

A chalkboard with several pieces of chalk (green, red, white) lying on its surface. The background is slightly blurred.

Mission 4 - Education and Research

Contents

| | | |
|---|---|----|
| 1 | M4C1 - Enhancement of skills and right to study | 3 |
| 2 | M4C2 - From research to business | 34 |

Mission's main objectives:



Fill the education and skill gap and improve secondary and tertiary education

Develop the growth potential of human capital and the new skills to adapt to technological and environmental challenges, with specific attention to regional gaps. Facilitate access to higher education and encourage investment in tertiary education.



Strengthen the R&D system

Support foundational research and investment in human capital to stimulate and attract scientific talent. Promote a systemic use of the leverage of public and private investments in R&D. Support IPCEI and other international initiatives.



Reinforce Private-public collaboration and support innovation through technology transfer

Promote the systemic use of research results by the economic system. Incentivize companies to strengthen the synergies with the system of fundamental and applied research, to develop and introduce new technologies in the production system. Introduce innovation ecosystems based on a network of applied research institutes, inspired by the best international practices.

Mission's financing snapshot:

M4 - Education and Research

| | Resources (euro/mln) | | | | |
|---|----------------------|--------------|------------------------|-----------------|-------------------------------|
| | Existing (a) | New (b) | Total (c) = (a)+(b) | REACT-EU (d) | TOTAL NGEU (e) = (c) + (d) |
| M4C1 Enhancement of skills and right to study | 2.99 | 12.38 | 15.37 | 1.35 | 16.72 |
| M4C2 From research to business | 1.38 | 9.91 | 11.29 | 0.48 | 11.77 |
| TOTAL | 4.37 | 22.29 | 26.66 | 1.83 | 28.49 |

Note: (b) includes existing resources under national FSC, to be devoted to specific measures.

1 M4C1 - Enhancement of skills and right to study

1. Description of the component

Summary box

Policy area: Promotion of the right to study and the fight against early school leaving, digitization of learning processes and tools, improvement of the quality of education and training through retraining, training and selection of teaching staff, closer interaction between skills development and the needs of the productive economy, institutions and culture, policies aimed at increasing the share of young high school and Universities graduates, widespread improvement of scientific and management skills, particularly in the field of digital technologies.

Objectives: The objectives of this component, developed with single proposed projects, are articulated on three axes:

(i) Access to education and reduction of territorial gaps in the level of education quality (code ACC). (ii) STEM skills and multilingualism (code DID). (iii) Research and vocational training reinforcement (code KNOW).

Reforms and investments:

Outcome 1: Access to education and reduction of territorial gaps

Investment 1.1: Student housing (code ACC);

Investment 1.2: Scholarships and exemption from school tuition fees (code ACC);

Investment 1.3: Nursery Schools and Early Childhood Education and Care (ECEC) services Plan (code ACC);

Investment 1.4: Upgrading kindergartens (3-6 years) and "spring" classes (from 2 years) (code ACC);

Investment 1.5: Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school. To tackle school dropout (code ACC);

Investment 1.6: Full-time School Fund (code ACC);

Outcome 2: STEM skills and multilingualism

Reform 2.1: Tertiary advanced school (University-Indire) and compulsory training for school managers, teachers, administrative and technical staff (code DID);

Reform 2.2: Reform of teachers recruitment (code DID);

Reform 2.3: Reform to strengthen STEM and digital skills in all school cycles (code DID);

Investment 2.1: Integrated digital teaching and life-long learning of school staff (code DID);

Investment 2.2: STEM skills and multilingualism for teachers and students (code DID);

Investment 2.3: School 4.0: innovative schools, wiring, new classrooms and workshops (code DID);

Investment 2.4: Teaching and advanced university skills (code DID);

Outcome 3: Research and vocational training reinforcement

Reform 3.1: Reform of the tertiary vocational training system (ITS) (code KNOW);

Reform 3.2: Reform of Technical and Professional Institutes (code KNOW);

Reform 3.3: Reform of the "Orientation" system (code KNOW);

Reform 3.4: Reform of Ph.D. Programmes (code KNOW);

Reform 3.5: Enabling university degrees (code KNOW);

Reform 3.6: University degree groups (code KNOW);

Investment 3.1: Development of the tertiary vocational training system (ITS) (code KNOW);

Investment 3.2: Active orientation in school-university transition (code KNOW);

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

Estimated costs:

EUR 15,370 million to be covered by RRF (16,720 total NGEU)

M4C1 - Enhancement of skills and right to study

| | Resources (euro/mld) | | | | |
|---|----------------------|--------------|---------------|-------------|-----------------|
| | Existing | New | Total | REACT-EU | TOTAL NGEU |
| | (a) | (b) | (c) = (a)+(b) | (d) | (e) = (c) + (d) |
| 1. Access to education and reduction of territorial gaps | 1.60 | 7.40 | 9.00 | 0.45 | 9.45 |
| - <i>Student Housing</i> | - | 1.00 | 1.00 | - | 1.00 |
| - <i>Scholarships and exemption from school tuition fees</i> | - | 0.90 | 0.90 | 0.45 | 1.35 |
| - <i>Nursery schools and early childhood education and care</i> | 1.60 | 2.00 | 3.60 | - | 3.60 |
| - <i>Upgrading kindergartens (3-6 years)and spring classes (from 2 years)</i> | - | 1.00 | 1.00 | - | 1.00 |
| - <i>Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school and tackle school dropout</i> | - | 1.50 | 1.50 | - | 1.50 |
| - <i>Full-time school fund</i> | - | 1.00 | 1.00 | - | 1.00 |
| 2. STEM skills and multilingualism | 1.39 | 2.73 | 4.12 | 0.90 | 5.02 |
| - <i>Integrated digital teaching and life-long learning of school staff</i> | 0.39 | 0.03 | 0.42 | - | 0.42 |
| - <i>STEM skills and multilingualism for teachers and students</i> | - | 1.10 | 1.10 | - | 1.10 |
| - <i>School 4.0: innovative schools, wiring, new classrooms and workshops</i> | 1.00 | 1.10 | 2.10 | 0.90 | 3.00 |
| - <i>Teaching and advanced university skills</i> | - | 0.50 | 0.50 | - | 0.50 |
| 3. Research and vocational training reinforcement | - | 2.25 | 2.25 | - | 2.25 |
| - <i>Development and reform of tertiary vocational training system (ITS)</i> | - | 1.50 | 1.50 | - | 1.50 |
| - <i>Active orientation in the school-university transition</i> | - | 0.25 | 0.25 | - | 0.25 |
| - <i>Cooperation between universities and territories on vocational training</i> | - | 0.50 | 0.50 | - | 0.50 |
| TOTAL | 2.99 | 12.38 | 15.37 | 1.35 | 16.72 |

2. Main challenges and objectives

a) Main challenges

Improving and qualifying the performance of the school and university systems is an essential condition for fostering smart, inclusive and sustainable growth. Italy registers high school dropout rates with important territorial differences (18,80% in the South, compared to 11,70% in the Center North - ISTAT “Italian national statistical institute” 2018 data). This is the result of regional disparities in the quality of the educational

offer coupled with differences in the socio-economic context of students. Even in higher education, dropout rates, albeit slightly down in recent years, remain among the highest in Europe, especially for students that have a technical-vocational school backgrounds. The health crisis caused by Covid-19 has amplified regional and socio-economic gaps existing in Italy, impacting on the accessibility of distance learning, with the probable consequence of greater school drop-out.

Our national education and training systems suffer from structural regional and gender disparities in school results, significant gaps in digital competences of school staff and students, underfunded and understaffed tertiary education. These deficiencies hinder intelligent, inclusive and sustainable growth, prevent the development of human capital and its access and contribution to the productive system. It is necessary to develop advanced skills and an open and dynamic culture, necessary to fully take advantage of the opportunities provided by continuous changes and new challenges related to technological and environmental evolution at national and international level.

Knowledge-based and inclusive development models require the ability to respond, and often to anticipate, a rapidly evolving demand for skills as a result of technological change and emergencies, especially the climate and health ones. In facing these transitions, in particular the digital one, the Italian productive system suffers from a weak demand for skills as well as a scarce supply. The small size of Italian companies limits their ability to interact with universities; at the same time Universities lack flexibility to engage in partnerships with private enterprises to promote research and technological transfer. These conditions add difficulties to the development of an appropriate training system, contributes to the stagnation of productivity and does not increase the ability of enterprises to innovate and compete with the evolving context, characterized by rapid technical progress.

b) Objectives

Investment in human and social capital represent an essential condition for the future of the country. Italy will undertake a strategy that aims at fighting early school drop out in the various training stages, at strengthening the conditions of equity in the education accessibility and in the perception of incentives for educational growth among all categories of the population, according to age, gender, different conditions of ability and territory of residence, overcoming the conditioning stereotypes that weigh in particular on the educational choices of women.

The component is placed in a strategic perspective, distinguished by a systemic approach that covers the entire education and training chain, through a coherent and articulated set of measures that aim at building innovative and resilient education systems for the benefit of future generations.

The goals are linked to the 3 axes in which the component is divided, which show a close coherence with the initiatives of the Commission for the creation of a European

Education Area. In detail:

- Access to education and reduction of territorial gaps (code ACC), is an intervention that aims at extending the right to study to deserving young people, who are in economic and social difficult conditions, by providing them with access to allowances, housing and tax reliefs;
- STEM skills and multilingualism (code DID), aims at improving the quality of competences offered by the educational system, with particular reference to STEM, digital and environmental skills. This axe will allow to increase the attractiveness of different training places, from schools of different levels to universities, offering the development of skills and competences in line with the priorities shared by the European Commission in the document "*Achieving the European Education Area by 2025*". This approach will include a life-long learning program for the upskilling and reskilling of teachers and other school staff, an essential element to improve and innovate the Italian education system.
- Research and vocational training reinforcement ("For a knowledge-based society") (code KNOW), will enhance the role of universities as a driving force for the widespread of knowledge and organizational models to companies and institutions. It will also contribute to strengthening professional training and to relaunching the Vocational Training Institutes (ITS), which offer significantly employment prospects (80% of graduates find work within a year). This line of action includes measures to strengthen active orientation to students in the last two years of high school, in order to increase the number of students enrolled in tertiary education and facilitate the successful completion of study paths.

3. Description of the reforms and investments of the component

1) Access to education and reduction of territorial gaps.

Investment 1.1: Student housing.

Challenges: In Italy, the participation in higher education is not widespread; the percentage of young people who decide to undertake a university course and manage to finish it, is among the lowest in Europe (27,7% of the population 25-34 years, in 2018), with stronger criticalities in some southern regions. The reasons behind this phenomenon are linked both to the accessibility of education for certain social groups and to the degree of diversification of the offered training. Indeed, in Italy the workforce with tertiary education is among the lowest in Europe (19,3% of the population up to 64 years of age against the EU average of 32,3% in 2018). This investment is closely integrated with the "Scholarships and exemption from school fees" project.

Objectives: The measure aims at ensuring a widespread access to quality education regardless of the socio-economic background of students. It aims at adding between

50.000 and 100.000 of sleeping accommodations to the current 40.000, reducing Italy's gap with the EU average (where 18% of students are provided with sleeping accommodations, against the current 3% in Italy). This result will be achieved by covering part of the cost of the residential service for 3 years, at a price that will be negotiated with the property. Students will pay part of the rent, on average equal to a quarter of the cost, but with progression mechanisms based on the Equivalent Financial Situation Indicator (ISEE) of its family of origin.

The initiative is based on the use of leverage mechanisms which generate savings or, alternatively, the possibility of satisfying a higher demand for affordable housing with equal resources committed. It is possible to finance infrastructure interventions proposed by cities by redeveloping deteriorated and unused public buildings to allocate them to student housings. The new residences activated by this mechanism would also become a driving force for the tourist enhancement of urban areas, increasing the number and the quality of accommodation in times when university attendance is not foreseen.

Implementation: The program is managed by the Ministry of University and Research. The implementation of the intervention will be accompanied by a reform of the legislative framework related to university buildings, initially on an experimental basis carried out through Ministerial Decree.

Target population: Students.

Timeline: The measures will start in 2021 and will last until 2025.

Investment 1.2: Scholarships and exemption from school tuition fees (code ACC).

Challenges: In line with the Commission's initiatives to encourage the creation of a European education area, this measures, which is closely integrated with the "Student accommodation" project, responds to the same challenges to promote the increase of tertiary education.

Objectives: This project pursues the integration of contribution policies with policies to support education through:

- no-tax area extension to students coming from families with ISEEs indicator below 23,500 euro;
- scholarships increase to 700 euros;
- scholarships funding for a larger share of members.

Implementation: The program is managed by the Ministry of University and Research. The implementation of the intervention will be accompanied by a Ministerial Decree that will reform scholarships legislation and a Ministerial Decree for the implementation of the tax fee amendment.

Target population: Students.

Timeline: The intervention will start in 2022 and will last until 2024.

Costs: The estimated cost related to the RRF is equal to 0.90 billion euro. This intervention will also benefit from additional resources (0.45 billion euro) allocated in React-EU.

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

Challenges: For years now, Italy's has shown one of the lowest total fertility rates in the EU (1.29 children per woman in Italy compared with 1.56 in the EU) and a continuous decline in births. The gap between births and deaths is increasing: for every 100 people who die, only 67 children are born (ten years ago, the same figure was 96). Significant territorial differences remain: the drop in the population is concentrated mainly in the South (- 6.3 per thousand inhabitants) and to a lesser extent in the Centre (-2.2 per thousand inhabitants). On the contrary, the population growth process continues in the North (+1.4 per thousand inhabitants). The latest projections on the Italian population estimate a decline from 60.3 million in 2020 to 51.4 million in 2100 (Eurostat, 2019). This process is also expected to be negatively affected by the COVID-19 emergency.

The specific recommendation for Italy (CSR) in 2019 noted that in 2017 only 28.6% of children under the age of three were placed in formal early childhood education facilities. To date, the availability of places in early childhood services is on average 25.5%, 7.5 percentage points lower than the European target of 33%. Moreover, this availability varies significantly at the territorial level: only 10% of children in Calabria attends a nursery school, compared to 47.1% in Valle d'Aosta.

Family care burdens have a significant negative impact on women's employment, especially in the case of mothers of 0-3 children. In order to look after their children, 11.1% of women who have had at least one child in their lives have never worked (the European average is 3.7%). In the South, this figure becomes one in five women. Reconciling work and family life is difficult for more than a third of those in employment (35.1%) who have care responsibilities for children, both men and women. 38.3% of employed mothers result to have made at least one change to their working conditions (e.g. reduced working hours), compared to 11.9% of employed fathers. This percentage rises to 44.9% for employed mothers of children between 0 and 2 years, while for fathers with children in the same age group it is just under 13%. The birth of children also leads to interruptions in women's employment, with the percentage varying according to the number of children (11% in the case of one child; 17% in the case of two children; 19% in the case of three or more children).

Objectives: The intervention is aimed at the construction of new structures and at the

requalification of existing ones for the provision of Early Childhood Education and Care (ECEC) services, so as to reach a national average supply level of at least 55% of nursery places (children aged 0-3), with the creation of about 415,000 new places by 2026.

The achievement of this objective would allow Italy, from the current supply of 25.5%, to exceed the European average (35.1%) and be in line with other Member States such as Spain (50.5%) and France (50%).¹

The objective is considered strategic in relation to the need to:

1. promote the birth rate in the country;
2. encourage female participation in the labour market, ensuring a better work-family balance;
3. invest in the well-being and education of children in their early years, whose socio-economic return is particularly significant.

Implementation: For the purposes of the overall implementation of the project, the available resources of the Fund for nursery schools and pre-school, established at the Ministry of the Interior by the 2020 Budget Law (Article 1, paragraph 59, Law No. 160/2019), will be increased to provide additional and specific funding for the conversion or construction of new early childhood services. This will be followed by the necessary acts to:

1. define the methods and procedures for submitting requests for grants, the allocation criteria and the methods of utilisation of resources, of monitoring, eligibility and evaluation criteria (Ministerial Decree and Public Notice);
2. establish a dedicated Steering Committee, composed of the following subjects: PCM - Department for Family Policies, Department for Regional Affairs and Autonomies, Ministry of the Interior, Ministry of Economy and Finance, Ministry of Education, Ministry of Infrastructure and Transport, as well as an element designated by the Unified Conference; this will be done by Decree of the Minister for Equal Opportunities and Family;
3. select the projects received from the Municipalities, which are the beneficiaries.

Following the publication of the ranking list of those admitted to funding, the beneficiaries will activate procedures to sign the agreements and start the conversion and construction works necessary to the creation of about 400,000 additional places in early childhood services, for the achievement of the average supply level of 55% of nursery places.

Target population: Children aged 0-3; women-mothers of children aged 0-3; potential mothers; families.

Timeline: The duration of the project is estimated in 5 years (till 2026).

¹ See the latest Istat report, available online: https://www.istat.it/it/files//2020/10/REPORT_ASILI-NIDO-2018-19.pdf.

Costs: The estimated cost related to the RRF is equal to 3,6 billion euro.

Investment 1.4: Upgrading kindergartens (3-6 years) and "spring" classes (from 2 years) (code ACC).

Challenges: The demand for childhood education and care - notably in yearly childhood - does not find adequate coverage in terms of quality and quantity, with severe territorial disparities. This slows down women return to their professional life and affects the birth rate decline.

The Enforcement of the 2015 school reform, which integrated education and training system from birth to six years, is aimed at improving the coverage and reducing regional differences. The 2020 budget law and the measures foreseen in mission 5 to be financed by the RRF, strengthen the financial support for families with children in the 0-3 age group who attend an early childhood education and care facilities, nonetheless, further efforts are needed to increase services and facilities quality for children in the 3-6 age group and as well attention to the experimentation of spring classes (from 2 years), a bridge that would help to cope with the inadequate offer for early childhood.

Objectives: The investment project is aimed at the construction, redevelopment and safety of preschools, guaranteeing the quality of teaching through the innovation of the learning environments, with particular strengthening to the experimental sections "spring" (24-36 months) and the constitution of centres for children, as per the legislative decree no. 65 of 2017, by overcoming the dichotomy between early childhood education services (0-3 years) and kindergarten (3-6 years), building a unitary educational path in compliance with the specific characteristics of the two segments. An estimated 33,300 children will benefit from the new kindergartens and 62,500 children will benefit from the upgrading of existing facilities, given the average capacity of 100 children.

Implementation: The program is managed by the Ministry of Education, in collaboration with local authorities and the Presidency of the Council - Family Department.

Target population: Children aged 2-6.

Timeline: The intervention will start in 2021 and will end in 2026.

Costs: The estimated cost related to the RRF is equal to 1 billion euro.

Investment 1.5: Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school. Tackling school dropout (code ACC).

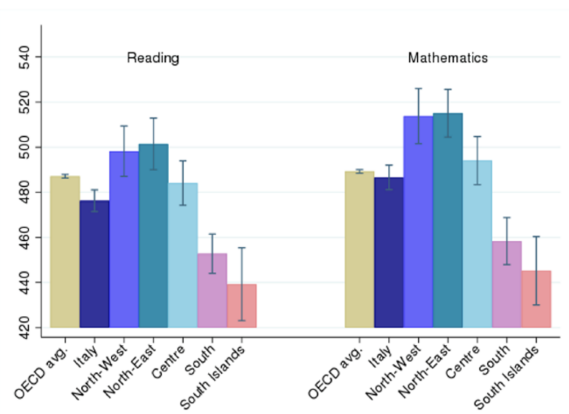
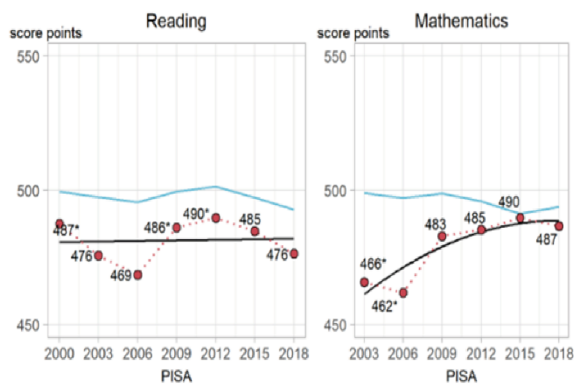
Challenges: National and international researches clearly and unequivocally show that the possession of good basic skills (understanding of the teaching language, mathematics

and English) is a very strong predictor of the educational success of young people. According to the Program for International Student Assessment (PISA), 15-year-old Italian students rank below the OECD average in reading, mathematics and science, with large territorial differences. In the North Italian student rank above the OECD average while in the South rank much lower. Similar evidence - as shown in Figure II 4.1 - occurs for Italian adults, for whom the International Assessment of Adult Skills Program (PIAAC) indicates a constant worsening of results compared to the OECD average.

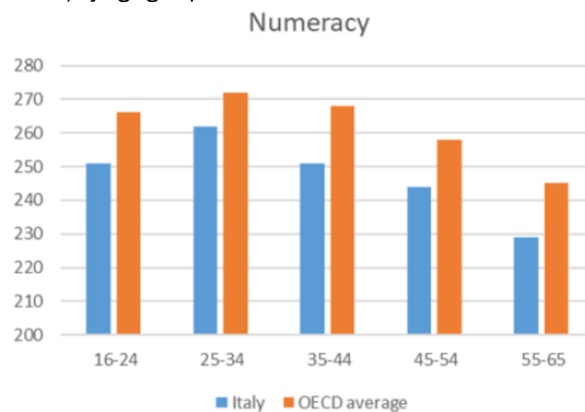
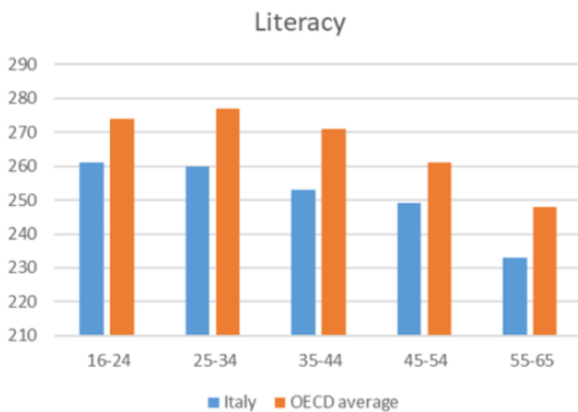
ITALY: BASIC KNOWLEDGE LEVELS IN SCHOOLCHILDREN AND ADULTS ARE WELL BELOW THE OECD AVERAGE

Results on school learning measured by OECD "PISA" tests show a gap for Italy..

... a gap that largely depends on the North-South divide in terms of educational results.



Results of PIAAC tests (2013-16) by age groups



Source: OCSE.

Although the National Guidelines for school curricula already set satisfactory targets to guarantee the achievement of these learning levels, there are still obstacles in reaching a sufficiently large share of students (potentially all students).

Another equally crucial challenge concerns the issue of early school leaving, a phenomenon that can be divided in two different cases: a) students who leave their studies prematurely already in the secondary school period and b) young people who are subject to early school leaving according to the European parameters of the ET2020 strategy (18-24 years).

a) In 2019, the Ministry of Education published the results of a survey on early school leaving according to which the average dropout rate in secondary school is around 3,8% (while it is 1,17% in the primary school). From the Ministry's (MIUR DGCASIS) survey, it is clear that where there are greater inequalities in income, a higher risk of poverty and material deprivation, the dropout rate is high. Likewise, "the inverse link between early school leaving and participation in work is evident, demonstrating the fact that low employment and social exclusion can also have negative impacts on the participation of children in education and training".

b) Early leavers from education and training, formerly referred to as early school leaver, refer to people aged 18 to 24 who have completed secondary education at the most and are not involved in further studies or training. The indicator 'Early leaving from education and training' is expressed as the percentage of people aged between 18 and 24 who find themselves in this situation compared to the total population aged between 18 and 24 years; According to Eurostat, the dropout rate for Italy is 14,5%. (above the ET 2020 parameter which by 2020 should not have exceeded 10%)

Objectives: A plan is envisaged for the enhancement of basic skills which, starting from the analysis of students outcomes that shows large gaps within the Country, will be developed over 4 years with the goal of guaranteeing adequate basic skills for at least 1.000.000 students per year, also through the development of a single national portal for online training. Particular attention will be paid to schools that have experienced greater difficulties in terms of performance - thus customizing interventions on students need - where there will be a support intervention by the school manager with external tutors as well as, in the most critical cases, the availability of at least one additional staff unit per subject (Italian, Mathematics and English) and for a minimum of two years. In particular, mentoring and training actions (even remotely) are envisaged for at least 50% of teachers and the strengthening of the number of teachers (4) and experts (2) for at least 2000 schools. A pilot project to be carried out in the first semester of 2021 will be financed by the PON school funds already available.

In order to develop a strategy to structurally fight early school leaving and since the investment on basic skills is strongly linked with the need of prevention (basic skills gaps are among the main causes of early school leaving), the project also defines intervention and compensation measures. In this sense, the project includes an investment specif-

ically aimed at fighting early school leaving, promoting educational success and social inclusion, with specific programs and initiatives for mentoring, counselling and active and vocational guidance that prevent premature abandonment of studies already in the period of secondary school (about 120.000 students to be involved) and make it possible to reduce the phenomenon of early school leaving to the European parameters of the ET2020 strategy (age group 18-24, about 350.000 young people to be involved). In particular, for situation a) (age group 12-18), online mentoring will be aimed both at young people at risk and at those who have already dropped out, with a teacher / student ratio equal to 1:1 for interventions of support and recovery of learning for a total of 20 hours each (3h of mentoring and 17h of teaching). To this end, teachers from the class or school attended, or even from other schools, chosen by the children themselves, will be involved according to their willingness to take on the position. The additional commitment for teachers would be carried out beyond ordinary working hours, for a maximum of 6 hours per week, payable as additional teaching activities (with the option – depending on teachers' choices – of partial or total relief of contribution charges). As for situation b) (age group 18-24), the support activities consist of 10h of mentoring, or consulting interventions aimed at reintroducing the young person into the training circuit.

Finally, the project also aims at promoting social inclusion and ensuring Integrated Digital Education for students with disabilities or living in disadvantaged areas.

Implementation: The program is managed by the Ministry of Education; INVALSI, schools. Territorial Support Centers (Centri Territoriali di Supporto, CTS) will also be involved in the implementation of the measures for students with disabilities or living in disadvantaged areas.

The actions envisaged have a structural effect that goes beyond the time horizon of the RRF, since the reduction of the dispersion of training outcomes is achieved through the increase in the teaching and methodological skills of teachers. These skills will be consolidated within the teaching system, which will benefit permanently. The structural nature of the project is also measured by the reduction of territorial disparities in basic skills, with positive repercussions that would occur over time even at the highest levels of education

Target population: Schools, students, young people who have abandoned their studies.

Timeline: The intervention will start in 2021 and will last until 2024.

Costs: The estimated cost related to the RRF is equal to 1,5 billion euro.

Investment 1.6: Full-time School Fund.

Challenges: To be completed... .

Objectives: The "school time" will be increased to expand the training offer and to help reconcile the life and work times of families, and especially of women. This initiative is closely integrated with preschools strengthening (3-6 years) and "spring" sections (from 24 to 36 months).

To be completed...

Implementation: The program is managed by the Ministry of Education.

Target population: School students, professors, school staff and families.

Timeline: To be completed... .

Costs: The intervention is financed by RRF with 1 billion euros. Additional 300 million will be provided through PON projects.

2) STEM skills and multilingualism.

Reform 2.1: Tertiary advanced school (University - INDIRE) and compulsory training for school managers, teachers, administrative and technical staff (code DID).

Challenges: The continuous professional updating of school staff (managers, teachers and the administrative and technical staff) is crucial to ensure that the education of new generations proceeds in line with the challenges imposed by rapid changes. It is also essential for the efficiency of the overall school system. With regard to the multiple strategic and highly complex functions exercised by school managers in the context of school autonomy, they require periodic updating for the management of complex systems and emerging issues. On the other hand, teacher training constitutes the decisive lever for improving the national education and training system. Considering the rapid evolution of society, it is a priority to ensure pedagogical and didactic training which, together with in-depth disciplinary knowledge, allows to effectively address cultural and digital challenges and to provide high quality teaching. The professional condition of teachers records an inadequate enhancement of the training programs envisaged by the National Plan for Digital Schools and by the National Teacher Training Plan, a fragmentation of the training objectives and discontinuity of the training modules and, finally, low participation rate to continuous in-service training courses. Finally, the Administrative, Technical and Auxiliary Personnel (personale amministrativo, tecnico e ausiliario, ATA) suffer from the absence of a constant professional training consistent with technological progress and with regulatory changes. ATA in-service training is also characterized by an inadequate definition of the programs within the Three-year Plans of the Training offer pursuant to art. 1 paragraph 12 of Law 107/2015.

Objectives: The reform aims to build a quality life-long learning system for school staff in line with a continuous professional and career development through the establishment of a tertiary advanced school and the compulsory nature of in-service training for school

staff, linked with career progressions. Although in-service training is already mandatory under Law 107/2015, Article 1, paragraph 124, it has not been implemented as it did not provide for quantification (in terms of hours). The reform will establish the “Unità Formative” system as the subject of the specific legislative provision and of the next national collective labour agreement.

Implementation: The program is managed by the Ministry of Education. For the purpose of the reform, INDIRE - today a research body under public law, pursuant to article 19 of the decree-law of 6 July 2011, and in accordance with Article 2, paragraph 4 of the Statute, has the goal of “taking care of the in-service training of school staff, in close connection with the processes of technological innovation, through accompanying activities and professional retraining both in presence and in e-learning mode” - will perform new functions, which will require a remodulation of the three-year plan of activities referred to in Article 3 of the Statute.

Target population: School staff.

Timeline: The intervention will start in 2021; the promulgation of the law is expected in 2022; the full implementation of the reform will take place by 2025 with the finalization of the related investment project sub 8.

Costs: The estimated cost related to the RRF is equal to 0,034 billion euro.

Reform 2.2: Reform of teachers recruitment (code DID).

Challenges: The current system for new teachers’ recruitment needs a thorough review to ensure the required professionalism of school staff. The related reform will strengthen the impact of investments described above and will enable more qualified teachers to educate young people on how to face future job-related challenges. Moreover, the current selection system does not guarantee students adequate access to knowledge, relational and methodological-learning skills.

Objectives: The reform, structural in nature, aims at establishing a new system for the recruitment of teachers and has the strategic objective of improving the quality of our national education system. Particularly, in addition to the current public competition procedures, the measure foresees that aspiring teachers spend one year in further training and evaluation, and only after their successful completion the selection process will be completed. This innovative methodology will allow to recruit teachers on the basis of their level of knowledge as well as on the basis of the teaching methods acquired and their ability to relate to the educative community.

It is useful to remind that the current system already includes a sort of training and evaluation period, with methodological training on-line and educational internship, at the end of which the new teacher is merely "confirmed in the role" by the Evaluation Committee.

In this sense, the selection and recruitment phases coincide, where confirmation in the role is a pro forma procedure. The reform proposed aims instead to separate selection and recruitment. After passing the Exam Competition (selection phase), the candidate will enter the training system that will lead him, after carrying out an ad hoc course (with renewed characteristics of selectivity, also with regard to the vocational dimension to the profession) to the definitive recruitment. The methodological training path will be strengthened and at the end of the training course and only after the evaluation (by the evaluation committee at the level of the individual school institution) the candidate will be formally placed in the role.

Implementation: The program is managed by the Ministry of Education.

Target population: Teachers to be hired.

Timeline: The regulatory process will be launched in 2021; it is expected to publish the first public competition applying the innovative selection method in 2023, once the reformed law has been promulgated.

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

Reform 2.3: Reform to enhance teaching of STEM and digital skills in all school cycles (code DID).

Challenges: The ongoing social transformations and their repercussions on the economy require specific changes in training courses in order to structure a school capable of acting as a builder of attitudinal orientation (free from gender stereotypes), and as a key player in the national social context. According to the latest PISA report (2018) on school readiness of 15-year-old students, Italy shows significant gaps compared to the OECD average in scientific literacy (468 points vs. 491 on average), advanced critical reading skills (5% vs. 9% for all OECD countries) and financial literacy. Another gap regards gender: the average score of 15-year-old males in mathematics is equal to 494 points against 479 points for females (-16). In science, the gap is equal to 3 points (470 points for males vs. 466 for females). In relation to the future prospects of Italian top performers in science and mathematics, 26% of males and only 12,5% of females imagine themselves working in science or engineering at the age of 30, while the 10,7% of males and 22,7% of female students imagine a career in the health sector.

Italian companies demand for skilled workers is estimated in at least 469.000 people in the next 5 years. They will probably need to look at foreign markets to meet their demand for technicians and professionals in technological, scientific and economic fields. Current orientation practices are inadequate and ineffective as they are anchored to an obsolete vision of work. The system suffers an overall difficulty in creating enough technological and social innovation, and adequate training in the scientific field. The lack of STEM

and digital competences, for which Italy is among the European countries with the worst results, constitutes one of the main limits for the Country's development and for its recovery from the current crisis.

Objectives: The regulatory reform intervention consists in the integration, among curricular disciplines, of activities, methodologies and contents designed to develop and strengthen - with a full interdisciplinary approach - STEM, digital and innovation skills, for all school cycles, starting from kindergarten to secondary school. The reform aims at guaranteeing equal opportunities in terms of access to scientific, technological, engineering and mathematical careers.

Implementation: The program is managed by the Ministry of Education.

Target population: Male and female students.

Timeline: The intervention will start in 2021 and the legislative act is expected to be promulgated in 2022; the full implementation of the reform will take place with the finalization of the related investment project 11 described below.

Costs: The reform costs are equal to 0.

Investment 2.1: Integrated digital teaching and life-long learning of school staff (code DID).

Challenges: The continuous professional updating of the entire school staff (managers, teachers and the administrative and technical staff) is crucial to ensure that the training of new generations proceeds in line with the challenges imposed by rapid changes - not only technological - as well as for the efficiency of the overall school system. The challenges that the investment project wants to meet are therefore those already indicated in the related reform project sub 7 (Tertiary advanced school (University - INDIRE) and compulsory training for school managers, teachers, administrative and technical staff).

Objectives: The project envisages the creation of a system for the continuous professional development of all school staff with targeted training interventions for 300.000 recipients, based on a survey of their professional updating needs. In particular, training actions are envisaged for teachers, school managers, administrative and technical staff. The project is also aimed at implementing a digital system for the recording of experiences and training activities (professional portfolio) and creating of a balance of skills and training actions for improvement. All the 8.000 schools on the national territory will be involved in the project and will implement the training activities envisaged by the national planning. The digital system sofia.istruzione.it will allow the monitoring and national governance of the project.

Implementation: The program is managed by the Ministry of Education in collabora-

tion with schools.

Target population: School staff.

Timeline: The intervention will start in 2022 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 0,42 billion euro.

Investment 2.2: STEM skills and multilingualism for teachers and students (code DID).

Challenges: The challenges that the investment project takes up are those already indicated in the related reform project sub 2.3), with a focus on multilingualism, an equally strategic challenge for new generations to fully achieve a European citizenship, promoting intercultural contamination through the mobility of students and teachers. The National Institute for Documentation, Innovation and Educational Research (INDIRE) has allocated approximately 38 million euros for the in-service training of school staff and approximately 90 million euros for partnership projects between schools for students' mobility in the framework of the current Erasmus 2014-2020 program. This allocation covers only about 40% of the demand. On the other hand, the Erasmus+ Program represents an excellent investment in human capital with a relatively fast "return" for society. All the surveys and analysis in recent years show that those who participate in this project acquire skills that can be rapidly used in their careers. For example, an impact study conducted by the European Commission in 2019 shows that 80% of university students with international mobility experiences are able to get a job within 3 months of graduation. The same study reveals that 40% of students who did an Erasmus traineeship received a job offer from the host company, while 75% developed a strong spirit of self-employment and therefore the idea to start a business.

Objectives: The intervention consists in the integration, among curricular disciplines, of activities, methodologies and contents designed to develop and strengthen STEM, digital and innovation skills, in all school cycles, starting from kindergarten to secondary school, and with a full interdisciplinary approach. The intervention aims at guaranteeing equal opportunities and gender equality in terms methodological approach and STEM orientation activities. This initiative aims to encourage up-skilling and re-skilling processes in digital education and to the full integration of such methodologies in current school curricula:

- "Digitalisation and Innovation", for the development of computer science skills that are necessary for the school system and play an active role in the transition towards jobs of the future;
- STEM, for the development of training programs and a culture oriented to scientific disciplines (science, technology, engineering and mathematics) especially for female students in order to promote equal opportunities in sectors still characterized by

male over-representation.

Another objective is the activation of skills development/enhancement program, in cooperation with the business sector, in order to support teachers and schools in the training and research activities for improving the students' educational and employment success rate.

Furthermore, a national program for sustainable orientation is envisaged to bridge young people's expectations to socio-economic transformations, promoting equal opportunities in terms of access to scientific careers.

Finally, the project aims at strengthening multi language skills in students and teachers through a series of actions. Among these, a widening of consulting and information programs on Erasmus+ with the support of the Erasmus+ National Institute for Documentation, Innovation and Educational Research (INDIRE) and its ambassadors' network. In particular, the project is expected to pursue:

- activation of courses to increase language skills for students through curricular activities for kindergarten, extra-curricular activities for primary school and lower secondary school and a period of study abroad for students of the upper secondary school (through an initial grant of scholarships for the first year);
- the internationalisation of the Italian school system by investing in incoming mobility;
- language and methodological courses for teachers.

A digital system will be developed to monitor language skills at national level with the support of respective certifier entities.

Implementation: The program is managed by the Ministry of Education, in cooperation with the Department for Equal Opportunities of the Presidency of the Council of Ministers for the reinforcement of STEM and digital skills and the orientation activities for young women. In the implementation phase, schools will also be involved. As for the strengthening of multi language skills, the National agency INDIRE will be involved.

Target population: Schools, students and teachers.

Timeline: The intervention will start in 2022 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 1.1 billion euro.

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

Challenges: Text... .

Objectives: The intervention aims at promoting and enhancing school digitalization, creating innovative learning environments, digital upgrading of school organization, in-

cluding wiring of school in order to improve connectivity, the supply of innovative and advanced tools in classrooms for digital teaching; in secondary schools, it is foreseen the activation of workshops for new professions connected with artificial intelligence, robotics and digitalization, also favouring the collaboration between public and private sectors. The intervention will be designed to reduce territorial gaps in the access to technologies by all school institution.

Implementation: Text... .

Target population: Text... .

Timeline: Text... .

Costs: The estimated cost related to the RRF is equal to 2.1 billion euro.

Investment 2.4: Teaching and advanced university skills (code DID).

Challenges: Emerging economic and social challenges for the future (primarily, environmental sustainability and digital diffusion) require adequate training courses consistent with the skills demanded by society and the labour market. In this perspective, Italian universities and the education system, in general, must be the driving force for the widespread adaptation of knowledge and organisational models to the continuous advancement of technology.

In line with the initiatives to contribute to the creation of a European education area and with the Action Plan for digital education (2021-2027), measures aimed at rethinking education and training for the digital age, at encouraging international openness and cooperation, and at promoting the dissemination of the culture of innovation, assume particular importance.

Objectives: The project aims at qualifying and innovate university (and doctoral) programs, through the levers of a) digitisation; b) “culture of innovation”; c) internationalisation, acting:

- on the promotion of open-access digital training courses of excellence, synergistic between universities and businesses;
- on strengthening the role of Superior Graduate Schools for high-merit and cutting-edge training in a new dimension of strong collaboration with universities and the business world, contributing to the dissemination of the culture of innovation;
- on the strengthening of scientific cooperation, on the circulation and attraction of talents, stably structuring training programs abroad, defining programs to support strategic partnerships to innovate the international dimension of the Italian university system, funding initiatives for the internationalisation of research.

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

which will constitute a control room for the effective management of the sub-measures, enhancing the synergies.

Target population: Students, university.

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

Costs: The estimated cost related to the RRF is equal to 0.50 billion euro.

3) Strengthening research and vocational training.

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

Challenges: The Vocational Training Institutes, (*Istituti Tecnici Superiori - ITS*), structured as “Participatory Foundations”, create forms of integration between public and private resources (private companies constitute over 43,1% of the associate partners) and are very relevant in decentralised governance contexts, universities / scientific and technological research centres, local authorities, schools and training systems highly specialised technical and technological training. The ITS activate job-oriented tertiary courses to train technicians who manage highly complex systems and processes, mostly digitised, paying particular attention to the integration between design, technologies and organisation, in six articulated areas: Energy efficiency; Sustainable mobility; New technologies of life; New technologies for the Made in Italy (Business services, Agri-food system, Home system, Mechanical system, Fashion system); Innovative technologies for cultural heritage and related activities; Information and communication technologies. The ITS are distinguished from other educational channels as they are mainly focused on employment opportunities, being able to guarantee to the 83% of their graduates a job one year after graduation (92% of cases compatible with the followed curriculum) linked to the real demand of the labour market (ITS national monitoring, Indire 2020). They represent a different training model capable to intercept the real need for new competences required by the production system. They offer teachers with direct experience in the labour market (70%), internships (43%), hours of theory carried out in business and research laboratories (25,5%). With educational modalities (locations and timing) designed according to the technological areas. ITS graduates particularly appreciate these courses, even though data on ITS enrolments (7.831 enrolled in courses launched in 2019, Indire) show that the goal of structuring a reliable channel of vocationally oriented tertiary education, competitive with the University, remains to be achieved. Often despite high demand from the labour market, the “technical training” option appears to be a second choice. Alongside this critical element, there is one more factor: to date, 11% of ITS seem to need improvement actions; some of them fail to provide educational paths continuously, thus giving families an image of an unstructured training channel. ITS have always obtained a negative result in the 2015-2020 monitoring and given their location and structural difficulties, they are more exposed to the social and economic impact of the crisis.

Objectives: The reform is intended to strengthen the tertiary vocational training system by extending the organisational and teaching model to other training contexts (supporting the training offer, introducing rewards and widening the paths for the development of enabling technological skills - Enterprise 4.0). It will also put Vocational Training Institutes in the legal system of job-oriented Tertiary Education and rebalance the quality of the connection with the entrepreneurs' network in the regions.

Implementation: The program is managed by the Ministry of Education.

Target population: Vocational Training Institutes (ITS), students.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022. The implementation is linked to the investment project 15.

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

Reform 3.2: Reform of Technical and Professional Institutes (code KNOW).

Challenges: The current system of Technical and Professional Institutes offers training programmed which are now obsolete with the needs of the labour market, as well as disconnected from the territories. As a consequence, the social and economic impact of the crisis is deepened by an insufficiently prepared human capital unable to face the challenges of the labour market and to contribute to the Country's development and innovation.

Objectives: The reform project of the Technical and Professional Institutes aims to invest in human capital in a targeted and specific approach tailored to the geographical, economic and social conditions of the territory, with direct short- and long-term benefits on the country's growth potential, as well as the promotion of new entrepreneurial settlements, to foster employment and development. The reform aims at orienting Technical and Professional institutes towards the innovation output of the National Industry 4.0 plan as well as the profound digital innovation in place in all sectors of the labour market. The high quality of the offered curriculum will encourage the graduates' employability thanks to the adoption and harmonisation of training programmes according to the needs of each territory and the labour market.

Implementation: The program is managed by the Ministry of Education.

Target population: Technical and Professional Institutes.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022. Full implementation is expected in 2025 through accompanying actions.

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

Reform 3.3: Reform “Orientamento” (code KNOW).

Challenges: According to UNICEF’s October 2019 report, based on ISTAT data, in Italy of young adults in the 15-29 years age class, 2,116,000 are NEET (*Not in Education, Employment, or Training*), equal to a share of 23.4% of young people present on the territory (in Sicily the share is as high as 38.6%, in Calabria 36.2% and in Campania with 35.9%). Among the more than 2 million NEET, 38% are aged 20 to 24 years².

In this context, “Orientation” is not only just a tool for managing the transition between school, higher education and labour market but also a lasting value in the life of each person, ensuring development and support in decision-making processes to promote active employment, economic growth and social inclusion.

Objectives: The regulation will introduce orientation modules - not less than 30 hours per year - in upper secondary schools (for students in the IV and V years) in order to promote increased levels of education. It will also create a digital orientation platform, related to the tertiary educational offer of Universities and Vocational Training Institutes (ITS), easily accessible by young students. The proposal favours the growth potential by targeting the most fragile front of the young population, subject to the risk of dispersion and unemployment in the future, preventing the NEET phenomenon. The proposal also promotes growth potential by investing in the creation and development of human capital in line with the actual demands of the labour market.

The proposal goes in the direction of supporting other investments in a strategic approach (to fight early school leaving and gender gap in STEM disciplines, to strengthen ITS, ecc..).

Implementation: The program is managed by the Ministry of Education.

Target population: Students in the iv and v year of upper secondary schools.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022.

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

Reform 3.4: Reform of university degree groups (code KNOW).

Challenges: Society and economic trends show that the current disciplinary classifications are obsolete and that in various scientific fields the prevailing organisational models of universities and institutions is inadequate. The growing complexity requires constant assessment between different disciplines, and the new educational paradigms should en-

² In details: 49% of them have obtained a secondary school diploma, while 40% have completed a lower cycle of education while 11% hold a university degree.

hance more advanced, transversal and multidisciplinary skills.

Objectives: The reform foresees the removal of constraints in the definition of credits to be assigned to the different disciplinary areas, in order to allow the construction of teaching systems that strengthen multidisciplinary skills, on digital technologies and environmental field, as well as on soft-skills. The reform will also be extended to job-oriented degree classes.

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

Target population: University professors, researchers and students.

Timeline: The reform will be implemented through D.M. to be adopted in 2021, for the application of updated teaching regulations starting from the academic year 22/23.

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

Reform 3.5: Reform of Ph.D. Programmes (code KNOW).

Challenges: An economy and a society built on knowledge imply an enhancement of the role of the Ph.D. programme, that must provide an adequate training to undertake a university career or high-level activities in firms or public institutions. Ph.D. graduates need to contaminate the ruling class of the Country, in the private and in the public sector, stepping out of the boundaries of the academic world, promoting knowledge and expertise spill-over which are usually built in the university environment, contributing to the capabilities of the productive system to innovate and compete.

Objectives: The reform will update the regulation on Ph.D. programmes, simplifying the procedures for the involvement of companies, research centres, national and international, in Ph.D. programmes. The proposed reform has clear integrations with all the investments related to Ph.D. programmes in the target domain “Education and research”.

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

Target population: University professors, researchers and students.

Timeline: The reform will be presented with the Ministerial Decree, which is currently under preparation, and ultimate in 2021, becoming effective for the cycles that will start in 2022.

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

Challenges: The proposed project allows full implementation of the xiv) reform to strengthen the education offer of Vocational Training Institutes, inspired by models es-

tablished in other European countries. By working in networks with companies, universities/scientific and technological research centres and local authorities, the education and training system will reduce Italy's significant backlog in non-academic tertiary training, as will reduce the mismatch between the demand and the supply of work that is at the root of much youth unemployment.

Objectives: The project intends to increase the educational offer of Vocational Training Institutes, enhancing their supplies and logistics needed and increasing the participation of the enterprises in the educational processes. In particular, the project aims at significantly increasing the number of ITS and at strengthening laboratory structures (introducing innovative technologies 4.0); it will also invest in enriching teachers' competences. The goal is to increase the number of enrolled students in ITS (+100% min-currently there are 15.000) and consequently the number of graduates (currently 8000 per year). Furthermore, it is foreseen to activate a national digital platform that allows students to know the job offers for those who obtain a professional qualification. The proposal helps to reduce the skills mismatch, by offering training opportunities with high standards and adapted to the promotion of the competitiveness of the country's economy in relation to the innovations of Enterprise 4.0 and the twin transitions. The implementation of new training courses and the dissemination of innovative training model would also enhance a fully specialized training chain linked to the Energy 4.0 and Environment 4.0 areas and therefore functional to the adaptation of 4.0 skills to strategic development sectors.

Implementation: The program is managed by the Ministry of Education with Vocational Training Institutes for its fulfilling.

Target population: Vocational Training Institutes (ITS), young people, students.

Timeline: The intervention will start in 2021 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 1.5 billion euro.

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

Challenges: In line with reform 3.3, it is appropriate to implement actions of active orientation to connect youngsters with the academic world, also through the reinforcement of specific teachings, to increase the awareness as well as the motivation to grasp economic and social opportunities of higher education.

Objectives: The project aims at elevating the transition from secondary school to university and, at the same time, tackling university dropouts in the following years, contributing to laying the foundations to reach the strategic goal of increasing the number of university graduates. The measure contributes to the qualification of the education system through a rise in the success indicators (school attendance, improvement of learning

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

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.

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) |
| 1. Strengthening R&D, and IPCEI initiatives | 1.38 | 5.91 | 7.29 | - | 7.29 |
| - 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 |
| 2. Transfer of technology and support to innovation | - | 4.00 | 4.00 | 0.48 | 4.48 |
| - 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 |
| TOTAL | 1.38 | 9.91 | 11.29 | 0.48 | 11.77 |

2. Main challenges and objectives

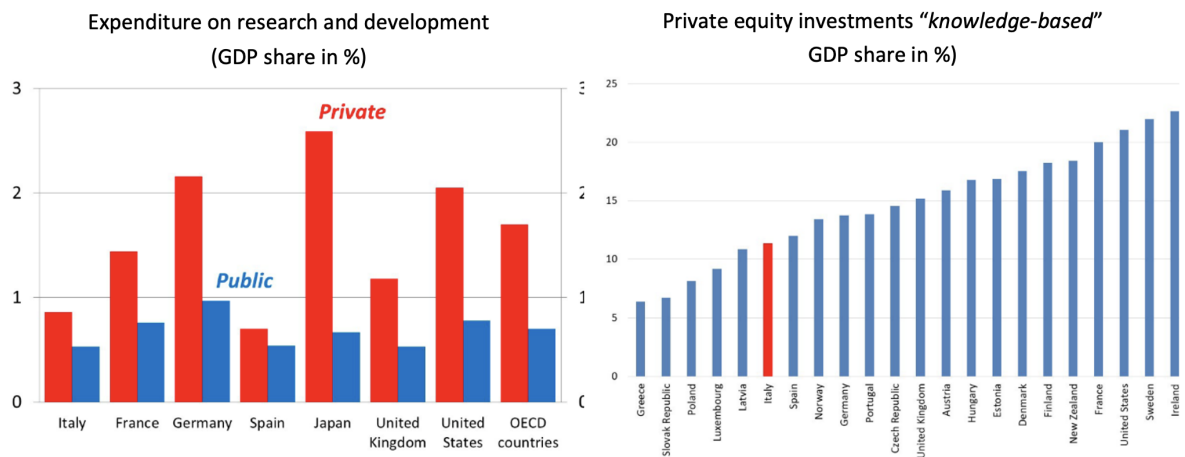
a) Main challenges

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.

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.

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.

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.

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.

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.

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.

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

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.

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 | | | | | | |
| Component M4C2 | | | | | | | | | | | |
| Strengthen the R&D chain and support IPCEI initiatives ("Research is the future") | | | | | | | | | | | |
| 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/mln | 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/mln | 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 NRPSPJ 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 |
| Technology transfer and supporting innovation ("For widespread innovation") | | | | | | | | | | | |
| 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: assets 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, DII, 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/mln | 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 submitted 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 doctoral 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 collaboration 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 researches 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, scholarships, 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 | Strengthen the R&D chain and support IPCEI initiatives ("Research is the future") | | | | | | | | | | | | | | |
| 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 | Technology transfer and supporting innovation ("For widespread innovation") | | | | | | | | | | | | | | |
| 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€/m²); 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.