
Internationalization and Innovation Challenges in the Context of Sustainable Development: The Case of Italian Regions

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Sintesi. Questo articolo esplora il legame tra innovazione, internazionalizzazione e sostenibilità ambientale in Italia. Nello specifico, l'obiettivo è quello di valutare come l'innovazione favorisca la crescita delle esportazioni e mitighi le questioni ambientali. La rassegna della letteratura e l'analisi comparativa, basata sui dati provenienti da indagini ISTAT sulle imprese italiane di questo articolo forniscono una comprensione dettagliata delle sfide e delle dinamiche regionali, contribuendo a delineare il contesto di ciascuna area italiana.

Abstract. This article explores the link between innovation, internationalization, and environmental sustainability, with a focus on Italian regions. It assesses how innovation fosters export growth and mitigates environmental issues. Drawing on a literature review and empirical data from ISTAT surveys on Italian firms, the article evaluates the impact of innovation on internationalization and the effectiveness of environmental policies, shedding light on the dynamics and challenges, across different regions of Italy.

Keywords: Internationalization; Innovation; Sustainable development; Environmental policies.

JEL codes: O33, F23, Q56, R11

Introduction

The increase in innovation is widely regarded as beneficial for firm performance and economic growth (Ibrahima et al., 2023; Saleem et al., 2023). Innovation not only fosters economic growth but also addresses socio-economic challenges like poverty, particularly in developing and emerging countries. Additionally, it plays a crucial role in addressing environmental issues such as climate change, resource depletion, and environmental degradation (Antonioli and Mazzanti, 2017; Abdelzaher et al., 2020; Qiao et al., 2023).

Globally, international institutions are responding to these challenges by implementing policies that encourage the development and adoption of eco-friendly technologies, highlighting the importance of international cooperation to tackle global environmental issues. The synergy between innovation and sustainable environmental policies is crucial for fostering a more ecologically conscious world.

The relationship between innovation and internationalization is extensively studied in the literature, with recent studies indicating the positive effects of internationalization on innovation (Ding et al., 2021; Du et al., 2023). Internationalization provides firms, especially SMEs, with resources, knowledge transfer, and market access necessary for innovation, thereby enhancing their competitiveness in the global market.

The surge in trade raises concerns regarding its environmental repercussions and the effects of climate change on business dynamics. While trade liberalization may contribute to environmental

degradation, it also facilitates access to cleaner technologies, offering potential avenues for mitigating environmental damage. Nevertheless, the effectiveness of environmental policies hinges on their implementation and the willingness of firms to embrace innovation and adaptation. The European Union's policies on environmental protection are closely linked to their implementation at various levels and the efforts of firms to incorporate them for sustainable production.

Evaluating how strong environmental policies align with an open trade regime and the ability of firms to internalize them through innovation is critical to maximizing the benefits of trade while minimizing environmental costs. The adoption of trade-related measures to address climate change is increasing globally, indicating a growing awareness of the importance of balancing economic growth with environmental sustainability.

The objective of policymakers often revolves around fostering innovation, a critical component of environmental policy, driven by regulatory pressures. Various political instruments, from regulatory standards to economic incentives, aim to mitigate emissions and environmental impacts globally and locally. Empirical studies, including those by Johnstone and Labonne (2007), assess the role of environmental policy in technological innovation. Authors such as Bergquist et al. (2013) and Jaffe et al. (2002) argue that general economic instruments, like taxes, are more effective in incentivizing the adoption of emission-reducing technologies than specific regulatory measures. Microeconomic models, as outlined by Requate (2005), advocate for price-based incentives over command-and-control policies. However, empirical evidence suggests that direct regulation may spur greater technology adoption and innovation, as indicated by Kemp and Pontoglio (2011).

Various policy instruments foster different forms of innovation, influenced by their contextual factors (Kemp and Pontoglio, 2011). General economic instruments promote diffusion and incremental innovation, while regulatory instruments drive significant advancements through modular innovation. For radically new technologies, technology-specific instruments are indispensable. Recent research underscores that the efficacy of policy instruments hinges more on their design than their classification (Kemp and Pontoglio, 2011; Brouillat and Oltra, 2012; Bergquist et al., 2013).

Furthermore, the impact of environmental regulations on innovation depends on their stringency, as demonstrated by Johnstone et al. (2010). Some argue that stringent regulations yield minimal environmental benefits (Lanjouw and Mody, 1996; De Vries and Withagen, 2005; Popp, 2006 and 2019), while others, such as Jaffe and Palmer (1997), assert that strict regulations drive environmental innovation.

In the context of technology diffusion, particularly within Italian regions, efforts are being made to bridge the technological gap, notwithstanding persistent challenges, notably in Southern Italy. Effective policies aimed at stimulating private sector investment in technology and enhancing regional human capital are imperative for technological progress and elevated living standards.

A comparative analysis utilizing data from the National Institute of Statistics (ISTAT) highlights the different levels of innovative performance across Italian regions, with some regions exhibiting notable advancements over time.

Given these considerations, the research question guiding this study is: How does innovation foster export growth and mitigate environmental issues? By addressing this question, we aim to provide insights into the dynamics and challenges associated with promoting innovation-driven export growth while ensuring environmental sustainability, particularly within the context of Italian regions.

Internationalization and Innovation

In the context of global business, innovations play a fundamental role in enhancing international competitiveness. The internationalization process acts as a catalyst, providing firms with crucial access to new markets, diversified resources, and valuable knowledge (Hitt et al., 1997; Camisón-Zornoza et al., 2004). Operating in different markets exposes firms to different customer needs, stimulating the development of innovative products and approaches. Furthermore, internationalization offers access to vital resources, including technologies and financing, thus improving a company's innovation capabilities. The collaborations and partnerships fostered by internationalization facilitate the transfer of knowledge, encouraging the exchange of ideas and good practices between companies, industries, and countries. This increased exposure to competitive pressures drives firms to become more efficient, productive, and responsive, thereby further promoting innovation.

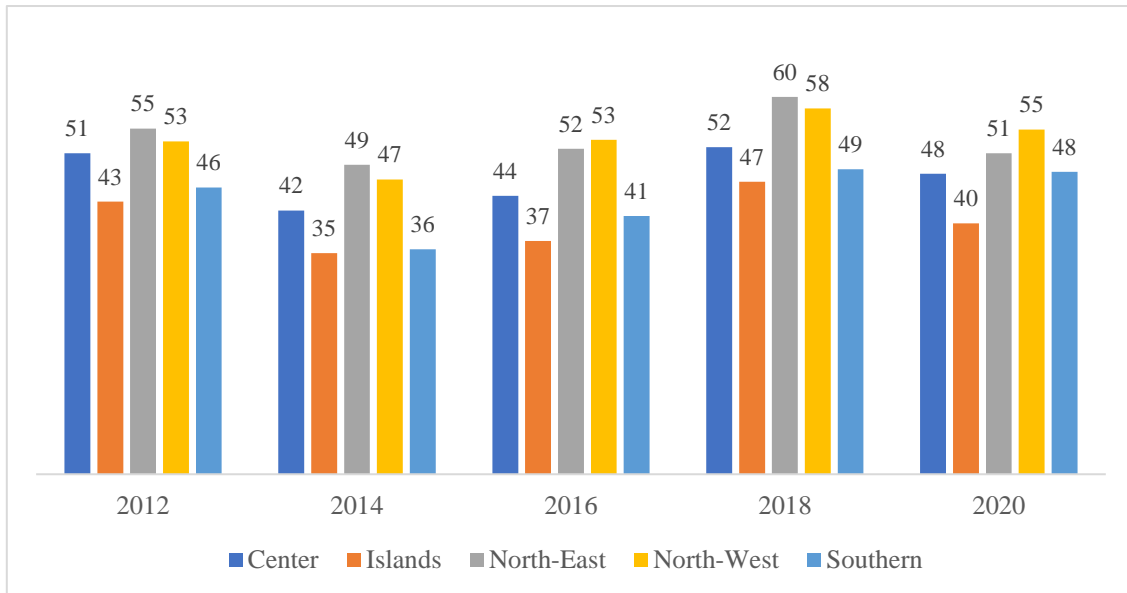
The relationship between internationalization and innovation, known as the internationalization-innovation nexus, is crucial for firms engaged in cross-border activities. Firms involved in exports and foreign direct investment may suffer impacts on innovation. Trade and investment liberalization can foster innovation toward cleaner processes and technologies, thereby enhancing productivity in home countries (Xie and Li, 2013 and 2018; Cipollina et al., 2016; Tse et al., 2017; Popp, 2019). Empirical analyses have underscored the importance of innovation activities both domestically and internationally since the early 1980s (Anand et al., 2021; Papanastassiou et al., 2020; Zhao et al., 2021).

Analyzing the data on Italian firms that actively pursue, complete, or interrupt innovative projects or initiatives, as depicted in Figure 1, it becomes evident that in the Northern regions, the percentage of firms engaged in innovative activity consistently exceeds that of the Southern, Central, and Islands regions. However, over time, there was a decline between 2012 and 2014, followed by an increase in the subsequent period, and then a decline again in 2020.

The initial decline in the percentage of firms engaged in innovative activity between 2012 and 2014 could be attributed to various factors, such as the economic repercussions of the financial crises in the period 2008-2013, which slowed down international trade. The subsequent increase in subsequent years indicates a potential recovery or change in the business environment, leading to a renewed emphasis on innovation. However, the subsequent decline in 2020 raises questions about the resilience of innovation in the face of challenges, possibly related to global events such as economic uncertainties, the COVID-19 pandemic, or other disruptions to international trade.

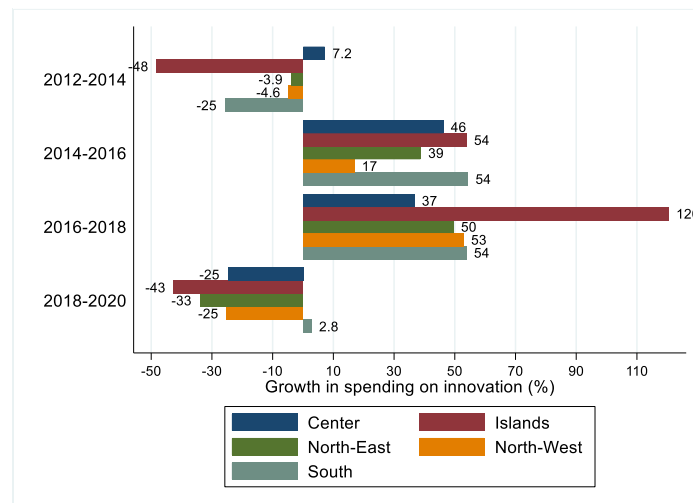
During the years of the financial crisis between 2012 and 2014, only firms in central Italy experienced a growth in spending on innovation, with an increase of 7.2%, while firms in the islands registered a decline of 48% (Figure 2). In the subsequent years, from 2014 to 2018, innovation spending increased, particularly among firms in the islands, where a significant rise of 120% was recorded during the period from 2016 to 2018. In 2020, compared to 2018, innovation spending decreased across all Italian regions due to the COVID-19 health emergency, except for the southern regions, where a growth of 3% was observed.

Figure 1: Evolution of Innovative Activity Firms by Geographical Area (%)



Source: Authors' elaborations on IstatData, percentages over the period 2012-2020

Figure 2: Growth in spending on innovation by geographical area (%). 2012-2020



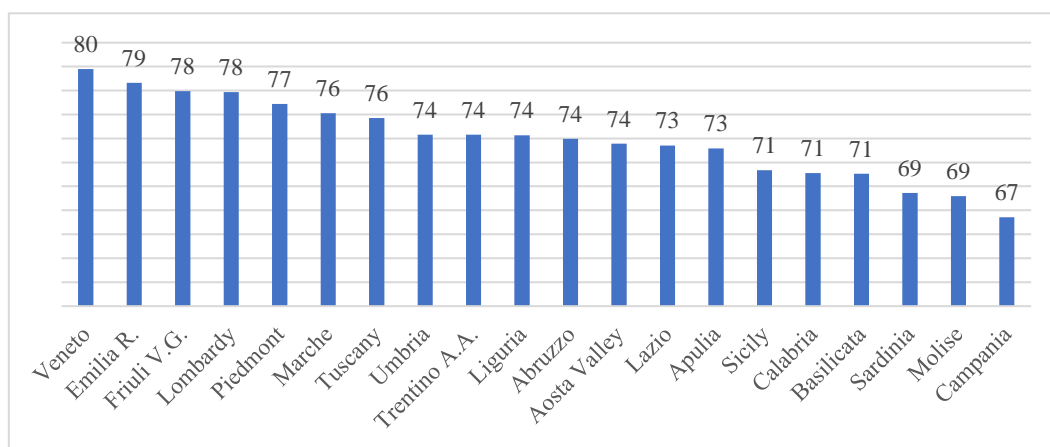
Source: Authors' elaborations on IstatData

Several studies (Ananthram and Chan, 2021; Hitt et al., 1997; Kafouros et al., 2008; Phene and Almeida, 2008; Xie and Li, 2018; Zahra et al., 2000) have delved into the strategic decisions and outcomes linked to companies bolstering their innovation capabilities through internationalization. While the majority of the literature forecasts positive results, certain studies hint at negative consequences stemming from heightened uncertainty and complexity (Ding et al., 2021). The divergence in findings across various theoretical perspectives and empirical investigations,

alongside firm-specific contextual factors such as size and technology intensity, highlights the necessity for improved research design.

In Italy, the northern regions of Veneto, Emilia Romagna, Friuli Venezia Giulia, and Lombardy consistently stand out in innovation. These areas boast the highest percentages of firms introducing new products or processes, indicating a strong culture of innovation and a business environment conducive to research and development activities. Conversely, the southern regions of Sardinia, Molise, and Campania exhibit the lowest innovation performance. This could be attributed to various factors, including limited investment in research and development, inadequate infrastructure, or greater obstacles in fostering innovation activities (see Figure 3).

Figure 3: Regional Dynamics of Innovative Firms with Product and Process Innovations (%).



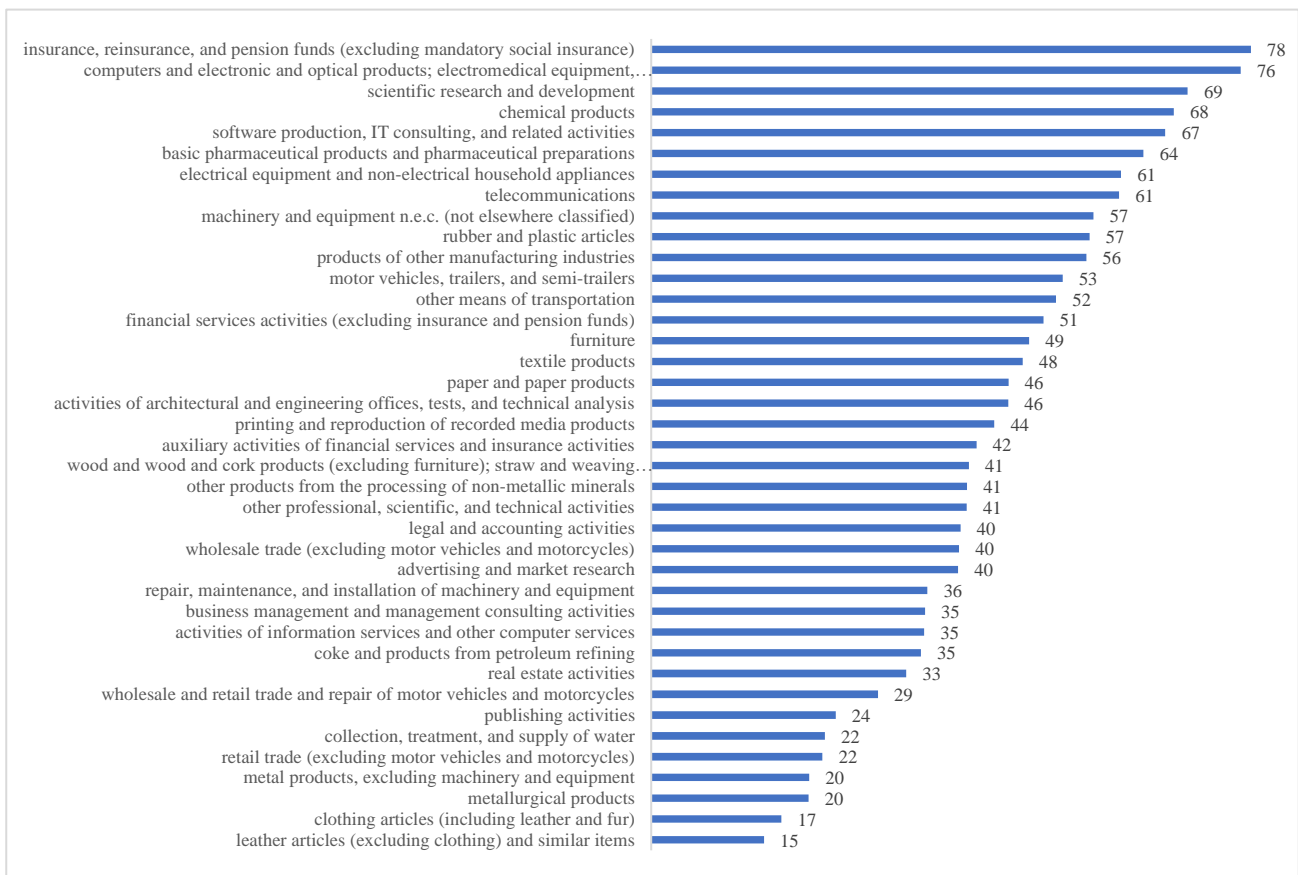
Source: Authors' elaborations on IstatData, simple averages over the period 2012-2020

Various service sectors have emerged as pivotal drivers of innovation. Notably, the insurance, reinsurance, and pension funds services sector (excluding mandatory social insurance) lead with a significant 78% of innovative firms, as depicted in Figure 4. Following closely are the scientific research and development sector (69%) and the sector encompassing software production, IT consulting, and related activities (67%), indicating a strong commitment to fostering process or product innovations.

Within the manufacturing sector, notable areas include computers and electronic and optical products, electromedical equipment, measuring devices, and clocks, boating a 76% innovation rate, alongside chemical products at 68%. Basic pharmaceutical products and pharmaceutical preparations also stand out, with 64% of innovative firms introducing product or process innovations.

Conversely, sectors with a lower percentage, less than 20%, of innovative firms introducing product or process innovations include metal products (20%), metallurgical products (20%), clothing articles (including leather and furs) (17%), and leather items (15%). These industries may face challenges or exhibit a lower adoption rate in incorporating new and innovative practices. Targeted strategies could prove beneficial in stimulating innovation and enhancing competitiveness within these specific sectors.

Figure 4: Innovative Firms with Product and Process Innovations by sector (%).



Source: Authors' elaborations on IstatData, simple averages over the period 2012-2020

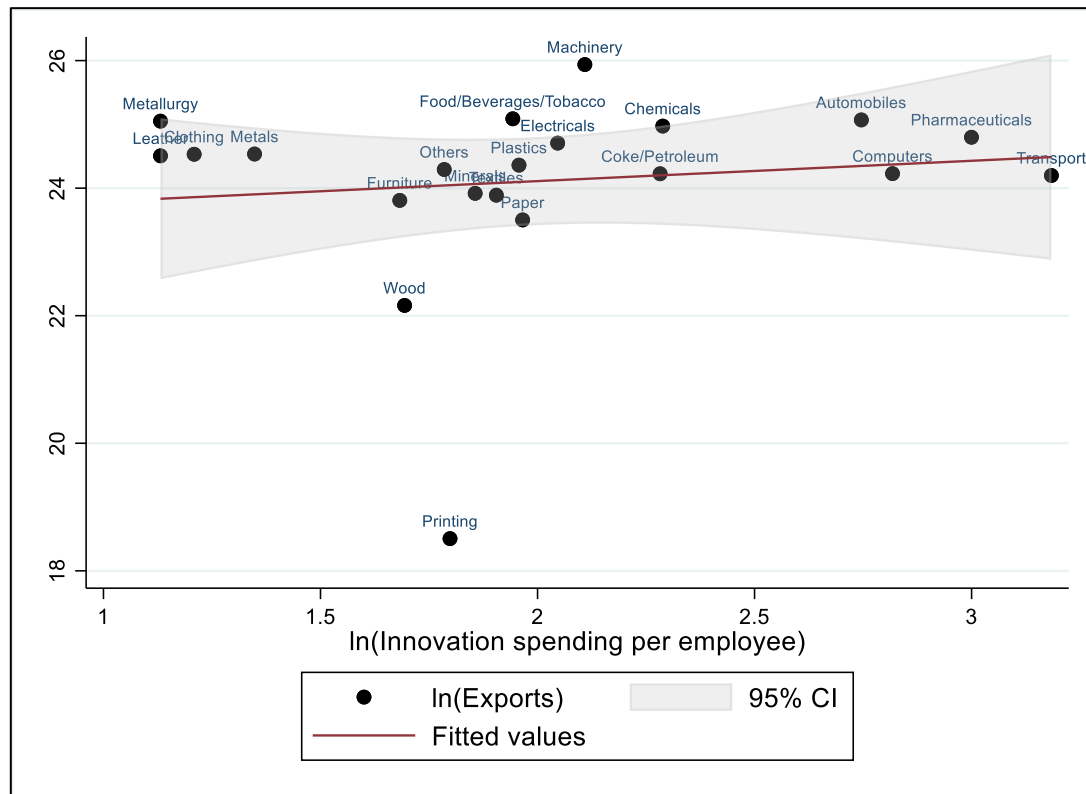
Analyzing the relationship between the export activities of Italian regions and their investment in innovation reveals a positive correlation between the growth in exports and the increase in spending on innovation per employee, as illustrated by scatter plots in Figures 5 and 6.

Research on the internationalization-innovation nexus often delves into the acquisition and utilization of resources, drawing on theories such as the knowledge-based view, dynamic capability view, organizational learning theory, network theory, and spillover effects.

These theoretical perspectives emphasize the importance of acquiring, developing, and effectively utilizing resources to gain competitive advantages. Organizational learning integrates these perspectives by transforming resources into competitive advantages through exposure to knowledge in international markets, thereby enhancing "learning by watching" and "learning by doing". Network theory contributes to enriching firms' resource pools through internationalization, fostering diverse interactions and knowledge development, and facilitating innovation by adapting to host environments. Research-based approaches, organizational learning, and network theory focus on resource acquisition, deliberate knowledge flows, and unintentional knowledge transfers, contributing to innovation. Establishing effective networks is critical for firms to absorb knowledge transferred through trade and foreign direct investment into local, regional, and national innovation systems.

A portion of the literature emphasizes the importance of research design and contextual factors in comprehending the link between internationalization and innovation (Hitt et al., 1997; Camisón-Zornoza et al., 2004).

Figure 5: Innovation spending and exports by sector.



Source: Authors' elaborations on IstatData and Coeweb.Istat, period 2012-2020.

Breaking down the data by region in Figure 6 provides a nuanced understanding of how different parts of the country contribute to this correlation. On the one hand, firms may strategically allocate resources, investing in innovation to enhance their competitiveness in exports. On the other hand, policymakers could adjust regional development strategies to capitalize on the observed positive relationship. Indeed, a comprehensive grasp of the causal pathways in this nexus is crucial for devising strategic and managerial policies (Frenz and Ietto-Gillies, 2009; Sasidharan and Kathuria, 2011; Wu and Wu, 2014; Jiang et al., 2016; Gkypali et al., 2017; Wang and Tao, 2019).

Innovation and Environment

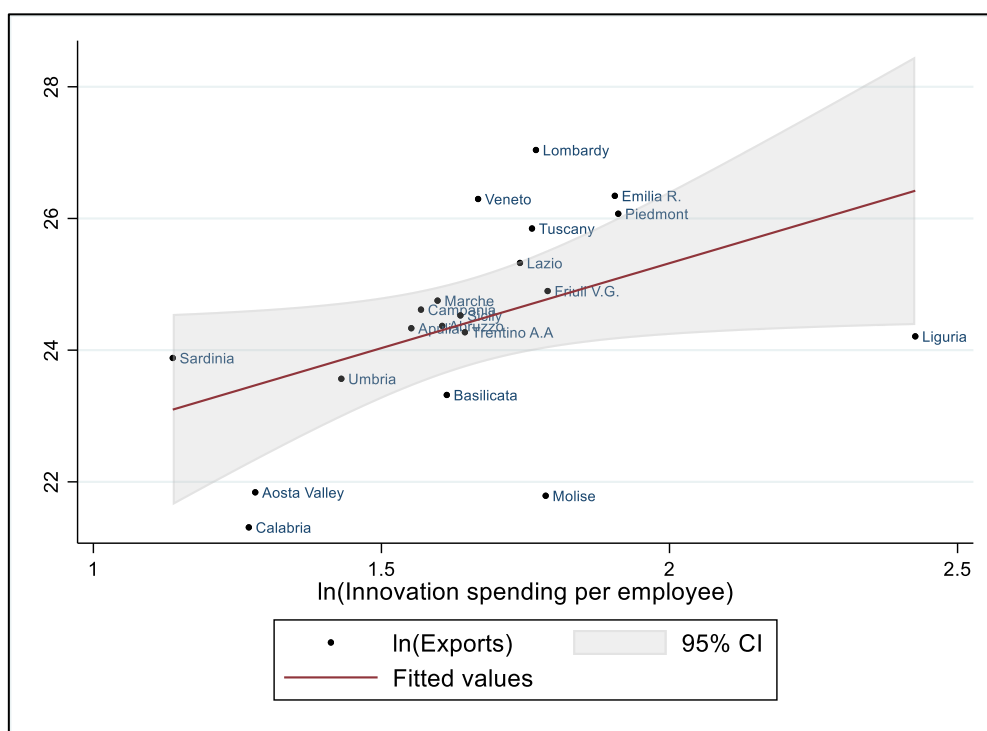
Over the past decade, innovation and sustainability have emerged as two key concepts in best management practices and the social and ecological aspects of organizational structures, products, and processes. The recognition of the adverse ecological repercussions of innovation has sparked significant interest among scholars and practitioners alike (Klewitz and Hansen, 2014; Cordova and Celone, 2019; Omri, 2020; Park et al., 2021).

However, despite this heightened awareness, the literature still lacks consensus regarding the conceptual framework of sustainable innovation (Adams et al., 2012; Schiederig et al., 2012; Boons and Lüdeke-Freund, 2013; Trifilova et al., 2013). Various terms have been employed interchangeably

to describe sustainable innovation: eco-innovation, eco-friendly innovation, environmental innovation, environmentally sustainable innovation, green innovation, sustainability-driven innovation, sustainability-enhancing innovation, sustainability-focused innovation, and sustainability-oriented innovation (Hansen et al., 2009; Carrillo-Hermosilla et al., 2010; Arnold and Hockerts, 2011; Adams et al., 2012; Maier et al., 2020).

Within the literature, conflicting viewpoints and mixed research findings abound concerning the potential environmental benefits of innovations attainable across different stages of economic growth and development. Technological advancements have facilitated environmental improvements and carbon emission reductions in certain developed nations like France and the USA (Dinda, 2018; Shahbaz et al., 2018). Conversely, countries such as Italy and Spain have reaped the benefits of stringent environmental regulations at the regional level, fostering economic growth and development (Bresciani et al., 2021). It is plausible, as suggested by Porter and Claas (1995), that strong environmental regulations can incentivize firms to invest in green innovations and technology aimed at enhancing environmental efficiency and quality.

Figure 6: Innovation spending and Exports by Region

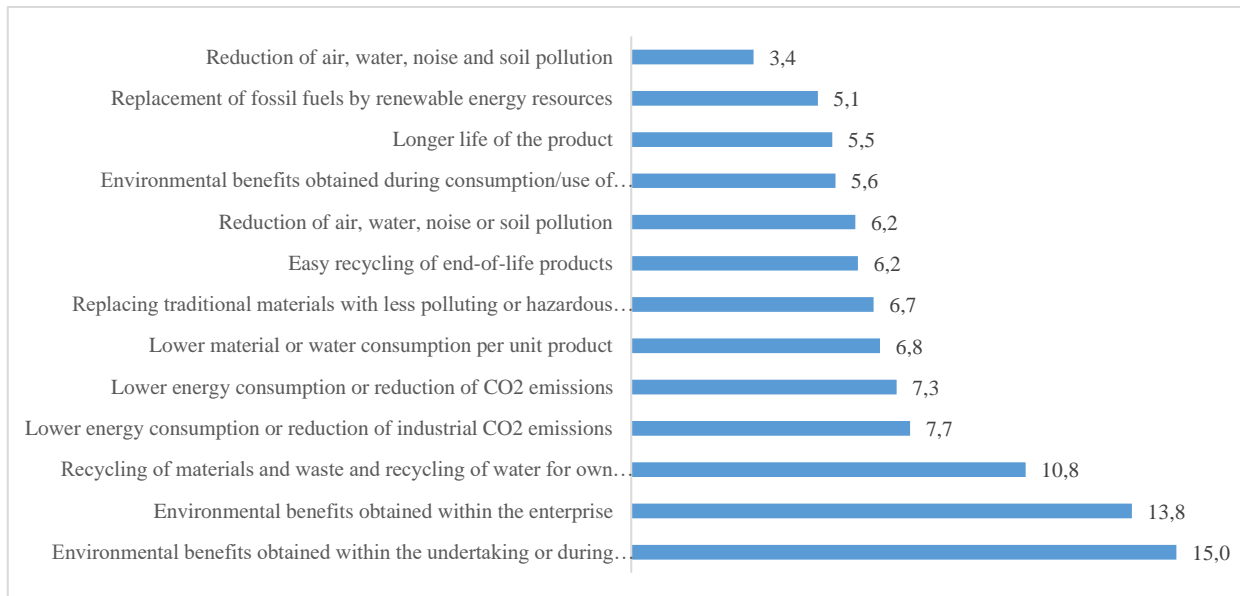


Source: Authors' elaborations on IstatData and Coeweb.Istat, period 2012-2020.

In 2020 in Italy, approximately 15% of firms experienced environmental benefits either through their operations or through the consumption and use of their goods and services. Specifically, about 14% derived these benefits solely from their production processes (see Figure 7). However, there has been a lesser commitment from firms towards reducing air, water, noise, and soil pollution, accounting for only 3.36% collectively, and adopting renewable energy sources as a replacement for fossil fuels, which stands at 5.12%.

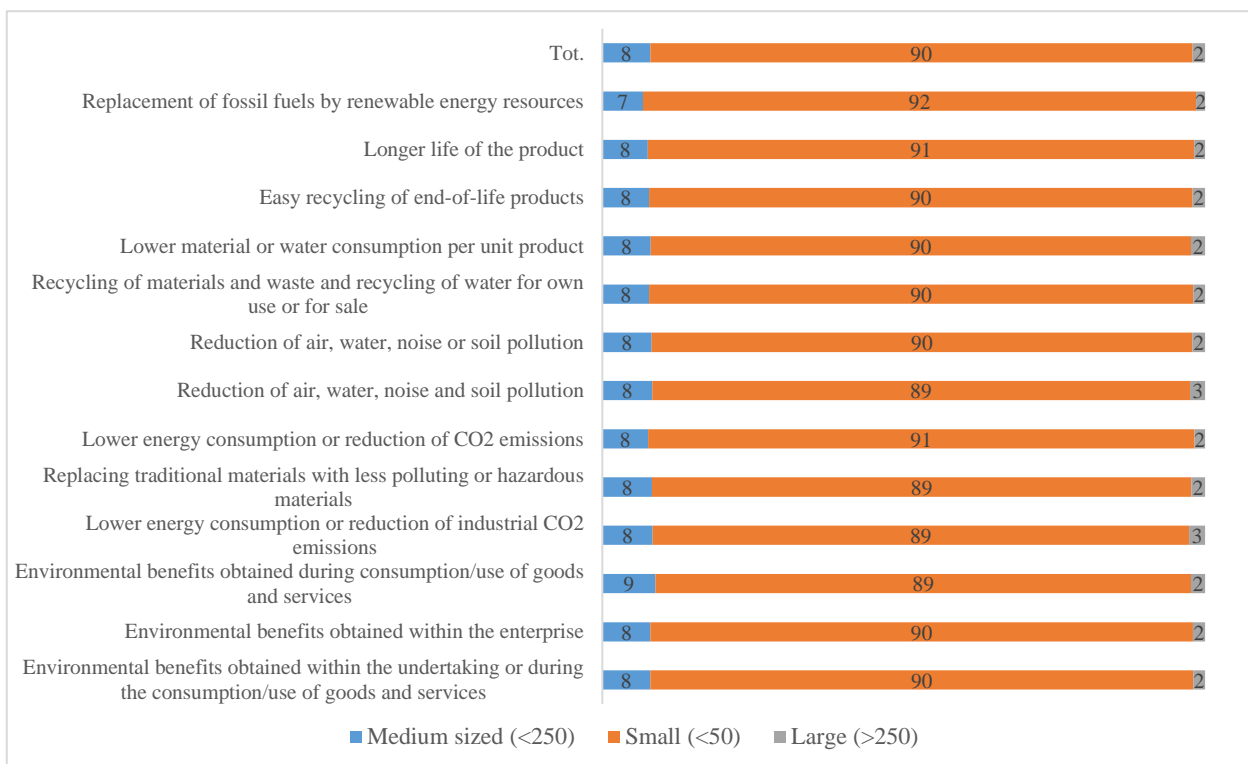
In terms of innovative practices, the landscape is dominated by small and medium-sized enterprises (SMEs), which represent nearly 98%. Among them, almost 90% have fewer than 50 employees, while close to 8% have fewer than 250 (see Figure 8). In contrast, large firms with over 250 employees, which have implemented innovative measures, constitute only 2% of the total.

Figure 7 - Environmental benefits for firms that introduced product/process innovations in 2020 (%).



Source: Authors' elaborations on IstatData, 2020.

Figure 8 - Environmental benefits for small, medium, and large innovative firms (%).



Source: Authors' elaborations on IstatData, 2020.

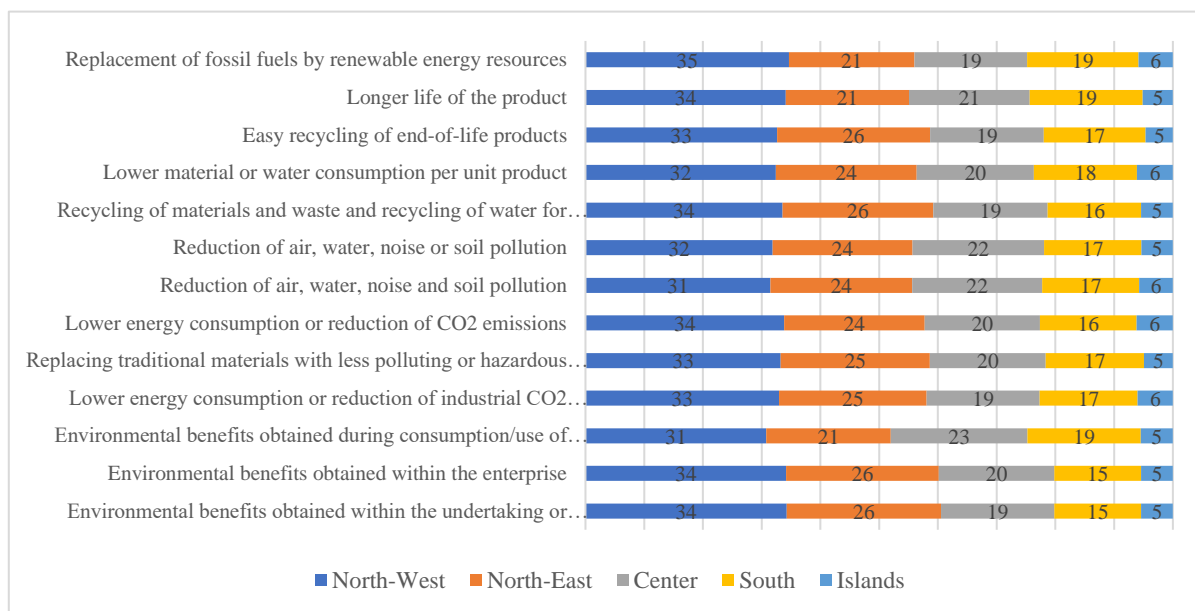
Examining the sustainability implications of technological innovation, Yii and Geetha (2017) posit that while innovation initially enhances environmental quality, its effects may be short-lived, a view countered by Ahmad et al. (2023) who advocate for long-term sustainability benefits. Recent studies (Azmat et al., 2023) underscores the challenges and advancements across various sectors such as agriculture, food, energy, healthcare, and tourism, with Vereijssen et al. (2017) observing a shift in agricultural innovation towards co-innovation processes.

Innovation outcomes, classified into types and forms, predominantly address environmental concerns including carbon emissions, energy efficiency, cleaner production, and the promotion of circular economy. Larson (2000) advocates for a synergistic relationship between the economy and the environment through innovative developmental models, often described as "win-win" scenarios. However, there is a divergence in perspectives on the drivers of sustainable innovation, with Zighan et al. (2023) shedding light on the varied approaches of SMEs.

Berrone et al. (2013) find positive impacts of external regulatory pressures on environmental innovation, contrasting with the findings of Eiadat et al. (2008). Factors such as the size of the firm, financial capacity, and culture play crucial roles in shaping the significance of regulatory frameworks (Welch et al., 2002; Earnhart and Lizal, 2006; Lu and Abeysekera, 2014; Wang and Juslin, 2009). Large firms, given their resources and market exposure, are often more inclined to innovate in response to regulations (Christmann, 2004).

In regions like Italy's North West, sustainable practices are notably prevalent among innovative firms employing 10 or more individuals, with 35% adopting renewable energy sources and 33.5% embracing circular production methods and waste recycling initiatives (see Figure 9).

Figure 9 - Distribution of small innovative firms with environmental benefits in the territorial area (%)

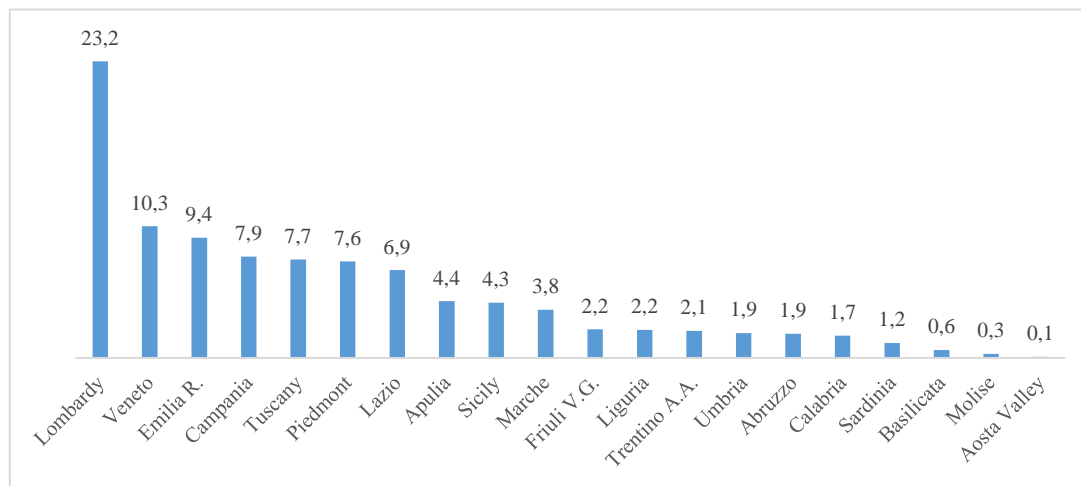


Source: Authors' elaborations on IstatData, 2020.

Conversely, firms in North-East regions of Italy exhibit notable environmental benefits both within the firm or during the consumption/use of goods and services (26.2%) and through easy recycling of products (26%). The innovative companies in Central and Southern Italy, as depicted in Figure 9, predominantly achieve environmental gains during consumption/use. Additionally, 6% of innovative firms in Sicily and Sardinia prioritize reducing energy consumption or CO2 emissions.

Results vary significantly across different Italian regions, as illustrated in Figure 10. In the North-West area, Lombardy boasts the highest concentration of firms (23%) leading in product and/or process innovations. Veneto stands out in the Northeast with 10% of innovative firms, while Tuscany records 7.7% in the Central region, and Puglia exhibits 4.4% in the South. In terms of sustainable practices adoption, Sicily outpaces Sardinia, with a higher percentage of small firms engaging in such practices (4.3% vs. 1.2%) among the two Islands.

Figure 10 - Small innovative firms with environmental benefits at the regional level (%).



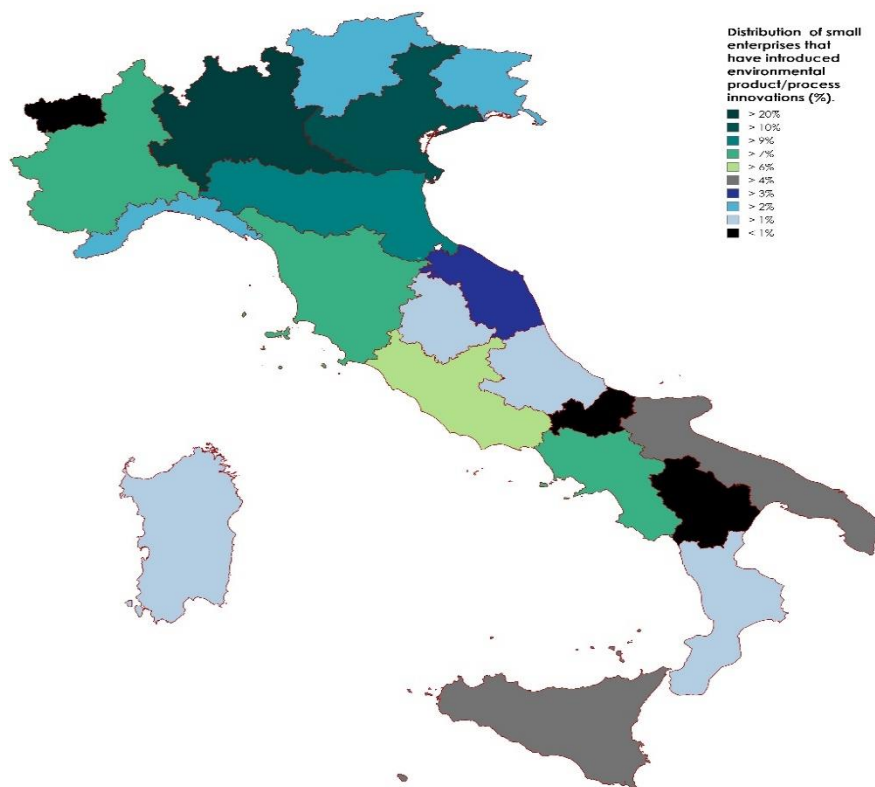
Source: Authors' elaborations on IstatData, 2020.

The distribution of innovative firms in Italy starkly illustrates the North-South divide (see Figure 11). Across the 20 regions, marked discrepancies exist in terms of environmental sustainability. Notably, these regions align across 10 distinct groups based on the prevalence of small innovative firms.

In the North, regions like Lombardy and Veneto boast a high concentration of small innovative firms, particularly those contributing to environmental benefits in the consumption and utilization of goods and services.

Conversely, the Southern regions such as Basilicata and Molise demonstrate a dearth of such firms. Even the Autonomous Region of Aosta Valley, despite its Northern location, aligns with this trend due to its notably low presence of small innovative firms contributing to environmental advancements. This regional disparity may be attributed to the prevalence of innovative industrial clusters in Northern Italy, which likely fostered a conducive environment for environmental innovation among small firms. Conversely, the structural constraints faced by regions like Aosta Valley—such as their distance from major urban centers, ports, and airports—may have hindered their ability to cultivate environmental innovations.

Figure 11 - The percentage distribution of small innovative firms in 10 groups



Source: Authors' elaborations on IstatData, 2020.

Conclusions

This article delves into the nexus of innovation, internationalization, and sustainability, highlighting their alignment with sustainable development goals. It emphasizes the constructive impact of innovation on economic growth and environmental challenges, catalyzing global responses in favor of eco-friendly policies. Through sectoral analysis, it identifies the primary drivers of innovation in both manufacturing and service sectors. Additionally, it demonstrates a positive correlation between export growth and investment in innovation. However, geographical differences reflect not only firm-specific contextual factors but also external influences such as financial crises and the COVID-19 pandemic. Disparities at the regional level underscore the importance of comprehending regional dynamics and sectoral variations. Ultimately, the article underscores the pivotal role of SMEs in propelling innovation and sustainable practices throughout Italy.

This analysis in this article serves as a preliminary assessment and comparative study, offering insights for a more in-depth analysis using highly detailed data. It lays the groundwork for a granular examination of firm, sectoral, and regional data, thereby providing a launching point for future research.

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