with the “Fund for construction and research infrastructure” as well as with the project “Strengthening of research structures and creation of "national R&D leaders" on some Key Enabling Technologies " and other measures of the Plan devoted to the creation of innovation ecosystems (see Missions 5 and 6).

**Target population:** Universities, research centres, enterprises.

**Timeline:** The intervention will start in 2021 and will last until 2026.

**Investment 2.4:** Introduction of innovative doctorates that respond to the needs of innovation by enterprises and promote hiring of researchers by companies (code INN).

**Challenges:** The current difficulties, exacerbated by the pandemic, call for a reconfiguration of the higher education and research systems of the Country. This perspective includes interventions aimed at increasing the opportunities to access most advanced skills, share basic transversal ones (related to digital technologies and environmental transition), promote active interaction with the productive world.

**Objectives:** This line of action aims at enhancing high-profile skills, especially in the KET's areas, through:

- the establishment of dedicated PhD programs, with the contribution and involvement of companies, also encouraging the creation of research spin-offs.
- incentives for companies to hire junior precarious researchers.

The establishment of PhD programs dedicated to industry activities and the tertiary sector is envisaged, with three cycles of 5,000 places per year. Private companies, SMEs in particular, will contribute and be actively involved through the establishment of cooperation networks. The program will be supported by a series of measures to streamline procedures: start of the courses, cooperation with companies in the management of the courses, with the involvement of research bodies.

This line of actions will also build a mechanism to cut the tax wedge for the recruitments of researchers with at least three-year experience in non-permanent positions in the university (e.g. PhD, scholarships, grants, RTDA). This measure will benefit workers and employers, and will be proportional to the length of experience gained in the academic world, with up to 10 points of reduction of the wedge per year of academic career. In the three years, the measure may concern up to 20,000 workers.

**Implementation:** The program is managed by the Ministry of University and Research. The measure foresees the creation of an hub aimed at supporting the technology transfer from the research field to the real economy and the economic enhancement of researches produced by doctorates, in order to allow some of the PhD researchers to become entrepreneurs or, alternatively, to enhance their research activity in favour of new start-ups created by third parties. The measure is closely integrated with the reform indicated in point ii) "Implementation of R&D support measures", and with the doctoral reform proposed in the second component of the mission statement.

**Target population:** Researchers.

**Timeline:** The intervention will start in 2021 and will last until 2026.

## 4. Green and digital dimensions of the component

### a) Green Transition:

The Regulation (proposal) COM (2020) 408, which establishing the Plan for Recovery and Resilience, sets a binding target for each Plan, which must include at least 37% of climate spending.

R&D Investments represent an essential lever in the transition process of the economy towards development paradigms oriented towards environmental sustainability, contributing significantly both to the improvement of the company's performance and to the introduction of useful solutions to reduce environmental impacts in society consumption habits.

In this perspective, there are many projects placed within the three axes in which the component is articulated. In fact, the strengthening of the R&D chain involves themes (innovative materials, energy, construction) that have a strong environmental impact. Similarly, investments in structures that enhance technology transfer mechanisms intercept certain areas (hydrogen, energy, environment) that contribute significantly to the green transition. Finally, investments in strengthening skills and supporting public demand (mobility, recycling of waste) are oriented towards issues that are broadly matched to green issues.

### b) Digital Transition:

The digital transition - and the resulting impact on the field of work, business and education - takes on a necessary central role in the component, as this transition must be accompanied, encouraged and supported by massive investments in research and innovation. Such investments are a necessary condition for creating skills and shaping processes that steer the economic and social system towards a digital future, facilitating the implementation of technology in business processes, without relegating it to the role of a commodity (you buy, you assemble, you use) but holding together the processes, organisation and technologies.

The essential leverage of digital can be considered, however, only if the radical change of business strategies will be accompanied by massive investment in skills. In such a perspective the investment of the component shows a close integration with the contents of the component. In detail, the link can be traced in all three axes in which it is articulated if we consider that the digital transition:

- is one of the priorities for R&D support,
- represents an architrave of the technology transfer strengthening mechanisms: DIH, skills centre, Key Enabling Technologies on which they are based all the national sample of R&D, litem directs training paths and the public demand for innovation.

## 5. Milestones, targets and timeline

Table 2. Milestones and targets											
Related reform or investment	Milestone or target name & number	Qualitative indicators (for milestones)	Quantitative indicators (for target)			Timeline for completion (indicate the quarter and the year)	Data source /Methodology	Responsibility for reporting and implementation	Description and clear definition of each milestone and target	Assumptions/ risks	Verification mechanism
			Unit of measure	Baseline	Goal						
<b>Component M4C2</b>											
<b>Strengthen the R&amp;D chain and support IPCEI initiatives ("Research is the future")</b>											
Partnerships extended to universities, research centers, enterprises and funding for research projects	M1. Financing procedures T1. Supply chain programs that receive support T2. New Researchers	M1. Call publication	#	n.a.	T1. 10 T2. 1000/1500	Q4, 2025	Ministry of University and Research	Ministry of University and Research	The project aims to finance 10 major research and innovation projects carried out by public and private entities networks		Ex-post monitoring of the indicators by the Ministry of University and Research
Implementation of R&D support measures - Reform	M1. Inter-ministerial control room M2. Legislation ruling the financing of R&D activities	M1. Adoption of the inter-ministerial regulation	n.a	n.a	n.a.	Q4, 2021	n.a	Ministry of University and Research / Ministry of Economic Development	The reform is referred to several areas that cover various aspects of the enforcement: mission-oriented approach, easing the managing funds methods for public-private partnerships dedicate to research activities, upgrading of technology transfer centers located within universities and research institutions		Publication in the Official Gazette
Funding for young researchers	Researcher projects receiving support		#	n.a.	500	Q4, 2026	Ministry of University and Research	Ministry of University and Research	The measure provides for the activation of 3 annual calls, in the first 3 years. In the years 2 to 6, the three-year research projects will be conducted with half-yearly reporting		Ex-post monitoring of the indicators by the Ministry of University and Research
Agreements for Innovation	Enterprises receiving support		#	2020=87	143	Q2, 2026	Ministry of Economic Development Mediocredito Centrale (Italian banking institution)	Ministry of Economic Development	The intervention, which take foundations on what has already been experienced, aims to support the enforcement of major research and development projects with significant technological impact throughout the country		Ex-post monitoring of the indicators by the Ministry of Economic Development
	Investments activated		Eur/mlin	0	1,873						
Initiatives based on the IPCEI model. Partnerships in research and innovation - Horizon Europe	Enterprises receiving support		#	0	20	Q1, 2026	Ministry of Economic Development	Ministry of Economic Development	The project aims to support and strengthen strategic value chains in Italy, in close synergy with European strategic planning and agendas.		Ex-post monitoring of the indicators by the Ministry of Economic Development
	Investments activated		Eur/mlin	2,000	3,000						
New Research Projects of Significant National Interest	Projects activated		#		1000		Ministry of University and Research	Ministry of University and Research	Measure is aimed at reinforcing the fund to finance call devoted to SRPNSI projects. Target are Universities and public research institutions that promote curiosity-driven research, both fundamental and oriented		Ex-post monitoring of the indicators by the Ministry of University and Research
Fund for the National Research Programme (NRP)	Projects activated		#		100		Ministry of University and Research	Ministry of University and Research	Fund is aimed at enhancing research areas of the NPR, in order to guarantee the implementation of T&I strategy in a coherent way to the European one		Ex-post monitoring of the indicators by the Ministry of University and Research
Fund for construction and research infrastructure	Financing procedures activated		#		20		Ministry of University and Research	Ministry of University and Research	Fund is targeted at reinforcing the research infrastructures, by also combining construction interventions (when necessary to the facilities)		Ex-post monitoring of the indicators by the Ministry of University and Research
<b>Technology transfer and supporting innovation ("For widespread innovation")</b>											
Strengthening of research structures and creation of "national R&D leaders" on some Key Enabling Technologies	Funded Centers		#		7	Q4, 2026		Ministry of University and Research / Ministry of Economic Development	The measure is part of a reform action conducted in collaboration with the Ministry of Economic Development which provides for the introduction of national thematic centers. Year I: necessary acts for the enforcement of the centers and the detailed development investment plan; Years II-III: investments for the headquarters construction; Years IV-VI: start-up of the centers		Ex-post monitoring of the indicators by the Ministry of University and Research and the Ministry of Economic Development
Strengthening and sectorial/ territorial extension of technology transfer centers by industry segments	Funded Centers		#	2020=63	60	Q4, 2025	Ministry of Economic Development	Ministry of Economic Development	The measure is aimed at the activation and qualification, through a process of reorganization and rationalization, of the centers (Centers of Competence, D4H, PID) in charge of providing companies with advanced technological services and innovative qualifying technology transfer services		Ex-post monitoring of the indicators by the Ministry of Economic Development
	Tech transfer service value		Eur/mlin	250	600						
Creation and strengthening of "innovation ecosystems", building "territorial leaders of R&D"	M1 Control room T1 Ecosystems created	M1 Control room creation for coordination	#		T1. 20	Q4, 2026	Ministry of University and Research	Ministry of University and Research	12 projects admitted by 2021; (extra-south area interventions) 120,000 m2 available to host activities by 2023 (extra-southern area interventions) 120 laboratories, teaching facilities and other locations for joint activities with enterprises by 2024; 120 activities started with enterprises by 2025; 80 laboratories, teaching facilities and other locations for joint activities with enterprises by 2025; 80 activities started with enterprises by 2026.		Ex-post monitoring of the indicators by the Ministry of University and Research
Innovative doctorates for private companies and introduction of researchers into enterprises	T1 PhD scholarships activated		#		T1. up to 5000/year for three years		Ministry of University and Research	Ministry of University and Research	The project envisages the enforcement of doctorate programs dedicated to industry activities of and the tertiary sector, with 3 cycles of up to 5000 places per year, with the contribution and active involvement of enterprises, both singularly and, in particular for SMEs, through the establishment of collaborations networks. The program will be accompanied by a series of measures to streamline procedures, from the start of the course, to the management of collaboration with companies, to the involvement of research bodies. Furthermore, it is foreseen, in collaboration with National Institutes, the creation of a hub aimed at supporting the technology transfer from the mere research sphere to the real economy, which means to give economic value to the research produced by industrial PhDs. This permit to some PhDs researcher to become entrepreneurs themselves or, alternatively, to enhance their research activity in favor of new start-ups created by third parties, in particular in the form of innovative micro / SMEs with good growth potential.		Ex-post monitoring of the indicators by the Ministry of University and Research
	T2 Research fellows or researchers hired by private entities		#		T2. Up to 20,000 workers.		Ministry of University and Research	Ministry of University and Research	The measure aims to build a cutting the tax wedge mechanism for recruitments, with at least three-year experience gained in non-permanent positions in the university (e.g. doctorate, scholarship, grants, RTDA), to the benefits of workers and employers, which is proportional to the length of experience gained in the academic world, up to 10 points of reduction of the wedge per year of stay in the academic career.		Ex-post monitoring of the indicators by the Ministry of University and Research

## 6a. Financing and costs

Table 3. Estimated cost of the plan															
Component	Investment/Reform	Relevant time period	Total estimated costs for which funding from the RRF is requested (mn EUR)	If available: Total estimated cost by year (mn EUR)							Funding from other sources				COFOG level 2 category / or type of revenue
				2020	2021	2022	2023	2024	2025	2026	from other EU programmes		from the national budget	Other sources	
											mn.bn nat. currency	specify the EU programmes and breakdown by programme if relevant			
From research to business	<b>Strengthen the R&amp;D chain and support IPCEI initiatives ("Research is the future")</b>														
From research to business	Partnerships extended to universities, research centers, enterprises and funding for research projects	Q1, 2021 - Q4, 2025	1610 mln			350.00	450.00	550.00	260.00						The measure will be built to be synergistic with the Horizon Europe research program and with the research missions identified in the program itself.
From research to business	Implementation of R&D support measures - Reform	Q4, 2021	0												
From research to business	Funding for young researchers	Q1, 2021 - Q3, 2026	600 mln			120.00	120.00	120.00	120.00	120.00					The measure is strategic to strengthen the role of research groups run by young people in the international arena. The measure is strongly inspired by ERC calls, in the Excellent Science pillar of the Horizon Europe program.
From research to business	Agreements for Innovation	Q1, 2021 - Q2, 2026	700 mln			100.00	100.00	200.00	200.00	100.00					
From research to business	Initiatives based on the IPCEI model. Partnerships in research and innovation – Horizon Europe	Q1, 2021 - Q1, 2026	1000 mln			100.00	250.00	250.00	250.00	150.00					
From research to business	New Research Projects of Significant National Interest		950 mln												
From research to business	Fund for the National Research Programme (NRP)		850 mln												
From research to business	Fund for construction and research infrastructure		1580 mln												
From research to business	<b>Technology transfer and supporting innovation ("For widespread innovation")</b>														
From research to business	Strengthening of research structures and creation of "national R&D leaders" on some Key Enabling Technologies	Q1, 2021 - Q4, 2026	1600 mln			80.00	490.00	490.00	210.00	210.00	210.00				The measure will be built to be synergistic with the Horizon Europe research program and with the research missions identified in the program itself.
From research to business	Strengthening and sectorial/ territorial extension of technology transfer centers by industry segments	Q1, 2021 - Q4, 2025	500 mln			50.00	100.00	100.00	50.00						
From research to business	Creation and strengthening of "innovation ecosystems", building "territorial leaders of R&D"	Q1, 2021 - Q4, 2026	1300 mln			100.00	200.00	350.00	350.00	200.00	100.00				The first discussions are underway with the counterparts of Spain, Portugal and France Ministries to ensure the synergy of this measure with similar initiatives in mentioned countries and ensure that innovation ecosystem nodes became a supranational relations network.
From research to business	Innovative doctorates for private companies and introduction of researchers into enterprises	Q1, 2021 - Q4, 2026	600 mln			50.00	100.00	100.00	200.00	100.00	50.00				Initial discussions are underway with the equivalent departments of Spain, Portugal and France to ensure the synergy of this measure with similar initiatives in those countries and thus encourage intra-European mobility of researchers from the private sector.

## 6b. Method of estimating costs

*i)* Supporting Partnership between universities, research centres, enterprises and funding for joint research projects - Investment (code RES).

In the last five years the industrial research expenditure generated by the support policies was equal to 1 billion euro. It was noted that this resulted in a significant demand for quality research which has not been financed; the project proposals which did not have access to the aid were at least five times those financed. Therefore, it is estimated that 5 billion research spending is of a quality that can be generated through partnerships between private and public entities. The research budget is calculated on an average leverage funding estimate to 0.35.

*ii)* Implementation of R&D support measures - Reform (code RES).

Reform that does not entail costs

*iii)* Funding for young researchers - Investment (code RES)

The costs, with three-year projects, were estimated assuming an average size of 750,000€. Short mobility periods have an estimated average unit cost of 10,000 euros.

*iv)* Agreements for Innovation - Investment (code RES).

Projection on historical data relating to Innovation Agreements, assuming an average investment per beneficiary of 13.1 million euros. [to recover additional supporting items...]

*v)* Initiatives based on the IPCEI model. Partnerships in research and innovation – Horizon Europe – Investment (code RES).

The estimation of target values is based on assumptions derived from the current mode of operation of IPCEI projects activated in Italy (Microelectronics 1, Batteries 1, Batteries 2). The average investment is 150 million euros per company. [to recover additional supporting items...]

*vi)* New Research Projects of Significant National Interest (PRINs financed with FIRST fund increase, DL relaunch art. 238) - Investment (code RES).

[to recover additional supporting items...]

*vii)* Fund for the National Research Programme (NRP) - Investment (code RES).

The average investment is 8.5 million euros per project. [to recover additional supporting items...]

*viii)* Fund for construction and research infrastructure - Investment (code RES).

The average investment is 50 million euros per intervention. [to recover additional supporting items...]

*ix)* Strengthening of research structures and creation of "national R&D leaders" on some Key Enabling Technologies – Investment (code INN).

Costs defined on the basis of a detailed analysis of management costs and the experience of similar centers. [to recover additional supporting items...]

*x)* Strengthening and sectorial/ territorial extension of technology transfer centres by industry segments – Investment (code INN).

The estimated target values are based on assumptions derived from the current methods of financing and implementing innovation clusters as set forth in the August 13, 2020 directive from the Minister of Economic Development. [to recover additional supporting items...]

*xi)* Creation and strengthening of "innovation ecosystems", building "territorial leaders of R&D" - Investment (code INN).

The budget forecast is based on an average estimation of 40 million of the single intervention, applied to the 20 planned interventions. The single intervention requires an investment under construction for the redevelopment of existing sites equal to 10 mln (taking in account an average size of 10000 square meters and a unit cost of redevelopment of 1000€/m<sup>2</sup>); an investment for the construction of research laboratories which includes both the acquisition of installations and equipment and specialised personnel in the first three years, equal, on average, to 20mln, and a margin of 10 million for the start-up and management of activities in partnership with private parties (large companies, SMEs, start-ups, spin-

offs), which provide for their co-financing. It should be noted that this assessment applies to interventions that will be installed in sites where there are already existing structures that need to be adapted to host the intervention. These sites are already being identified.

*xii)* Innovative doctorates for private companies and introduction of researchers into private companies - Investment (code INN).

The estimate is based on:

- the cost of a PhD fellowship of approximately €60,000 and foreseeing companies co-financing at 50%.
- number of junior precarious researchers who leave their academic careers after an average experience of 5 years. It is assumed that for every year of experience gained researchers can enjoy tax relief for 1000 euros once hired, spread over the first 2 years of work, which determines a cost of 50 mln euros. Activating this measure for 3 years has a cost of 150 mln.