

An Italian preview of evidences in accessing EU funds by the SMEs.

Social and economic development leveraging in the R&D and Innovation capabilities

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Abstract

An overview of the Italian scenario has been developed considering the driving role SMEs play in the economic structure of the country and the pioneering function they have played in R&D and Innovation of Italy and of the whole Union in general. Through secondary data provided by various sources, such as the Cordis¹ database, Istat and CIS 2018² we have done the analysis of regional disparities, which is also evident in the access to the European funds for research and innovation of SMEs. The purpose of this paper is to highlight the position held by Italy in relation to the opportunities offered by the European Union in the field of R&D and innovation, reflecting the changes that can be undertaken by the Italian national policy to serve as a bridge between the European institutions that offer these types of funds and SMEs and to better guide the latter towards the appropriate resources based on their distinctive characteristics which constitute a great development potential.

Keywords: Italian SMEs; “Made in Italy”; Horizon 2020; regional disparities

Introduction

Nowadays, in addition to globalization, SMEs also face the challenge of digitalization, rising prices for energy and other commodities, and an aging population. Facing these challenges is possible only through new and innovative solutions. European SMEs find it difficult to be competitively priced against emerging economies such as China and Brazil. Under these conditions, only through the promotion of quality, image and innovation will they be able to survive in a globalizing world. SMEs that have invested in innovation in the recent past, find it easier to adapt to the changes that the future may bring. Why do small firms react faster to changing market demands than large firms? Because their size makes them more flexible, unlike large firms that are hindered in undertaking changes due to their bureaucracy. These behavioral advantages are the main key to the success of small firms that engage in innovative activity (Vermeulen, P. et al., 2003). In industrialized countries such as Germany, France, Spain and Italy, sustainable

¹ The Community Research and Development Information Service (CORDIS) is the European Commission’s primary source of results from the projects funded by the EU’s framework programmes for research and innovation (FP1 to Horizon 2020).

² Community Innovation Survey 2018

economic development is being guided by innovation as the only way to achieve high welfare in the long run. Also at the firm level, innovation is an essential determinant of their economic success. It is already confirmed that companies that constantly invest in new products and/or in the modernization of production processes gain comparative advantages over competitors and increase their market share. Innovative enterprises grow in terms of employment and income and are more profitable than non-innovative ones (Abel-Koch, J et al., 2015).

Italian SMEs are constantly considered the Achilles heel, embracing innovation and competition. But, this peculiarity of the Italian industrial system has not always restrained innovation. Until the 1970s, the Italian industrial system, as in other industrialized economies, was dominated by managerial capitalization, where large firms invested in new technologies and organizational innovation. In Italy, due to the small size of domestic capital and consumer markets, this industrialization process was carried out through the massive public sector. In the 1990s, the lack of investment from the sector and the lack of appropriate public policies in support of technological innovation, put this industrial model in difficulty. But the final result was an uncoordinated management of structural changes rather than the collapse of Italian industry or the dissolution of Italian SMEs. The latter showed that they were very resilient, mainly in their export performance, which has continued to remain in figures that significantly exceed the EU, referred to the data of 2017³ there are high results by 15.05% of Italian SMEs with extra EU exports of goods versus the EU average of 9.96%. Thus, the Italian industrial system should not be judged on the basis of the size distribution of its firms, which has been contingent on ever-changing economic factors, but should be judged on the basis of factors that may promote or hinder its success.

During the period of the financial crisis 2008-2011, among other consequences, the effects were also seen in the field of innovation. During these years, the drastic decline of firms implementing any kind of innovation from 35.6% to 11.7% in the industrial sector and from 29% to 9.7% in the service production sector was an indicator that should be taken into account. In 2013, when the recovery of innovation activities began, there was a growth of about 49 % in the industrial sector and about 13.7 % in the service production sector, but it was still far from creating a visible innovative result. In terms of firm size, the share of innovating SMEs increased during 2009-2013, while the share of innovating large firms increased during the period 2009-2011, but declined thereafter. This is explained by the fact that SMEs are the most dynamic group in terms of innovation in the Italian market.

In the post-crisis period, trends have changed, but innovation activities still lag behind their pre-crisis levels for most firms. In part, this slow recovery is explained by the

³ Source: SME Performance Review 2021, Italy 2021, EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)

negative expectations that make firms procrastinate or give up investing in new products and new markets. Investments in innovation have also been hampered by financial conditions. It is a fact now that in the post-crisis period, Italian firms had to rely mainly on their own sources of financing, because bank credits were on short supply and other financial intermediaries were hardly present in Italy.

The “Innovation in businesses” report, published on 17 December 2020, reports the growth trend of the propensity for innovation in Italy. According to ISTAT, “in the three-year period 2016-2018, it is estimated that 55.7% of industrial and service companies with 10 or more employees carried out activities aimed at introducing innovations. Compared to the previous period (2014-2016), the share of these companies increased by 7 % points. It is confirmed that the propensity for innovation grows as the size of the company increases: the percentage of companies with this characteristic goes from 53.3% in the range of companies with 10-49 employees to 71.4% in those with 50-249 employees, up to 81.0% in large companies (250 employees or more). The data for all sectors of the economy are summarized in table no.1 below. However, there are signs of a repositioning of SMEs towards a higher propensity for innovation (+7.7 % points for the former and +3.1 % for the latter), while substantial stability is evident for large companies. Industry in the strict sense remains the sector with the greatest propensity for innovation, with 65.7% of companies with innovative activities (+8.6 points compared to the previous three years). In particular, for almost all large industrial companies, innovation is confirmed as a central aspect of corporate strategic choices (90.3%) even if their commitment to innovation is slightly reduced (-1.6 points compared to the three-year period 2014-2016) “.

	10-49	50-249	250 & more
Total industry and services	53%	71%	81%
Total industry	56%	78%	89%
Total industry excluding construction	63%	82%	90%
Construction	34%	48%	64%
Total services	50%	61%	72%

Table 1: Innovative enterprises according to economic sectors, year 2018 (Oslo’s manual 2018)⁴
Source: Statistiche Istat

Characteristics of Italian SMES

In Italy the presence of micro companies is substantially higher than in other European countries, even if medium-sized companies have grown very quickly since 2003. This aspect of SMEs on the Italian economy can be seen, in particular, from the

⁴ Innovation activities include all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm. A business innovation is a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.

employment rate: while in Europe, less than a third of the workforce is employed in micro enterprises, in Italy, on the other hand, in 2010 it was around 50%. The Italian economy is characterized by an extremely high percentage of SMEs, as shown in the two tables below with data for the 2020. This fact is also the main cause of the low rate of innovation in Italy.

	Absolute value	% share
No. SMEs	3610 877	99.9
Persons employed	11 251 081	76.1
Value added (billion Euro)	431.1	64.3

Table 2: The weight of Italian SMEs in 3 above components, year 2020

Source: SME Fact Sheet 2021, European Commission.

Family businesses represent one of the most widespread forms of entrepreneurial institution in the Italian scenario, as their activity constitutes a significant part in the composition of the gross domestic product. Although it is a widespread phenomenon also at an international level, the relationship between business and family seems to be particularly close in Italy, where family businesses are not only small and medium-sized ones, but also numerous large companies.

It is concluded that the Italian innovative activity is not inconsistent but is linked to traditional sectors and little inclined to invest in R&D. However, thanks to business networks it is possible to connect the local environment with the international one by exchanging technologies with the nearest and more distant markets. In Italy, the presence of the districts has allowed the emergence of supply and order relationships with the largest companies, generating interdependencies between larger and smaller companies that allow the entire district to maintain its competitive advantage.

To relaunch the Italian system, it would be necessary to use organizational models aimed at encouraging the birth of new ideas and at better regulating relations. The competences currently present within companies should be identified to develop a scheme in order to best distribute them. Sometimes it is not necessary to make huge investments in R&D, but already existing technologies can be used in a more functional and specific way.

Expenditure on innovation

In the table below, we have summarized the costs for innovation by type in 2012 and 2018 for Italian companies by size. For this six-year period we see the tendency that all enterprises are dedicating more resources to the development of human capital engaged in innovative activity. This investment choice will give its effects in the long term for the Italian economy.

	2012 (in thousands of Euro)			2018 (in thousands of Euro)			Increase in % (2018-2012)		
	10-49	50-249	250 & more	10-49	50-249	250 & more	10-49	50-249	250 & more
Internal R&D expenditure	1779065	2032944	5766766	3535812	4216340	9055206	99%	107%	57%
Expenditure on the acquisition of R&D services	258025	413367	1397999	1033845	1012886	3434977	301%	145%	146%
Other expenditure on innovation activities (excluding R&D expenditure)	2974185	2740678	3171113	7421771	5142739	10656719	150%	88%	236%
Expenses for internal staff engaged in innovation activities (excluding R&D expenditure)	152762	125480	229842	2206956	1829977	2459121	1345%	1358%	970%
Expenses for the purchase of goods and services for innovation (excluding R&D expenditure)	404115	331164	863061	3258407	2092855	4382039	706%	532%	408%
Capital expenditure for innovation (excluding R&D expenditure)	426480	368207	849108	1956409	1219907	3815559	359%	231%	349%

Table 3: Expenditures on innovation

Source: Statistiche Istat

Digitalization of Italian market

According to SME Performance Review 2021, Italy 2021, EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), where we can see data for the level of digitization of Italian businesses in relation to the average of the European Union, in the 7 indicators presented⁵, only one has shown a very visible positive progress (almost double the EU's indicator of companies that send electronic invoices for the year 2018, 41 for Italy and 24 for EU). This is a pleasing fact considering that in Italy the obligation of electronic invoicing was introduced gradually. From January 1, 2017, the Ministry of Economy and Finance has

⁵ Start-up environment (Italy 0.29, EU 0.69), online availability of info for business mobility (Italy 80, EU 76.07), enterprises having access internet \leq 10 Mbps speed (Italy 25, EU 19), enterprises using their own website or apps for sale (Italy 12, EU 16), enterprises that buy cloud computer services (Italy 22, EU 23), enterprises having website homepages (Italy 72, EU 76), enterprises sending e-invoices (Italy 41, EU 24).

made available the interchange system also for the transmission and the reception of electronic invoices for private entities, as optional. Only since July 1, 2018, started the general obligation of electronic invoicing for private entities⁶.

Skills and Innovation of Italian market

Italian firms are more inclined towards product innovation than process and organizational innovation. This trend is observed in general in the entire industrial sector and especially in the SMEs sector. This also visually expressed in the graph below in its first two indicators.

Italy's performance in skills & innovation is in line with the EU average and has shown improvements since 2008. However, several indicators are lagging behind. On a positive note, the share of SMEs that provide ICT training to their employees has continuously improved – at 18.73% in 2019 - twice as much than in 2014. Furthermore, most indicators (9 from 14 as shown in the graph above) measuring SME innovation are below the EU average.

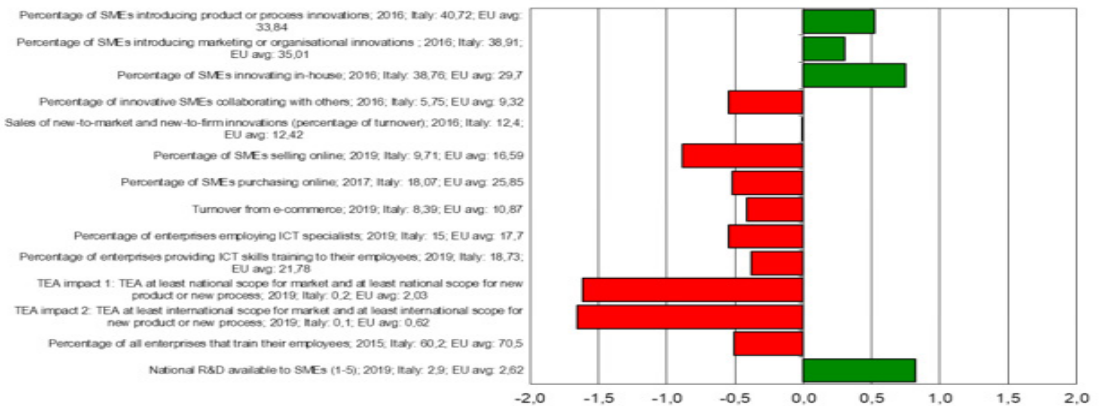


Chart 1: Skills and Innovation of Italian market, variation from EU average

Source: *SME Performance Review 2021, Italy 2021, EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)*

According to Istat, about 80% of SMEs will not invest in ICT. However, there is an increase in e-commerce, in which 56.1% of international sales are SMEs. This increase is motivated by national incentives as vouchers and subsidized funds.

⁶ Law no. 205/2017

Problems of innovation development in the Italian market

According to the Bank of Italy, Italian SMEs face limited access to traditional finance which hinders their growth. According to the Italian Association of Private Equity and the OECD, small company capitalization and the absence of a well-developed venture capital ecosystem are also barriers. According to Deloitte Italy, limited access to managerial and technical skills is a major issue for Italian SMEs, which are also lagging in digital skills. The graph below summarizes the problems encountered by Italian SMEs in relation to their sources of financing.

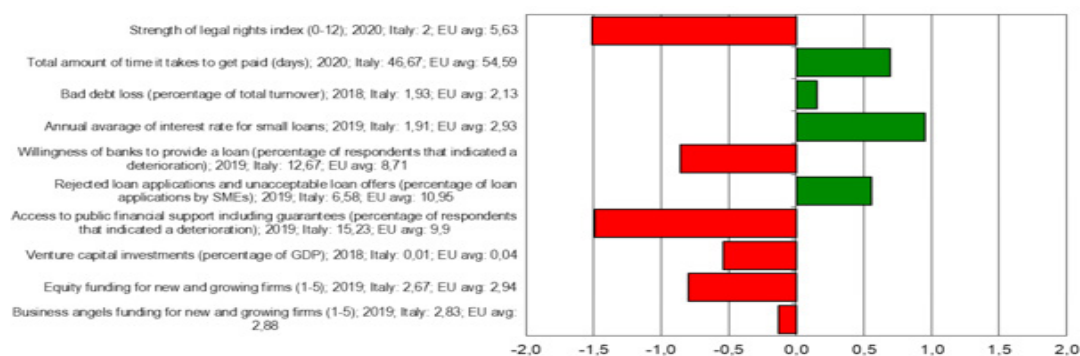


Chart 2: Access to finance, variation from EU average

Source: SME Performance Review 2021, Italy 2021, EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)

Italy and European Union support for innovation

Italy is one of the founding countries of the European Union, since 1951, when together with Belgium, France, Germany, Luxembourg and the Netherlands, signed the Treaty of Paris which established the European Coal and Steel Community (ECSC). On 25 March 1957, this country hosted a fundamental event for the process of European integration in Rome, of the Treaties establishing the European Economic Community (EEC), or “Common Market”, and the European Community of atomic energy or Euratom.

- *EU Structural funds:* For the period 2007-2013, the Italian government in cooperation with the EU Structural Funds has co-financed the €4.4 billion National Operational Program “Research and Competitiveness” (PONREC). The effect was visible in the increase of Structural Funds resources spent on R&D from 3.1% in the period 2000-2006 to 22% in 2007-2013. Then in the new program 2014-2020 they marked a decrease to 15%.

- *Smart Specialization Strategy*: At the European level, this strategy was launched to require each region to identify its strengths in research and innovation in order to provide EU funds to support them. The Italian strategy since 2013 has been managed by the government agency Invitalia⁷ in cooperation with MISE⁸ and MIUR⁹ with the broad involvement of regional authorities and businesses. In 2016, the Agency for Territorial Cohesion evaluated the actions taken by this policy, highlighting the great contrast that exists between the high quality of research output, the small size of Italian skill-intensive industries and the lack of a common governance of the national research and innovation system
- *Support for business innovation*: As local network contact particularly focused on SMEs serves the Enterprise Europe Network. Lots of Italian independent organizations active in 58 different locations in Italy are part of this network, which consist of about 600 organizations in 60 different countries. Members are organized in consortia at country level. The Enterprise Europe Network helps SMEs bring innovative ideas to commercial success on international markets.

National SMEs innovation initiatives in Italy

Larédo & Mustar (2001), in their book *“Research and innovation policies in the new global economy: An international comparative analysis”* articulated a meaningful quote about the impact of the Japanese model in the implementation of policies dedicated to civil technologies, by stating that *“The rise of Japan as an innovation model has increased the belief that an explicit national technology can be affective: in the end it has been widely argued that a nation will be progressively left behind if it does not have a clear technology policy”*. When we talk about the innovative national system, we should not limit only to institutions who carry out R&D and to the funding sources for these activities, but we should expand to policies such as anti-trust policy, intellectual property rights and regulatory policy. These directly affect technology, the training of scientists and the adoption of technology by all interested parties. In the function of this paper, arises the question *“What has Italy done in relation to this?”* In this section, we will present the national initiatives that consist of the Italian policy in the field of research and innovation, focusing of course on the actions taken to promote innovation for SMEs. As shown in the table below, Italy as a whole country has had a stable Innovation Index since 2014, very close to the level of innovation with Spain, but far from the other two industrialized countries of Europe such as Germany and France which are in the top 10 of the most innovative countries globally.

⁷ Is the National Development Agency, owned by the Ministry of Economy, which manages all national incentives that favor the birth of new businesses and innovative start-ups. It finances large and small projects, targeting entrepreneurs with concrete development plans, especially in innovative sectors with high added value.

⁸ Ministry of Economic Development = Ministero dello Sviluppo Economico

⁹ Ministry of Education, University and Research = Ministero dell'istruzione, università e ricerca =

Year	Output rank	Input rank
2021	25	33
2020	24	33
2019	29	30
2018	32	29
2017	29	29
2016	31	28
2015	32	29
2014	33	32

Table 4: Italy ranking 2014-2021

Source: Global Innovation Index

Europe's overall (public and private) R&D on GDP ratio currently stands below 2 %, significantly lower than the ratios in the US, Japan, South Korea and Singapore (Veugelers, R., at.al, 2015). As shown in the graph below, the Italian rate during the period 2000-2020 remains at lower levels than the total OECD countries and also European ones in particular.

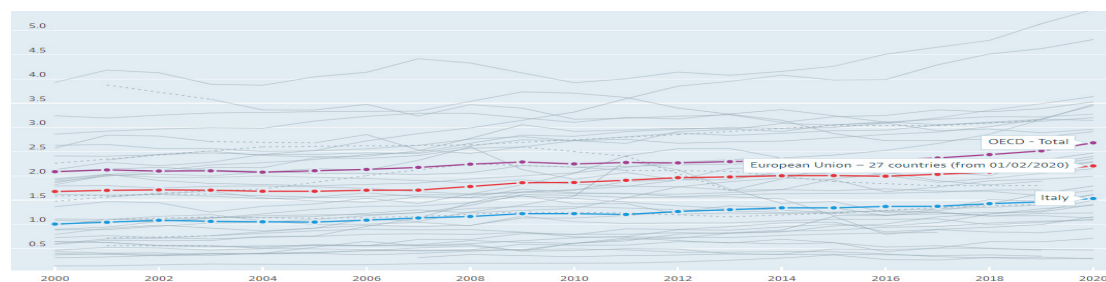


Chart 3: Gross domestic spending on R&D Total, % of GDP, 2000 – 2020

Source: Main Science and Technology Indicators

The Italian National Research Program according to Nascia & Pianta (2018) offers weak opportunities for undertaking public activities in research and innovation. Therefore, policies in recent years have been focused on the incentives of indirect taxes for a series of activities, such as R&D, human capital patents, investments in machinery and technology etc. The approach of these industrial and innovative policies is “horizontal”. This means that it is assumed that markets and firms are effective and efficient in making decisions for R&D, for innovative projects and for the direction in which technological change goes. Governments should not distort this direction by conducting selective measures.

Since 2008, the Italian government has undertaken support initiatives for innovation. In recent years, Italian government policies have made innovation a priority. As a broad initiative we can mention the national strategy ‘Industry 4.0’ - launched in 2016, later

renamed 'Impresa 4.0' in 2017 and then 'Transition 4.0' in 2020 - which introduced a series of incentives to encourage private investment in innovation and digitalization. "Nuova Sabatini"¹⁰ and "Nuovi Macchinari" are just some of the modernization policies of the industry, from which many Italian SMEs have benefited. According to Istat, 71 % of Italian SMEs with more than 10 employees claim that their main competitive advantage is the quality which makes them competitive in international markets. The "Made in Italy" strategy, "Pact for Export"¹¹ and many other initiatives have been taken in order to promote Italian exports. Italy has a performance above the EU average of the share of SMEs innovating in-house. According to the European Innovation Scoreboard, intellectual assets also have high performance, which are facilitated by funds for the registration of patents and industrial designs such as Brevetti+, Patent Box, etc which have been set up on purpose to boost investments in intangible assets. Other support measures for innovation have included the use of certified incubators and capacity-building projects in public technology transfer centers. Eight highly specialized national centers of public-private competence and 18 centers of digital innovation were established in line with the European initiative "ICT Innovation for Manufacturing SMEs". The centers of competence include more than 450 participants such as research centers, universities and industrial companies. The first two competence centers were START 4.0 and Made in Italy 4.0 which start their activity in April 2019.

Below is presented a brief description with key data for some of the national measures focused on research and innovation in Italy.

National Innovation Fund: Serving as a fund of funds, supports start-ups, scale-ups and innovative SMEs in high-tech sectors with a budget of € 1 billion.

The National Research Program 2015-2020 (NRP): Was developed by MIUR and approved in May 2015. This program includes funding sources from MIUR and EU programs, including the PON Research and Innovation funds coming from Europe's Regional Development Fund and the European Social Fund, and from Europe's Structural Fund, and €500 million from the FSC (Fondo Sviluppo e Coesione). The main fields of action of the NRP include human capital (€1.02 billion); public private partnerships (€487 million); territorial inequalities (€436 million); research infrastructures (€343 million); internationalization (€107 million).

¹⁰ Is the aggravation available for SMEs by the Minister of Economic Development with the object of facilitating access to credit and increasing the competence of the productive system in order to invest in acquiring equipment, machinery, equipment, tools, hardware, as well as digital software and technology. The financing granted to SMEs has an amount between 20 thousand to 2 million Euros and can cover up to 100% of the investments (DL 69/2013 'New Sabatini Law').

¹¹ Is an innovative strategy for relaunching "Brand Italy" exports in the wake of the health emergency, by strengthening the business internationalization tools and through far reaching promotional actions. It was proposed by Minister Di Maio in the Steering Committee for Internationalization in December 2019.

Call for projects in Smart Factory and Agri-Food sectors: A mix of non-repayable grants and medium-long term loans range from € 800.000 to € 5 million per project - covering 80% of eligible costs. The total budget is € 167 million.

National Fund for Artificial Intelligence, Blockchain and IoT: Finances R&D, innovation and technology transfer projects in emerging technologies and vertical applications in deep-tech. A working group of experts was also set up to help the Ministry of Economic Development create a national strategy for the uptake of artificial intelligence and blockchain technology in the country.

Fund for the European Common Interest Project on Microelectronics (IPCEI): provides grants for integrated R&D and innovation projects focused on microelectronics. The project has focus to involve large industries in cooperation with research centers and SMEs.

Exemption of social contributions for the recruitment of young talents: exempts businesses from paying social contributions if they hire unemployed young people (aged 16-29) participating in the Youth Guarantee program or recent PhD graduates under 35.

R&D tax credit: Until 2015, 4 tax credit measures were introduced (in 2007, 2011, 2013, 2015). The Stability Law of 2017 amended the tax credit scheme, allowing a tax credit of 50% for R&D expenses, exceeding the average of expenses 2012-2014 (previously the rate of tax credit for internal R&D was 25%). The maximum amount that companies can receive as tax credit increases from € 5 million to € 20 million. According to data from Istat in 2015 there were 7993 private businesses that benefited from tax credits for about € 590 million; similar to other indicators presented in this paper for regional distribution in Italy, three fourths of recipients of tax credits are located in Northern regions.

Loan guarantees for SMEs. In order to help SMEs in accessing the financial markets, the loan guarantee system is widely used (Fondo Nazionale di Garanzia), created after the credit crisis of the 2008 global crisis. In the period 2008-2014, the fund made available € 32 billion of collateral, causing about € 56 billion of new investments, mainly from firms located in the northern regions.

Patent Box: Regulated by the 2015 Stability Law, this is a specific tax benefit for firms' profits arising from patents, trademarks, licenses and software. A deduction from the tax base of the firm is provided for 30% of the income from patents, trademarks, licenses and software in 2015, 40% in 2016 and 50% in 2017. Their objective is to stimulate the production of patents and Intellectual Property Rights, but no empirical evidence on such an impact is available internationally. Even for Italy, the public benefits of the "Patent Box" in terms of additional effect have not yet been proven.

Support from national institutions has a significant negative variation compared to the EU in most indicators. In the graph below, we can see that the Italian national initiatives mentioned above need a lot of improvement in order to be an efficient resource for Italian SMEs in particular and to be able to approach EU levels.

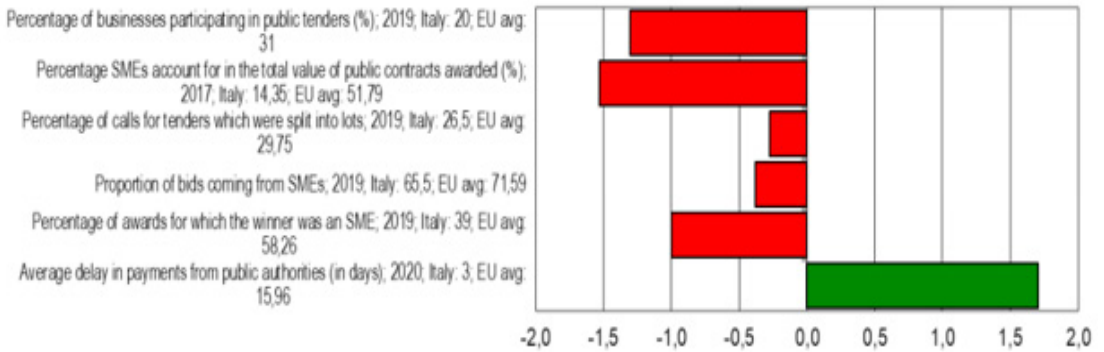


Chart 4: State aid and public procurement, variation from EU average

Source: SME Performance Review 2021, Italy 2021, EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)

Italian SMEs by 5 geographical areas.

The economic and social development of Italy is characterized by starker regional disparities between the North and the South. Regarding SMEs, referring to MET survey 2013, most SMEs are concentrated in the North with about 55.6%, compared to 22.8% that are located in the South. Also, in terms of regional SMEs distribution and employment, the North-South ratio is more visible with 60 % of employees concentrated in the North, while in the South only about 17.3%. SMEs in the North have an average of 6 employees, while those in the South have 4 employees. The central region has an intermediate position, since the share of SMEs is closer to the North East (21.6% versus 23.4%), the share of employment is closer to the South (19% versus 17.3%). Thus, we understand that the Center hosts lots of SMEs whose average size is very small. This is explained by the characteristics of production in these regions, which is typical handcraft bound to historical traditions.

The disparities are even more visible in the field of research and innovation. Some of the indicators that demonstrate this are as follows:

- *R&D expenditure on regional GDP*: 1.4% in the North, 0.9% in the South
- *Patents at the European Patent Office per million inhabitants*: 106.8 in the North and 10.1 in the South.
- *The share of employees in high tech industries*: 3.7% in the North, 2% in the South.

- *SMEs undertaking R&D investments*: North East has the highest percentage of with 9.1%, compared to the South with 5.8%.

Taking into consideration the data of 2012 and 2018, in the following table we notice very huge differences in expenditures on innovation in absolute value between the 5 regions, where we see that the North West region has nearly 11 billion Euros, while the South region has only nearly 1.5 Euro. Comparing the data for the period 2012-2018, we see that the three regions (North West, South and Islands) have almost the same level of growth with about 70-75%, while the other two regions have experienced greater growth with 99.5% and 114.3% for North East and Center respectively.

	Expenditure on innovation (in thousands of Euro) 2012	Expenditure on innovation (in thousands of Euro) 2018	Increase in % (2012-2018)
North West	10993883	18743456	70.50
North East	6347295	12665243	99.50
Centre	4899826	10498039	114.30
South	1496191	2641464	76.50
Islands	547164	962094	75.80

Table 5: Expenditures on innovation in absolute value for Enterprises with 10 or more employees, 2012-2018

Source: Statistiche Istat

In Italy, in its all 5 geographical areas as above defined, the process innovation dominates over product innovation with a visible difference as shown in the graph below which reflects the regional data for 2018.

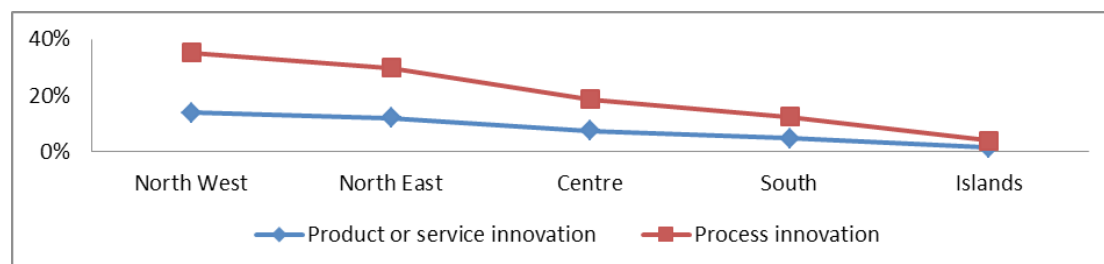


Chart 5: Regional Product or service innovation Vs. Process innovation for total service + industry for year 2018 (Oslo's manual 2018).

Source: Statistiche Istat

Regarding gender, the table below shows that the employees involved in innovative activities are mostly men in 60-70% of them in all regions of Italy. To analyze these data in depth, other evidences are useful regarding the level of education of men

and women in Italy, the level of discrimination according to gender in recruitment processes, the internal policies of Italian companies in the management of human resources etc. There are a number of studies undertaken in recent years which have highlighted the importance of the women factor in the innovative activities of SMEs, mainly in their contribution to management and direction. The results of the study by Madison et al., (2022) challenge the general perception that men are more innovative than women. They have discovered that the presence of women in SMEs in emerging markets has brought greater innovation results. The findings of the study of Owalla et al., (2021) suggest that, despite their limited numbers, female-led SMEs in the United Kingdom are proactively engaged in innovative activities.

Area	Male (%)	Female (%)
North West	70%	30%
North East	71%	29%
Centre	62%	38%
South	66%	34%
Islands	60%	40%
Total Italy	68%	32%

Table 6: Research and development employees, 2019

Source: Statistiche Istat

Italy in FP1-FP7, Horizon 2020 and Horizon Europe in relation to other EU member countries

In this part of the study, we present data for all the programs of the European Union dedicated to research and innovation. Here are included data from FP1, FP2, FP3, FP4, FP5, FP6, FP7, Horizon 2020 and Horizon Europe¹² for 27 EU member states. The aim is to identify the position that Italy has in relation to other member countries through the funds obtained from the EU for innovation.

Indicatore	Value	% of EU total
Net EU Contribution	13.19 billion Euro	8.44%
Singed Grands	30482	25.94%
No. participation organisations	58020	9.36%
Success Rate	14.18%	
Eligible Proposals	103094	23.08%
Applications	183706	10.66%
Experts (females)	5895	32.49%

Table 9: Italy in FP1-FP7, Horizon 2020 & Horizon Europe

Source: Author processing from <https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8acece77640154726/sheet/0c8af38b-b73c-4da2-ba4173ea34ab7ac4/state/analysis/select/Country/Italy>, accessed on July 2022.

¹² FP1-FP7 are the previous framework programs of the European Commission until 2013, Horizon 2020 included the period 2014-2020, ongoing Horizon Europe includes the period 2021-2027

In the figure below, there are 4 graphs that show the results of the 4 indicators of all EU programs for Innovation, such as Singed Grands, Net EU Contribution, Applications and Eligible Proposals for all member countries of the European Union. Data for Italy is visually identified with a red arrow. In brackets after the name of the country is a number indicating the ranking according to the Global Innovation Index 2021. For these 4 indicators, Italy has very similar data to Spain. Both of these countries have similar rankings in the 2021 World Innovation Index, respectively 29 for Italy and 30 for Spain. As can be seen, the member country that has absorbed more funds from the EU is Germany, followed by France. These two countries have high innovative performance, being ranked 10th and 11th in the world.



Figure 1: FP1-FP7, Horizon 2020 and Horizon Europe results, Italy and other EU member states

Source: Author processing from <https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8acece77640154726/sheet/0c8af38b-b73c-4da2-ba4173ea34ab7ac4/state/analysis/select/Country/Italy>, accessed on July 2022.

In the second figure below, there are 3 graphs that show the results of other 3 indicators of all EU programs for Innovation, such as Success Rate, Participations and Experts (female) for all member countries of the European Union. Interesting results are for the participation of female experts in EU programs, seeing the countries that lead this indicator such as Bulgaria, Croatia, and Romania with over 50% of female experts. These are three countries that became part of the EU later than the others (in 2007 Bulgaria and Romania and in 2013 Croatia).



Figure 2: FP1-FP7, Horizon 2020 and Horizon Europe results, Italy and other EU member states
 Source: Author processing from <https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8acece77640154726/sheet/0c8af38b-b73c-4da2-ba4173ea34ab7ac4/state/analysis/select/Country/Italy>, accessed on July 2022.

From the data in the two figures above, we note that there is no direct relationship between the ranking according to the World Innovation Index and the benefit from the EU funds for innovation. So, the most innovative countries are not the countries that have benefited the most funds from the EU. Here we mention Sweden, Holland, Finland and Denmark with low percentages in all indicators of the EU programs for innovation.

Italian SMEs in Horizon 2020

Horizon 2020 is one of the most important programs of the European strategy for Innovation, which replaces the previous framework programs of the European Commission. Its purpose is very similar to the previous programs. Its main goal is to improve the conditions and access to finance for research and innovation in Europe so that innovative ideas turn into products and services that create growth and jobs (Veugelers, R., et al., 2015). Other researchers such as Salmelin (2013), see it differently as a totally new type of research program for the EU that has been designed to deliver results that make a real difference to people’s lives. The study of Jesus-Silva & Ribeiro (2019) has measured the quantitative impact of Horizon 2020 for the Northern region

of Portugal, revealing that each 1 Euro of support granted by the EU has an impact on business investments by 2.05 Euros.

We accessed the Cordis database in April 2022 for the Horizon 2020 program, from which we obtained data only for Italian SMEs that have been participants in closed or ongoing projects. We excluded SMEs that had the role of coordinator, international partner, partner or third party. So, in total there are 1433 Horizon 2020 projects in which 604 Italian SMEs have participated.

As Frietsch et al. (2015) estimate in their study, if Horizon 2020 in the selection process would be based only on excellence and expected output and not on geographical distribution (which has practically characterized EU funding), this would serve to help less developed regions improve innovative capabilities in the long term. But in the short term, this may not bring a significant increase in the production of knowledge and new technologies necessary for regaining competition and increasing jobs in the long term. So, regionalization is a vicious circle from which even Horizon 2020 has not escaped. We think that improvements in this aspect can be made in the successor program Horizon Europe, which is expected to have even more impact and more openness through the strengthening of international cooperation, through a reinforced policy of Open Science and through a new political approach to the European partnership (Ravet, Julien, et al., 2019).

Referring to the data in the graph below, we notice that the distribution according to the 5 regions of SMEs and the net contribution of the EU is in similar proportions to all the indicators that we have reflected in the previous parts of this paper, reconfirming the dominant role of the North West era. The only change here is the position of the central region, which surpasses the North East region in percentage.

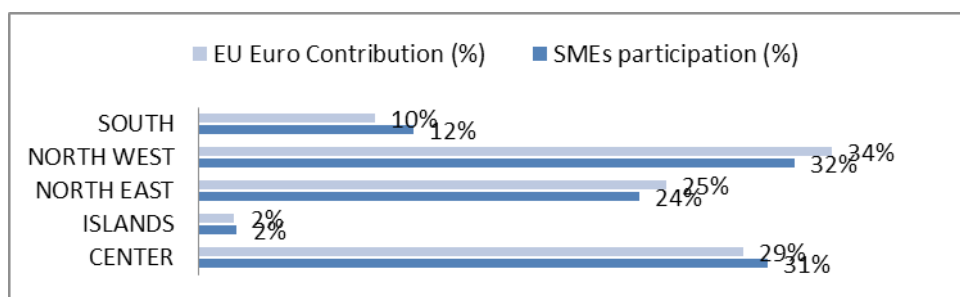


Chart 7: EU contribution & SMEs participation in Horizon 2020 for Italian SMEs by regions
Source: CORDIS database, accessed on April 2022.

The three main pillars of the Horizon 2020 program are Industrial Leadership, Excellent Science and Societal Challenges. In the chart below, we see that Italian SMEs are more engaged in innovative projects of a social nature that includes health issues, food, energy, transport, environment, security ext.

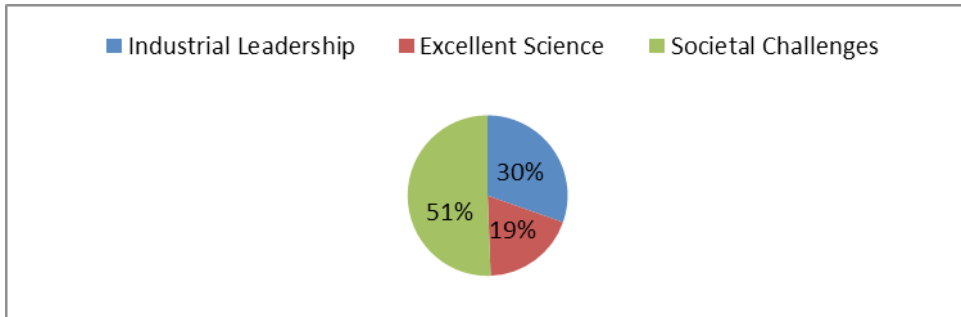


Chart 8: Italian SMEs Projects (%) - 3 Pillars of Horizon 2020
Source: CORDIS database, accessed on April 2022

In the following table, we have presented Italian SMEs and the number of projects they have benefited from funds for research and innovation. As could be expected, it is the Nord West region that has the most SMEs that have benefited from funding for a project, followed by the Nord East, Centre, South and Islands. In this region there is also the SME that has benefited from the maximum number of projects (35 in total), followed by the central region with an SME that has benefited from 26 projects. In the second part of the table, we have presented the activity carried out by SMEs that have benefited from the maximum number of projects for each area, and it turns out that these subjects have activity with a focus on scientific research in their field of expertise.

	No. of projects																Field of activity ¹¹ (Ateco)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	18	21	23		26	35
Centre	88	38	23	10	5	5	3	1	1	0	2	0	2	1	1	0	1	0	R&D in the field of other natural sciences and engineering
Islands	6	4	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Production of software not related to the edition
N. East	87	35	10	6	6	7	4	1	1	1	0	0	2	0	0	0	0	0	* R&D in the field of other natural sciences and engineering * Other business consultancy & other administrative-management consultancy & business planning
N.West	94	37	54	5	5	1	4	1	0	0	2	3	0	0	0	1	0	1	Integrated engineering design services
South	37	24	5	5	1	1	2	1	1	0	0	1	0	0	0	0	0	0	Other business support services

Table 10: No. of Italian SMEs and no. of projects that have benefited from Horizon 2020 by geographical areas

Source: Author processing from Cordis database, accessed on April 2022

¹³ Here we have presented the type of activity according to the Ateco Code for SMEs that has benefited the maximum number of projects from Horizon 2020 in each region. In the first part of the table, these are highlighted in blue.

The impact of R&D and Innovation activity for Italian SMEs and the Italian market

To understand the real impact of R&D and Innovation activity of Italian SMEs, the results expressed in % of the Community Innovation Survey of 2018 helped us, from which we have selected the indicators presented in the 5 graphs below. This survey includes data for small and medium enterprises, and not for micro-ones (0-9 employees). We have also decided to present data for large enterprises, which serve as a means of comparison for the other two groups.

Business process innovation



Chart 9: Business process innovation

Source: Author processing from the CIS 2018 available at https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database?node_code=inn

As it seems, Italian SMEs are more engaged in introducing new methods of organizing work responsibility, decision making or human resource management than in other fields during the year 2018.

Business product innovation

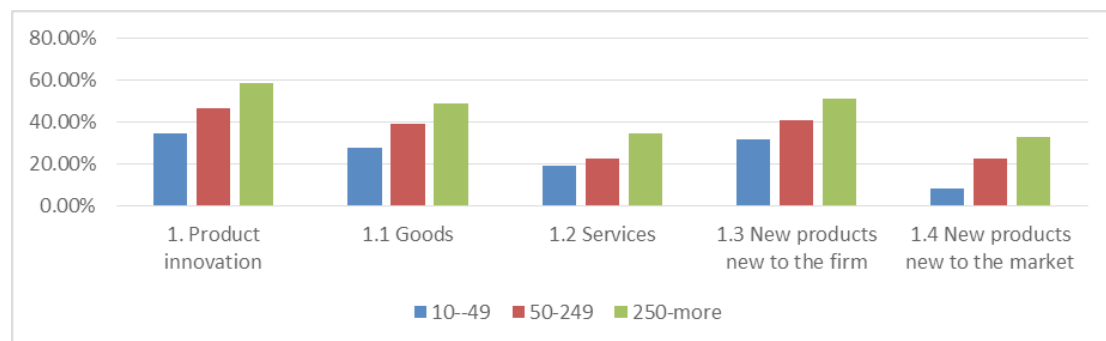


Chart 10: Business product innovation

Source: Author processing from the CIS 2018 available at https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database?node_code=inn

SMEs are more engaged in the launch of new goods than in new services, but large enterprises have also acted in the same line. The very small contribution of small SMEs (10-49 employees) in the creation of new products for the market is expected, due to limited financial and human resources to undertake the highest level of innovation.

If we compare the data of this chart with those of the business process innovation chart, we notice that Italian SMEs are involved in more innovative activities related to processes than to products. Regardless of the level of involvement in the type of innovation, referred to Acs, Zoltan J., and David B. Audretsch (1990) for SMEs, process innovations offer less added value than product innovations.

Turnover of enterprises from new products

According to the study of Gherghina et al., (2020) carried out for Romanian enterprises using statistics series over the period 2009–2017, in the case of innovation-oriented expenditures, results show a positive impact on turnover for all enterprises and big companies, but for SMEs it was found that such an association did not exist.

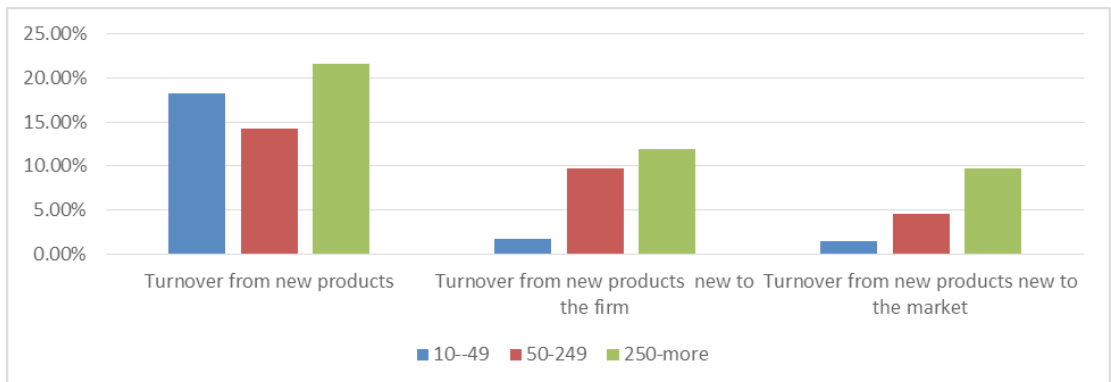


Chart 11: Turnover of enterprises from new products

Source: Author processing from the CIS 2018 available at https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database?node_code=inn

Sources of public funding for R&D or other innovation activities

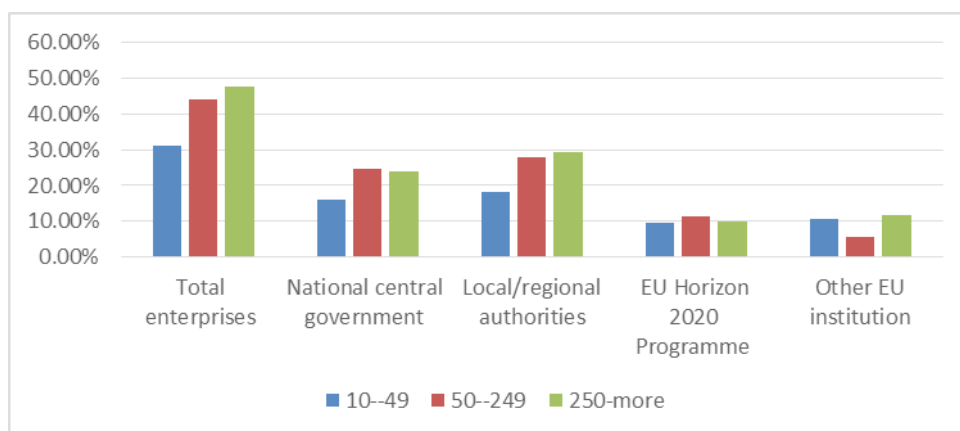


Chart 12: Sources of public funding for R&D or other innovation activities

Source: Author processing from the CIS 2018 available at https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database?node_code=inn

This graph directly serves the purpose of our study. The data show that the access that Italian companies have for financing innovation activities in external public sources is relatively low, where for all three groups of companies, the figures do not exceed 50%. As a result of the way of governance through the regions¹⁴, the biggest source of funding is the regional authorities. Regulated by legislative decree no. 112 of 31 March 1998, implementing the law 59/97, with which the functions are effectively delegated to the regions inherent in the granting of concessions, contributions, incentives and benefits of any kind of industry, including interventions for small businesses; the effects are visible even nowadays. Further empirical studies are needed for the absorptive abilities of Italian SMEs of the funds offered by the EU for innovation promotion programs. The policies, practices and procedures of the EU institutions that offer these funds should also be analyzed, if they are easily accessible by Italian SMEs.

During 2018, the Horizon 2020 program financed more medium SMEs than small SMEs and large enterprises, while the opposite happened with other EU support institutions, financing these last two more than small SMEs. Aiello et al. (2019) show that for SMEs in the Italian manufacturing industries the effect of public support on firm R&D investments is stronger for micro and small firms than for medium-sized firms (measured both as amount and as a share of sales). This partially supports the argument that subsidies are most effective when the beneficiaries face greater financial constraints in financing innovation activity privately.

¹⁴ Each region is a territorial body with its own statutes, powers and functions according to the principles established by the Constitution, as established by art. 114, second paragraph of the text (Wikipedia)

Other Innovation outputs

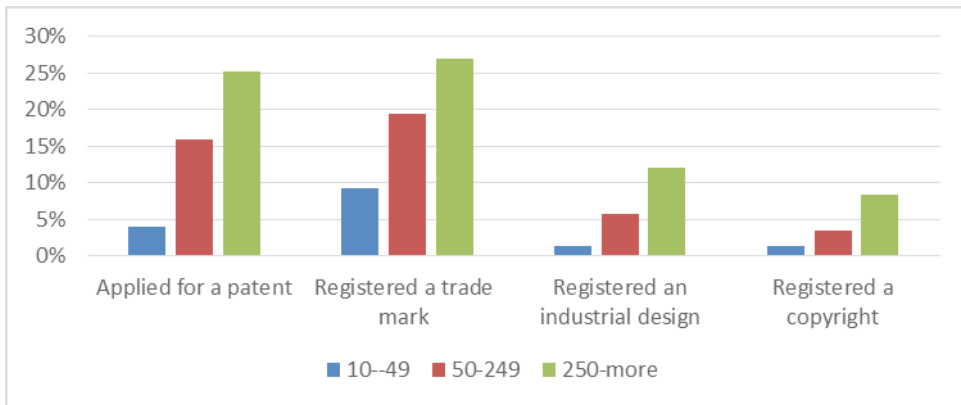


Chart 13: Other Innovation outputs

Source: Author processing from the CIS 2018 available at https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database?node_code=inn

The graph above reflects the enterprises that have reported except new products, other final outputs by their innovative activity (such as patent, trade mark, industrial design and copyright), which serve firms to identify and preserve their innovative achievements.

In the study of Vermeulen et al., (2003) it was found that the size of the firms has a conditional impact on innovation. They found a significant effect on the innovative output that comes as a result of the interaction between the size of the firm and the innovative result. According to them, the largest SMEs will benefit more from investing in their development processes in which innovative inputs are transformed into outputs. This is also reflected in the data of Italian enterprises in 2018 regarding the outputs, where it can be seen that with the increase in the size of the enterprises, the amount of innovative output also increases.

Conclusions

In summary, the Italian SME scenario is distinguished by the following characteristics:

- The weight of micro enterprises is substantially higher than the European average, which employs about 50% of the active workforce compared to only less than one third in Europe.
- Industry in the strict sense remains the sector with the greatest propensity for innovation.

-
- Family businesses represent one of the most widespread forms of entrepreneurial institution in the Italian scenario.
 - The main advantage of Italian SMEs with more than 10 employees is the quality which makes them competitive in international markets. The “Made in Italy” strategy, has influenced the success of Italian SMEs with extra EU exports of goods significantly exceeding the EU average.
 - In Italy, in all 5 geographical areas and referring to all sizes of enterprises, the process innovation dominates over product innovation.
 - Regional disparities (North versus South) in the economic development of Italy, are reflected by variations also in the field of R&D and innovation of SMEs. SMEs located in the northern areas have more access to participation in the innovative projects of the EU programs, to innovative national projects and consequently the output they offer for the Italian economy and society is larger in quantity, as well as more qualitative and avant-garde than in other geographical areas.
 - In the post-crisis period, Italian firms had to rely mainly on their own sources of financing, because bank credits were on short supply and other financial intermediaries were hardly present in Italy.
 - The Italian innovative activity is not inconsistent but is linked to traditional sectors and little inclined to invest in R&D.
 - The employees involved in innovative activities are mostly men in 60-70% of them in all regions of Italy.
 - Based on the above characteristics, we have drawn the following conclusions from the analysis of the data provided by the Italian reality.
 - For the period 2012-2018, we see the greatest increase in the expenses for human resources involved in innovative activities by Italian enterprises, regardless of their size. This constitutes the effort of the Italian business to contribute to the national growth of the level of innovative development. But the Italian national rate of R&D expenditure to GDP at the average level of about 1% for the 20-year period 2000-2020, does not make us very optimistic to think that Italy, even for a relatively long period, can become competitive with the top innovative European countries with actual rate over 1.5% up to 2%. On a regional basis, for the period 2012-2018, the central region has the largest increase in expenditure on innovation with 114.3%. This shows the potential of this part of Italy, which is making efforts to get closer to the North.
 - The “horizontal” nature of the Italian national innovation policy, is based on the benefits expected from the continuous liberalization of the market, in the creation of conditions such as education and infrastructure and the establishment of rules in line with the actions of the European Commission for new activities. But, even at the European level, the effectiveness of “horizontal” policies is being

discussed more and more (Nascia & Pianta, 2018). The actual evidences of the Italian market for state aid and public procurement, create the necessity to require a greater presence of national institutions in the coordination of innovative activity, especially in the support of SMEs in order to orient them more effectively to new horizons in the internal and external markets.

- Italy is positioned after Germany and France in terms of the countries that have benefited the most from funds of all European programs dedicated to innovation (FP1-FP7, Horizon 2020 and Horizon Europe) and has very close data with Spain for signed grants, net EU contribution, applications, eligible proposals and participants. The Union has an irregular distribution of these funds among the member countries, where not necessarily the top innovators (Sweden, Holland, Finland and Denmark) are the biggest beneficiaries. It turns out that the funds have been absorbed more by the most industrialized countries such as Germany, France, Italy and Spain.
- Although the policy of Horizon 2020 emphasizes that the European system of science and research has as selection criteria for competitive calls only according to quality and capability and without taking into account the geographical distribution (Frietsch, R., et al., 2015), in the case of Italy the regional factor is very decisive, reconfirming the dominant role of the North West area and the surprising evidence that the central region surpasses the North East region in percentage.
- Although according to Kalisz & Aluchna (2012), most of the European companies consider Horizon 2020 as one of the most important funding programs of this century, referring to the data for Italy, we see that the EU is far from being the main source of financing for Italian SMEs.

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