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INNOVATION AND DIGITALIZATION AS GROWTH LEVERS: A STUDY OF ITALIAN INDUSTRIES

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1. Introduction

Although Italy is seen as a moderately innovative country internationally, something is changing. Italian companies have increased their willingness to invest in technological innovation and digitalization. In addition, companies have declared their intention to focus on launching new products and a new approach to processes that reflect the technological innovations of recent years. For about half of the Italian companies, investments in research and product innovation, focusing on sustainability, are the priorities.

Innovation has always been essential to success in the Italian business industry. Companies' survival, growth, and wealth depend on their ability to adapt to ongoing changes and adopt new techniques and methods.[1]

This study aims to investigate the intricate dynamics of innovation in Italian industries and to elucidate the complex interplay between various internal and external aspects within an organization's operating environment that can either facilitate or hinder innovation capacities and their resulting outcomes.

The work is based on the assumption that innovation is a complicated process influenced by several determinants, including market conditions, regulatory framework, organizational culture, and leadership. It focuses on finding ideas on how companies can better navigate the landscape of innovation and digitalization, taking advantage of their strengths and addressing the challenges to improve their capability to innovate and achieve better results by analyzing these dynamics within Italian industries. This thesis explores the intricate dynamics involved in innovation among Italian companies.

It also aims to examine various factors in the organization’s operating environment that are crucial in developing or hampering innovation capabilities and related outcomes. The undertaking thus springs from an understanding that unlike popularly conceived notions of monolithic

[1] CRIBIS. (2024). Imprese italiane: innovare stimola la crescita e la puntualità di pagamento.

factors that only range from organizational cultures, leaderships, market structures, regulatory frameworks, etc., innovation is a complex process characterized by multiple elements. In this regard, studying Italian companies' context of operation, therefore, hopes to bring insights into how companies can enhance their innovative skills about their current strong points and the challenges they face.

This research will, therefore, have the priority and the aim of satisfactorily answering the following research question:

"To what extent did the innovation factors between 2018 and 2020 and digitalization variables in 2023 influence Italian industries' economic and operational performance, and how much will these factors determine future performance across industries?"

2. Background

Economic development and innovation [2]

Economists have always wondered what factors drive economic development in the long run. For a long time, the accumulation of physical capital was considered the main lever for development: more halls, lathes, and hammers. Later, the focus shifted to technological progress and productivity: The invention of the electric motor and the electrification of factories over a century ago, as well as the invention of distributed computing and the digitalization of production, increased workers' productivity. The question today is what, in turn, determines technical progress and productivity growth. The answer is the ability of a company, an economy, or a society to continuously 'learn': dynamism, internal inventiveness, and the desire to take on intellectual and entrepreneurial challenges.[3]

The community wants companies, the 'good' ones, to be guided by competent managers and supported by political action in all their vital phases: they think they are born, they grow, and even when they exit the market, they have exhausted their vital momentum. What is the definition of a 'good' company? It means a company that can continuously explore and develop new products and methods to conquer new markets. Such a company is very difficult and must remain small. Italy has the most comprehensive productivity gap between small and medium-sized companies among the major European countries. Companies may start

[2] This paragraph develops considerations contained in Rossi, S. (2014), A finance for development, Conference at the Banca Popolare di Sondrio.

[3] Schumpeter, J. A. (1934); Solow (1956,1957). There followed numerous theoretical and empirical refinements of Solow's model, as in Romer (1990), Grossman and Helpman (1991), Aghion and Howitt (1992).

small but then grow or die quickly. In Italy, they almost always remain small unless they go bankrupt or grow quickly. [4]

The history of innovation in Italian companies

Innovation in the Giolitti era was mainly supported by foreign direct investment in Italy, imports of foreign-made machinery, and licensing agreements with foreign companies.[5]

Italy relied on foreign innovation, particularly in the most advanced industries.[6] The German and US chemical and electro-technical industries were the leaders in terms of scientific research and industrial exploitation; Italian companies were caught in a vicious cycle of inferior technology, inferior quality, and inferior demand.

In the inter-war period, the import of technology continued in the textile and steel industries, while the first significant investments in autonomous, innovative activities began in the chemical and metal-mechanical sectors.[7] Systematic research activities and the creation of laboratories began in the 1930s, albeit on a limited scale, in the major companies of the chemical and rubber industry.

After the Second World War, the Marshall Plan enabled Italian companies to obtain large sums of money, which were largely used to buy American machinery. The Italian economy began to recover.

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[4] Fondazione Luigi Einaudi onlus, speech by Salvatore Rossi, Turin, Palazzo d'Azeglio, 15 October 2014.Italian. Speech by the Director General of the Bank of Italy, Salvatore Rossi." Turin, Palazzo d'Azeglio, 15 October 2014.

[5] Barbiellini Amidei, Cantwell, Spadavecchia (2013). For a more general examination of the successes and difficulties of the Giolittian age, see Ciocca (2007).

[6] Hertner (1984), Federico (1996).

[7] Federico, Toninelli (2006); Giannetti (1999).

Growth accounting exercises show that Italian progress was mainly due to the shift of millions of workers from agriculture to industry and, above all, to innovation and higher levels of business efficiency.

International technology transfer and the ability of the Italian industry to transfer technological knowledge by imitating, redesigning, and adapting the best experiences of others, particularly in the machinery industry, remained crucial.[8]

The Oslo Manual

Addressing contemporary and emerging economic, social, and environmental challenges requires new perspectives, innovative methods, and a greater degree of cooperation between nations. Digitalization and innovation are becoming increasingly crucial in almost every sector and in the daily lives of citizens worldwide. Therefore, political leaders place the innovation imperative at the center of their political agendas.

However, policy design, development and implementation are fraught with obstacles, and are even more difficult when global cooperation is required. Innovation has often been seen as a notion 'too fuzzy' to be evaluated and taken into account.

The OECD Frascati Manual has made it possible to measure an important dimension of science, technology, and innovation. As a result, today, research and development (R&D) investments are promoted and monitored worldwide. However, today's policy still focuses heavily on what is easiest to measure. Therefore, it is crucial to understand how ideas are created and how they can be transformed into tools that change organizations, local markets, nations, the world economy, and the very fabric of society.

[8] Antonelli, Barbiellini Amidei (2007, 2011).

In 1991, the first agreement was reached in Oslo between the global community of practitioners in the OECD Working Group of national experts on scientific and technological indicators to conceptualize and measure business innovation. With the support of the European Union, these guidelines were published and tested as the Oslo Manual. The rapid adoption and dissemination of the Handbook's proposals within and outside the OECD and the EU show the breadth of this initiative; indeed, research on innovation has so far been conducted in more than 80 countries.

The handbook is a truly international resource that benefits from contributions from UNESCO, the World Bank, and numerous regional development banks, like the OECD, which are strongly committed to developing a knowledge base to support investment in innovation and promote economic and social development. The 2018 edition is relevant to economies worldwide, regardless of their level of economic development, and supports the assessment of the Sustainable Development Goals (SDGs).

The Oslo Manual provides for the first time a shared framework for measuring innovation more inclusively in companies, households, government, non-profit organizations, and across the economy.[9]

The concept of product and process innovation

The concept of innovation has different meanings depending on the context in which it applies. Focusing on product and process innovation, with a central role within this research, the two definitions given respectively by the Harvard Business School and Eurostat (Directorate General of the European Commission that collects and processes data from the EU Member States for statistical purposes, promoting the process of harmonization of statistical methodology between the states) are taken.

[9] IBS Consulting. "Manuale Oslo." (2020)

Product innovation is the process of creating a new product or improving an existing one to meet customer needs in a new way. There are three main types of innovation: enduring innovation, low-end innovation, and new market disruption.[10]

Process innovation, on the other hand, refers to the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment, and software.

Process innovations may be aimed at reducing unit costs of production or delivery, increasing quality, or producing or delivering new or significantly improved products.[11]

Innovation Selection and Evaluation Strategies

Looking at history, three elements must be taken into account to help prioritize innovation that leads to success. These three elements concern the who, the what, and the how.

It is necessary to start by looking at the customer's need (who), to propose a viable solution that solves a possible problem (what). Then, you have to think about how the solution will create value for the customer (how).

After setting priorities to achieve product or process innovation and solve a significant problem, it is crucial to be able to measure it. One of the most popular ways to measure it is to look at the net growth of new products, called the 'green box.'

The 'green box' refers to the way in which an innovation must deliver revenue or profit growth within a given period of time. This idea can help define aspirations and influence the decisions that are made in the innovation process.

Many people think that innovation is only about creativity and idea generation, but in reality, innovation is also about how resources are distributed. To put it another way, it is one thing to think of innovation as

[10] Harvard Business School Online. "Product Innovation" (2024)
[11] European Union. "Glossary: Process innovation." Eurostat Statistics (2024)

a catalyst for growth; it is another to act on innovation by redirecting people, resources, and management's attention to the organization's best ideas.

Regarding the effectiveness of an organization's R&D expenditure, two simple metrics can provide surprising information beyond the green box concept. Both are suitable for benchmarking because they can be assessed by outsiders and provide information on a company's entire innovation portfolio. The following are the two R&D to product conversion metrics: R&D to Product Conversion, which can show the extent to which R&D funds translate into new product sales and could demonstrate that higher expenditure does not necessarily mean better performance, and New Product Conversion Margin, that takes into account the ratio of new product sales to gross margin percentage.

It can illustrate how sales of new products contribute to raising margins.

While no metric is perfect, these can provide insight into the returns to innovation and the value it produces. These returns are often more important than measures of internal activity, such as the number of patents obtained.[12]

The concept of Digitalization

To define the concept of the other focus of this research, it is important to refer to the attributions given by Gartner (a multinational strategy consulting company). Gartner's glossary states, "Digitalization is the use of digital to change a business model and provide new revenue and value generation opportunities." "It is the process of moving to a digital business."[13]

Therefore, Gartner's definition differs from the scholars' definition because it focuses on changing business models rather than social interactions.

[12] McKinsey & Company. "What is Innovation?" (2022)
[13] Gartner. "Glossary: Digitalization."

But Gartner's definition poses another problem: What does 'digital business' mean? The glossary developed by Gartner states, ' The creation of new business models through the fusion of the digital and physical worlds is known as digital business. '[14]
Unfortunately, this most recent definition is completely inaccurate. How is the digital world defined? What is the meaning of 'blurring' worlds? So what is 'business design'?

To try and clarify this somewhat vague concept, let us refer to a recent report by the Brookings Institute, which cites a much more articulate definition given by Gartner later than the glossary definition seen above. "Digitalization is the process of using digital technologies and information to transform business operations."
This definition states that digitalization is primarily about business operations rather than social interactions or business models. However, these two concepts are undoubtedly related.
According to the Brookings report, digitalization has a significant impact on people. The report states that "Digitalization is changing the world of work." Individual, industrial, and regional success depends on acquiring digital skills.[15]

Sectors and Sizes: An Overview of Italian Companies

It is fair to have a clear overview of Italian sectors and companies before proceeding with the literature review and empirical analysis of this research. In Italy, a classification called ATECO (Economic Activity) is used to categorize companies and economic activities. It follows the basis of the EU's NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) classification, which in turn is based on the global NAICS (North American Industry Classification System). The ATECO classification is updated periodically, and the last time this was

[14] Bloomberg, Jason. "Digitization, Digitalization, and Digital Transformation: Confuse Them at Your Peril." Forbes (2018)
[23] Muro, Mark, Sifan Liu, Jacob Whiton, and Siddharth Kulkarni. "Digitalization and the American Workforce." Brookings (2017)

done was in 2022. Each ATECO code is associated with categories of economic activities, is organized into sections, and is further divided into groups.

According to the most recent ISTAT data, most Italian companies have fewer than 250 employees. About 76.5% of people work in SMEs, including micro companies, and they provide almost 65% of the value added at factor cost (64.4%).[16] In Confindustria, the majority of member companies are micro-, small-, and medium-sized companies. However, their average size is larger than the national average, as there are fewer micro, small, and medium-sized companies than the national average.

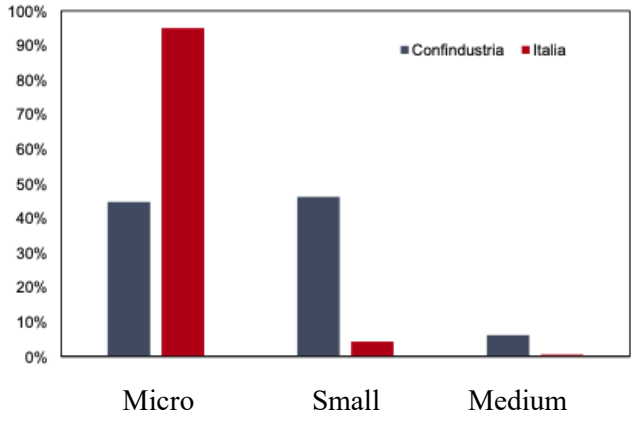
The number of companies increased slightly from 2012 to 2021; as far as SMEs are concerned, the performance of medium-sized companies (which increased by 13.5% since 2012) and small companies (which increased by 5.0 since 2012) was the best. This contrasts with the general increase in the number of companies of 2%. Only medium-sized companies are ahead when considering production alone.

Alternatively, the trend in turnover and product value added is favorable: Both small and medium-sized companies have shown improved performance, even improving more than large companies. Italy trails only France in terms of the number of companies in Europe; when considering only companies with at least ten employees, i.e., micro companies, Italy is second to Germany, even though Germany has a much lower percentage of SMEs than Italy.

This is in line with company employees: Italy has an average of 3.9 employees per company, in contrast to the EU27 of 5.1 and Germany of 12.1.[17]

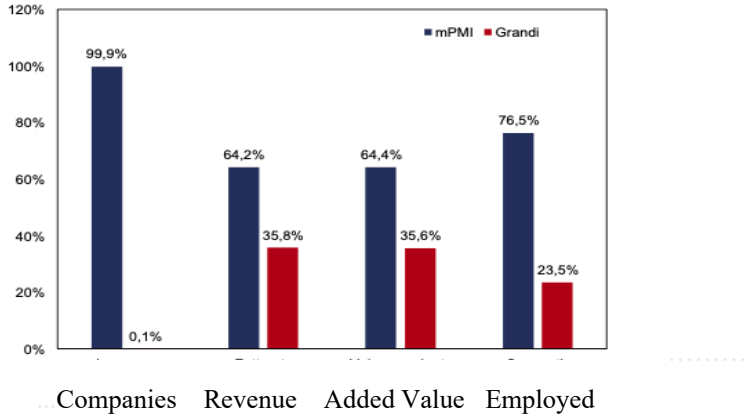
[16] ISTAT. "14 IMPRESE" (2023)
[17] ANIE. (2023). *Dati PMI Forum Piccola Industria 2023*

Figure 1. SME distribution in Italy and Confindustria (data 2021 for Italy, 2023 for Confindustria)



Source: Piccola Industria Confindustria elaboration on Istat data

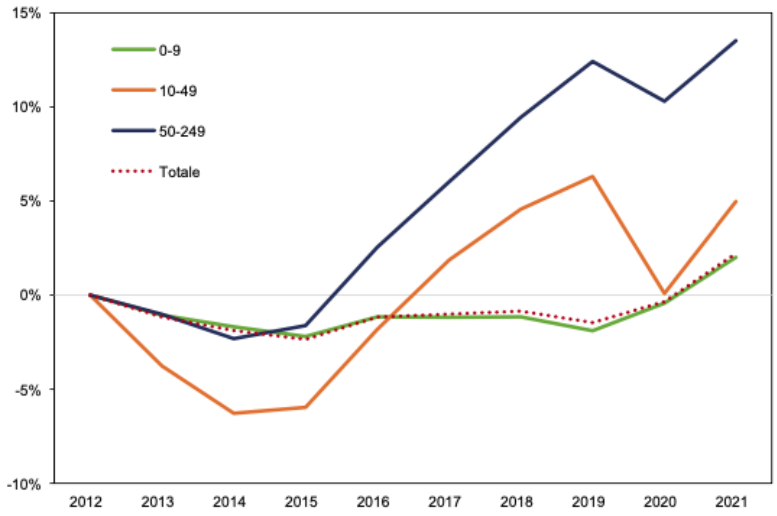
Figure 2. Percentage share of number, turnover, value Italian companies by size added and employed Italian companies by size (2020, % of total) (2021, % of total)



Source: Piccola Industria Confindustria elaboration on Istat data

Looking at the trend over time and taking 2012 as a base, medium-sized companies quickly recovered after a general downturn and continued their growth path, only partially interrupted by the pandemic. All company sizes see an improvement in 2021.

Figure 3. Percentage change in the number of companies by size (2012=100, total companies, also artisan)



Source: Piccola Industria Confindustria elaboration on Istat data

3. Literature Review

Evolving Dynamics of Industry-specific Innovation

In the current context, understanding the relevant factors related to innovation and digitalization has proven crucial to understanding the performance of different industries and sectors.

This review aims to critically examine the existing literature, highlighting the main previous findings related to this research.

Although there has been and still is a great deal of recognition regarding the study of innovation and business growth, it remains a topic that creates complex challenges. Certainly, innovation-related indicators provide a fundamental tool for analyzing impacts.

The leading innovation indicators used, broken down by macro sector and class of employees from 2012 to 2018, are as follows:

Figure 4. MAIN INDICATORS OF INNOVATION IN COMPANIES BY MACRO-SECTOR

Years 2012-2014, percentage values (unless otherwise indicated)

Macro-sectors / Class of Employees / Territorial Distributions	Companies with innovative activities*	Companies that have introduced at least one product-process innovation**	Expenditure on innovation per employee (thousands of euros) - Year 2014	Innovative companies that cooperate with external entities***
Industry	50.5%	40.4%	8.0	17.9%
Construction	30.5%	17.7%	2.8	23.1%
Services	42.2%	26.5%	4.3	22.5%
10-49 employees	41.3%	28.7%	6.6	17.0%
50-249 employees	64.9%	51.9%	6.5	27.7%
250 employees and more	83.3%	72.0%	5.9	41.3%

Footnotes: (*) Percentage of total companies (**) Refers to companies that have carried out innovative activities in product-process (***) Percentage of total companies with product-process innovative activities

Source: Istat (2016). "L'innovazione nelle imprese: Anni 2012-2014"

Figure 5. MAIN INDICATORS OF INNOVATION IN COMPANIES BY MACRO-SECTOR AND CLASS OF EMPLOYEES

Years 2014-2016, percentage values (unless otherwise indicated)

Macro-sectors / Class of Employees	Companies with innovative activities*	Companies that have introduced at least one product-process innovation**	Expenditure on innovation per employee (thousands of euros) - Year 2016	Innovative companies that cooperate with external entities***
Industry	57.1%	49.5%	9.6	13.2%
Construction	30.8%	19.5%	4.9	9.0%
Services	44.8%	31.1%	6.0	15.1%
10-49 employees	45.6%	35.0%	8.9	11.6%
50-249 employees	68.3%	57.6%	7.1	18.3%
250 employees and more	81.8%	74.9%	7.7	35.7%

Footnotes: (*) Percentage of total companies (**) Refers to companies that have carried out innovative activities in product-process (***) Percentage of total companies with product-process innovative activities

Source: Istat (2018). "L'innovazione nelle imprese: Anni 2014-2016"

Figure 6. MAIN INDICATORS OF INNOVATION IN COMPANIES BY MACRO-SECTOR AND CLASS OF EMPLOYEES

Years 2016-2018, percentage values of total companies (unless otherwise indicated)

Macro-sectors / Class of Employees	Companies with innovative activities*	Companies that have introduced product innovations**	Companies that have introduced new processes***	Innovative companies that cooperate with external entities****	Expenditure on innovation per employee (thousands of euros) - Year 2018
Industry	65.7%	58.7%	39.1%	55.9%	9.7
Construction	34.9%	29.3%	15.5%	28.1%	5.4
Services	51.1%	46.0%	27.3%	43.8%	8.5
10-49 employees	53.3%	47.3%	29.3%	45.0%	8.2
50-249 employees	71.4%	64.1%	42.5%	61.5%	8.3
250 employees and more	81.0%	76.3%	55.2%	73.5%	9.8

Footnotes: (*) Percentage of total companies (**) Refers to companies that have carried out innovative activities in product-process (***) Percentage of total companies with product-process innovative activities

Source: Istat (2020). "L'innovazione nelle imprese: Anni 2016-2018"

A clear picture of the trends and differences in the different sectors can be created by looking at the main indicators related to innovation over the three-time ranges.

First, the general increase in innovation across sectors and employee classes is evident. There is a general trend towards a greater commitment to innovation visible in the increase in the percentages of companies with innovative activities from 50.5% to 65.7% in industry, from 30.55% to 34.9% in construction, and from 42.2% to 51.1% in the service sector over the three-year periods 2012-2014 and 2016-2018.

Then, Spending on employee innovation increased from EUR 8.0 thousand in 2014 to EUR 9.7 thousand in 2018. This indicates an increasing commitment to research and development and potentially more costs associated with advanced technologies.

The percentage of innovative companies collaborating with entities outside the sector fluctuated significantly. The restricted sector declined from 17.9% to 13.2% between 2012 and 2014 before increasing to 55.9% in the next two years. The shifts could signify a change of innovation tactics that ranges from internal development to external collaboration.

The industrial sector steadily increased innovative activities and spent heavily on innovation, underlining its key role in technological advances.

The construction sector remained the least innovative in activity and investment despite gradual improvements (from 17.7% to 29.3% of product-process innovations between 2012-2014 and 2016-2018). This could be due to the sector's inherent difficulties.

Significantly, the influence of digital technologies today has resulted in a notable improvement in creative methods within the service sector. An increased proportion of businesses adopting at least one innovation in procedure or product was observed from 2012 to 2014 and reached 46.0% in 2016.

Big businesses (250 employees or more) showed better results in terms of external cooperation (from 41.3% to 73.5%) and creative activity participation (83.3% in 2012–2014 to 81.0% in 2016–2018).

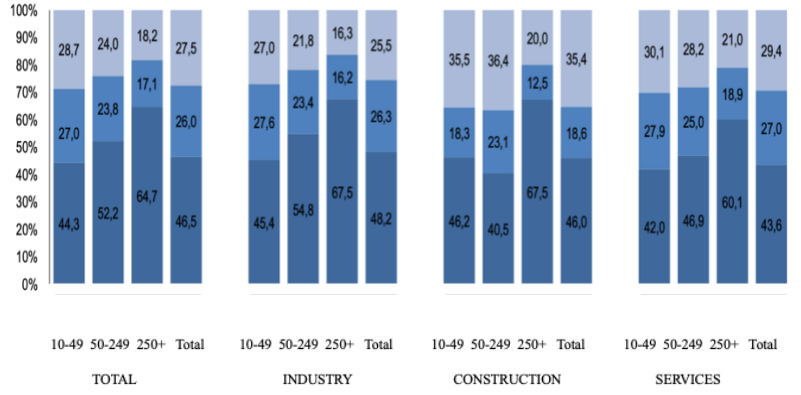
The smallest companies (10–49 employees) exhibited resilience because their creativity rose from 41.3% during the period of 2012-14 to a peak of up to 53.3% registered between years 2016-18 thus showing that they were more agile and resilient.

This means that small sizes can make major contributions towards innovation development.[18]

Product and Process Development Innovation Patterns

Investment in product and process innovations has largely influenced this company's growth. In the last three six-year periods, from 2012-2014, 2014-2016, and 2016-2018, these innovations are represented as follows.

Figure 7. PRODUCT-PROCESS INNOVATING COMPANIES BY TYPE OF INNOVATION INTRODUCED, MACRO SECTOR AND CLASS OF EMPLOYEES. Years 2012-2014, percentage compositions



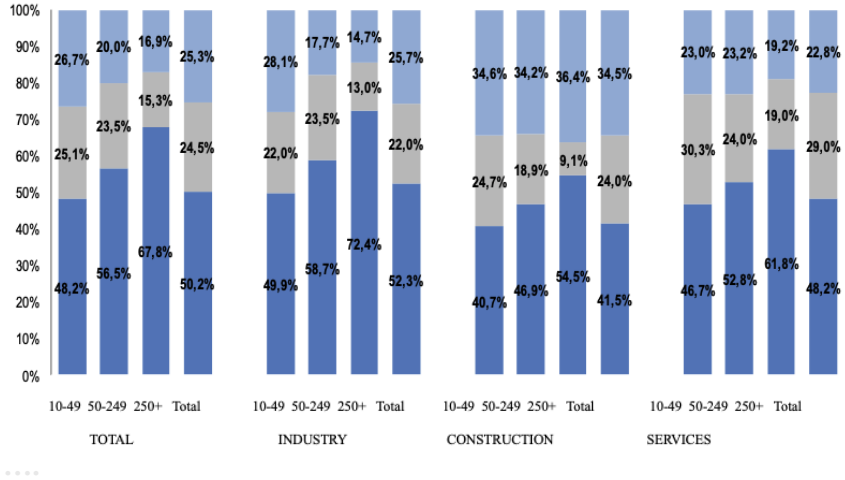
Source: Istat (2016). "L'innovazione nelle imprese: Anni 2012-2014"

[18] *Istat (2020). "L'innovazione nelle imprese: Anni 2016-2018"*

Istat (2018). "L'innovazione nelle imprese: Anni 2014-2016"

Istat (2016). "L'innovazione nelle imprese: Anni 2012-2014"

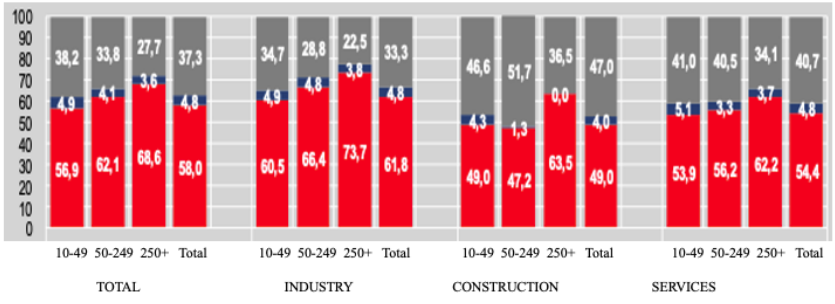
Figure 8. PRODUCT-PROCESS INNOVATING COMPANIES BY TYPE OF INNOVATION INTRODUCED, MACRO SECTOR AND CLASS OF EMPLOYEES. Years 2014-2016, percentage compositions



Product and process innovations Product innovations only Process innovations only

Source: Istat (2018). "L'innovazione nelle imprese: Anni 2014-2016"

Figure 9. PRODUCT AND PROCESS INNOVATING COMPANIES BY MACRO-SECTOR AND CLASS OF EMPLOYEES. Years 2016-2018, percentage compositions



Product and process innovations Product innovations only Process innovations only

Source: Istat (2020). "L'innovazione nelle imprese: Anni 2016-2018"

The percentage of companies that reported product and process innovations has been increasing, starting at 46.5% in the first period to 58.0% by the end of 2018.

Regarding the size of assets, big companies with over 250 employees slightly increased combined innovations, which went from 64.7% to 68.6%, considering all the industries.

However, the proportion of companies focused on product innovation changed significantly (26.0% in 2014 and 4.8% in 2018). Within this category, services have decreased by approximately twenty percent, as have industry and construction categories.

Companies that only introduced process innovations rose from 27.5% to 37.3%, with construction being the most influential sector (up from 35.4% to 47.0%).

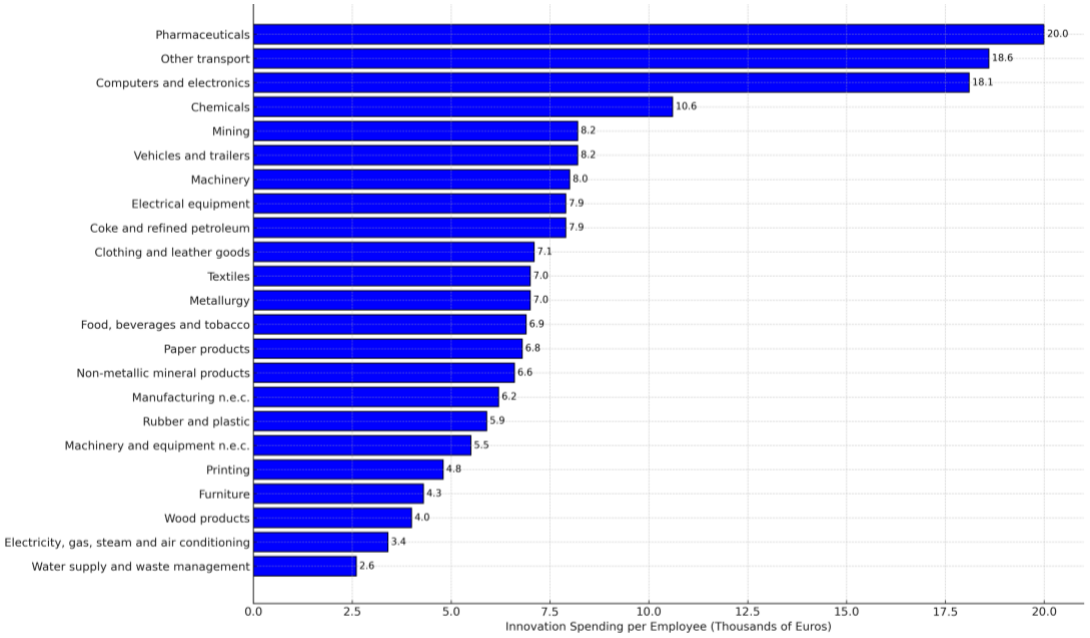
The data suggest that an increasing number of companies are reporting both product and process innovations over time. Although the big businesses have experienced a slight rise in their combined innovations, there has been a huge change from focusing solely on product innovation across all areas, including services, industry, and construction. In contrast, many firms, especially in the construction industry, are now showing more interest in process-oriented innovation. This change signifies diverse corporate innovation strategies that entail improving rather than just inventing new items.

Innovation Expenditure

By exploring the industrial innovation landscape, it's relevant to delve into the different facets of creative investments across economic sectors. This visual representation underlines the diversity of commitment to innovation, highlighting that industries prioritize research and development to varying degrees.

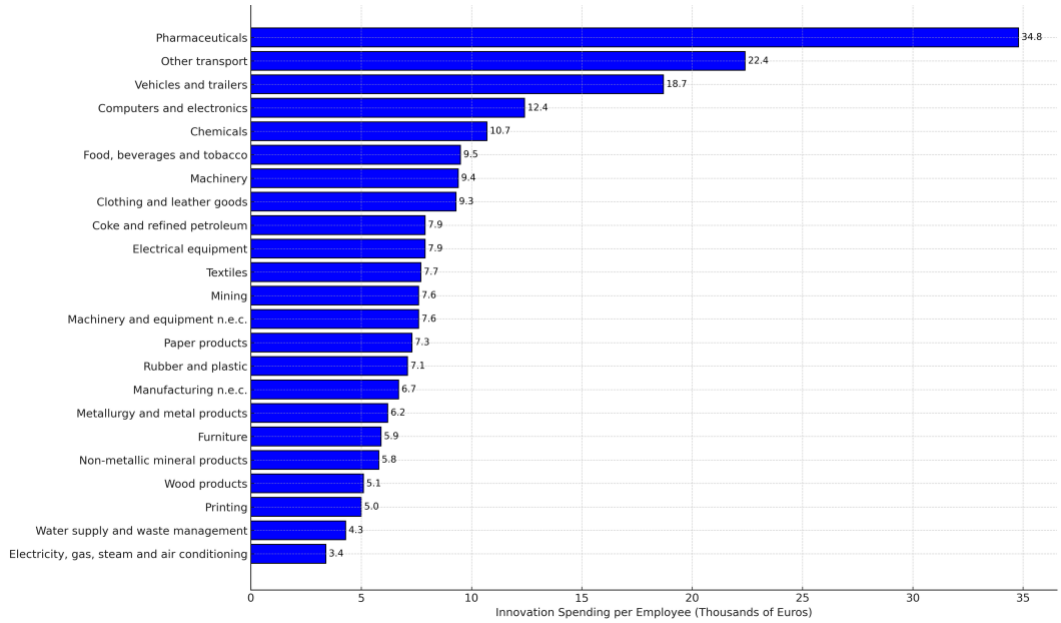
Figure 10. INNOVATION EXPENDITURE PER EMPLOYEE BY ECONOMIC ACTIVITY - INDUSTRY

Year 2014, values in thousands



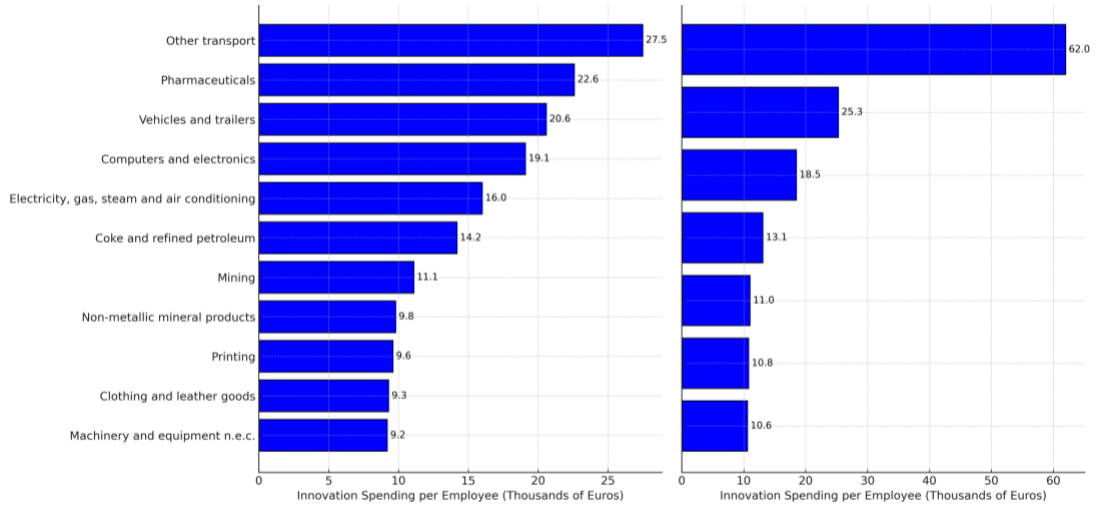
Source: Istat (2016). "L'innovazione nelle imprese: Anni 2012-2014"

Figure 11. INNOVATION EXPENDITURE PER EMPLOYEE BY ECONOMIC ACTIVITY, INDUSTRY. Year 2016, values in thousands



Source: Istat (2018). "L'innovazione nelle imprese: Anni 2014-2016"

Figure 12. INNOVATION EXPENDITURE PER EMPLOYEE OF INNOVATION-INTENSIVE SECTORS, INDUSTRY IN THE NARROW SENSE AND SERVICES. Year 2018, values in thousands



Source: Istat (2020). "L'innovazione nelle imprese: Anni 2016-2018"

These charts have offered a snapshot of the innovation landscape across different industrial sectors.

Several sectors have had a greater eye on innovation-related investments per employee.

The amount of money pharmaceutical companies spend per employee has been going up consistently, from EUR 20 thousand in 2014 to EUR 22.6 thousand in 2018. Conversely, the computer and electronics industry spent less compared with the previous year's figure of EUR 18.1 thousand, which went down to EUR 12.4 thousand in 2016 before rising to EUR 19.1 thousand in 2018 again.

The 'other transport' sector increased from EUR 18.6 thousand in 2014 and rising to EUR 27.5 thousand in 2018.

Finally, the 'communications' sector had a notable presence in the graph for the three years 2016-2018, with an expenditure of 25.3 thousand euros per employee, testifying to a significant investment in innovation within this sector that had not been evident in previous years.

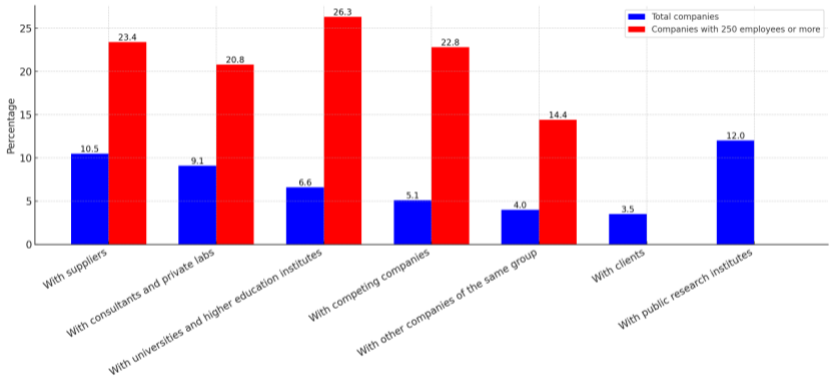
These movements show a versatile and puzzling investing landscape that mirrors both global economic developments and internal industrial strategies, pointing to an upcoming period in which innovation shall remain as one of the principal factors driving growth and competitiveness in industry.

Collaborative Ventures: Partnerships between Firms on Innovation

This subsection will discuss collaborative innovation, that is, how companies partner with others to develop or enhance their capabilities for innovation. The figure demonstrates some of these collaborations that depict how organizations work together with different types of partners to support their innovations. This

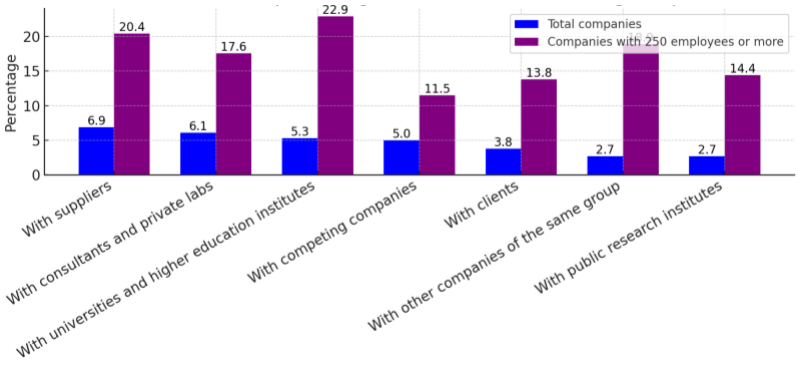
display clarifies the integrative concept of innovation and its perception of diverse dimensions or levels within a company.

Figure 13. COMPANIES WITH INNOVATION COOPERATION AGREEMENTS BY TYPE OF PARTNER - TOTAL AND LARGE COMPANIES. Years 2012-2014, percentage values of total innovating companies in the narrow sense



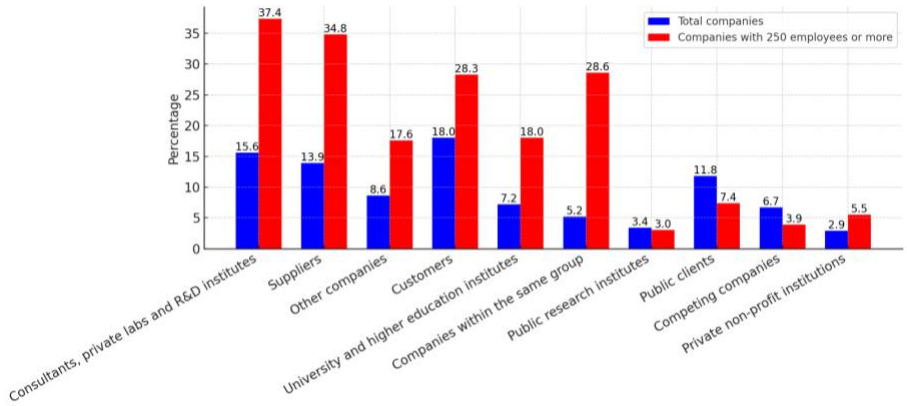
Source: Istat (2016). "L'innovazione nelle imprese: Anni 2012-2014"

Figure 14. COMPANIES WITH INNOVATION COOPERATION AGREEMENTS BY TYPE OF PARTNER - TOTAL AND LARGE COMPANIES. Years 2014-2016, percentage values of total innovating companies in the narrow sense



Source: Istat (2018). "L'innovazione nelle imprese: Anni 2014-2016"

Figure 15. COMPANIES WITH INNOVATION COOPERATION AGREEMENTS BY TYPE OF PARTNER - TOTAL AND LARGE COMPANIES. Years 2016-2018, percentage values of total companies with innovative activities



Source: Istat (2020). "L'innovazione nelle imprese: Anni 2016-2018"

Regarding cooperation agreements, in 2018, the proportion of large companies that team up with suppliers has shot down from 23.4% to 13.9%.

Big corporations witnessed the highest number of businesses working with universities. At the end of the first period 2, 26.3% of companies cooperated in this category, decreasing slightly to 18.0% at the end of 2018.

Large corporations' cooperation with rivals has significantly decreased, from 22.8% in 2014 to 3.9% in 2018.

This change indicates that cooperation with suppliers and educational institutions is increasing, while cooperation with rival companies and public research institutions has decreased, particularly among large companies. These trends could indicate strategic shifts in corporate innovation strategies, focusing on more robust partnerships with upstream providers and knowledge

centers while possibly decreasing direct innovation collaboration with competitors and public entities.

Digitalization and Indicators of the European Digital Transition 2021

Another fundamental pillar in the Italian business landscape is digitalization, which is essential for addressing the challenges in a constantly changing market.

Digital transformation leads to a radical change in corporate strategies, which, through the integration of innovative technologies, exploit data as a lever to compete.[19]

Digitalization helps to expand and consolidate relationships with the market and also helps to achieve significantly better internal efficiency.

In summary, this section of the literature reviewed highlights a complex landscape in which digitalization plays a vital role in the transformation of Italian industries.

The measurement of the digital transition at the European level is based on crucial indicators of digitalization, including enabling infrastructures, skills, and usage by individuals, households, businesses, and public institutions. The Digitalization Index of Economy and Society (Desi), which has been used since 2015, includes some of these indicators. The Desi monitors the evolution of digital performance in EU Member States and the results of national policies.

Within the European Commission's 'Digital Compass 2030' framework, the Desi has been strengthened as a tool to monitor the digital decade and identify targets to be reached by 2030.

[19] H.T. High Technology (2019). "Le Strategie di Innovazione delle Aziende Italiane"

Figure 16. INDICATORS OF THE EUROPEAN AND ITALIAN DIGITAL TRANSITION MONITORED BY DESI (percentages)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2030 Targets
SMEs with at least a basic level of digital intensity (%) - EU27	...	...	57	56	57	57	52.47	60	60	60	56	90
SMEs with at least a basic level of digital intensity (%) - IT	...	...	49	46	44	45	58	69	69	69	60	75
Companies purchasing cloud services of medium to high level (%) - EU27	...	...	...	...	...	...	...	...	...	25	...	...
Companies purchasing cloud services of medium to high level (%) - IT	...	...	...	...	...	...	...	...	...	38	nd	...
Companies that have ERP - EU27	...	...	...	...	...	29	34	38	...	36	39	...
Companies that have ERP - IT	...	...	...	...	...	36	37	...	...	35	32	...
Companies 10+ using two or more social media - EU27	...	...	12	13	14	14	16	17	22	17	27	...
Companies 10+ using two or more social media - IT	...	...	14	14	16	16	17	...	23	17	30	...
SMEs with e-commerce sales of at least 1% of turnover - EU27	...	...	...	...	...	14	14	16	17	18	18	...
SMEs with e-commerce sales of at least 1% of turnover - IT	...	...	...	...	...	15	16	17	17	18	13	...
Total SME turnover from e-commerce sales - EU27	...	...	...	...	...	8	9	10	11	12	12	...
Total SME turnover from e-commerce sales - IT	...	...	...	...	...	5	8	...	8	9	9	...
SMEs with e-commerce sales in other EU countries - EU27	...	...	...	...	...	4	5	8	8	8	9	...
SMEs with e-commerce sales in other EU countries - IT	...	...	...	...	...	3	4	6	6	7	7	

Source: Istat. (2021). "IMPRESE E ICT | ANNO 2021" [Companies and ICT | Year 2021].

1) *Two digital intensity indices (DII) were produced in 2018. The index consists of 12 indicators that vary from year to year, and therefore, it is not possible to compare the indicators in a time series.*
2) *The value reported in 2021 in brackets refers to the intermediate-sophisticated cloud, while the others refer to the medium-high cloud.*

- *'EU27' refers to the 27 member states of the European Union after Brexit*
- *'IT' is the abbreviation commonly used to refer to Italy. It refers to data collected specifically for Italy.*

The evolution over time of the digital transition indicators estimated in the year 2021 shows, on the one hand, slow improvements in the area of SMEs' e-commerce, similar to the EU27 average. In contrast, there have been significant

accelerations in the adoption of intermediate or sophisticated cloud services (60% against the EU27 average of 57%) and in the use of at least two social media (30%, +16% since 2013).

The adoption of software for sharing information between different business functions (Erp, Enterprise Resource Planning) decreased from 37% in 2017 to 32% in 2021, in contrast to the EU27 average of 39%.[20]

Italy is in 18th position among the 27 EU member states in the Digital Economy and Society Index (DESI) 2022, which has seen an improvement in connectivity but still faces obstacles in all matters of big data, artificial intelligence, and e-commerce. Although Italy has made considerable strides over five years, it still lags below Europe's mean digital performance as a whole, implying the necessity of greater investment in and planning for sustainable digital growth.[21]

The Complexity of Business and Digitalization in 2020

Every year, the behavior of companies was assessed according to 12 specific characteristics (over 50% of workers use online operations, cross-functional data sharing by ERP solution, contracted download speed that should not be less than the minimum requirement, B2C sales mainly through web amounting to not less than 1% of total revenue, adoption of IoT in business processes, internal or external data analytics capability, the use of social media together with CRM system, purchase of advanced and middle-level cloud computing services, usage of AI technologies in organizations; selling products through networks; being active on various sites on social media. That contributes to each edition of the survey. These characteristics have been used to create a composite indicator of digitalization called the

[20] Istat. (2021). "IMPRESE E ICT | ANNO 2021" [Companies and ICT | Year 2021].
[21] "Digitalization in Italy 2022: Significant Progress but Challenges Ahead." Frontiere, 2022.

“Digitalization Intensity Index,” which is used to identify the areas in which Italian companies have the most significant difficulties.

In general, about 82% of the companies with at least ten employees have a 'low' or 'very low' level of ICT adoption, not participating in more than 6 of the activities considered; the remaining 18% perform at least 7 of the 12 functions, ranking at 'high' or 'very high' levels of digitalization.

With reference to the 12 indicators, the largest gap between the various classes of employees is in the presence of ICT specialists among the company's employees, as well as in the use of robotics and cloud services at a medium-high level. In addition, indicators are highlighted that are only significant for higher levels of the Index (such as robots and 3D printing), while others are only used for smaller businesses.

In addition, a positive correlation was observed between the increase in the number of activities carried out and the class of personnel: While the percentage of small companies involved in various digital activities increases up to the acquisition of five activities, the percentage of large companies decreases rapidly up to the acquisition of around eight activities.

The size and organizational complexity of a company is related to the degree of digitalization of the company, which varies according to the type of technology used. The most common models for companies with up to 99 employees include a connection speed of at least 30 Mbit/s, the sending of electronic invoices, the website, and the presence of specific services on the website, according to the combination of 12 indicators that make up the summary indicator per employee class.

The presence of mid- to the high-level cloud and high use of computers and mobile devices by the workforce and ICT

specialists are more common in companies with at least 100 people.

Lastly, organizations that have already adopted at least five of the other activities tend to utilize those connected to more advanced technical breakthroughs, such as robots, big data analysis, and 3D printing, which are mostly associated with high and very high degrees of digitalization.[22]

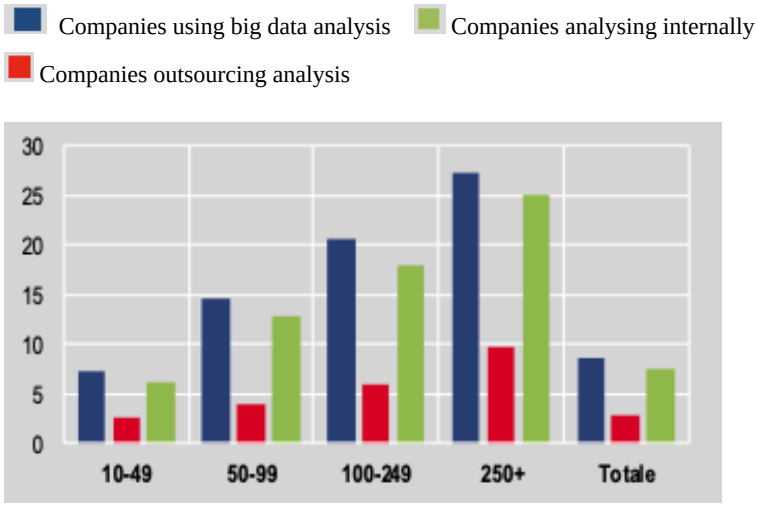
AI Developments 2020-2021

In the previous year, 8.6% of the companies with over ten employees engaged in big data analytics and dealt with a huge amount of information through methods, techniques, or software tools. Also, 7.4% of these companies analyzed big data internally, while only 2.8% outsourced the analysis.

Geolocalisation information from mobile devices (45.3%), social media (46.5% of the companies), and digital and smart sensors (31.1%) are the most analyzed data sources internally. About a quarter of large companies participated in big data analysis, while only 6.2% of smaller companies (10-49 employees) obtained helpful information from the data.

[22] Istat. (2020). "IMPRESE E ICT | ANNO 2020" [Companies and ICT | Year 2020]

Figure 17. Percentage values over total companies with at least ten employees



Source: Istat. (2020). "IMPRESE E ICT | ANNO 2020" [ICT |Year2020]

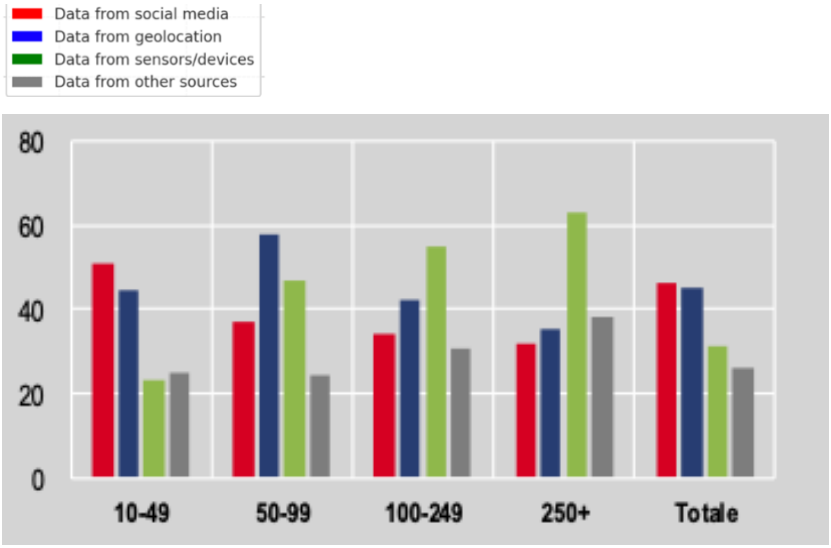
The use of big data also varies depending on how useful the analysis is for certain business activities and how much data can be produced using specific analysis techniques. Indeed, among the companies analyzing data internally, transport and warehousing (93.7%), postal services and courier activities (76.7%), and construction (72.5%) used geolocation information the most. Big data from sensors or smart devices rather than the computer manufacturing (85.3%), metallurgy (69.1%), and textile companies (69.0%) sectors, especially the restaurant industry (99.2%), motor vehicle trade (86.9%) and hospitality services (85.0%) examine social media data internally.

Industrial robots are more common (6.7%) than service robots (3.1%), with companies operating in metallurgy and metal products manufacturing (26.2%), means of transport (25.5%) and electrical and/or household equipment (20.9%) being the main users. In contrast, service robots are used for tasks such as surveillance, transport, and cleaning, mainly by companies

producing computers, electronic and optical products (9.1%), food (8.8%), and means of transport (7.8%).

In 2020, Eurostat proposed a summary indicator for the diffusion of artificial intelligence (AI) in business, considering that AI is more prevalent in some technologies than others. The indicator considers the use of chatbots to interact with customers over the Internet, autonomous service robots that can interact with people, and big data analysis techniques such as machine learning, speech recognition, and natural language processing. In 2019, 91.8% of companies with at least ten employees said they did not use any AI tools. 7.9% of SMEs said they used at least one, compared to 26.3% of larger companies.[23]

Figure 18. Percentage values of total companies analyzing BD internally



Source: Istat. (2021). "IMPRESE E ICT | ANNO 2020" ICT

[23] Istat. (2021). "IMPRESE E ICT | ANNO 2021" [Companies and ICT | Year 2021].

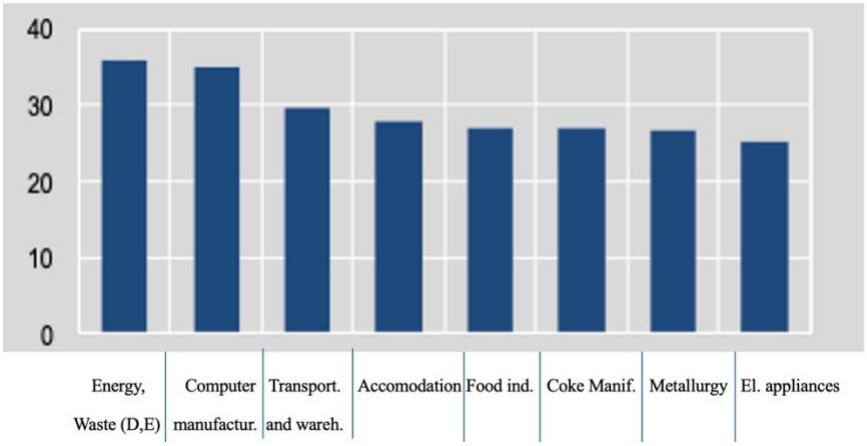
IoT (Internet of Things)

The Internet of Things is made up of interconnected devices that utilize the internet to amass, exchange and monitor information. In 2020, 23.1% of companies with ten or more employees used it.

In particular, companies that used IoT devices often used smart sensors, RFDI tags, Internet-controlled cameras, or devices to improve customer service and optimize energy consumption on business premises.

The tools are mainly used in the energy sector (35.8%), in some manufacturing activities such as the production of computers and electronic products (34.9%), in the food industry (27.0%), in the postal services (39.0%), telecommunications (32.0%), and transport and storage (29.5%).[24]

Figure 19. Companies using IoT tools



Source: Istat. (2020). "IMPRESE E ICT | ANNO 2020" [Companies and ICT | Year 2020]

[24] Istat. (2020). "IMPRESE E ICT | ANNO 2020" [Companies and ICT | Year 2020]

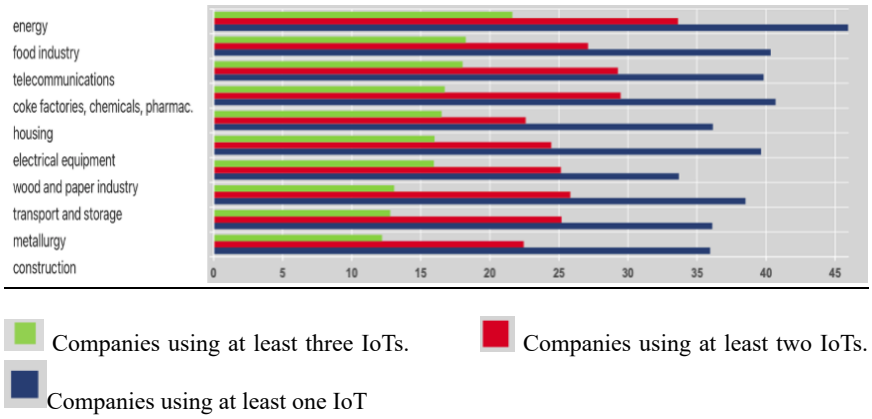
In 2021, 32.3% of companies with at least ten people use IoT devices (29% of the EU27 average).

Businesses using the Internet of Things most often use devices for the security of business premises, such as smart or intelligent alarm systems (74.6%) and sensors monitored or controlled via the Internet to maintain machines or vehicles (29.9%).

Most of these tools are used in energy (45.9%), real estate (42.5%), the food industry (40.3%), telecommunications (39.8%) and electrical equipment manufacturing (39.6%).

The use of IoT devices varies greatly according to company size; companies with at least 250 employees are more likely to use these smart technologies to increase efficiency in production and management.

Figure 20. The top ten economic activities for companies using at least three instruments



source: Istat. (2021). "IMPRESE E ICT | ANNO 2020" [Companies and ICT | Year 2021]

4. Methodology

The initial stages of the empirical analysis involved the collection of data sets from the National Institute of Statistics (ISTAT) on innovation and digitalization in different sectors of Italian industry. The data were selected on the basis of their completeness, their relevance to the thematic scope of the study and their recent relevance to the period 2018-2023. In addition, the samples were selected strategically, taking into account the distribution across industry sectors and the size of the firms to understand the dynamics of innovation and digitalization.

In total, four different datasets were generated by including the relevant variables and removing the unnecessary ones: two on innovation activities and two focused on digitalization levels.

The variables underlying these measures were carefully chosen to highlight the critical points in this research. These were metrics on product innovations, process innovations, and the internal company level of digitalization.

Descriptive statistics and inferential analysis constitute the most important part of the analytical part of this study. Descriptive analysis is a basic tool that helps to understand the central distribution of the data and its spread in terms of central tendency. Correlation analysis was then performed to identify the initial relationships between the variables. Regression was then applied to analyze the effect of innovation and digitalization on industry growth. The analytical procedures were conducted using statistical software packages (SPSS), ensuring a rigorous examination of the data sets.

The methodology was developed to reflect scientific requirements and strictly adhere to report accuracy and clarity. This detailed methodological documentation encourages a rich engagement with the empirical results presented in the following chapters, contributing to the discourse on innovation and digitalization in Italian industries.

5. Empirical analysis

5.1 Descriptive Analysis and Correlation Analysis

Data presentation – Dataset Innovation 1

The first dataset (Dataset 1) focuses on the innovation of Italian companies in various sectors from 2018 to 2020. It combines categorical and numeric data (scale variables).

It has 74 columns*. “Economic sector” identifies each sector, followed by metrics such as companies innovating in products, processes, or both, companies driving innovation in 2020, companies increasing revenue from new products, and companies spending heavily on innovation in 2020.

As for the rows, they were set up in two different ways. The first sees the ten lines representing the different economic macro-sectors considered, each assigned an ATECO code (Italian Statistical Classification of Economic Activities). The ATECO system is used by the National Institute of Statistics (ISTAT) to collect economic data at a national level. The sectors taken into consideration are Mining (Ateco: B), Manufacturing (Ateco: C), Supply of electricity, gas, steam, and air conditioning (Ateco: D), Water supply, sewerage, waste management and reclamation activities (Ateco:: E), Wholesale and retail trade, repair of motor vehicles and motorcycles (Ateco: G), Transport and warehousing (Ateco: H), Information and communication services (Ateco: J), Financial and insurance activities (Ateco: K), Real estate activities (Ateco: L), Professional, scientific and technical activities (Ateco: M69-74). This type of setup is adequate for having a complete descriptive analysis and understanding of sector diversity.

It is also set up with another approach. To have a greater number of observations and to obtain more truthful and statistically significant results. To be precise, the subcategories of the ATECO industries mentioned above were taken into consideration (for a detailed discussion, see Appendix A): Food, beverage and tobacco industries (Ateco: 10-12),

Textile industries (Ateco: 13), Manufacturing of clothing items, articles in leather and fur and Manufacture of leather and similar articles (Ateco: 14-15), Industry of wood and products made of wood and cork (excluding furniture); manufacture of straw articles and plaiting materials (Ateco: 16), Manufacture of paper and paper products (Ateco: 17), Printing and reproduction of recorded media (Ateco: 18), Manufacture of coke and products deriving from the refining of petroleum (Ateco: 19), Manufacture of chemical products (Ateco: 20), Manufacture of basic pharmaceutical products and pharmaceutical preparations (Ateco: 21), Manufacture of rubber and plastic articles (Ateco: 22), Manufacture of other products from the processing of non-metallic minerals (Ateco: 23), Metallurgy and Manufacture of metal products, excluding machinery and equipment (Ateco: 24-25), Manufacture of computers and electronic and optical products, electro-medical equipment, measuring equipment and of watches (Ateco: 26), Manufacture of electrical equipment and non-electric household equipment (Ateco: 27), Manufacture of machinery and equipment nec (Ateco: 28), Manufacture of motor vehicles, trailers and semi-trailers (Ateco: 29), Manufacture of other means of transport (Ateco: 30), Manufacture of furniture (Ateco: 31), Other manufacturing industries (Ateco: 32), Repair, maintenance and installation of machinery and equipment (Ateco: 33), Wholesale and retail and repair of motor vehicles and motorcycles (Ateco: 45), Wholesale trade, excluding motor vehicles and motorcycles (Ateco: 46), Retail trade, excluding motor vehicles and motorcycles (Ateco: 47), Transport land, via pipelines, maritime and waterways, air (Ateco: 49-51), Warehousing and transport support activities, postal services and courier activities (Ateco: 52, 53), Publishing and film production activities , video and television programs, musical and sound recordings, programming and broadcasting (Ateco: 58-60), Telecommunications (Ateco: 61), Software production, IT consultancy and related activities (Ateco: 62), Service activities information and other IT services (Ateco: 63), Financial services activities (Ateco: 64), Insurance, reinsurance and pension funds (Ateco: 65), Activities auxiliary to financial services and insurance activities (Ateco: 66), Legal and accounting activities (Ateco: 69), Corporate management and

management consultancy activities (Ateco: 70), Activities of architecture and engineering companies, technical testing and analysis (Ateco: 71), Scientific research and development (Ateco : 72), Advertising and market research (Ateco: 73), Other professional, scientific and technical activities (Ateco: 74).

In this case, the descriptive analysis will be considered for purely statistical and non-interpretative purposes (the values will be presented together with the correlation).

The following analysis provides a comprehensive description of the companies according to the critical variables associated with innovation.

**The 74 variables on which this first dataset is based are the following:*

Companies that have innovated products	*Product innovations developed internally*	*Environmental benefits*
Companies that have innovated processes	*Innovations developed in collaboration with other entities*	*Environmental benefits obtained within the company*
Companies with innovative activities not concluded but still ongoing...	*Innovations implemented by adapting or modifying processes... (product)*	*Lower material or water consumption per unit of product*
Companies that have innovated both products and processes	*Product innovations developed in collaboration with other companies*	*Lower energy consumption or reduction in industrial CO2 emissions*
Companies that have innovated only processes	*Product innovations developed in collaboration with universities...*	*Reduction of air, water, noise, and soil pollution*
Companies that have innovated only products	*Product innovations developed in collaboration with other private...*	*Replacement of traditional materials with less polluting or hazardous materials*

Companies with innovations in processes and production methods	*Process innovations developed internally*	*Replacement of fossil fuels with renewable energy resources*
Companies with innovations in logistics, distribution, or product supply	*Process innovations developed in collaboration with other entities (process)*	*Recycling of materials and waste and water recycling for own use or for sale*
Companies with information system innovations	*Innovations implemented by adapting or modifying processes... (process)*	*Environmental benefits obtained in the consumption/utilization phase of goods and services*
Companies with innovations in accounting systems or other administrative activities	*Process innovations developed with other companies*	*Lower energy consumption or reduction in CO2 emissions*
Companies with innovations in business organization practices or external relations	*Process innovations developed with universities and research institutes*	*Reduction of air, water, noise, or soil pollution*
Companies with innovations in work organization or human resource management	*Process innovations developed with other private and public institutions...*	*Ease of recycling products at end of life*
Companies with marketing practice innovations	*Innovation expenditure 2020 (thousands of Euros)*	*Longer product lifespan*
Companies that have introduced original products to the market	*Innovation expenditure per employee*	*Existence of environmental regulation*
Revenue from new products	*Internal R&D spending*	*Existence of environmental taxation*
Revenue from products new to the market	*External R&D spending*	*Future prospects of applying environmental regulations or taxation*

Companies that have received public funding (total)	*Other innovation expenditures*	*Availability of incentives, grants, and other financial incentives for low-impact innovations*
Companies that have received public funding from regional or local administrations	*Expenditures for internal staff engaged in innovation activities*	*Current or expected demand for low-impact innovations*
Companies that have received public funding from central state administrations	*Expenditures for the purchase of goods and services intended for innovation*	*Improvement of corporate reputation*
Companies that have received funding under the European Horizon 2020 Framework Program	*Capital expenditures for innovation*	*Voluntary actions and initiatives for the promotion and dissemination of good environmental practices within their economic sector*
Companies that have received other European public funding	*Companies with cooperation agreements with consultants, private laboratories...*	*High costs of energy, water, or materials*
Companies that have used tax incentives	*Companies with cooperation agreements with suppliers of equipment, materials...*	*Need to comply with conditions set by public supply and service contracts*
Companies that have obtained loans	*Companies with cooperation agreements with client companies*	*Total companies that have suspended or reduced their innovative activities in 2020*
Companies have obtained equity financing	*Companies with cooperation agreements with competitor companies*	*Companies that have suspended their innovative activities and have not resumed them during 2020*

Companies with cooperation agreements with other companies	*Companies with cooperation agreements with companies belonging to the same group*	*Companies that initially suspended their innovative activities but then resumed them during 2020*
Companies with cooperation agreements with public clients	*Companies with cooperation agreements with universities or high-tech education...*	*Companies that have reduced their innovative activities in 2020*
Companies with cooperation agreements with public research institutes	*Companies with cooperation agreements with public research institutes*	*Companies that have not experienced changes in their innovative activities in 2020*
Companies with cooperation agreements with private non-profit institutions	*Companies with cooperation agreements with Italy*	*Companies that have intensified their innovative activities in 2020*
Companies with cooperation agreements with foreign countries	*Companies with cooperation agreements with EU or EFTA countries*	*Public financial support*
Lack of internal financial resources for innovation	*Lack of external financing (credit or private equity)*	*Tax relief*
Difficulty in obtaining public financing and grants	*Innovation costs too high*	*Consumer product safety*
Lack of qualified internal staff	*Lack of partners to collaborate with*	*Environment*
Difficulty in accessing external knowledge	*Uncertain market demand*	*Intellectual property*
Market characterized by strong competition	*Other priorities for the company*	*Taxation*
Data protection	*Urgent measures related to the COVID-19*	*Employment, worker safety, and social affairs*

In particular, the companies that innovated in products and processes, as well as both products and processes, are examined.

Statistics (percentage)

		Companies that have innovated products	Companies that have innovated processes	Companies that have innovated products and processes
N	Valid	10	10	10
Mean		24.2	42.7	49.6
Median		20.4	43.6	44.2
Mode		13.2[a]	29.6[a]	41.0
Std. Deviation		11.4	10.3	10.7
Range		33.8	30.3	29.9
Minimum		13.2	29.6	40.1
Maximum		47.0	59.9	70.0

a. Multiple modes exist. The smallest value is shown

Dataset Innovation 2

The second dataset (Dataset 2) presents the same variables as 'Dataset 1' relating to innovation in Italian companies from 2018 to 2020, with a prevalence of numerical scale variables.

In this case the subdivision is based on the company size (more precisely on the number of employees), considering the total of industry and services (Ateco: B, C, D, E, F, G, H , J, K, L, M69-74).

Again, this dataset has 74 columns. The first identifies the company size, followed by the same metrics as dataset 1.

The three lines represent distinct sizes, and they are classified into small, medium, and large companies. Specifically, small businesses have 10-49 employees, medium businesses have 50-249 employees, and large businesses have more than 250 employees.

It will focus only on considerations regarding a descriptive analysis from a dimensional point of view, as the more complex analyses between

variables will be satisfied with the second approach of Dataset 1, which, as mentioned, studies the same variables.

Statistics (percentage)

		Companies that have innovated products	Companies that have innovated processes	Companies that have innovated products and processes
N	Valid	3	3	3
Mean		37.3	55.5	59.3
Median		37.4	57.6	58.9
Mode		25.0[a]	41.2[a]	52.1[a]
Std. Deviation		12.2	13.3	7.4
Range		24.5	26.5	14.9
Minimum		25.0	41.2	52.1
Maximum		49.5	67.7	67.0

a. Multiple modes exist. The smallest value is shown

Correlation Innovation

To measure the relationship between the variables considered, three correlation analyses were developed through SPSS (Statistical Package for the Social Science) to see which variables were significantly correlated with: companies that have innovated products, companies that have innovated processes, and companies that have innovated both products and processes.

Three tables representing only the significantly correlated variables follow.

COMPANIES THAT HAVE INNOVATED PRODUCTS	Pearson Correlation	Significance (2-tailed)
Companies that have innovated processes	.914**	<.001
Companies with unfinished innovative activities still in progress, abandoned or suspended during the triennium	.497**	.002
Companies that have innovated products and processes	.919**	<.001
Companies that have innovated only processes	-.919**	<.001
Companies with innovations in production processes and methods	.668**	<.001
Companies with innovations in logistics, distribution, or product/service supply	.321*	.049
Companies with information system innovations (process innovations in processing and information communication)	.806**	<.001
Companies with innovations in accounting systems or other administrative activities	.571**	<.001
Companies with innovations in business organization practices or external relations	.700**	<.001

COMPANIES THAT HAVE INNOVATED PRODUCTS	Pearson Correlation	Significance (2-tailed)
Companies with innovations in work organization or human resource management	.777**	<.001
Companies with innovations in marketing practices	.642**	<.001
Companies that have introduced original products to the market	.896**	<.001
Turnover from new products	.465**	.003
Turnover from new products for the market	.501**	.001
Product innovations developed in collaboration with Universities and research institutes	.395*	.014
Innovations developed internally (process)	.350*	.031
Innovations developed in collaboration with other entities (process)	.411*	.010
Process innovations developed with Universities and research institutes	.404*	.012
Innovation expenditure per employee	.586**	<.001
Internal R&D expenditure	.502**	.001
Other innovation expenses*	-.436**	.006
Expenditure for the purchase of goods and services intended for innovation*	-.351*	.031
Companies that have obtained public funding (total)	.611**	<.001
Companies that have obtained public funding from regional or local administrations	.620**	<.001
Companies that have obtained public funding from central government administrations	.478**	.002

COMPANIES THAT HAVE INNOVATED PRODUCTS	Pearson Correlation	Significance (2-tailed)
Companies that have obtained public funding within the European Framework Programme Horizon 2020	.631**	<.001
Companies that have obtained other European public funding	.515**	<.001
Companies that have resorted to tax incentives	.549**	<.001
Companies that have obtained equity financing	.488**	.002
Companies with cooperation agreements with: Consultants, private labs, and private research institutes	.788**	<.001
Companies with cooperation agreements with: Equipment, material, component, or software suppliers	.741**	<.001
Companies with cooperation agreements with: Client companies	.597**	<.001
Companies with cooperation agreements with: Competing companies	.448**	.005
Companies with cooperation agreements with: Other companies	.626**	<.001
Companies with cooperation agreements with: Companies within the same group	.635**	<.001
Companies with cooperation agreements with: Public clients	.452**	.004
Companies with cooperation agreements with: Universities or institutes of high education and high technology	.728**	<.001
Companies with cooperation agreements with: Public research institutes	.597**	<.001

COMPANIES THAT HAVE INNOVATED PRODUCTS	Pearson Correlation	Significance (2-tailed)
Companies with cooperation agreements with: Private non-profit institutions	.405*	.012
Companies with cooperation agreements with: Italy	.821**	<.001
Companies with cooperation agreements with: Foreign countries	.747**	<.001
Companies with cooperation agreements with: EU or EFTA countries	.708**	<.001
Other priorities for the company	-.321*	.049
Reduction of air, water, noise, or soil pollution	-.339*	.037
Ease of product recycling at end of life	-.326*	.046
Companies that suspended their innovative activities and did not resume them during 2020	-.542**	<.001
Public financial support*	.331*	.049
Tax incentive**	.666**	<.001
Intellectual property	.371*	.022
Employment, worker safety, and social affairs	-.337*	.039

* and ** indicate statistical significance levels, with * typically representing a significance level of 0.05 and ** a more stringent level of 0.01 or less. These are standard notations in statistical analysis, where ** denotes very strong evidence against the null hypothesis, suggesting that the correlation is not due to random chance.

COMPANIES THAT HAVE INNOVATED PROCESSES	Pearson Correlation	Significance (2-tailed)
Companies with unfinished innovative activities but still in progress, abandoned or suspended during the triennium	.360*	.026
Companies that have innovated products and processes	.777**	<.001
Companies that have innovated only processes	-.715**	<.001
Companies with innovations in production processes and methods	.735**	<.001
Companies with innovations in logistics, distribution, or product/service supply	.343*	.035
Companies with information system innovations (innovations in information processing and communication)	.914**	<.001
Companies with innovations in accounting systems or other administrative activities	.710**	<.001
Companies with innovations in business organization practices or external relations	.790**	<.001
Companies with innovations in work organization or human resource management	.827**	<.001
Companies with innovations in marketing practices	.598**	<.001
Companies that have introduced original products to the market	.810**	<.001
Turnover from new products	.357*	.028
Turnover from new products for the market	.408*	.011
Innovations developed in collaboration with other subjects (process)	.503**	.001
Process innovations developed with Universities and research institutes	.465**	.003

COMPANIES THAT HAVE INNOVATED PROCESSES	Pearson Correlation	Significance (2-tailed)
Innovation expenditure per employee	.550**	<.001
Internal R&D expenditure	.442**	.005
Other innovation expenses*	-.425**	.008
Expenditure for the purchase of goods and services intended for innovation*	-.386*	.017
Companies that have obtained public funding (total)	.599**	<.001
Companies that have obtained public funding from regional or local administrations	.613**	<.001
Companies that have obtained public funding from central government administrations	.533**	<.001
Companies that have obtained public funding within the European Framework Programme Horizon 2020	.547**	<.001
Companies that have obtained other European public funding	.452**	.004
Companies that have resorted to tax incentives	.507**	.001
Companies that have obtained equity financing	.469**	.003
Companies with cooperation agreements with: Consultants, private labs, and private research institutes	.769**	<.001
Companies with cooperation agreements with: Equipment, material, component, or software suppliers	.732**	<.001
Companies with cooperation agreements with: Client companies	.535**	<.001
Companies with cooperation agreements with: Competing companies	.414**	.010

COMPANIES THAT HAVE INNOVATED PROCESSES	Pearson Correlation	Significance (2-tailed)
Companies with cooperation agreements with: Other companies	.582**	<.001
Companies with cooperation agreements with: Companies within the same group	.638**	<.001
Companies with cooperation agreements with: Public clients	.424**	.008
Companies with cooperation agreements with: Universities or high-tech institutions	.717**	<.001
Companies with cooperation agreements with: Public research institutes	.588**	<.001
Companies with cooperation agreements with: Private non-profit institutions	.469**	.003
Companies with cooperation agreements with: Italy	.779**	<.001
Companies with cooperation agreements with: Foreign countries	.744**	<.001
Companies with cooperation agreements with: EU or EFTA countries	.727**	<.001
Ease of product recycling at end of life	-.361*	.026
Companies that suspended their innovative activities and did not resume them during 2020	-.503**	.001
Tax incentive**	.583**	<.001
Intellectual property	.343*	.035

* denotes significance at the 0.05 level, while ** denotes significance at the 0.01 level or better, meaning the correlation is statistically significant.

COMPANIES THAT HAVE INNOVATED BOTH PRODUCTS AND PROCESSES	Pearson Correlation	Significance (2-tailed)
Companies with unfinished innovative activities still in progress, abandoned or suspended during the triennium	.533**	<.001
Companies that have innovated only processes	-.959**	<.001
Companies with innovations in processes and production methods	.549**	<.001
Companies with innovations in logistics, distribution, or supply of products/services	.345*	.034
Companies with innovations in information systems (innovations in information processing and communication)	.694**	<.001
Companies with innovations in accounting systems or other administrative activities	.432**	.007
Companies with innovations in business organization practices or external relations	.665**	<.001
Companies with innovations in the organization of work or human resource management	.751**	<.001
Companies with innovations in marketing practices	.709**	<.001
Companies that have introduced original products to the market	.777**	<.001
Revenue from new products for the market	.366*	.024
Innovations developed in collaboration with other entities (process)	.360*	.027
Innovation expenditure per employee	.408*	.011
Internal R&D expenditure	.446**	.005
Other innovation expenses*	-.358*	.027

COMPANIES THAT HAVE INNOVATED BOTH PRODUCTS AND PROCESSES	Pearson Correlation	Significance (2-tailed)
Companies that have obtained public funding (total)	.500**	.001
Companies that have obtained public funding from regional or local administrations	.497**	.001
Companies that have obtained public funding from central government administrations	.368*	.023
Companies that have obtained public funding as part of the European Horizon 2020 Framework Programme	.499**	.002
Companies that have obtained other European public funding	.408*	.011
Companies that have made use of tax incentives	.464**	.003
Companies that have obtained equity financing	.422**	.008
Companies with cooperation agreements with: Consultants, private labs, and private research institutes	.650**	<.001
Companies with cooperation agreements with: Suppliers of equipment, materials, components, or software	.619**	<.001
Companies with cooperation agreements with: Client companies	.518**	.001
Companies with cooperation agreements with: Competing companies	.367*	.023
Companies with cooperation agreements with: Other companies	.490**	.002
Companies with cooperation agreements with: Companies within the same group	.485**	.002

COMPANIES THAT HAVE INNOVATED BOTH PRODUCTS AND PROCESSES	Pearson Correlation	Significance (2-tailed)
Companies with cooperation agreements with: Universities or high-tech and high-education institutes	.562**	<.001
Companies with cooperation agreements with: Public research institutes	.435**	.006
Companies with cooperation agreements with: Italy	.703**	<.001
Companies with cooperation agreements with: Foreign countries	.570**	<.001
Companies with cooperation agreements with: EU or EFTA countries	.511**	.001
Companies that suspended their innovative activities and did not resume them during 2020	-.493**	.002
Tax incentive**	.574**	<.001
Intellectual property	.354*	.029

* indicates significance at the 0.05 level, and ** indicates significance at the 0.01 level or better. These notations indicate that the correlations are statistically significant.

Data presentation – Dataset Digitalization 1

This third dataset (Dataset 3) focuses on the inter-sectoral digitalization of Italian industries in 2023, with a prevalence of numerical scale variables.

There are 79* columns focusing on information and communication technologies (ICT), business digitalization levels, and the use of innovative technologies.

The five rows represent the grouping by macro-sector. Industrial structures are divided into four categories, namely manufacturing, electricity, gas, steam and air conditioning supply, water supply; sewerage, waste management, and remediation activities (D-E); construction industry, all non-financial services excluding real estate activities as well as ownership of dwellings (G-N), and total economic activity excluding ownership of dwellings (C-N). Also, in this case, as for Dataset 1, in addition to having been divided into five macro-sectors as just described, a further approach was taken to ensure a greater number of observations and obtain more complex, meaningful, and truthful statistical analyses.

Using the same variables, there was a further subdivision into 23 sectoral subcategories, which are: Food, beverage, and tobacco industries; textile, clothing, leather goods, and similar industries; wood and paper products industry; printing, manufacture of coke and refined petroleum products, chemicals, pharmaceuticals, rubber and plastic products, and non-metallic mineral products, metallurgy and manufacture of metal products excluding machinery and equipment, manufacture of computers, electronic and optical products, electromedical devices, measuring devices, and clocks, manufacture of electrical equipment and non-electric domestic appliances and machinery and equipment n.e.c. (not elsewhere classified), manufacture of transport equipment, other manufacturing industries, repair and installation of machinery and equipment, wholesale and retail trade, repair of motor vehicles and motorcycles, retail trade (excluding motor vehicles and motorcycles), transportation and storage, excluding postal and courier services (except 53), postal services and courier activities, accommodation, food and beverage service activities, cinematographic, video, and television program production activities;

sound recording and music publishing activities, publishing activities, telecommunications, computer programming, and other information service activities, real estate activities, professional, scientific, and technical activities, rental and leasing activities, business support services excluding travel agency, tour operator services, reservation services and related activities (excluding 79 travel agencies), activities of travel agencies, tour operators, reservation services, and related activities.

**The 79 columns represent the following variables (categorized by "Area" and divided by variables):*

Internet Connectivity and Employee Access

Internet Connectivity	***Employee Internet Access***	***Device Usage***
Companies with a fixed connection	*Companies where more than 50% of employees have internet access for work purposes*	*Employees who use internet-connected devices for work purposes (percentage of total employees)*
Companies with fixed connections at speeds of at least 30 Mb/s		
Companies with fixed connections at speeds of at least 100 Mb/s		
Companies with fixed connections at speeds of at least 1 Gb/s		

Online Presence and Services

Online Presence	***E-commerce Features***	***Customer Interaction***
Companies with a website	*Possibility of placing orders or reservations online*	*A chat service for customer support*
Description of goods and services offered	*Online order tracking*	*Announcement of job vacancies or the possibility of applying for jobs online*
Information on prices	*Possibility to personalize site content for regular visitors*	*Website content available in at least two languages*
	Possibility to customize or design goods and services for site visitors	

Digitalization and Social Media Use

Digitalization Level	***Social Media & Apps***	***Online Sales***
Companies with a very low level of Digitalization	*Companies with an app*	*Companies that have sold online via web and/or EDI-type systems*
Companies with a low level of Digitalization	*Companies that use social media, social networks, blogs, content-sharing websites or apps*	*Companies that have sold via the web*
Companies with a high level of Digitalization	*Companies that use at least two social media platforms*	*Companies that have sold via EDI-type systems*
Companies with a very high level of Digitalization		*Companies that have sold via the web to the final consumer market (B2C)*

Enterprise Software and Data Management

Enterprise Software Usage	***Data Management & Sharing***	***Cloud and Computing Services***
Companies that use at least one enterprise software (ERP, CRM, BI)	*Electronic data sharing with suppliers or customers of the supply chain*	*Companies that purchase cloud computing services*
Use of ERP software	*Electronic invoicing*	*Email services*
Use of CRM software	*Companies that store data from enterprise software in relational databases*	*Office software (e.g., word processing, spreadsheets)*
Use of Business Intelligence software	*Companies that analyze data internally*	*File storage*

Advanced Technologies and AI Utilization

AI and Machine Learning	***AI Application Areas***	***AI Challenges and Considerations***
Companies that use AI software or systems for text mining	*Marketing or sales with AI*	*High costs for AI*
Voice recognition technologies	*Production processes enhancement with AI*	*Lack of skills within the company for AI*
Natural language generation	*Organization of corporate administration processes*	*Incompatibility with existing systems*
Image processing and recognition	*Logistics improvements with AI*	*Data availability or quality issues*

AI and Machine Learning	*AI Application Areas*	*AI Challenges and Considerations*
Machine learning, deep learning, neural networks	*ICT security enhancements with AI*	*Data protection and privacy concerns*

These variables will be analyzed, in particular, from the point of view of the level of digitalization, which can be very low, low, high, or very high.

Statistics (percentage)

		Companies with a level of Digitalization: very low	Companies with a level of Digitalization: low	Companies with a level of Digitalization: high	Companies with a level of Digitalization: very high
N	Valid	5	5	5	5
Mean		41.2	39.3	16.8	2.5
Median		39.7	39,0	17.7	2.5
Mode		33.7[a]	37.9[a]	9.0[a]	.5[a]
Std. Deviation		6.8	1.5	4.8	1.4
Range		18.7	3.7	13.2	3.9
Minimum		33.7	37.9	9.0	.5
Maximum		52.3	41.7	22.2	4.3

a. Multiple modes exist. The smallest value is shown

Dataset Digitalization 2

The fourth dataset (Dataset 4) represents the same variables as the third one regarding the digitalization in Italian Industries in 2023.

In this case, the rows are 3, and the categories are divided into small, medium, and large companies (following the same employees number as Dataset 2).

The 79 columns concern information and communication technologies (ICT), company digitalization levels, and innovative technologies.

This dataset will be considered a purely descriptive approach, as other types of analysis, such as correlation or regression between variables, will be performed on the third dataset. Thanks to the more significant number of observations, this dataset can give more truthful statistical result s.

Again, the analyses that will be addressed on this dataset will be done from a digitalization-level point of view (which can be very low, low, high, or very high).

Statistics (percentage)

		Companies with a level of Digitalization : very low	Companies with a level of Digitalization : low	Companies with a level of Digitalization : high	Companies with a level of Digitalization : very high
N	Valid	3	3	3	3
Mean		26.6	36.2	29.3	7.7
Median		25.5	39.4	29.9	4.6
Mode		13.1[a]	29.3[a]	16.8[a]	2.5[a]
Std. Deviation		14.1	5.9	12.3	7.3
Range		28.2	10.6	24.7	13.6
Minimum		13.1	29.3	16.8	2.5
Maximum		41.3	39.9	41.5	16.1

a. Multiple modes exist. The smallest value is shown

Correlation Digitalization

Four correlation analyses were created to determine which variables significantly correlated with companies with very low, low, high, or very high levels of digitalization.

COMPANIES WITH A VERY LOW LEVEL OF DIGITALIZATION	Pearson Correlation	Significance (2-tailed)
Companies with fixed broadband connections	-.518*	.011
Companies with fixed connections at speeds of at least 30 Mb/s	-.754**	<.001
Companies with fixed connections at speeds of at least 100 Mb/s	-.881**	<.001
Companies with fixed connections at speeds of at least 1 Gb/s	-.688**	<.001
Companies in which more than 50% of employees have access to the Internet for work purposes	-.799**	<.001
Employees using internet-connected devices for work purposes (percentage of total employees)	-.737**	<.001
Companies with a website	-.705**	<.001
Description of goods and services offered, pricing information	-.562**	.005
Online order tracking	-.426*	.043
Ability to personalize website content for regular visitors	-.458*	.028
Chat service for customer support (provided by chatbots, virtual agents or live persons)	-.610**	.002
Announcement of job vacancies or the ability to apply online	-.706**	<.001

COMPANIES WITH A VERY LOW LEVEL OF DIGITALIZATION	Pearson Correlation	Significance (2-tailed)
Companies with an app	-.594**	.003
Companies that use social media	-.702**	<.001
Social networks	-.699**	<.001
Websites or apps for sharing multimedia content	-.607**	.002
Companies using at least two social media platforms	-.643**	<.001
Companies with a high level of Digitalization	-.903**	<.001
Companies with a very high level of Digitalization	-.680**	<.001
Companies that have sold online via websites and/or EDI systems	-.461*	.027
Companies that have sold via the web	-.486*	.019
Companies using at least one business software (ERP, CRM, BI)	-.687**	<.001
Use of ERP software	-.468*	.024
Use of CRM software	-.818**	<.001
Use of Business Intelligence software	-.730**	<.001
Companies that incurred expenses for business software purchases in 2022 among those using them in 2023	-.688**	<.001
Companies analyzing data internally through their own or group company staff	-.765**	<.001
Companies analyzing data externally through another company or external organization	-.540**	.008
Companies purchasing cloud computing services	-.822**	<.001

COMPANIES WITH A VERY LOW LEVEL OF DIGITALIZATION	Pearson Correlation	Significance (2-tailed)
Email services, certified email	-.832**	<.001
Office software (e.g., writing programs, spreadsheets)	-.839**	<.001
File storage	-.802**	<.001
Computing power to run the company's software	-.809**	<.001
Financial and accounting software applications	-.803**	<.001
ERP software applications (Enterprise Resource Planning)	-.729**	<.001
CRM software applications (Customer Relationship Management)	-.840**	<.001
Security software applications (e.g., antivirus software, network access control)	-.773**	<.001
Hosting the company's database	-.880**	<.001
Computing platform providing an environment for the development, testing, distribution of applications	-.699**	<.001
Companies purchasing at least one intermediate or sophisticated service	-.807**	<.001
Companies using software or systems of Artificial Intelligence (AI) for at least one of 7 purposes	-.625**	.001
Enabling the physical movement of machines through autonomous decisions based on environmental observation (autonomous robots or drones, self-driving vehicles)	.520*	.011

COMPANIES WITH A VERY LOW LEVEL OF DIGITALIZATION	Pearson Correlation	Significance (2-tailed)
Companies using software or systems of Artificial Intelligence (AI) for at least two of 7 purposes	-.549**	.007
Companies using software or systems of Artificial Intelligence (AI) for at least three of 7 purposes	-.481*	.020
AI for logistics	.438*	.037
Research and Development (R&D) activities or innovation for AI	-.592**	.003
High costs for AI	.513*	.012

The stars denote the level of significance, with one star (*) indicating a significance level of 0.05, and two stars (**) indicating a higher significance level of 0.01 or less.

COMPANIES WITH A LOW LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Ability to place orders or bookings online (e.g., online shopping cart)	-.616**	.002
Online order tracking	-.691**	<.001
Ability to personalize website content for regular visitors	-.461*	.027
Companies with a very high level of Digitalization	-.509*	.013
Companies that have sold online via web and/or EDI systems	-.627**	.001
Companies that have sold via web	-.615**	.002
Companies that store business software data in relational databases among those using them in 2023	.417*	.048
Electronic invoicing	.415*	.049

COMPANIES WITH A LOW LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Accounting, control or financial management for AI	-.532**	.009
Lack of skills in the company for AI	-.449*	.032

The stars (*) and (**) indicate levels of statistical significance, with one star (*) indicating a significance level of 0.05, and two stars (**) indicating a higher significance level of 0.01 or less, suggesting that the relationship is not due to chance.

COMPANIES WITH HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Companies with a fixed connection	.526**	.010
Companies with fixed connections at speeds of at least 30 Mb/s	.793**	<.001
Companies with fixed connections at speeds of at least 100 Mb/s	.820**	<.001
Companies with fixed connections at speeds of at least 1 Gb/s	.692**	<.001
Companies where more than 50% of employees have Internet access for work purposes	.730**	<.001
Employees using Internet-connected devices for work purposes (% of total employees)	.643**	<.001
Companies with a website	.614**	.002
Description of goods and services offered, information on prices	.534**	.009

COMPANIES WITH HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Ability to place orders or bookings online (e.g., online shopping cart)	.519*	.011
Online order tracking	.604**	.002
Ability to personalize website content for regular visitors	.575**	.004
Ability to personalize or design goods and services for website visitors	.442*	.035
Customer service chat (provided by chatbot, virtual agent or physical person responding to customers)	.665**	<.001
Advertisement of vacant job positions or possibility to apply for employment online	.565**	.005
Companies with apps	.672**	<.001
Companies using social media	.718**	<.001
Social networks	.712**	<.001
Websites or apps for sharing multimedia content	.641**	<.001
Companies using at least two social media platforms	.669**	<.001
Companies with a very low level of Digitalization	-.903**	<.001
Companies with a very high level of Digitalization	.712**	<.001
Companies that have sold online via web and/or EDI systems	.581**	.004
Companies that have sold via web	.603**	.002
Companies using at least one business software (ERP, CRM, BI)	.608**	.002

COMPANIES WITH HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Use of CRM software	.830**	<.001
Use of Business Intelligence software	.660**	<.001
Companies that have incurred expenses for purchasing business software in 2022 among those using them in 2023	.794**	<.001
Companies analyzing data internally through their own employees or employees of other group companies	.752**	<.001
Companies analyzing data externally through another company or external organization	.614**	.002
Companies purchasing cloud computing services	.724**	<.001
Email services, PEC	.730**	<.001
Office software (e.g., word processing programs, spreadsheets)	.786**	<.001
File storage	.679**	<.001
Computing capacity to run company software	.733**	<.001
Finance and accounting software applications	.757**	<.001
ERP (Enterprise Resource Planning) software applications	.593**	.003
CRM (Customer Relationship Management) software applications	.815**	<.001
Security software applications (e.g., antivirus program, network access control)	.702**	<.001
Hosting of company databases	.812**	<.001
Computing platform providing an environment for application development, testing, distribution	.630**	.001

COMPANIES WITH HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Companies purchasing at least one intermediate or sophisticated service	.721**	<.001
Companies using software or Artificial Intelligence (AI) systems for at least one of the 7 purposes	.618**	.002
Companies using software or Artificial Intelligence (AI) systems for at least two of the 7 purposes	.575**	.004
Companies using software or Artificial Intelligence (AI) systems for at least three of the 7 purposes	.568**	.005
Research and Development (R&D) or innovation activities for AI	.504*	.014

The stars (*) and (**) indicate levels of statistical significance, with one star (*) indicating a significance level of 0.05, and two stars (**) indicating a higher significance level of 0.01 or less, suggesting that the relationship is not due to chance.

COMPANIES WITH A VERY HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Companies with fixed connections at speeds of at least 30 Mb/s	.490*	.018
Companies with fixed connections at speeds of at least 100 Mb/s	.652**	<.001
Companies with fixed connections at speeds of at least 1 Gb/s	.603**	.002

COMPANIES WITH A VERY HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Companies where more than 50% of employees have Internet access for work purposes	.487*	.018
Employees using Internet-connected devices for work purposes (% of total employees)	.503*	.014
Companies with a website	.573**	.004
Description of goods and services offered, information on prices	.779**	<.001
Ability to place orders or bookings online (e.g., online shopping cart)	.832**	<.001
Online order tracking	.791**	<.001
Ability to personalize website content for regular visitors	.636**	.001
Ability to personalize or design goods and services for website visitors	.457*	.028
Customer service chat (provided by chatbot, virtual agent, or physical person responding to customers)	.671**	<.001
Companies with apps	.726**	<.001
Companies using social media	.590**	.003
Social networks	.591**	.003
Websites or apps for sharing multimedia content	.657**	<.001
Companies using at least two social media platforms	.706**	<.001
Companies with a very low level of Digitalization	-.680**	<.001
Companies with a low level of Digitalization	-.509*	.013

COMPANIES WITH A VERY HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
Companies with a high level of Digitalization	.712**	<.001
Companies that have sold online via web and/or EDI systems	.845**	<.001
Companies that have sold via web	.852**	<.001
Companies using at least one business software (ERP, CRM, BI)	.517*	.012
Use of CRM software	.778**	<.001
Use of Business Intelligence software	.638**	.001
Companies that have incurred expenses for purchasing business software in 2022 among those using them in 2023	.529**	.009
Electronic data sharing with suppliers or customers in the supply chain	.493*	.017
Electronic invoicing	-.510*	.013
Companies analyzing data internally through their own employees or employees of other group companies	.611**	.002
Companies analyzing data externally through another company or external organization	.578**	.004
Companies purchasing cloud computing services	.659**	<.001
Email services, PEC	.669**	<.001
Office software (e.g., word processing programs, spreadsheets)	.621**	.002
File storage	.664**	<.001
Computing capacity to run company software	.589**	.003
Finance and accounting software applications	.657**	<.001

COMPANIES WITH A VERY HIGH LEVEL OF DIGITIALIZATION	Pearson Correlation	Significance (2-tailed)
ERP (Enterprise Resource Planning) software applications	.431*	.040
CRM (Customer Relationship Management) software applications	.819**	<.001
Security software applications (e.g., antivirus program, network access control)	.692**	<.001
Hosting of company databases	.757**	<.001
Computing platform providing an environment for application development, testing, distribution	.546**	.007
Companies purchasing at least one intermediate or sophisticated service	.684**	<.001
Logistics for AI	-.462*	.026

The stars (*) and (**) indicate levels of statistical significance, with one star (*) indicating a significance level of 0.05, and two stars (**) indicating a higher significance level of 0.01 or less, suggesting that the relationship is not due to chance.

5.2 Regression Analysis

The Drivers of Innovation and Digitalization in Italian Companies

The research subsequently sees the development of advanced statistical analyses through SPSS (Statistical Package for the Social Sciences), such as linear and multiple regression, aimed at understanding which factors, variables, and characteristics, among those taken into consideration, influence and will influence the ability of Italian companies to respond to innovation and digitalization challenges.

The aim is to create valuable input to further understand what has already been studied, the mechanisms that support innovation and digitalization in the Italian industrial landscape, thus highlighting the main areas that can be worked on to stimulate business growth in the long term. Then, let's proceed with presenting the analysis's results, to understand which variables interact with the processes of innovation and digitalization and which weaknesses may occur. Companies that have innovated products, processes, or both in terms of innovation analysis are the dependent variables that are taken into consideration. In terms of digitalization analysis, companies with very low, low, high, and very high levels of digitalization are the dependent variables.

Following this section, a part will be devoted to interpreting the following analyses.

5.2.1 Innovation: Regressions Analysis

1A. To what extent does innovation in processes predict the rate of product innovation in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6573.619	1	6573.619	181.600	<.001[b]
	Residual	1303.139	36	36.198		
	Total	7876.758	37			

a. Dependent Variable: Companies that have innovated products

b. Independent Variable: Companies that have innovated processes

Coefficients[a]

Model		Unstandardized Coefficients B	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	-17.711	<.001	-25.810	-9.612
	Companies that have innovated processes	1.024	<.001	.870	1.178

a. Dependent Variable: Companies that have innovated products

1B. How do internal R&D expenditure and innovation expenditure per employee influence the ability of companies to innovate products?

ANOVA[a]

		Sum of Squares	df	Mean Square	F	Sig.
	Regression	3599.168	2	1799.584	14.725	<.001[b]
	Residual	4277.590	35	122.217		
	Total	7876.758	37			

a. Dependent Variable: Companies that have innovated products

b. Predictors: (Constant), Expenditure on internal R&D, Expenditure on innovation per employee

Coefficients[a]

Model		Unstandardized Coefficients B	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	11.517	.074	-1.173	24.207
	Expenditure on innovation per employee	.639	<.001	.282	.995
	Spending on internal R&D	.341	.010	.086	.597

a. Dependent Variable: Companies that have innovated products

1C. How do different types of innovation (production processes, information systems, work organization, or human resource management) influence product innovation in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6011.662	3	2003.887	36.530	<.001[b]
	Residual	1865.096	34	54.856		
	Total	7876.758	37			

a. Dependent Variable: Companies that have innovated products

b. Predictors: (Constant), Companies with innovations in information systems (innovations in information processing and communication processes), Companies with innovations in production processes and methods, Companies with innovations in work organisation or human resource management

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interva	
		B	Sig.	Lower Bound	Upper E
1	(Constant)	-2.035	.604	-9.927	
	Companies with innovations in production processes and methods	.372	<.001	.174	
	Companies with innovations in work organisation or human resources management	.495	.114	-.125	
	Companies with information system innovations (innovations in information processing and communication processes)	.382	.134	-.124	

a. Dependent Variable: Companies that have innovated products

1D. How do cooperation agreements with various external entities (client companies, competing companies, universities, or institutes of high education and high technology) influence product innovation in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4535.461	3	1511.820	16.005	<.001[b]
	Residual	3117.216	33	94.461		
	Total	7652.677	36			

a. Dependent Variable: Companies that have innovated products

b. Predictors: (Constant), Companies with cooperation agreements with:Universities or institutes of higher education and technology, Companies with cooperation agreements with: Customer companies, Companies with cooperation agreements with:Competitor companies

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	24.645	<.001	18.609	30.680
	Companies with cooperation agreements with: Customer companies	.593	.216	-.363	1.550
	Companies with cooperation agreements with: Competing companies	-2.675	.030	-5.071	-.279
	Companies with cooperation agreements with :Universities or institutes of higher education and technology	1.324	<.001	.707	1.941

a. Dependent Variable: Companies that have innovated products

2A. How does obtaining public funding predict the innovation of processes in Italian Companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2248.788	1	2248.788	20.148	<.001[b]
	Residual	4018.087	36	111.614		
	Total	6266.875	37			

a. Dependent Variable: Companies that have innovated processes

b. Predictors: (Constant), Companies that have obtained public funding (total)

Coefficients[a]

Model		Unstandardized Coefficients B	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	38.806	<.001	32.311	45.301
	Companies that have obtained public funding (total)	.738	<.001	.404	1.071

a. Dependent Variable: Companies that have innovated processes

2B. How does introducing original products to the market predict the level of process innovation in Italian companies?

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4107.912	1	4107.912	68.498	<.001[b]
Residual	2158.963	36	59.971		
Total	6266.875	37			

a. Dependent Variable: Companies that have innovated processes b. Predictors: (Constant), Companies that have introduced new products in the market

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	31.953	<.001	26.646	37.260
	Companies that introduced original products to the market	1.052	<.001	.794	1.310

a. Dependent Variable: Companies that have innovated processes

2C. How do various organizational innovations (production, work organization, business practices) collectively predict process innovation in companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5565.418	3	1855.139	89.920	<.001[b]
	Residual	701.457	34	20.631		
	Total	6266.875	37			

a. Dependent Variable: Companies that have innovated processes

b. Predictors: (Constant), Companies with innovations in work organisation or human resource management, Companies with innovations in production processes and methods, Companies with innovations in business organisation practices or external relations

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	15.796	<.001	10.973	20.619
	Companies with innovations in production processes and methods	.436	<.001	.321	.552
	Companies with innovations in business organisation practices or external relations	.520	.021	.083	.957
	Companies with innovations in work organisation or human resources management	.446	.023	.066	.826

a. Dependent Variable: Companies that have innovated processes

2D. How do different forms of financial investment in R&D and per-employee innovation expenditure predict processes innovation in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2410.087	2	1205.043	10.936	<.001[b]
	Residual	3856.788	35	110.194		
	Total	6266.875	37			

a. Dependent Variable: Companies that have innovated processes

b. Predictors: (Constant), Expenditure on internal R&D , Expenditure on innovation per employee

Coefficients[a]

Model		Unstandardized Coefficients B	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	32.987	<.001	20.938	45.037
	Expenditure on innovation per employee	.547	.002	.208	.886
	Spending on internal R&D	.258	.038	.016	.501

a. Dependent Variable: Companies that have innovated processes

2E. How do cooperation agreements with external entities influence process innovation in companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3711.554	2	1855.777	25.418	<.001[b]
	Residual	2555.321	35	73.009		
	Total	6266.875	37			

a. Dependent Variable: Companies that have innovated processes

b. Predictors: (Constant), Companies with cooperation agreements with: Suppliers of equipment, materials, components or software, Companies with cooperation agreements with: Consultants, private laboratories and research institutes

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	30.969	<.001	24.001	37.937
	Companies with cooperation agreements with: Consultants, private laboratories and research institutes	1.062	.035	.081	2.042
	Companies with cooperation agreements with: Suppliers of equipment, materials, components or software	.099	.874	-1.158	1.356

a. Dependent Variable: Companies that have innovated processes

3A. How does obtaining public funding influence innovations in both processes and products in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1346.104	1	1346.104	11.977	.001[b]
	Residual	4045.916	36	112.387		
	Total	5392.020	37			

a. Dependent Variable: Companies that have innovated products and processes

b. Predictors: (Constant), Companies that have obtained public funding (total)

Coefficients[a]

Model		Unstandardized Coefficients B	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	47.604	<.001	41.086	54.122
	Companies that have obtained public funding (total)	.571	.001	.236	.905

a. Dependent Variable: Companies that have innovated products and processes

3B. How do internal R&D and per-employee innovation expenditures predict innovations in products and processes in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1508.261	2	754.130	6.796	.003[b]
	Residual	3883.759	35	110.965		
	Total	5392.020	37			

a. Dependent Variable: Companies that have innovated products and processes

b. Predictors: (Constant), Expenditure on internal R&D , Expenditure on innovation per employee

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	39.891	<.001	27.799	51.982
	Expenditure on innovation per employee	.332	.055	-.007	.672
	Spending on internal R&D	.281	.025	.037	.524

a. Dependent Variable: Companies that have innovated products and processes

3C. How do cooperation agreements with external entities and suppliers influence innovation in both products and processes in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2278.325	2	1139.163	12.805	<.001[b]
	Residual	3113.695	35	88.963		
	Total	5392.020	37			

a. Dependent Variable: Companies that have innovated products and processes

b. Predictors: (Constant), Companies with cooperation agreements with: Suppliers of equipment, materials, components or software, Companies with cooperation agreements with: Consultants, private laboratories, and research institutes

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	41.329	<.001	33.637	49.021
	Companies with cooperation agreements with:Consultants, private laboratories and research institutes	.827	.130	-.256	1.909
	Companies with cooperation agreements with:Suppliers of equipment, materials, components or software	.084	.903	-1.303	1.472

a. Dependent Variable: Companies that have innovated products and processes

3D. How do innovation in work organization and marketing practices collectively influence product and process innovations?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3386.796	2	1693.398	29.557	<.001[b]
	Residual	2005.224	35	57.292		
	Total	5392.020	37			

a. Dependent Variable: Companies that have innovated products and processes

b. Predictors: (Constant), Companies with innovations in marketing practices, Companies with innovations in work organisation or human resource management

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	27.985	<.001	19.913	36.057
	Companies with innovations in work organisation or human resources management	.623	.002	.255	.992
	Companies with innovations in marketing practices	.517	.019	.089	.944

a. Dependent Variable: Companies that have innovated products and processes

5.2.2 Digitalization Regression Analysis

1A. How do broadband connection speeds influence the likelihood of companies being categorized with a very low level of digitalization?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5236.933	3	1745.644	25.800	<.001[b]
	Residual	1285.569	19	67.662		
	Total	6522.501	22			

a. Dependent Variable: Companies with a very low level of Digitalization

b. Predictors: (Constant), Companies with fixed connections at speeds of at least 1 Gb/s , Companies with fixed connections at speeds of at least 30 Mb/s , Companies with fixed connections at speeds of at least 100 Mb/s

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	128.466	<.001	68.399	188.534
	Companies with fixed connections at speeds of at least 30 Mb/s	-.410	.331	-1.271	.451
	Companies with fixed connections at speeds of at least 100 Mb/s	-1.289	<.001	-1.905	-.673
	Companies with fixed connections at speeds of at least 1 Gb/s	.615	.177	-.303	1.533

a. Dependent Variable: Companies with a very low level of Digitalization

1B. How does having an online presence impact a company's digitalization level?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4193.337	2	2096.669	18.004	<.001[b]
	Residual	2329.164	20	116.458		
	Total	6522.501	22			

a. Dependent Variable: Companies with a very low level of Digitalization

b. Predictors: (Constant), Companies using social media, Companies with website

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	100.232	<.001	74.976	125.488
	Companies with a website	-.515	.009	-.886	-.144
	Companies using social media	-.472	.010	-.816	-.128

a. Dependent Variable: Companies with a very low level of Digitalization

1C. How do CRM (Customer Relationship Management) and Business Intelligence Software usage affect a company's level of digitalization?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4383.139	2	2191.569	20.488	<.001[b]
	Residual	2139.363	20	106.968		
	Total	6522.501	22			

a. Dependent Variable: Companies with a very low level of Digitalization

b. Predictors: (Constant), Use of Business Intelligence software, Use of CRM software

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	55.810	<.001	44.629	66.990
	Using CRM software	-.822	.009	-1.411	-.232
	Using Business Intelligence software	-.170	.710	-1.108	.768

a. Dependent Variable: Companies with a very low level of Digitalization

1D. How does the use of AI software or systems impact a company's digitalization level?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2550.794	1	2550.794	13.487	.001[b]
	Residual	3971.708	21	189.129		
	Total	6522.501	22			

a. Dependent Variable: Companies with a very low level of Digitalization

b. Predictors: (Constant), companies that use Artificial Intelligence (AI) software or systems for at least one of the 7 purposes (Marketing, Processes, Administration, Logistic, Security, Accounting, R&D)

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	46.229	<.001	35.888	56.571
	Companies that use Artificial Intelligence (AI) software or systems for at least one of the 7 purposes	-2.279	.001	-3.570	-.989

a. Dependent Variable: Companies with a very low level of Digitalization

2A. How is selling online via the web and/or EDI systems related to the digitalization levels of Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	637.947	1	637.947	13.572	.001[b]
	Residual	987.114	21	47.005		
	Total	1625.061	22			

a. Dependent Variable: Companies with a low level of Digitalization

b. Predictors: (Constant), Companies that sold online via web and/or EDI-type systems

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	44.096	<.001	39.236	48.956
	Companies that sold online via web and/or EDI-type systems	-.275	.001	-.430	-.120

a. Dependent Variable: Companies with a low level of Digitalization

2B. What impact does using AI for accounting, control, or financial management have on a company's digitalization level?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	460.391	1	460.391	8.301	.009[b]
	Residual	1164.670	21	55.460		
	Total	1625.061	22			

a. Dependent Variable: Companies with a low level of Digitalization

b. Predictors: (Constant), Accounting, Controlling or Financial Management for AI

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	42.893	<.001	37.715	48.071
	Accounting, control or financial management for AI	-.337	.009	-.580	-.094

a. Dependent Variable: Companies with a low level of Digitalization

2C. How does a lack of AI skills within a company relate to its level of digitalization?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	326.959	1	326.959	5.289	.032[b]
	Residual	1298.102	21	61.814		
	Total	1625.061	22			

a. Dependent Variable: Companies with a low level of Digitalization

b. Predictors: (Constant), Lack of skills in the company for AI

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	46.305	<.001	37.465	55.145
	Lack of skills in the company for AI	-.165	.032	-.314	-.016

a. Dependent Variable: Companies with a low level of Digitalization

3A. How do different tiers of internet connection speeds influence the digitalization levels of Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2804.235	3	934.745	16.763	<.001[b]
	Residual	1059.512	19	55.764		
	Total	3863.746	22			

a. Dependent Variable: Companies with a high level of Digitalization

b. Predictors: (Constant), Companies with fixed connections at speeds of at least 1 Gb/s , Companies with fixed connections at speeds of at least 30 Mb/s , Companies with fixed connections at speeds of at least 100 Mb/s

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	-68.532	.016	-123.063	-14.001
	Companies with fixed connections at speeds of at least 30 Mb/s	.721	.068	-.060	1.503
	Companies with fixed connections at speeds of at least 100 Mb/s	.605	.035	.046	1.164
	Companies with fixed connections at speeds of at least 1 Gb/s	-.197	.627	-1.031	.637

a. Dependent Variable: Companies with a high level of Digitalization

3B. How do CRM and BI Software adoption correlate with higher digitalization levels in companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2712.223	2	1356.112	23.553	<.001[b]
	Residual	1151.523	20	57.576		
	Total	3863.746	22			

a. Dependent Variable: Companies with a high level of Digitalization

b. Predictors: (Constant), Use of Business Intelligence software, Use of CRM software

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	9.722	.023	1.520	17.925
	Using CRM software	.877	<.001	.445	1.310
	Using Business Intelligence software	-.302	.371	-.990	.386

a. Dependent Variable: Companies with a high level of Digitalization

3C. How does the use of AI software or systems impact a company's digitalization level?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1477.030	1	1477.030	12.996	.002[b]
	Residual	2386.717	21	113.653		
	Total	3863.746	22			

a. Dependent Variable: Companies with a high level of Digitalization

b. Predictors: (Constant), companies that use Artificial Intelligence (AI) software or systems for at least one of the 7 purposes

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	14.322	.001	6.305	22.339
	Companies that use Artificial Intelligence (AI) software or systems for at least one of the 7 purposes	1.734	.002	.734	2.735

a. Dependent Variable: Companies with a high level of Digitalization

3D. What is the impact of AI-related R&D and innovation activities on the digitalization level of Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	980.666	1	980.666	7.143	.014[b]
	Residual	2883.080	21	137.290		
	Total	3863.746	22			

a. Dependent Variable: Companies with a high level of Digitalization

b. Predictors: (Constant), Research and Development (R&S) or innovation for AI

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	17.816	<.001	9.866	25.767
	Research and Development (R&D) or innovation for AI	.416	.014	.092	.741

a. Dependent Variable: Companies with a high level of Digitalization

4A. How do high-speed internet connections impact achieving a very high level of digitalization in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	421.902	2	210.951	7.639	.003[b]
	Residual	552.317	20	27.616		
	Total	974.219	22			

a. Dependent Variable: Companies with a very high level of digitalization

b. Predictors: (Constant), Companies with fixed connections at speeds of at least 1 Gb/s, Companies with fixed connections at speeds of at least 100 Mb/s

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	-11.000	.070	-22.978	.978
	Companies with fixed connections at speeds of at least 100 Mb/s	.258	.132	-.085	.602
	Companies with fixed connections at speeds of at least 1 Gb/s	.143	.608	-.430	.717

a. Dependent Variable: Companies with a very high level of digitalization

4B. How do CRM and Business Intelligence Software usage correlate with very high digitalization levels in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	593.498	2	296.749	15.589	<.001[b]
	Residual	380.721	20	19.036		
	Total	974.219	22			

a. Dependent Variable: Companies with a very high level of digitalization

b. Predictors: (Constant), Use of Business Intelligence software, Use of CRM software

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	-2.169	.349	-6.885	2.548
	Using CRM software	.383	.004	.135	.632
	Using Business Intelligence software	-.088	.647	-.484	.308

a. Dependent Variable: Companies with a very high level of digitalization

4C. How does engagement with social media platforms relate to a very high digitalization level in Italian companies?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	339.602	1	339.602	11.238	.003[b]
	Residual	634.617	21	30.220		
	Total	974.219	22			

a. Dependent Variable: Companies with a very high level of digitalization

b. Predictors: (Constant), Companies using social media

Coefficients[a]

Model		Unstandardized Coefficients		95.0% Confidence Interval for B	
		B	Sig.	Lower Bound	Upper Bound
1	(Constant)	-8.892	.062	-18.270	.487
	Companies using social media	.237	.003	.090	.384

a. Dependent Variable: Companies with a very high level of digitalization

6. Interpretation of results

The particular segment that is critically important here has an interpretation that begins with statistical aspects but is mainly oriented toward the actual contextualization of the results obtained. The most important insights from each analysis have been taken in order to understand the divergent motivations and connections, and articulate answers have been given to the research questions posed in the empirical analysis in order to satisfy the main research question of this research thesis.

6.1.1 Product innovation

Correlation analyses indicate an intertwined set of relationships between integrated innovation plans, collaboration, strategic financial support, public support, and control of intellectual property. This implies that all these parts form a dynamic business innovation landscape that shows companies how to improve their innovation capabilities under practical conditions.

There are thus several aspects related to product innovation.

However, those most congruent with the research were taken into account to develop various regression analyses and answer valuable questions.

This first analysis invites us to delve into the essence of process innovation in an innovation economy. With $r = .914^{**}$ ($p < .001$), and $b = 1.024$ ($p < .001$), a strong correlation between process and product innovation is not only a sign of their coexistence but also suggests that efficiency and improvements in internal processes trigger the development of new products. This relationship emphasizes the need for a systemic approach to innovation whereby continuous improvement of processes does not exist as an independent target but rather is some part of all-inclusive plans enhancing competitiveness and long-term growth.

Additionally, product innovations can be significantly influenced by R&D investments and allocation of funds per-employee as shown by the significant coefficients (innovation expenditure per employee: $\beta = .639$, p

< .001; internal R&D expenditure: β = .341, p = .010). This means that financial resources committed to promotion are essential while at the same time pointing out that organizations should pay attention to how they distribute and make use of their finances. By receiving targeted investments in human capital and R&D activities, companies could increase their speed in the market when introducing new products.

By looking at different types of innovation and how they affect product innovation, it can be seen the intricacy and interdependence of innovation as a process that goes beyond the typical confines of R&D. This can be through progressions made in production processes (β = .372; Sig = < .001), which can encourage the development of new products. This is because such innovations enhance efficiency, communication, and collaboration within the company while also improving its ability to react quickly to market changes and customer needs, reducing costs and leading time.

Innovation in information systems can improve data collection and analysis and lead to informed decision-making. Such improvements increase products and provide opportunities for creating innovative products. This variable had a positive impact on the regression analysis (β = 0.495); however, there was no statistical evidence of a significant influence on product innovation, at least not in the usual statistical sense. Nevertheless, the coefficients' direction suggests that there is a possibility of a positive effect, which could be statistically significant with a larger sample size or in other contexts. The findings related to cooperation agreements show that strategic partnerships are important for product innovation. The same applies to innovation in work organization or human resources management.

Findings on cooperative agreements show that strategic partnerships are important for product innovation.

In this case, working with colleges and schools of advanced technology has been found to have the highest positive effect on product innovation (β = 1.324, p < .001), giving companies an opportunity to get state-of-the-

art knowledge, skills, and technologies. This could also explain why partnering with a competitor is problematic since it goes against the core elements of product innovation itself (β = -2.675, p = .030). It may be due to the difficulties in protecting intellectual property and managing knowledge sharing within a rival environment.

The resilience and adaptability of the businesses was exposed by the size impact of the 2020 pandemic, as different companies responded in different ways to the pressures involved, thereby showing that operational flexibility, access to finances and tax breaks were important. From this context, it is clear that innovation strategies must be flexible and resilient enough to accommodate quick changes in external conditions. To sum up, Italian companies' ability to innovate will be enhanced by a joint approach and strategy which includes; external collaboration, internal effectiveness and prudent management of resources. This helps to understand how companies can effectively compete within their sectors or at specific scales while preserving innovations for future sustainable growth.

6.1.2 Process Innovation

In this comprehensive study, several variables that drive process innovation in Italian companies, ranging from public funding for the introduction of new products into the market to organizational innovations, R&D expenses, and cooperation agreements, are examined. This section is a synthesis of key findings based on strong statistical evidence implications that give insight into the promotion of an innovative culture.

The assessment uncovers a significant positive relationship between the provision of public funds and process innovation with a beta coefficient of .738 ($p < .001$). The finding cuts across the traditional understanding that views public funding as mere financial support but instead suggests that government funding acts as a catalyst prodding companies to engage in innovative processes. It, therefore, underscores the importance of government support in fostering an environment conducive to company development toward devising new ways.

Data demonstrates that launching an original product is an important predictor for process innovation, as indicated by a beta coefficient of 1.052 ($p < 0.001$). This holds true because developing new products often requires major changes throughout manufacturing, logistics, and administrative systems. It argues that innovation is a whole-system approach where developments in product offerings are synonymous with better operational procedures.

Business organization practices ($\beta = .520$, $p = .021$) , and work organization ($\beta = .446$, $p = .023$) all have significant influence over process innovations. These findings expose the complexity underpinning firm-based innovations within multiple dimensions of organizational change; it points toward the papers' assumption about the necessity for organizations to take an integrated approach to innovating every aspect of their operations.

In addition, investment in internal R&D expenditures ($\beta = 258$; $p = .038$) and expenditure per employee on innovation ($\beta = 547$; $p = .002$) are identified as crucial factors impacting corporate success. This shows why companies should strategically invest in research and development to ensure that it is not only significant but also wisely allocated for maximum innovation output.

The analysis of cooperation agreements displays various impacts on process innovation. Cooperation enhances innovations considerably among knowledge-intensive bodies such as consultants, private labs, or research institutes with ($\beta = 1.062$, $p = .035$). In contrast to this result, agreements with equipment suppliers, software vendors and material providers ($\beta = .099$, $p = .874$) have a weak influence. The divergence emphasizes the importance of strategic partnerships for accessing external expertise and knowledge that supports innovative process design.

Consequently, this analysis portrays the complex networks of factors contributing to Italian companies' process innovation within Italy. It recommends public funding and R&D investment as the foundational basis for strategic innovations. In addition, it accentuates an upward spiral linking new product launches to better processes, thereby requiring an integrated approach where organizational change goes hand in hand with strategic alliances aimed at innovating products and services.

Companies must be able to position themselves well by having strategic know-how to navigate these areas in order to improve business growth and maintain competitiveness in a rapidly changing business environment.

6.1.3 Product and Process Innovation

Although it was explained in detail in the two previous interpretations that process and product innovation are strongly correlated with each other, a further regression analysis was developed to investigate which factors and variables positively or negatively influence companies that innovate both products and processes.

The presented statistical data gives a comprehensive and nuanced picture, shedding light on the complex interplay of forces that lead to product and process innovation in Italian companies. A detailed examination of correlation coefficients and regression analysis gave deeper insights about how factors such as public funding, internal R&D, and strategic collaborations influence companies' innovative trajectories. There is a strong positive correlation between companies having received public financing and innovating in products & processes ($\beta = .500$, $p = .001$), indicating that public financing is an important predictor for the outcome of innovation. The ANOVA results validate this connection with an F-value of 11.977 and significance at $p = .001$, implying a good fit of the model. This means that public funding promotes innovations implying that such funds are not just financial aids but rather have a place within the innovation ecosystem.

For example, internal expenditure on R&D has a somewhat mixed relationship with respect to human resource costs per employee. While investment in internal R&D expenditure has positively significant effects on both products and processes ($\beta = .281$, $p = .025$), there is also an increase in innovation expenditures per employee, which shows a positive but statistically insignificant p-value at the .055 level, which is slightly above the usual significance cutoff point. This implies that spending on research and development clearly drives innovation, although the effect of per-employee expense on innovation is weaker across these companies.

On the one hand, cooperation agreements with consultants, private labs, and research institutes indicate positive though non-significant associations with innovations in both products and processes. Meanwhile, partnership agreements with suppliers of equipment, materials, components, or software do not significantly affect innovations ($\beta = .084$, $p = .903$). Thus, while partnerships may turn knowledge-intensive entities appropriate for exchanges necessary for innovations, supplier agreements seem not to contribute directly to this information.

ANOVA results show this for companies making use of either innovative work organization or human resource management and marketing practices, which demonstrate a high collective impact upon innovations in products and processes ($F = 29.557$, $p < .001$). Both variables are statistically significant predictors of innovation, with work organization and HR management displaying slightly stronger relationships ($\beta= .623$, $p=.002$) than marketing practices ($\beta= .517$, $p=.019$). It thus emphasizes the significance of internal organizational dynamics as well as market-facing strategies in innovation.

The data reflects a multifaceted landscape where financial, strategic, and organizational elements all play vital roles in shaping innovation in products and processes. Public funding and internal R&D investments emerge as strong drivers of innovation (again confirming what was

analysed previously), implying that governments need to provide adequate support while corporate research spending is also important. The importance of human resources and marketing-based innovations points to an integrated approach involving both internal capabilities and external competencies for achieving innovation. Lastly, although strategic partnerships are necessary, their impacts differ across collaborations. This suggests that such coalitions have to be selected carefully.

6.2.1 Low Level of Digitalization

Moving on to the second main theme of this empirical analysis, the findings act as a convincing story about the criticality of digital infrastructure and capabilities in determining one's digital position. There is an important underlying point that the correlation between high-speed internet connectivity and low levels of digitalization, particularly among fixed lines at speeds of 100 Mb/s or higher ($r = -.881$, $p < .001$) exemplifies: fast connection is not just a utility but rather interdependence to any other digital activity including innovation. Through this high-speed internet, companies have efficient communication, cloud services, and advanced online tools for easier access. That is why it was suggested long ago that more than half of employees are on the Internet while working ($r = -.799$, $p < .001$). These companies are not poorly digitized; rather, they need their workers to get more involved in innovations by enhancing their digital access.

Another huge negative relationship with CRM software ($r = -.818$, $p < .001$) points towards the lack of enough digitalization within companies when applying sophisticated digital solutions to business processes can bring about radical transformation. This is because Customer Relationship Management systems provide more than that as they hold complex data sets on customer behavior, preferences, and needs, which, if leveraged upon, will allow informed decision-making and personalizing of customer experiences; hence, this may give a business a competitive advantage in the digital economy.

Similarly, the adoption of cloud services has shown a strong negative association ($r = -.822$, $p < .001$). The implication here would be that businesses have increasingly migrated from on-premise setups relying on hardware into cloud-based models, which bring flexibility, scalability, and cost-effectiveness to operations. Cloud services eliminate costs related to physical servers while allowing companies to deploy applications quickly at scale, store vast data volumes safely, and use advanced computation power whenever needed. Agility herein helps organizations keep adjusting to market shifts and promote innovation.

The presence of a website acting as 'e-commerce' does more than just increase a company's revenue in an era when customers want to buy online; therefore, the ability to sell on the Internet is part of its digital strategy. Through e-commerce platforms, companies can reach their boundaries, obtain customer data and engage them digitally.

The leap towards automation and data-driven decision-making that AI represents within accounting or financial control ($r = -0.337$; $p = 0.009$) underscores its transformative potential in enhancing levels of digital maturity. Algorithms based on artificial intelligence and machine learning have the capability to analyze big data sets, uncover trends, and predict future outcomes by automating routine tasks so companies can focus more on strategic initiatives, thereby increasing efficiency.

This lack of AI skills has been recognized as one of the problems experienced on the path toward digitalization ($r = -0.165$; $p = 0.032$). The skills gap is a bigger issue in the digital economy considering how rapidly technology changes, such as AI-related roles, cybersecurity persons, and people doing data analysis, among others, quickly become irrelevant just because no skilled practitioners are available, yet they are urgently required. This means that any organization cannot go through a successful transformation to become a digital company without taking the learning process seriously, while employees should be involved in re-skilling

programs constantly within the company itself because this situation created on its own needs immediate intervention.

This means that in a snapshot, digital infrastructure, capabilities, and skills are combined with innovation, competition, and sustainability of business. The presence of these interconnections requires companies to invest in high-speed Internet, CRM applications and cloud services, e-commerce, and AI technologies, as well as to bridge the digital skills gap. These factors underpin successful digital transformation strategies that enable companies to effectively navigate the complexities of the digital world. Therefore, from here, it can be seen how companies should act on this in order to ensure their survival in today's world.

6.2.2 High Level of Digitalization

This section focuses on understanding how technological diffusion interrelates with high digitalization levels in Italian companies. The role of high-speed internet connection in driving digital development is so evident.

As with the previous analysis showing the negative relationship, companies enjoying internet connectivity speeds that are not lower than 100 Mbps demonstrate a significant positive correlation between digital maturity ($r = .605$, $p = .035$). This link thus emphasizes the essence of fast and reliable internet connections for various digital activities, including real-time data analytics within cloud computing platforms, which are therefore indispensable for any modern company operating in the era of digitalization.

The adoption of Customer Relationship Management (CRM) and Business Intelligence (BI) software is recognized as playing a critical role in driving digital transformation efforts. Notably, CRM systems exhibit a strong positive association with levels of digitalization ($r = .877$, $p < .001$), implying their significance in enhancing customer interactions and simplifying sales processes through advanced data analytics. Thus, this

solution is beneficial to businesses as it enables them to accrue better insights about the clients, hence becoming sources of competitive advantage.

Furthermore, companies that have effectively utilized artificial intelligence (AI) can be distinguished from those whose adoption rates of AI are low. For instance, connecting at least one of seven stated areas (Marketing, Processes, Administration, Logistic, Security, Accounting, R&D) with AI has a great influence on levels of digitalization ($r = 1.734$, $p = .002$), which highlights its ability to automate processes, improve decision making and drive innovations. This move towards integrating AI signifies an orientation toward efficiency, agility, and innovation aimed at gaining a competitive advantage over rivals.

Specifically, investing in R&D relating to AI explains why businesses should allocate resources to combining new technologies and fostering innovative thinking (.416; $p<0.014$). These investments represent a proactive approach supporting current changes within the digital space and using all potential suggested by artificial intelligence for transforming operating models or products offered on the market.

Therefore, the overall story here has been one about strategic digitalization whereby concerted efforts in embracing high-speed internet, advanced CRM and BI systems, forward-looking AI solutions, and investments in R&D have been the backbone of a comprehensive digital approach. It aims to improve the efficiency of operations as well as customer interactions and innovation capabilities for organizations to excel in the new era of digitalization. As such, Italian companies should explore their own digital transformation paths if they are to remain ahead by employing these enabling technologies and strategies with which they can gain a competitive advantage in the digitized markets to stimulate growth and sustain their market position.

6.3 Sector and Dimension Considerations

The relevance and applicability of this analysis can be enhanced if a sectorial, as well as dimensional perspective, is integrated into it, recognizing the diversity of the business environment. It acknowledges that innovation and digitalization dynamics are not uniform but differ significantly in each industry and organization size. This strategy guarantees that the findings and recommendations from the analysis are both generalizable and applicable to different sectors and dimensions of businesses by meeting their particular requirements and difficulties.

6.3.1 Considerations of Innovation

The analysis of the Italian innovation panorama, divided by economic sectors and company size, reveals a complex and stratified ecosystem where innovative capacity manifests itself in distinct ways, rooted in the unique fabric of each sector and company size.

Innovation is a continuous effort in sectors such as information and communication services or manufacturing, influenced by the rapid evolution of digital technologies and machinery. This suggests a trend towards increasing assimilation of new technologies and innovative business models in line with the global wave of digital transformation.

In contrast, traditional industries such as mining or real estate show lower levels of innovative activity, potentially reflecting a more cautious approach to innovation, which may be intrinsically linked to the nature of operations and investments in the sector. This perhaps signals areas where positive law could facilitate such change through the integration of green techniques or more durable processes.

When considering company size, it is evident that larger companies demonstrate a greater capacity to pursue innovative activity, probably due to more abundant and easily accessible resources. On top of that, they are

also more likely to obtain public financial aid and take advantage of tax breaks that further promote their research and development activities.

The devotion of smaller companies to the growth of novel items and procedures in the midst of restricted resources remains considerable. This tendency underscores how crucial it is to create a fostering environment for innovation within SMEs, which can play the role of real change-making agents in terms of economics.

This resilience highlighted both the continuity and in some areas intensification of innovative efforts by Italian companies during 2020. Consequently, this endurance imposes strategic significance on this initiative as an instrument that helps attain competitive advantage over long-term stability.

Therefore, different approaches should be considered when supporting innovation across industries and sizes. It is important for public policies to be well thought-out so as to address specific impetus, barriers, and incentives for innovation pertinent to each local context. For instance, partnerships between universities, research centers, and industry could foster innovation within sectors where such processes are still in their infancy stage. Also, the creation of financial grants targeting small businesses geared towards new technology access, as well as simplified regulatory frameworks, might unlock their ingeniousness.

In conclusion, the sectoral and size considerations make an essential contribution to understanding the dynamics of innovation in Italy. They highlight the need for an innovation policy that is not only stimula but also ensures that its benefits are diffused and contribute to the sustainable growth of the Italian economy.

6.3.2 Considerations of Digitalization

Within sectors, digitalization manifests itself as a complex mosaic, where each sector has its own nuances in assimilating digital technologies. The manufacturing sector, for example, uses digitalization to reshape the value chain and quickly adapt to market changes; in fact, the factory of greater long-term efficiency and process innovation requires careful reflection on how to use new technologies. In the energy sector, it is interesting to highlight a link between sustainability and digitalization through the use of digital capabilities in the management and distribution of resources.

An important consideration can be made about the construction sector, which is traditionally less ready to welcome changes in the digital world. However, it can improve in terms of its attitude towards software-based project development and construction site management. This represents a real shift towards innovation in one of the most important segments of the economy.

In terms of size, large companies differ from small ones in that they can afford it thanks to the internal resources, both financial and professional, necessary for the use of advanced solutions, including artificial intelligence systems. These companies are more likely to use metamethods of data collection to make decisions based on extremely complicated data or use industrial robotics to find a place in the industry in the future.

Small businesses, on the other hand, are expected to overcome barriers such as skills and resource shortages that make digital migration more gradual. However, they could use digital strategies successfully adapted based on their flexibility and proximity to customers, which would allow them to compete in an increasingly digital market.

Therefore, collaboration between industries in the form of partnerships can provide SMEs with the tools and skills needed to overcome these barriers to digitalization, such as experiencing prohibitive costs or lacking the necessary skills. Rapid progress in the digital development of these

companies would be facilitated by disseminating best practices and access to common technological platforms.

Overall, the digitalization landscape in Italy reflects the variety of paths and speed of adoption. Creating favorable conditions for digitalization across all business sizes and sectors is essential for digital innovation to be inclusive and spread equitably. These sectoral and dimensional considerations about digitalization not only enhance the peculiarities of each area but also ensure that the digital transformation is consistent with the specific dimensional needs of the business sector.

7. Conclusion

The exploration of innovation and digitalization within Italian industries, as undertaken in this thesis, has brought to the fore a complex and multifaceted panorama that characterizes the transformative power of these forces on the economic fabric of the country. This survey, which has covered aspects from 2018 to 2023, denoted a crucial period in which Italian companies are increasingly embracing technological progress and digital transformation as critical factors for growth, competitive advantage, and sustainability. The empirical analysis presented here, therefore, not only highlights the different impacts of these factors on Italian companies but also sheds light on complex internal-external dynamics that facilitate or hinder innovation and digitalization efforts within companies.

At the heart of this thesis is the assertion that innovation and digitalization are not just technological imperatives but fundamentally intertwined with broader organizational, cultural, and strategic dimensions. Consequently, the variables that will have the greatest influence on the innovative aspects in Italy were examined; thus, understanding what quantitative impact they will have in the future is very important.

Therefore, there is a positive correlation between digitalization and the improvement of operational performance of Italian industries, which implies that digital technologies play an important role in improving efficiency, driving product and process innovation, and promoting new business models. However, this document also highlights the challenges associated with this transition. For example, digital skills gaps and financial constraints on investment are significant obstacles to be overcome if the full potential of economic growth is to be reached.

Furthermore, the analysis of the Italian landscape with respect to broader global technological trends and changes in economic models provides valuable information on the strategies that companies can adopt to face the complexities of the digital age.

It emphasizes investments in technology, as well as collaboration or the development of new capabilities that can adapt to and take advantage of technological changes.

The additional considerations to the central part underline the role by which technological progress supports the need for a flexible organizational culture in organizations of an innovative and digitalized nature. To effectively integrate technological advances into business operations, effective integration of digital technologies requires more than simply purchasing new tools. To achieve this, developing skills, strategic connections, and channels that promote continuous improvement is necessary.

It also reveals other forms of innovation by companies using these devices and technologies, such as Internet of Things (IoT) based solutions, Industry 4.0 concepts, as well as the development of new products or services using digital technologies that increase efficiency while reducing operating costs. However, reaching full maturity in digitalization is accompanied by several challenges.

Furthermore, the research has exposed the value that external collaborations and networks bring during this innovation process. The relationship between technology provider partners, especially those in research fields or even participation in any form of technological or innovation ecosystem, opens up knowledge gaps within the limited resources that companies possess regarding their specific area of interest. This will certainly help us understand how to overcome internal obstacles, thus accelerating the pace at which it is possible to adopt recent advances in data processing.

The nature of the digital landscape in Italy has substantially changed as a result of the emergence of artificial intelligence, blockchain technology, the Internet of Things, and other developments related to the digital economy. For Italian companies to survive in this ever-changing world of

business, they must be able to adapt themselves by learning and adapting constantly so that they are ready for forthcoming digital revolutions.

The thesis, therefore, contributes to a better understanding of how Italian industries are affected during this era of technological change. It can be used by researchers who want to examine issues such as the relationship between new technologies and innovation in businesses so that they can develop techniques on how industry players can survive in the digital environment. Consequently, it is hoped that the results of this research will provide some guidance for Italian companies operating in today's increasingly digital era and who are interested in exploiting these factors as a source of sustainable expansion or competitive advantage over rivals.

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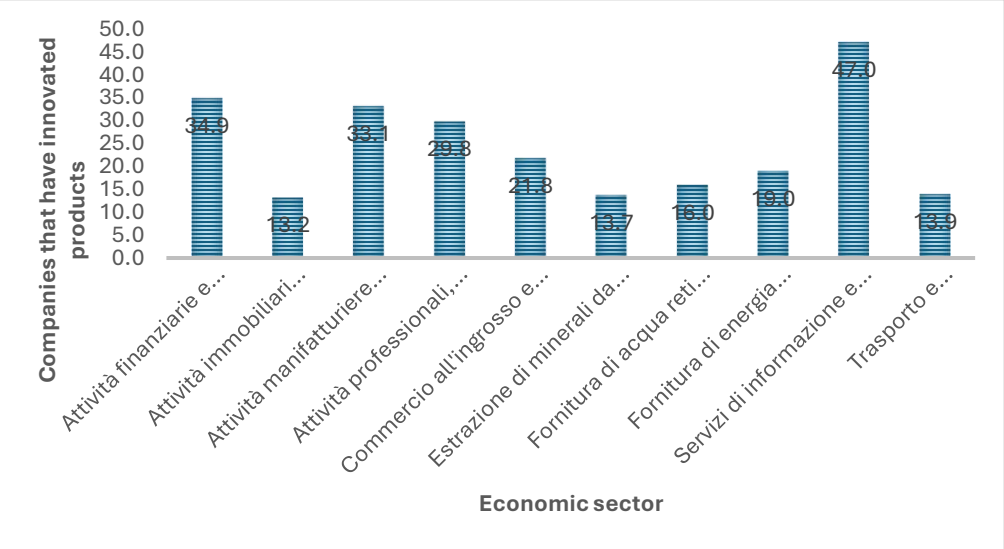
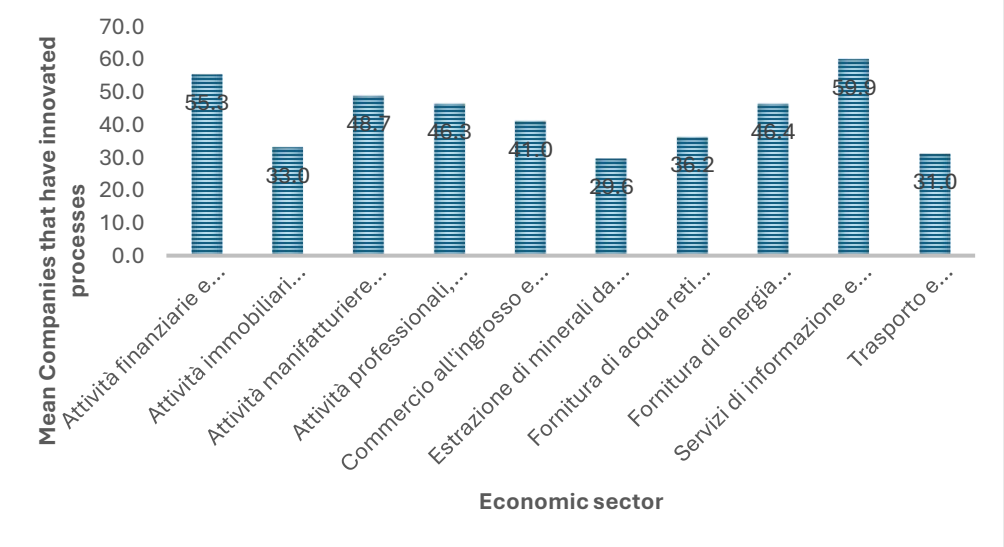
**The grammatical and stylistic assistance provided by Grammarly was used in the revision of this paper to ensure linguistic accuracy and formal consistency. Such use has not affected the content and analysis presented.*

Appendix

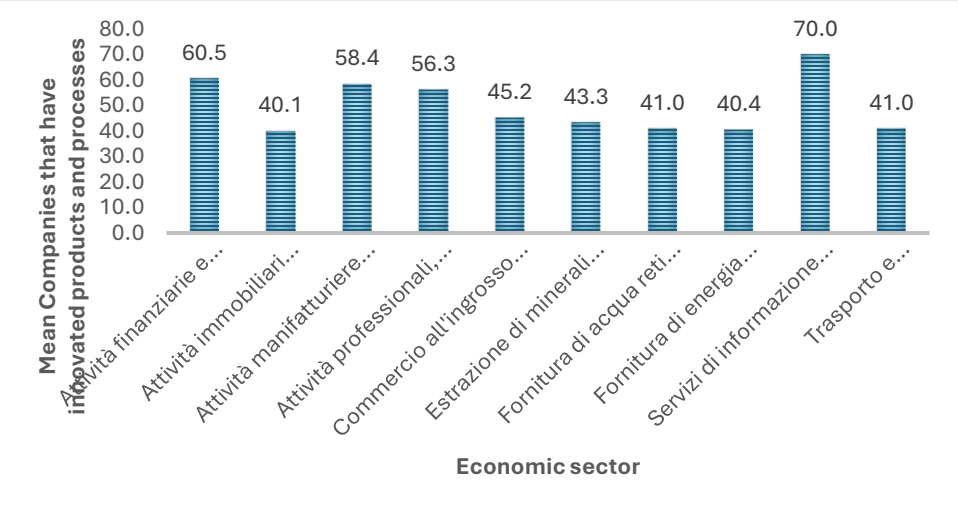
Simple Bar of Companies That Innovated Products by Economic Sector



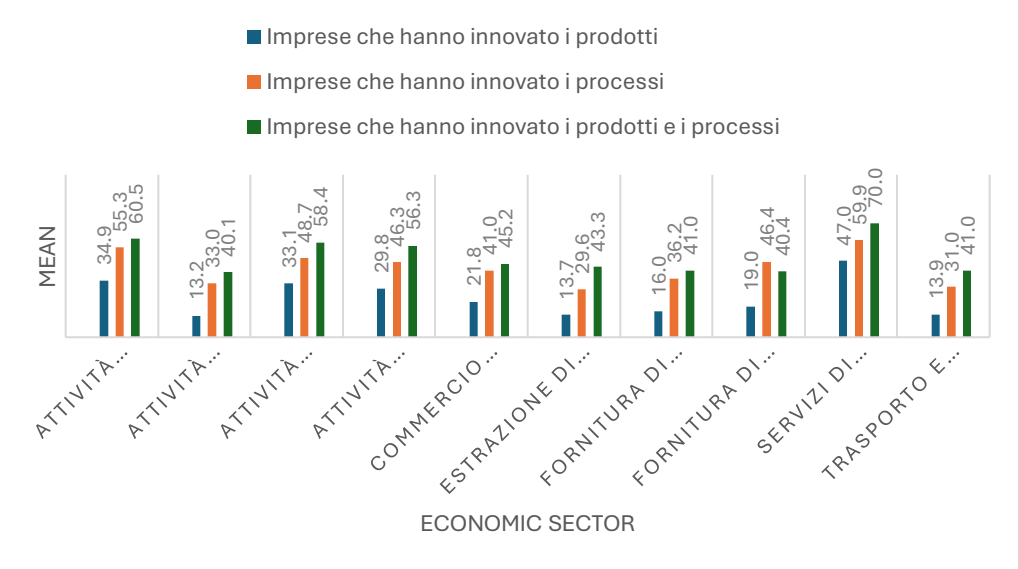
Simple Bar Mean of Companies that Innovated Processes by Economic Sector



Simple Bar Mean of Companies that Innovated Products and Processes by Economic Sector



Simple Bar means companies that have innovated products, companies that have innovated processes, and companies that have innovated products and processes by the economic sector.



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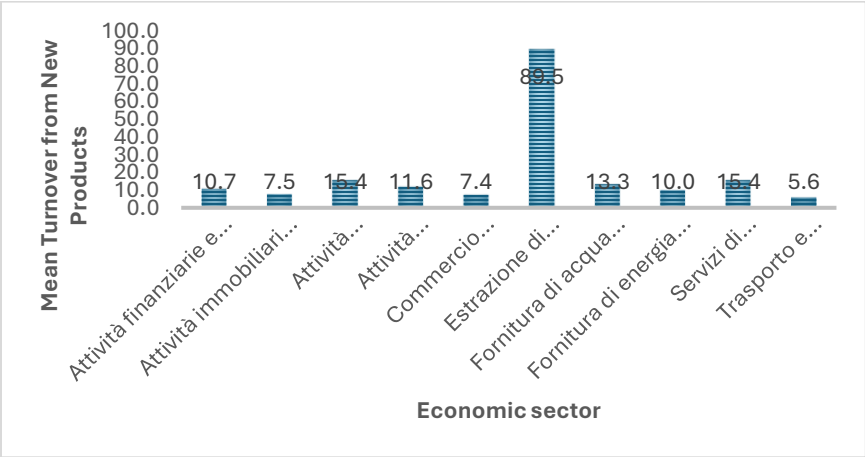
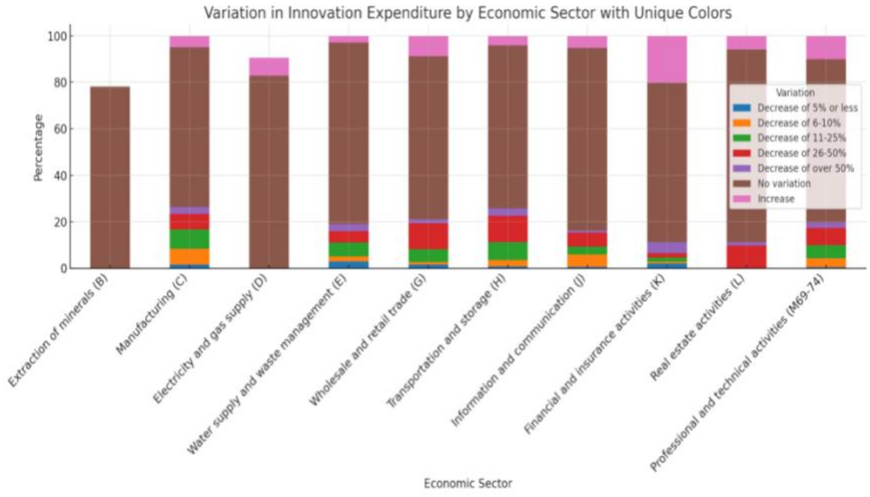
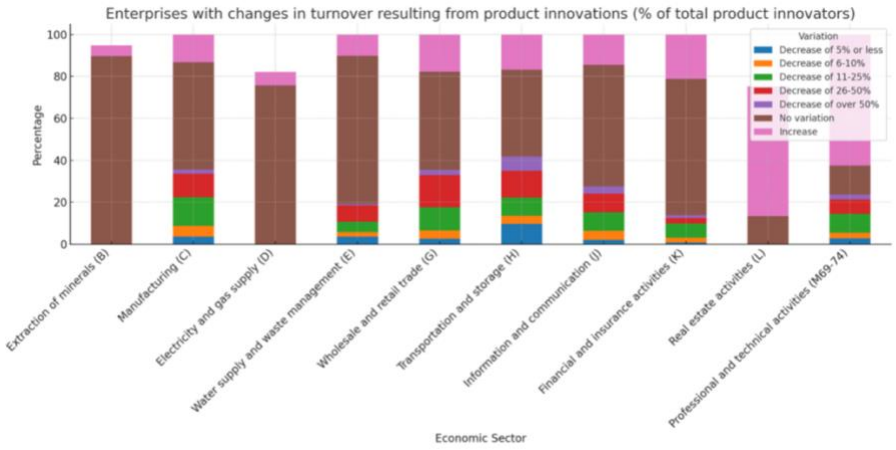
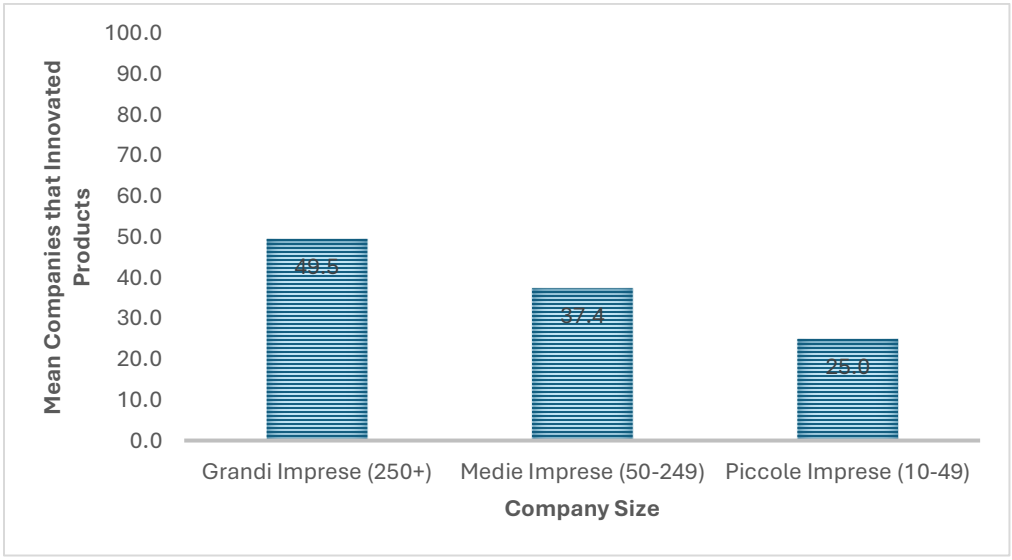


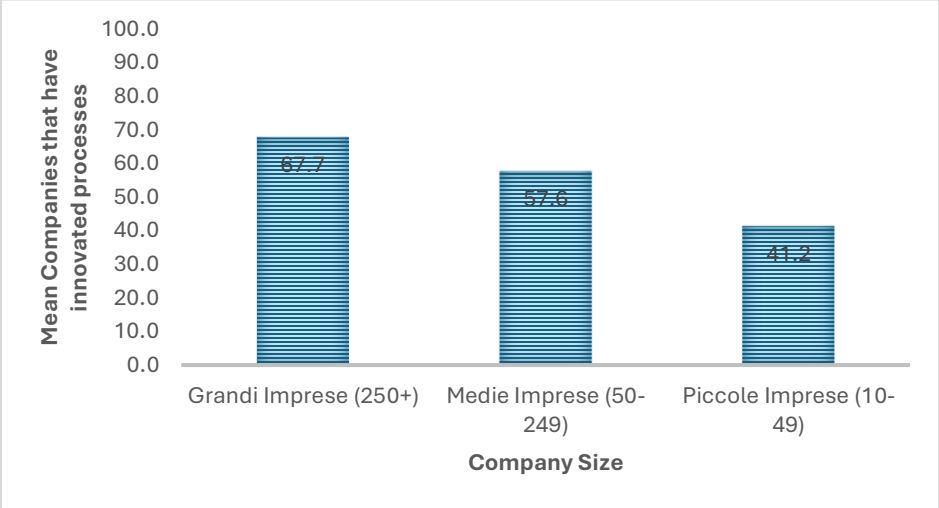




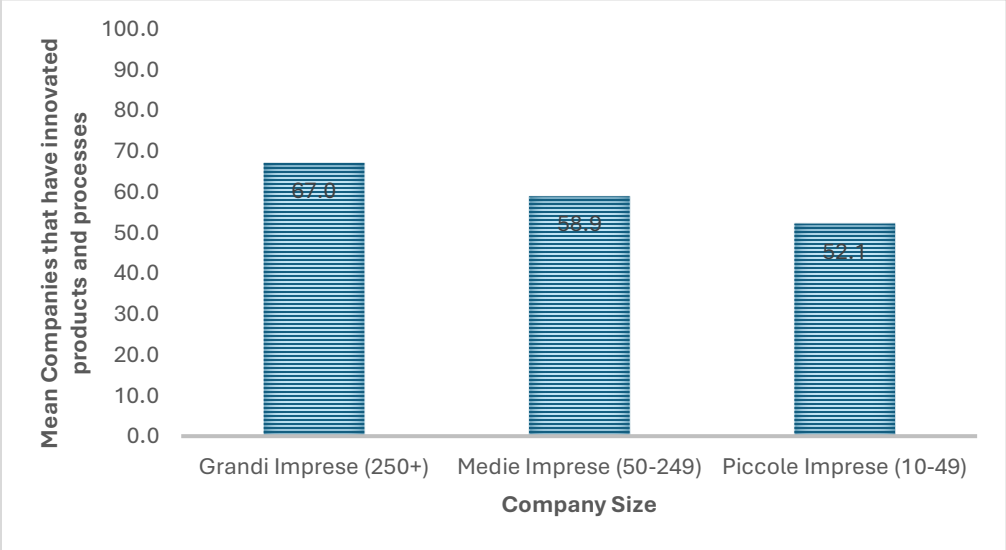
Simple Bar Mean of Companies that have innovated products by Company Size



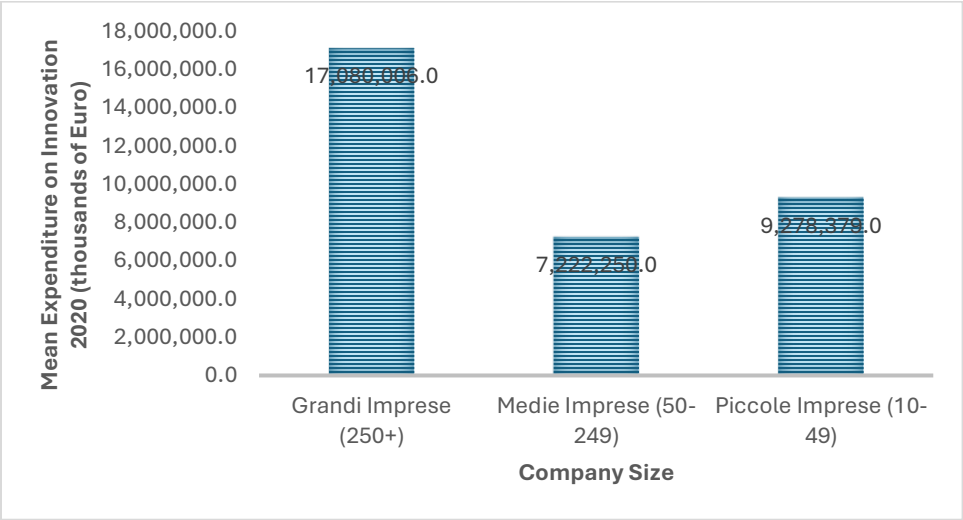
Simple Bar Mean of Companies that Innovated Processes by Company Size

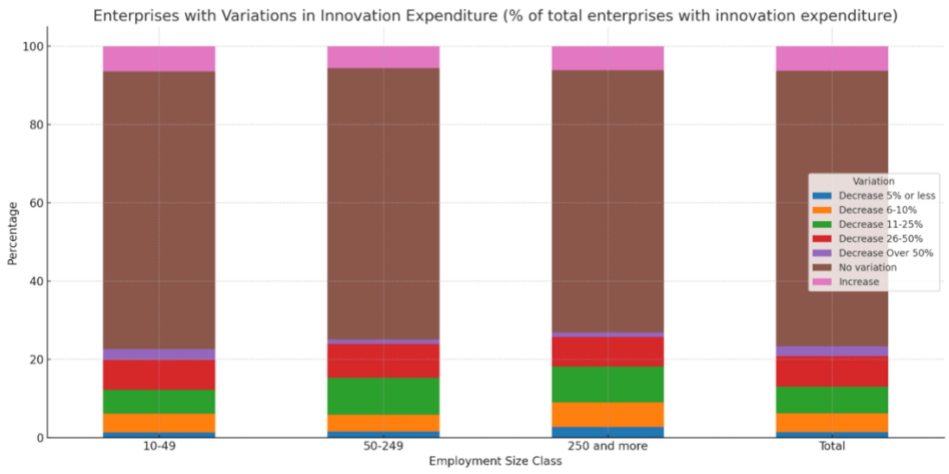


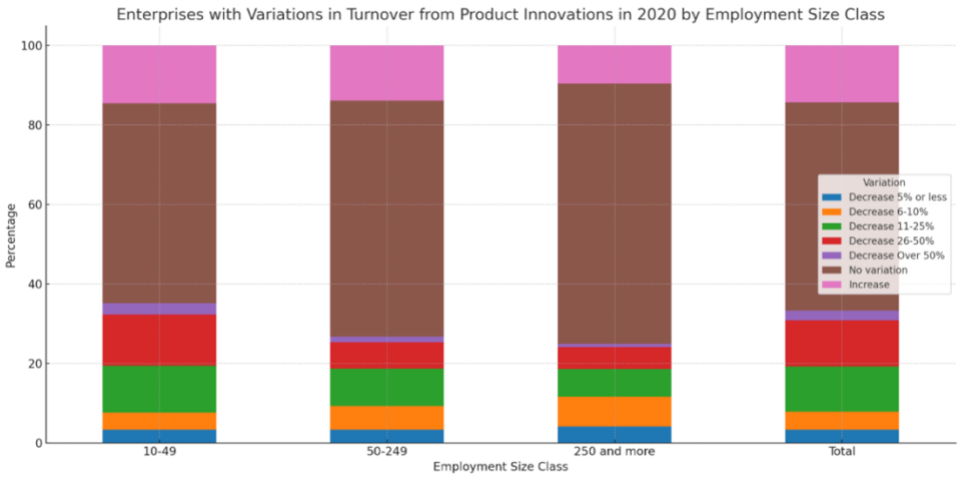
Simple Bar Mean of Companies that Innovated Products and Processes by Company Size



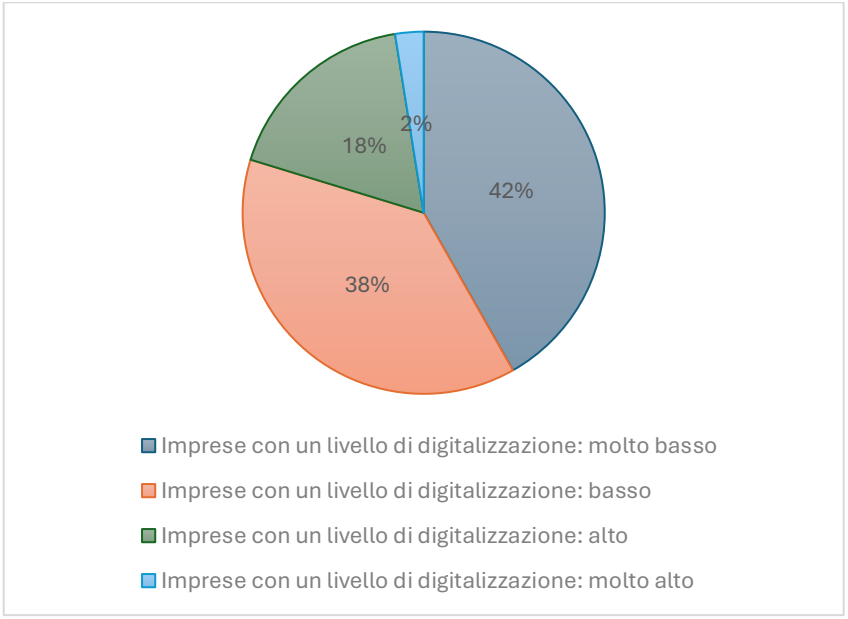
Simple Bar Mean of Expenditure on Innovation 2020 (thousands Euro) by Company Size



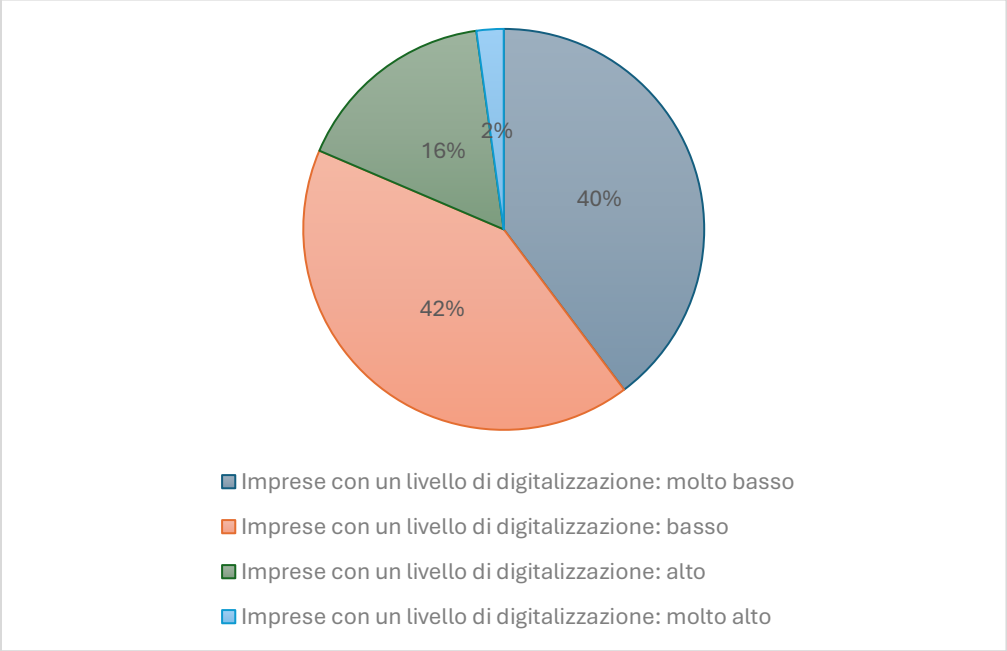




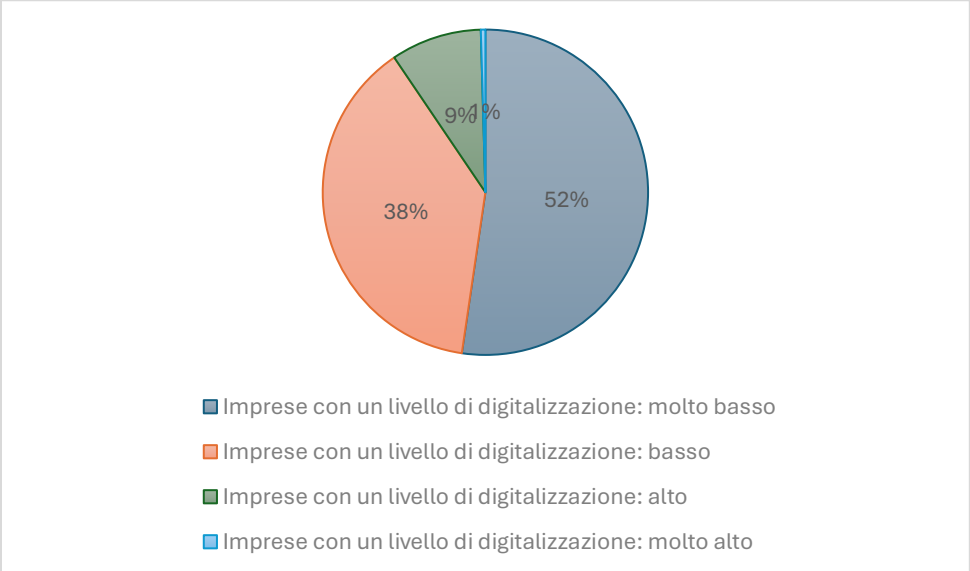
Manufacturing activities



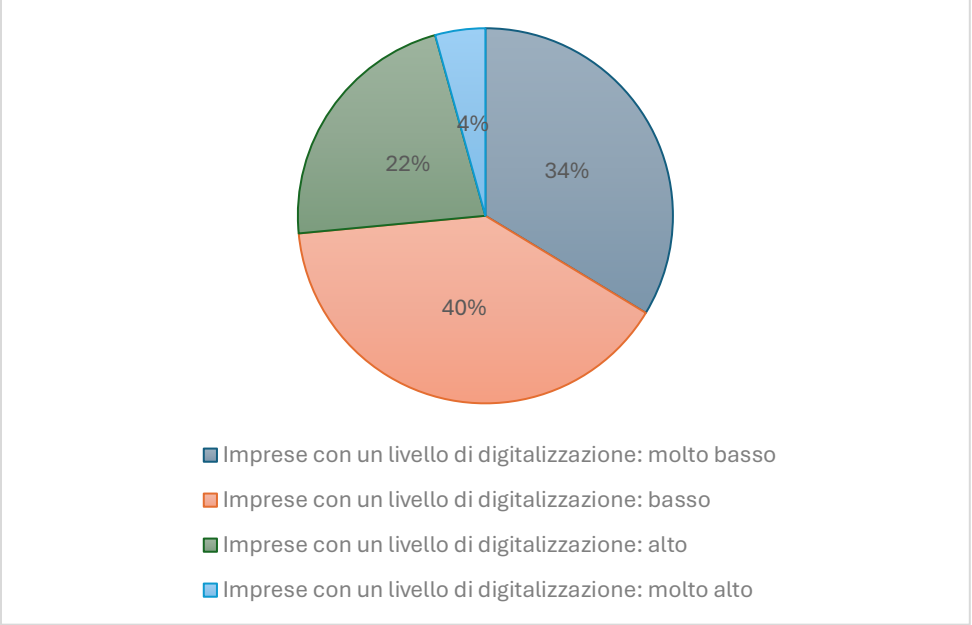
Supply of electricity, gas, steam and air conditioning, water, sewerage, waste management and sanitation (d-e)



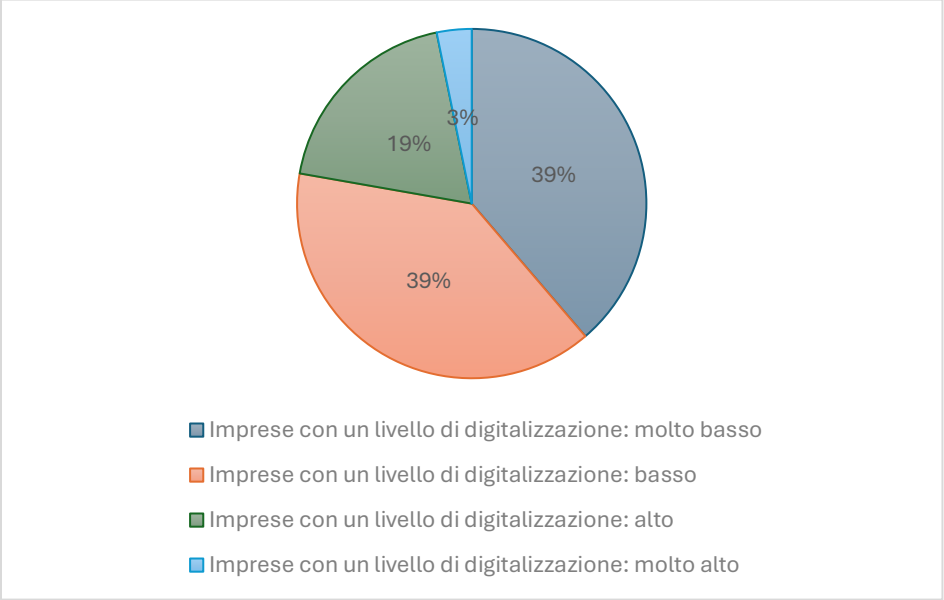
Construction



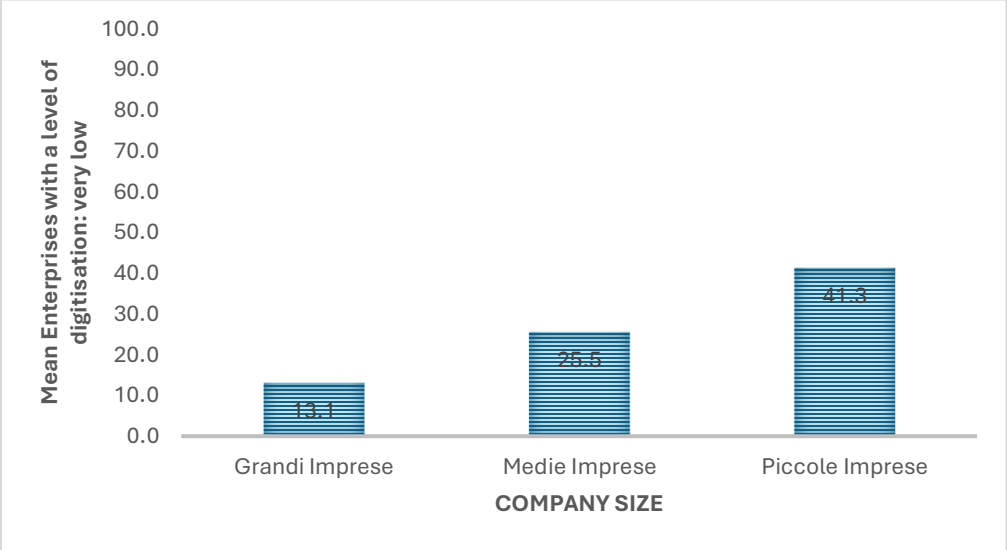
Total non-financial services (g-n, incl. 951, excl. k)



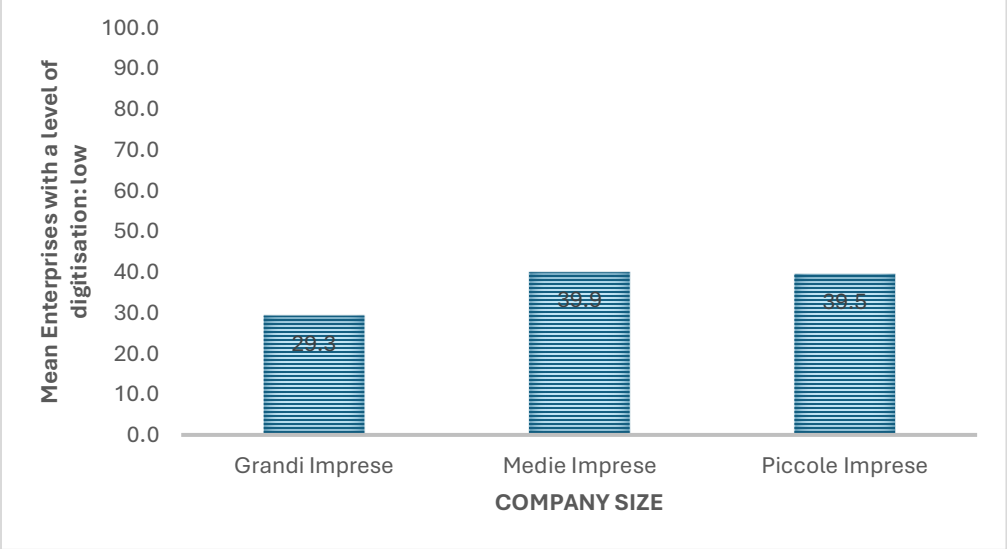
Total economic activities (c-n, incl. 951, excl. k)



Simple Bar Mean of Enterprises with a level of digitalization: very low by COMPANY DIMENSION



Simple Bar Mean of Enterprises with a level of digitalization: low by COMPANY DIMENSION



Simple Bar Mean of Enterprises with a level of digitalization: high by COMPANY DIMENSION