



Desk-based analytical review: the current state-of-play of the KEC system in Italy ¹

Output 2

MUR/DG Reform Project 21IT42, ITA.CON: *“Improving the system of Knowledge Exchange and Collaboration between universities and society in Italy”*

In the context of the Technical Support Instrument (TSI) of the European Commission, and the financial and technical support of the Directorate-General for Structural Reform Support (DG REFORM), the OECD is undertaking a project with the Ministry of University and Research (MUR) in Italy. The objective of the project is to enhance knowledge exchange between universities and society (including businesses, public authorities, and civil society).

As described in the Detailed Project Description (DPD), this document, the “Desk-based analytical review”, provides an overview of the current policy framework in which knowledge exchange and collaboration (KEC) practices take place in Italy. Building on the HEInnovate Review of Italy (2019), the desk review analyses the evolution of the definition of knowledge exchange, the supporting policy frameworks on national and regional levels, and the relevant institutional actors. In addition, the Review illustrates opportunities and challenges for the Italian higher education sector vis-à-vis the NextGenerationEU Funds. The Review responds to Output 2 of the ITA.CON project.

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1. Defining knowledge exchange and collaboration (KEC)

Public research is an essential tool to foster a knowledge-based society, through innovation, increased productivity, sustainability and competitiveness. Higher Education Institutions (HEIs) are increasingly being called on to collaborate and contribute to social, economic, and environmental goals (Laino, 2019^[1]). HEIs produce the world's most important resources: young minds and an educated workforce, which, in turn, can produce innovative ideas and products, thus contributing to societal development (Breznitz, 2014^[2]; Fantino, Mori and Scalise, 2012^[3]; Associazione Italiadecide, 2017^[4]). Generating these resources is pivotal to enhancing the productivity and sustainable growth of a country and its regions. In this context, the role of HEIs in socio-economic development has become increasingly important.

Knowledge exchange and collaboration (KEC) activities connect HEIs with their stakeholders, including entrepreneurs, public administrators, at central and local level, nongovernmental organisations (NGOs), and citizens (OECD/European Commission, 2021^[5]). These counterparts collaborate with HEIs, generating a circular flow of information and knowledge. What was once called the “third mission” of HEIs has become a broader concept that requires HEIs to connect proactively with their societal stakeholders (see Table 1 for operational definitions of KEC ‘building blocks’).

Table 1. Building blocks of Knowledge Exchange and Collaboration operational definitions

Term	Process, participants and implications
Knowledge generation or knowledge production	Implies “new” knowledge produced as an outcome of some form of process, but does not indicate the nature of the process. Recently, a new mode of knowledge production has been set in motion, to find a halfway point between disciplinary inputs, fusion of disciplines, lay knowledge and expertise.
Coproduction of knowledge	Implies a process where knowledge is or can be produced through interaction among different actors, possibly among people with different perspectives and backgrounds, through co-operative endeavours and mutual learning.
Knowledge utilisation	Implies a focus on the intent and purpose behind the use of knowledge. It does not limit itself to the uses to which the knowledge is supposed to be aimed at, but seeks to reveal intent, purpose and agency in the process.
Knowledge transfer	Implies that knowledge is portable, has a linear direction, and that delivery and reception is a one-way process from A (usually a researcher/the research team/ the university department/ the whole research institutions) to B (a “user”, for example a company).
Brokerage of knowledge	Implies negotiated knowledge, deliberation between different parties – A and B (and C, etc.), and possibly mediation through a third party towards a mutually acceptable set of goals, working methods and more effective interactions and knowledge processes.
Storage of knowledge	Implies that knowledge is portable and can be held in a form that can be accessed when needed.
Knowledge exchange	Implies a two or multiple-path process with reciprocity and mutual benefits, maybe with multiple learning, but not necessarily recognition of the equitable value of the different forms of knowledge being exchanged.

Note: This table presents some of the many terms used to describe processes of knowledge exchange and their implied meanings. Source: Adapted from (Fazey et al., 2013^[6]) & (De Silva et al., 2021^[7])

As much as there is not a single definition of KEC, there is not a one-size-fits-all approach to KEC. The definition of KEC is evolving, combining the traditional sense of knowledge exchange with social and environmental factors. To adopt this wider definition, just as with frameworks for innovation and socio-economic development, HEIs’ approach to KEC needs to be shaped around the needs and strengths of

local¹ communities. Building on the specific characteristics of each ecosystem, policies aimed at encouraging knowledge exchange and collaboration should design *ad hoc* tools to support stakeholders in focusing on the potential of the community in which HEIs operate, and in encouraging the integration of additional external (including international) knowledge. In addition, this also requires looking at KEC practices through the multidisciplinary and interdisciplinary lens. Until recently, in Italy as well as elsewhere, HEIs have focused almost exclusively on technological innovation and technology transfer to produce and disseminate knowledge, in collaboration with external stakeholders. However, if the process is understood not only in technological terms, but rather as knowledge co-creation aimed at tackling societal challenges (e.g. those targeted in the SDGs, the inclusion of migrants, encouraging cultural and creative development...), all the knowledge areas must be involved, and citizens' participation becomes crucial.

By adopting a wider definition, KEC activities of universities can also create positive spillovers to a wide range of policy areas. Examples include education and health policies, as well as programmes that address the challenges of the 'green transition' and the digital transformation of societies (the 'twin transitions'). All these issues require a more explicit public commitment of the university system to spread the benefits of research exploitation, improve the effectiveness of policy responses to big challenges, combat social, economic, and territorial inequalities, and thus mitigate the risks of ineffectiveness of policies aimed at improving social welfare.

In this sense, KEC activities in Italy - usually known as the 'third mission' of universities - may be defined as interactions between HEIs and society at large (Blasi et al., 2019^[8]). This entails that innovation has also evolved as a concept, moving beyond technology and including social and environmental dimensions. Due to this wider focus of KEC on the national landscape, the ITA.CON project will adopt this terminology. In particular, the project will adopt and use the term "knowledge exchange and collaboration" when referring to activities conducted by universities in interaction with non-academic actors (i.e. firms, administrators, NGOs and citizens) that contribute to sustainable and inclusive socio-economic development.

Through the adoption of a broader approach to KEC, collaboration activities show a strong spatial dimension: the presence of research-intensive universities is often associated with the production of geographically-bounded knowledge spillovers, which may entail an enhancement of the innovation capacity of firms located in close proximity of universities generating frontier research (Jaffe, 1989^[9]; Atta-Owusu, Dahl Fitjar and Rodríguez-Pose, 2018^[10]). This implies that geographically-defined ecosystems and networks may enhance the impact of these exchanges, also in terms of knowledge co-production. To this end, the next section of the Review will focus on the context in which KEC is carried out, the origins of the KEC definitions, and the milestones of its expansion, within the national stage.

¹ The term *local* here can be interpreted in several ways: it may refer to the territory proximal to the HEI, to the region where the HEI is located, to its national country, or even to the macro-region of the world (e.g., the EU).

2. KEC in Italy

2.1 Context

The context in which KEC takes place in Italy reflects the characteristics of the country. In Italy, the productivity of labour (measured as GDP per hour worked) is stagnating, with an almost flat trend over the last 20 years¹. However, over the same period, despite a lower level of R&D spending compared to OECD and EU27 average (OECD, 2021_[11]), the scientific productivity of the country has been remarkable. This contradiction may partly be explained by features of Italy's productive sector. The MSME sector contributes to 76% of employment and 64% of value added (OECD average, 68% and 59%, respectively) (OECD, 2021_[12]). The country also counts many self-employed (22.7%) (OECD, 2021_[12]). The disproportionately large number of MSMEs, often specialised in traditional sectors, with a small endowment of capita, and limited connections to productive supply-chains, hampers innovation diffusion and adoption (OECD, 2018_[13]). Furthermore, regional disparities also play a role, affecting Italian HEIs' KEC activities. Some universities have difficulties in co-specialising within innovation needs which are often not expressed by their territories and/or in translating their discoveries into products of 'local' social utility.

Legal structures start setting the base to support universities' KEC activities. During the 2008-2010 period, a set of reforms were enacted, influencing the Italian higher education system. Notably, the law n. 240/2010 gave leeway to the evaluation of third mission activities (at least in their traditional view as 'technology transfer') in the HE sector, introducing competitive funding mechanisms, the standardization of academic qualifications and the establishment of a new performance-oriented evaluation system, aimed at improving the recruitment policies and the managerial structure of the universities. This gave birth to an evaluation system of third mission activities, boosted by the role of the National Agency for the Evaluation of the Universities and Research (ANVUR). In addition, the law n. 240/2010 also introduced the participation of external stakeholders within the administration boards (CDA) of the universities. The members of the CDA now include 2 to 3 (depending on the institutions' dimension) "external stakeholders". This important change reinforces, at least 'on paper', the links between the university and the society, potentially giving a sharper role to the university in its territory, and enhancing, in principle, its 'listening capability' to the needs of the surrounding ecosystem.

Different national and regional policies have been put in place to strengthen KEC. These policies mirror the increasing demand for innovation and skills in the country and aim to support academic engagement. Measures include, among others, the reinforcement of HEIs' Technology Transfer Offices (TTOs) by the Ministry of Economic Development (MiSE), and the New Competence Fund administered by the Agency for Active Employment Policy (ANPAL). Furthermore, the industrial PhD programmes, which have been supported by the MUR, with contributions by the Italian employer association (Confindustria), by individual enterprises and by regional governments promote high-levels skills in the productive sector. In addition, the National Plan for Industry 4.0 represents another example of promoting stronger university-industry technological partnerships (OECD, 2017_[14]). Industry 4.0 connects with initiatives such as the National Technology Clusters and Competence Centres, which, at least in some cases, Italian stakeholders consider positively in terms of their capacity to promote entrepreneurial education and start-ups.

These policy interventions have intensified KEC activities in the country. Over the past 20 years, progress has been made. Italian university have been consolidating their TTOs, fostering a culture of collaboration with businesses among researchers and university managers, while still limited attention has been devoted to universities' societal impact in its wider meaning.

Remaining challenges require the mobilisation of policies and stakeholders to give centrality to KEC in Italy's higher education system and institutions. Third mission activities led by staff and offices

of universities suffer from a limited consideration within the academic community. A traditional approach to the third mission, focussing on technology transfer and based on the economic exploitation of inventions, has led to privileging relationships with large companies in high-tech sectors, leaving out more challenging relationships like, for instance, those with MSMEs, social organizations and public institutions. Location is still an important factor impinging upon the capacity of a given HEIs to promote innovation and social impact. In particular, HEIs located in less affluent regions have suffered, more than others, from budgets constraints, which have undermined the full deployment of their capabilities to develop structured collaborations with external stakeholders.

HEIs fully embedded in their ecosystems will have a positive impact on innovation and development, in all Italian regions. Promoting KEC in the Italian university system may be a way to improve the productivity of firms of all size and maturity, as well as societal progress and wellbeing, in all regions. The application of intellectual capital to economic and social challenges, in partnership with research end-users, as a structured institutional activity, rather than an incidental spillover, will help Italy to move away from its current status of ‘moderate innovator’ (European Commission, 2021^[15]). The following section illustrates examples of national and regional policy frameworks to promote knowledge exchange and collaboration in the Italian higher education system.

2.2 National and regional research policies

National Policies

FIRST and National Technological Clusters (CTN)

The Fund for Investment in Scientific and Technological Research (FIRST) and the National Technological Clusters (CTN) are among the main policy initiatives the Ministry of Education, Universities and Research (MIUR, now MUR) has put in place to promote market-oriented research. Since 2017, FIRST allocates funds to the National Technological Clusters (CTN) initiative, which represents a policy favouring public-public and public-private collaboration. Consistently with the EU Framework Programme for research 2014-2020 (Horizon 2020) priorities, the objective of CTNs is to gather together critical skills from the productive sector, the research system and the public sector – both at the national and regional levels – to define shared goals for the respective research and innovation agendas and co-ordinate their implementation roadmaps.

Industrial PhD and PhD ITalents

The Italian higher education system has been promoting the use of high-level skills in the productive sector. Initiatives have been launched, such as the innovative doctoral programmes and the project PhD ITalents (Vincenzo et al., 2021^[16]). The former are PhD programmes implemented in collaboration with firms that generate research opportunities for the firms and employment opportunities for the PhD candidates. The latter is a project incentivising (by co-funding the employment contract) the employment of PhD graduates in firms looking to improve their R&D capacity. PhD ITalents has been a successful initiative, as the number of firms involved in the project was much larger than expected. When the CRUI Foundation launched the project in 2016, it received 682 applications from Italian firms, including many MSMEs.

In December 2021, Decree n. 226 sets out new rules for the accreditation of Doctoral Courses². The Decree confirms the typology of “Industrial Doctoral Programmes” already foreseen by the previous Decree 45/2013. The fellowships supporting the doctoral candidates enrolled in this Programmes are co-funded for at least 50% by companies, which participate to the definition of the objectives of the study course. Furthermore, the doctoral candidates should spend part of their time in the company. This opens door to

expand and support KEC activities, as doctoral candidates are considered ‘vectors’ of knowledge exchange.

Interestingly, the National Recovery & Resilience Plan (PNRR) is investing a remarkable amount of resources (more than 1.5 billion euro) in doctoral programmes, including specifically earmarked funds for programmes on the green and digital transitions, on the modernisation of the public administration, on cultural heritage research, and on industrial doctorates.

National Research Programme (Programma Nazionale per la Ricerca)

On 15 December 2021, the Italian Ministry of University and Research (MUR) approved the National Research Programme (PNR) for the 2021-2027 period. The PNR aims to foster effective coordination of research policies at European, national and regional level and to strengthen the presence and competitiveness of Italian researchers in the European Research Area, extending also on the global scene (MUR, 2021^[17]). The PNR is divided into system priorities, overall areas of research and innovation and related areas of intervention, national plans and missions (MUR, 2021^[17]). The six main areas of focus for research and innovation are: health; culture; social systems; digital; climate and energy; agriculture. The Programme places a strong emphasis on KEC activities and the complexity to achieve an effective and efficient KEC system. The PNR outlines *inter alia* the need for: a solid portfolio of knowledge and skills by KEC actors; an entrepreneurial ecosystem capable of profitably absorbing the products of research and innovation; specific professional profiles, i.e. highly qualified research managers, who understand the language of science and that of business.

By introducing the evaluation of Societal Readiness Levels (SRLs), together with the Technology Readiness Levels (TRLs), the PNR promotes both open innovation and societal impact. Innovation, in fact, has not only a technological and industrial market-oriented dimension, but also a social and cultural dimension that, in the Italian context, is pursued through third mission initiatives, with the aim of enhancing the synergy among science, technology, culture, arts and territories.

In this regard, the PNR underlines how the potential of Italian higher education and research entities to collaborate with the productive system is not fully exploited. The promotion of innovation and entrepreneurship of Italian universities needs a national shared strategy and a whole-of-government approach, able to reinforce interactions among HEIs, firms and society at large. This effort should not address only academic entrepreneurial pathways and support to high tech start-ups, but also broader models as the civic university, to create a stable dialogue and exchange with citizens and societal contexts, likewise important for the socio-economic sustainable and inclusive development of territories.

Regional policies

Regional governments are actively supporting the entrepreneurial and innovation agenda of HEIs. Some regions have put in place a broad range of programmes and initiatives to strengthen knowledge exchange between the universities located in their territories and local stakeholders, focusing on promoting regional development. Universities represent a reservoir of competence and knowledge, with a high potential for activating development plans, especially in disadvantaged territories, particularly extended in the southern regions. Another area in which regional governments, being responsible for vocational education and training, have played an important role is ISCED level 5 tertiary education. Since 2010, Italy has been developing, at regional level, a new format for professional/vocational tertiary education, with the establishment of the *Istituti Tecnici Superiori* (ITS), a biennial post-secondary course, gathering around a specific training subject secondary schools, firms and universities (OECD, 2017^[14]). There are, by now, a few interesting examples linking vocational training and higher education, where regional authorities and industry associations are co-operating to promote the creation of integrated higher education pathways between ITS and professional bachelor’s programmes. The aim is to provide regional manufacturing companies with skills that help them make the most of digital technologies and university students with the

possibility to use ITS laboratories, which are equipped with modern machinery and tools, due to the collaboration with local manufacturing companies.

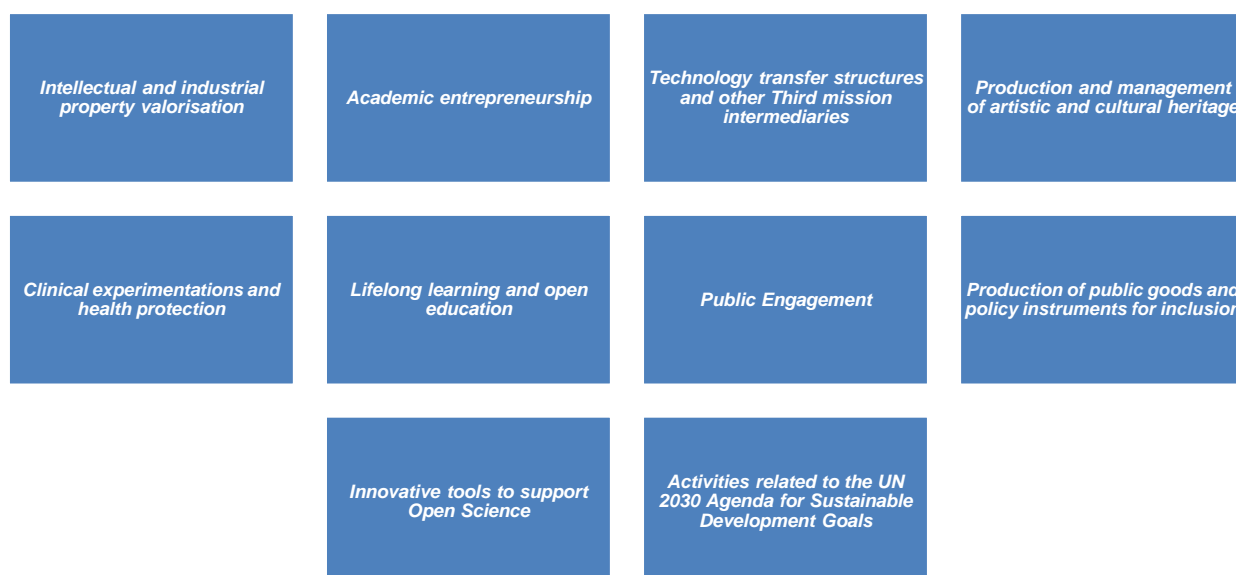
2.3 Institutional actors and the role of evaluation

The role of MUR and ANVUR

Institutional actors have helped to revamp policy support to KEC, with new evaluation processes and criteria. The Italian governance architecture of the research and higher education system has at its core the Ministry of University and Research (MUR), in charge of elaborating policies to promote scientific and technological research, and allocating funds to universities and public research organizations. The role of the evaluation Agency (ANVUR) is also crucial, since it is responsible for assessing the quality of universities and research centres, recipients of public funding (private universities and research centres can be evaluated ‘on demand’).

Applying the 2019 Ministerial guidelines for the third round of the research assessment exercise (VQR 2015-2019), ANVUR fully acknowledged the broadened definition of ‘third mission’ given in the Ministry’s mandate, embracing a wide set of KEC activities, aimed at producing impact on the social, cultural and economic context (Blasi et al., 2019^[8]). In fact, the VQR 2015-2019, carried out by ANVUR in 2020-2022, aimed at the evaluation not only of the scientific research results achieved in the evaluation period, but also of the third mission activities that generated impact during that period. While the definition of impact is open, ANVUR has provided a set of ten specific areas, named “fields of actions”, to which the third mission activities should be referred, illustrated in Figure.1. In the document on the evaluation panel criteria, issued by ANVUR in January 2021, these areas have been extensively described.

Figure.1. 10 fields of action in ANVUR’s VQR 2015-2019



Source: based on ANVUR (2020), Call for participation VQR 2015-2019, art. 9

Moreover, applying the 2019 ministerial guidelines, ANVUR required the evaluated institutions, instead of providing numbers to quantify their activities in one or more of these fields of action (as it was the case in the previous round of the research assessment exercise VQR 2011-2014), to provide a limited number of ‘case studies’, illustrating their commitment to produce a measurable societal impact.

2.4 KEC: State of the art

KEC activities are increasingly being embedded within the activities of Higher Education Institutions (HEIs) in Italy. Beyond their conventional missions of teaching and research, it has become an objective of Italian universities to collaborate with external partners and support the sustainable development of their territories and the society at large. HEIs collaborate more and more with firms, civil society and public administrations. This dynamics reflects the quadruple helix model, which puts forward the idea of “co-created” research and innovation (Carayannis and Campbell, 2009^[18]).

In the past decades, the valorisation of research has made important strides in Italy. Notably, it has evolved through different phases (see “the life-cycle of Italian TTOs” in (Piccaluga & Balderi, 2007^[19])); consequently, the activities of the Technology Transfer Offices (TTOs) have also expanded. Since the early 2000s, the Ministry of University and Research (MUR)³, in collaboration with the Ministry of Economic Development (MISE), has increasingly supported the development of TTOs and of their activities. Interestingly, 50% of TTOs in Italian universities were born between 2004 and 2006 (Piccaluga and Bianchi, 2012^[20]). As of 2021, Italian universities had about 400 technical officers within their TTOs, managing over 5 400 patents licenses, increasing by 500 each year, giving birth to over 120 spin-offs yearly (NETVAL, Unpublished^[21]).

The TTOs have increasingly developed their activities. This expansion was also supported by the creation of the Network for Research Valorisation (NETVAL)⁴ in the early 2000s, whose role was pivotal for strengthening the role of TTOs. In particular, in recent years, technology transfer (TT) activities in Italy include:

1. raising awareness / training of researchers,
2. the identification of market areas towards which to develop goods and services based on research results,
3. the generation and protection of industrial property,
4. prototyping and proof of concept,
5. the enhancement of industrial property,
6. the possible establishment of start-ups or spin-offs. (NETVAL, Unpublished^[21])

The transition from TT to KEC is the result of a global paradigm shift. This transition, in Italy, started from a few pioneering universities and academics, who engaged in programmes and projects with external stakeholders within the social sciences and humanities domains (Blasi, Romagnosi and Bonaccorsi, 2018^[22]), and put pressure on institutional actors to recognise other realms beyond the ‘traditional’ valorisation of research in STEM (Sciences, Technology Engineering and Mathematics) disciplines. Studies illustrate that the impact of universities extends beyond commercialisation of research results, recognising that the activities of universities in social and cultural realms are very relevant for the country’s sustainable development (Atta-Owusu, Dahl Fitjar and Rodríguez-Pose, 2018^[10]; Blasi et al., 2019^[8]). In this context, the HEIs are called upon to participate in a wider range of activities.

KEC takes shape through different models. Reflecting the expansion of the definition of KEC activities, universities have been compelled to adopt a more comprehensive taxonomy, including several ‘categories’ of KEC. For instance, public engagement is often a category used for defining KEC activities in Italian universities, also demonstrated by the presence of the APEnet association⁵. The activities taking place within this realm encompass, e.g., those with social objectives for the nearby territory (Anzivino, Ceravolo and Rostan, 2018^[23]), as well as those connected to the UN Sustainable Development Goals (SDGs)⁶, whereby, as early adopters of the SDGs, universities integrate the Goals to promote a culture of sustainable development in teaching, research and KEC activities with external actors.

The types of universities, and the ecosystems around them, influence universities' KEC activities.

Italy shows a very rich and diverse landscape of HEIs, including generalist, technical and specialist institutions, whose dimensions span from mega- to micro-universities (from above 100.000 to a few hundreds of students), distributed over regions with GDP ranging from well above to well below the EU average. In consequence, their KEC activities are organised in different manners.

The expanded notion of KEC, however, also raises some concerns. While traditional activities of research valorisation can be 'easily' measured by pre-identified and well-established indicators (such as numbers of patents, spin-offs, licenses), the societal impact of research is way more difficult to be measured and/or assessed. Nevertheless, these difficulties should not avert the HEIs from committing to this endeavour. In fact, defining expected results, finding appropriate indicators and ambitious but feasible targets for the HEIs societal impact requires some intellectual effort and creativity. Hard as it is, this effort is worth and important, in order to learn about activities as well as evaluation practices. Collaboration is a moving target, so it will be challenging to identify absolute best practices that can be reproduced in different ecosystems, however, some 'invariants' can be detected and shared in a mutual learning approach.

The problem of measurement has been raised also in the evaluation processes carried out by ANVUR. The broader definition of the 'third mission' allowed the Italian HEIs' efforts towards enriching the spectrum of their KEC activities to be captured, but robust indicators to measure these activities have still to be developed. Moreover, contextual factors, such as university's location, disciplinary background, size, history, and strategy, were considered prominent and not easy to be grasped and kept into consideration within the established evaluation model. For this reason, in the application of the 2019 Ministerial guidelines, the evaluation methodology for the third edition of VQR (VQR 2015-2019) has been completely changed and based on a qualitative case study-based approach, in which each institution submits a set of third mission case studies highlighting the impact that has been generated. The case studies are related to the ten fields of action mentioned above and propose a narrative on the activities undertaken, and a set of indicators, selected by the universities, to give evidence of the reported impact. The quality of the case studies is expressed into a five-point rating scale.

At the time of writing, ANVUR has completed the evaluation of the submitted case studies and the results are being published. These results will be used by the Ministry as a source of information to enhance university-society collaboration and inform KEC policies, beyond their use in the funding allocation formula. A detailed analysis of the findings emerging from this first experience will be conducted along the next steps of the ITA.CON Project.

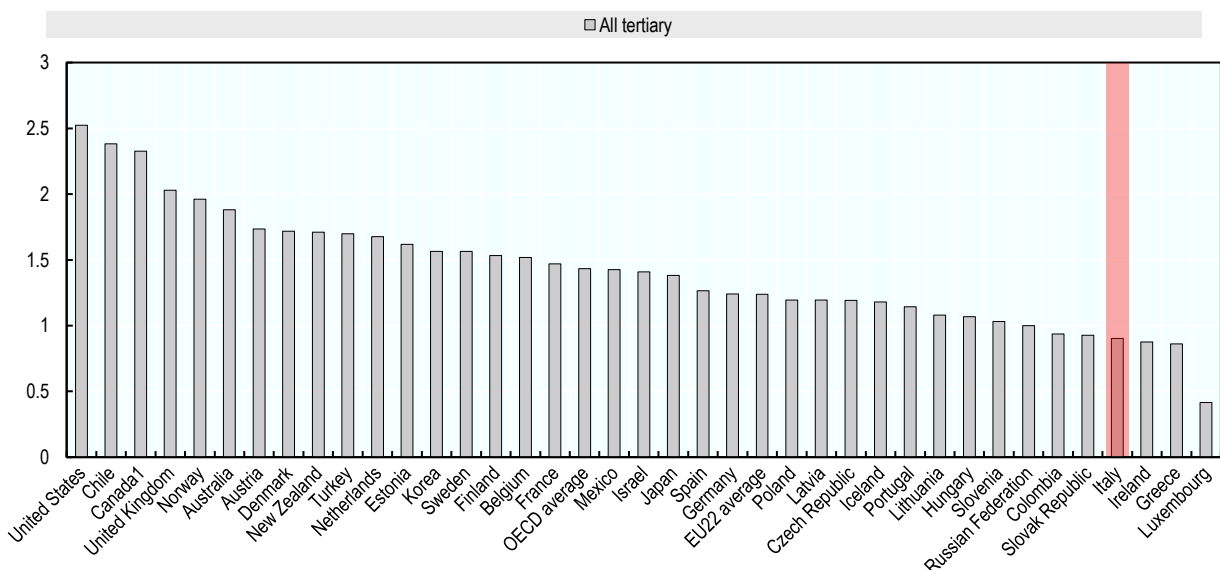
3. The role of the Recovery Plan in setting new KEC models

In response to the socio-economic consequences of the recent COVID-19 pandemic, the European Union has mobilised a Recovery Plan, the “NextGenerationEU”, which consists of fund packages destined to member countries to support their post-pandemic recovery. Italy is among the largest recipients, receiving almost 200 billion EUR, consisting of EUR 68.9 billion in grants and EUR 122.6 in loans (European Commission, 2021^[24]). Within its National Recovery and Resilience Plan (PNRR), presented to the European Commission in 2021, Italy has included a set of measures (Mission 4) focusing on higher education (especially doctoral training) and research. Among the Mission 4 objectives, an emphasis is placed on fostering the development of models for basic and applied research conducted in synergy between universities and businesses.

In particular, Component 2 of Mission 4 of Italy’s recovery and resilience plan calls for a “new vision for the university” (MUR, 2021^[25]). This vision represents an evolution from the traditional model of university, based exclusively on teaching and research activities, and relatively ‘disconnected’ from the societal needs, towards a more integrated model, in which it works in synergy with other players in the ecosystem. Based on an interdisciplinary approach and the need to extend the definition of KEC, with the related measurement tools and evaluation methods, this renewed vision can give leeway to a wider understanding of the “third mission” of universities, which is becoming “the” mission of universities, encompassing as well its constitutive pillars of research and teaching.

NextGenerationEU may generate a turnaround. Lack of investment has been a chronic issue for the Italian HEIs. For instance, in 2018, before the pandemic hit, total expenditure on tertiary education in Italy fell short of 1% of GDP (Figure.2). In this context, the mobilisation of the available funds represents a unique opportunity for Italian HEIs to support, through structural reforms, the country filling the gaps it still presents in several indicators related to research and innovation.

Figure.2. Total expenditure on tertiary institutions as a percentage of GDP (2018)



Note: Countries are ranked in descending order of total expenditure on tertiary educational institutions as a percentage of GDP.
Source: OECD/UIS/Eurostat (2021), Table C3.2. See Source section for more information and Annex 3 for notes (https://www.oecd.org/education/education-at-a-glance/EAG2021_Annex3_ChapterC.pdf)

The MUR and the Italian Universities are now confronted with a crucial challenge. The financial dimension of the PNRR and the tight deadline to allocate and use its funds represent a challenge for the MUR and for universities. Both actors should demonstrate their ability to respond to the European Commission's request to allocate and use the additional resources made available by the Next Generation EU funds to sustainably improve their performance as 'engines' of an inclusive country's development.

References

- Anzivino, M., F. Ceravolo and M. Rostan (2018), "Italian academics' Public Engagement: An opportunity to strengthen the relationship between universities and their territories", *Stato e mercato*, Vol. XXXVIII/3/2018, pp. 547-582, <https://doi.org/10.1425/91630>. [23]
- Atta-Owusu, K., R. Dahl Fitjar and A. Rodríguez-Pose (2018), "What drives university-industry collaboration: Research excellence or firm collaboration strategy?", <http://peeg.wordpress.com> (accessed on 22 April 2022). [10]
- Blasi, B. et al. (2019), "A new method for evaluating universities' third mission activities in Italy: Case study contribution to the OECD TIP Knowledge Transfer and Policies project". [8]
- Blasi, Romagnosi and Bonaccorsi (2018), "Do SSH Researchers have a Third mission (and should they have?)", *Springer International Publishing*. [22]
- Breznitz, S. (2014), *The Fountain of Knowledge: the role of universities in economic development*, Stanford University Press. [2]
- Capano & Regini (2015), "Come cambia la governance. Università italiane ed europee a confronto", https://www.crui.it/images/allegati/pubblicazioni/2015/manoscritto_capano_regini_2015_04_1.pdf (accessed on 25 April 2022). [29]
- Carayannis, E. and D. Campbell (2009), "'Mode 3' and 'Quadruple Helix': Toward a 21st century fractal innovation ecosystem", *International Journal of Technology Management*, Vol. 46/3-4, pp. 201-234, <https://doi.org/10.1504/IJTM.2009.023374>. [18]
- De Silva, M. et al. (2021), "Addressing societal challenges through the simultaneous generation of social and business values: A conceptual framework for science-based co-creation", *Technovation*, Vol. 104, p. 102268, <https://doi.org/10.1016/J.TECHNOVATION.2021.102268>. [7]
- European Commission (2021), *EIS-RIS 2021 | Research and Innovation - European and Regional Innovation Scoreboard*, <https://ec.europa.eu/research-and-innovation/en/statistics/performance-indicators/european-innovation-scoreboard/eis> (accessed on 17 June 2022). [15]
- European Commission (2021), *Recovery and Resilience Facility | European Commission*, https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en (accessed on 13 July 2021). [24]
- Fantino, D., A. Mori and D. Scalise (2012), "Temi di Discussione Collaboration between firms and universities in Italy: the role of a firm's proximity to top-rated departments". [3]

- Fazey, I. et al. (2013), "Knowledge exchange: a review and research agenda for environmental management", *Environmental Conservation*, Vol. 40/1, pp. 19-36, <https://doi.org/10.1017/S037689291200029X>. [6]
- Fronzizi, R. et al. (2019), "The Evaluation of Universities' Third Mission and Intellectual Capital: Theoretical Analysis and Application to Italy", *Sustainability 2019*, Vol. 11, Page 3455, Vol. 11/12, p. 3455, <https://doi.org/10.3390/SU11123455>. [26]
- Jaffe (1989), "Real Effects of Academic Research", *The American Economic Review*, Vol. Vol. 79/No. 5, <https://www.jstor.org/stable/1831431?seq=1>. [9]
- Laino, A. (2019), "Technological Transfer in Italy: From University to the Industry - A brief Analysis". [1]
- Ministero dell'Istruzione, U. (2013), *Decreto Ministeriale del 8 febbraio 2013 n. 45 - Atti Ministeriali MIUR*, [http://attiministeriali.miur.it/anno-2013/febbraio/dm-08022013-\(1\).aspx](http://attiministeriali.miur.it/anno-2013/febbraio/dm-08022013-(1).aspx) (accessed on 22 April 2022). [28]
- Mulino, I. (ed.) (2017), *Università, ricerca, crescita.*, laFeltrinelli, <https://www.lafeltrinelli.it/universita-ricerca-crescita-rapporto-2017-libro-vari/e/9788815271013#cc-anchor-dettagli> (accessed on 15 June 2022). [4]
- MUR (2021), "Linee Guida MUR per le iniziative di Sistema della Missione 4 Componente 2". [25]
- MUR (2021), *Programma Nazionale per la Ricerca*, <https://www.mur.gov.it/it/aree-tematiche/ricerca/programmazione/programma-nazionale-la-ricerca>. [17]
- NETVAL (Unpublished), "Appunti di NETVAL sui temi del Trasferimento Tecnologico (TT) e Scambio di Conoscenza (KE)". [21]
- OECD (2021), *OECD Economic Surveys: Italy 2021*, OECD Publishing, Paris, <https://dx.doi.org/10.1787/07d8b9cd-en>. [11]
- OECD (2021), *OECD SME and Entrepreneurship Outlook 2021*, OECD Publishing, Paris, <https://dx.doi.org/10.1787/97a5bbfe-en>. [12]
- OECD (2018), *OECD Skills Strategy Diagnostic Report: Italy 2017*, OECD Skills Studies, OECD Publishing, Paris, <https://dx.doi.org/10.1787/9789264298644-en>. [13]
- OECD (2017), *Getting Skills Right: Italy*, Getting Skills Right, OECD Publishing, Paris, <https://dx.doi.org/10.1787/9789264278639-en>. [14]
- OECD/European Commission (2021), *Supporting Entrepreneurship and Innovation in Higher Education in Greece*. [5]
- Piccaluga & Balderi (2007), "Consistenza ed Evoluzione delle Imprese Spin Off della Ricerca Pubblica in Italia. Rapporto di Ricerca", https://www.impresaprogetto.it/sites/impresaprogetto.it/files/articles/ip_1-07_saggio_piccaluga.pdf (accessed on 2 March 2022). [19]
- Rolfo, S. and U. Finardi (2014), "University Third mission in Italy: Organization, faculty attitude and academic specialization", *Journal of Technology Transfer*, Vol. 39/3, pp. 472-486, <https://doi.org/10.1007/S10961-012-9284-5/TABLES/7>. [27]
- Springer (ed.) (2012), *La sfida del trasferimento tecnologico: le Università italiane si raccontano*, [20]

<https://link.springer.com/content/pdf/10.1007/978-88-470-1977-5.pdf>.

Vincenzo, A. et al. (2021), “Ph.D. courses in Italy after the Gelmini Reform”, *Munich Personal RePEc Archive*, https://mpa.ub.uni-muenchen.de/108144/1/MPRA_paper_108144.pdf (accessed on 17 June 2022). [16]

Notes

¹ Data retrieved from: <https://data.oecd.org/lprdt/gdp-per-hour-worked.htm>

² Decree n. 226 of 14 December 2021, available at: <https://www.mur.gov.it/sites/default/files/2021-12/Decreto%20Ministeriale%20n.226%20del%2014-12-2021.pdf>

³ Formely known as the “*Ministero dell’Istruzione, Università e Ricerca*” (MIUR)

⁴ NETVAL is the Network for Research Valorisation, which aims to bridge public research and companies to up competitiveness through innovation. For more information: <https://netval.it/en/about-us/>

⁵ For more information on the APEnet association and its activities (eg. Barometer for public engagement), please see here: www.apenetwork.it

⁶ For more information: <https://sdgs.un.org/goals>