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Review Article

# Innovation in peripheral areas: Insights and future directions

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ABSTRACT

The geography of innovation investigates local elements that contribute to territorial innovation by focusing on the geographic dimension of innovative processes. Emerging studies emphasise the relevance of peripheral areas, which have traditionally been seen as less innovative due to infrastructure deficiencies. This systematic literature review (SLR) examines innovation patterns in these areas by analysing 77 peer-reviewed articles published between 2003 and 2024. Using a 2-by-2 matrix structure, we classified enabling and constraining factors at both the local and firm levels. Geographic isolation and deficits in digital infrastructure are identified as barriers, whereas public-private partnerships, local identity, and cooperation act as enablers of innovation. This study provides policymakers and firms with insights into how to support innovation in peripheral areas while also integrating local identity with technological advances. Beyond digital innovation, the study also highlights the importance of social, organizational, and tradition-based forms of innovation that leverage local identity and heritage practices.

## 1. Introduction

By focusing on the geographic dimension of innovative processes, the geography of innovation has become a critical area of study within the broader field of economic development (Feldman, 1994). Local factors and the spatial agglomeration of innovative activity influence the development and diffusion of innovations, making some territories more innovative than others (Andrews & Whalley, 2022). Emerging research is reshaping traditional views that primarily associate innovation with urban areas, business clusters, and industrial districts (Fritsch & Wyrwich, 2021), emphasising the dynamic geographical distribution of innovation and the growing importance of peripheral areas (Fritsch & Wyrwich, 2021). Peripheral areas are defined by their geographical, economic, and social distance from central economic, political, and cultural cores, and often face infrastructural shortages that limit their integration and development within the broader national context (McAdam, 2014; Varis et al., 2014; Rietmann, 2023; Schmidt et al., 2022; Mariotti et al., 2023; Dotzel & Faggian, 2019). These areas differ significantly across contexts: peripheral zones in highly industrialised countries often face institutional neglect and infrastructural decline, whereas those in developing regions may struggle with limited access to markets or technological resources. Moreover, some peripheral areas are geographically close to urban centres but remain functionally isolated due to poor transportation, limited connectivity, or weak political representation. This diversity suggests that peripherality is not only spatial, but also relational and systemic. Empirical evidence demonstrates that the geographical distribution of innovation is dynamic, showing that regions previously considered peripheral in technological narratives are now becoming central due to economic and institutional change (Andrews & Whalley, 2022). Similarly, research during the COVID-19 pandemic highlights that peripheral territories, once seen as less innovative, have begun to close the innovation gap thanks to shifts in public R&D funding distribution (Mitze & Makkonen, 2024) (see Table 1).

The existing literature on innovation has mainly focuses on urban centres, often neglecting how it manifests in peripheral areas. While some studies have addressed the infrastructural and educational challenges that discourage innovation in these less central areas (García-Cortijo et al., 2019; Tödtling & Trippl, 2005), a gap remains in understanding how peripheral areas overcome these barriers to innovate and integrate into the broader economic framework (Fritsch & Wyrwich, 2021; Xu & Dobson, 2019). Additionally, the literature has yet to fully explore the effect of local knowledge, digital technologies, social capital, and traditional cultural practices (e.g., artisan knowledge, heritage-based skills) in promoting innovation within firms. These elements have not typically been examined for their collective contribution to developing innovative ecosystems in peripheral areas (Bourdieu,

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**Table 1**
Database search results.

| | Scopus | Manual | Exclusion | Total |
|---|---|---|---|---|
| Automatic search | 191 | | | 191 |
| Manual search | | 21 | | 212 |
| After reading Title/Abstract | | | −120 | 92 |
| After reading entire articles | | | −15 | 77 |
| Final sample | | | | 77 |

1986; Putnam, 2000; Rae, 2017).

The main objective of our systematic literature review (SLR) is to comprehensively investigate innovation dynamics in peripheral areas. In this sense, the dynamics of innovation are further explored in Section 5, where we link systemic, organizational, and individual levels (as illustrated in Fig. 5) to show how these factors interact over time rather than remaining static. This topic remains underexplored in economic development research, despite some important recent contributions. Recent contributions (e.g., Eder, 2018; Eder & Trippl, 2019) have outlined the need to distinguish between forms of innovation that emerge either as compensatory responses to structural disadvantage or as exploitative uses of contextual opportunities. Our review complements this line of thinking by proposing a systematic and categorised account of the enabling and constraining conditions across territorial and organizational dimensions. To achieve this, we have analysed 77 peer-reviewed articles published between 2003 and December 2024. A 2-by-2 matrix framework categorises each article by identifying the constraining and enabling factors at the local and firm levels, thus mapping the evolution of research on firm innovation in peripheral areas and indicating future research directions. This systematic approach enhances our knowledge of how peripheral areas can overcome geographical isolation and infrastructural weaknesses to foster innovation. The findings can inform policymakers and economic developers about valuable strategies to strengthen innovation capacity. Furthermore, our insights may benefit businesses and organisations that operate in, or are considering expansion into, peripheral areas, by providing a clearer understanding of the local innovation ecosystems and how to engage productively with them. This dual contribution advances academic research and provides practical guidance to for decision-makers in the field.

## 2. Theoretical background

### 2.1. Defining peripheral areas

Drawing on recent literature, peripheral areas do not have a universally accepted definition. In general, these regions are characterised by their geographical, economic, and socio-political marginality from central zones of dense population and economic activity (McAdam et al., 2014). These areas are often characterised by geographic remoteness, which makes them less accessible and limits their integration into wider economic frameworks (Dotzel & Faggian, 2019). Infrastructure deficiencies, particularly in technology, transportation, and public services, aggravate their isolation and impede development (Rietmann, 2023; Varis et al., 2014). Economically, peripheral areas tend to depend on less diverse economies concentrated in primary industries, which limits employment opportunities and economic growth (Garcia-Cortijo et al., 2019). Demographic challenges such as ageing populations and the migration of young people to more urbanised centres can reduce community vitality (Blanchard, 2017; Schäfer & Henn, 2023). Moreover, the isolation experienced by peripheral areas often leads to cultural and social exclusion, limiting their participation in broader socio-economic and innovation processes. This exclusion both results from and reinforces the lack of focused policy and investment, sidelining these regions in broader national development agendas (Rae, 2017). Although often conflated, rural and peripheral areas differ. Rural areas are commonly characterised by sparse populations and agricultural landscapes. Not all rural areas meet the criteria of peripherality, which encompass economic marginalisation, infrastructural deficits, and socio-political neglect (Muñoz et al., 2024). This distinction is important because it highlights that peripheral areas can include both rural and non-rural regions that are marginalised in different ways. Additionally, scholars such as Eder (2018), Eder and Trippl (2019), and Bosworth et al. (2023) emphasise that peripherality manifests differently depending on broader socio-economic contexts. For instance, peripheral regions in urbanised countries may exhibit strong industrial traditions but suffer from policy marginalisation, whereas remote zones in emerging economies may face more structural barriers related to infrastructure, education, or governance. This layered understanding supports a more nuanced interpretation of innovation challenges faced in non-central territories.

### 2.2. Defining innovation

Innovation within firms is widely recognised as a key driver of economic growth and competitive advantage (Schumpeter, 1934). This concept extends beyond technological progress to include product, process, and business model innovations that improve operational efficiency and market responsiveness (Blanchard, 2017). Internal research and development are not the sole sources of innovation. Indeed, innovation develops through interaction with the local socio-economic environment, where geographical factors and regional characteristics significantly influence innovative capabilities (De Noronha Vaz, 2004). Product innovation within firms is commonly seen as a strategic response to environmental challenges and market demands, whereby firms utilise local resources to create differentiated products (Blanchard, 2017).

To measure innovation, the economic literature considers different inputs, outputs and outcomes. R&D expenditure is often highlighted as a key input for innovation, as noted by De Noronha Vaz (2004), who measured it as a percentage of turnover and considered it alongside workforce skills and education. Similarly, Aryal et al. (2018) included internal and external R&D activities as innovation inputs, emphasising design services and external knowledge sources. In contrast, McKitterick et al. (2016) and Tuitjer and Küpper (2022) focused less on traditional R&D metrics and more on the role of social capital and network engagement, particularly in rural contexts. These studies highlight the importance of external knowledge networks and relationships with institutional actors as inputs for innovation, reflecting the collaborative nature of innovation in rural settings. Regarding innovation outputs, classic measures such as patent applications are used by Aryal et al. (2018), who track the number of patents filed as a critical indicator of innovation output. De Noronha Vaz (2004) also considers intellectual property ownership, including patents, licenses, and trademarks. However, many rural and peripheral firms' studies adopt broader definitions of innovation outputs. Dotzel and Faggian (2019) and Schmidt et al. (2022) focus on innovations that arise from interactive networks rather than formal R&D efforts. Tuitjer and Küpper (2022) highlight whether firms have introduced new offerings in the last few years, capturing product and process innovations. By contrast, Schmidt et al. (2022) and McKitterick et al. (2016) emphasise the impact of collaborative networks in driving these outcomes, mainly through social capital and trust-based relationships. These studies show that in rural and peripheral contexts innovation often extends beyond patents to include incremental innovations that improve local market competitiveness (Steinerowska-Streb et al., 2024). Some evidence suggests that maintaining competitiveness and ensuring long-term sustainability requires alignment with global market trends, which makes such innovations crucial (De Noronha Vaz, 2004). Business model innovation significantly influences firms' external relations and customer engagement strategies. These innovations often involve the creation of networks that improve firms' ability to operate efficiently in the market (Marques

et al., 2018). Furthermore, marketing innovations emphasise the distinctive characteristics of regional products, which can create new market segments and increase brand loyalty (Quinn et al., 2013). The socio-economic environment shapes entrepreneurial opportunities and challenges, so successful innovation requires technical skills, resources, and a deep understanding of the socio-economic environment (Blanchard, 2017). These perspectives converge with broader theoretical approaches that underpin our analytical framework. In particular, we draw on three conceptual lenses: the resource-based view (RBV), which emphasises internal firm capabilities as a source of innovation (Barney, 1991); the literature on regional innovation systems (RIS), which underscores the importance of place-based institutional and infrastructural support (Cooke, 2004); and the notion of territorial embeddedness, which highlights how firms' innovation strategies are shaped by their integration within specific geographic and social contexts (Hess, 2004; Kalantaridis & Bika, 2006). We focus on these three perspectives because they capture complementary dimensions of innovation in peripheral areas. The RBV emphasises firm-level capabilities and strategic assets; the RIS underscores the importance of institutional arrangements and policy frameworks; and territorial embeddedness highlights the role of place-specific resources and identity. Taken together, they provide a coherent theoretical lens that connects micro-level organisational factors with meso- and macro-level territorial dynamics. These foundations support our classification of innovation enablers and constraints along territorial and organisational dimensions.

### 2.3. Strategic perspectives on innovation in peripheral contexts

Recent contributions have conceptualised firm strategies in peripheral contexts in terms of how they respond to structural constraints and local opportunities. Eder and Trippl (2019) proposed a well-established distinction between "compensation" and "exploitation" strategies that peripheral firms adopt to cope with innovation-related constraints. This conceptualisation highlights how firms either mitigate structural disadvantages (e.g., through external linkages and internal capacity-building) or leverage contextual specificities (e.g., social cohesion or niche markets).

Our review adopts a complementary perspective by organising the empirical evidence through a two-dimensional matrix that distinguishes between enabling and constraining factors at both the territorial and organisational levels. This design builds directly on the theoretical perspectives introduced earlier (RBV, RIS, and territorial embeddedness) while aligning with Eder and Trippl's (2019) distinction between compensation and exploitation strategies. In doing so, the framework provides a more nuanced interpretation of how place-based resources, institutional conditions, and firm-level agency interact in shaping rural innovation. This conceptual link ensures that the matrix is not merely descriptive but firmly grounded in established theoretical debates, and it prepares the ground for the analytical discussion in Section 3.

## 3. Research questions and method

### 3.1. Research design and search strategy

The goal of our systematic literature review is to explore the dynamics of innovation in peripheral areas with a deep focus. To direct our investigation, we formulated two main research questions.

**RQ1**: What is the current state of knowledge regarding firms' innovation in peripheral areas, and how has the literature developed over the past two decades?
**RQ2**: What are the enabling and constraining factors at both the local and firm levels that influence innovation in peripheral areas?

To address these questions, we conducted an extensive search of peer-reviewed journal articles published in English between 2003 and 2024, using Scopus as our primary database. Search terms were carefully selected to capture key concepts related to peripheral areas, innovation, and firms. Specifically, we adopted the following keywords: 1) rural area* OR inner area* OR peripheral area*; AND 2) digital* OR digital innovation OR innovation; AND 3) SMEs OR small and medium enterprise* OR entrepreneur* OR business* OR firms. By combining these terms with Boolean operators, we created search strings applied to article titles, abstracts, and keywords to maximise the retrieval of relevant studies.

### 3.2. Selection criteria and screening

The initial search on Scopus yielded 191 articles. To provide broader coverage and address RQ1, we complemented this with a manual search, adding 21 articles for a total of 212. We then undertook a rigorous screening process: reviewing titles and abstracts to assess relevance, which reduced the pool to 92 articles. We performed a full-text review using our inclusion and exclusion criteria - such as a focus on innovation in peripheral areas and providing empirical data or theoretical insights relevant to our research questions - resulting in a final sample of 77 articles. From each article, we extracted crucial information, including study characteristics, variables, outcomes, type of innovation, and key findings related to our research questions.

### 3.3. Analytical framework

To address RQ2, we categorised each article using a 2-by-2 matrix framework that maps the enabling and constraining factors along two dimensions: territorial (context-related) and organisational (firm-related). The framework is theoretically grounded in the perspectives outlined in Section 2 and further informed by Eder and Trippl's (2019) distinction between compensation and exploitation strategies. At the same time, it reflects empirical regularities observed across the reviewed literature, which consistently highlight enabling and constraining factors at both territorial and organisational levels. The territorial dimension reflects infrastructural, institutional, and policy-related conditions, consistent with theories of regional innovation systems and territorial embeddedness (Cooke, 2004; Hess, 2004). The organisational dimension draws on the resource-based view, emphasising internal capabilities such as leadership, strategy, and absorptive capacity (Barney, 1991; Zahra & George, 2002). Importantly, several factors — such as digital infrastructure - may act as either enabling or constraining, depending on the local configuration. This duality is central to understanding the dynamics of innovation in peripheral contexts. The framework enables us to systematically identify patterns, trends, and gaps in the existing literature. In the following section, we present the distribution of the 77 reviewed articles across the four quadrants, together with a synthesis of the key enabling and constraining factors that emerge in each category.

## 4. Findings

### 4.1. Descriptive overview

This section provides a descriptive analysis of the 77 articles included in our systematic literature review. The aim is to provide an overview of the field's development and characteristics, in response to RQ1.

The distribution of articles published from 2003 to 2024 is shown in Fig. 1. In the early years of the period, publication frequency was sparse and irregular, with only one selected article in 2003, 2006 and 2011. From 2013 onwards, there has been a marked increase in scholarly attention to the topic. The most significant growth occurred after 2019. The rising number of articles over the past decade reflects growing academic interest in innovation in peripheral areas, suggesting that the field is gradually consolidating and attracting sustained scholarly

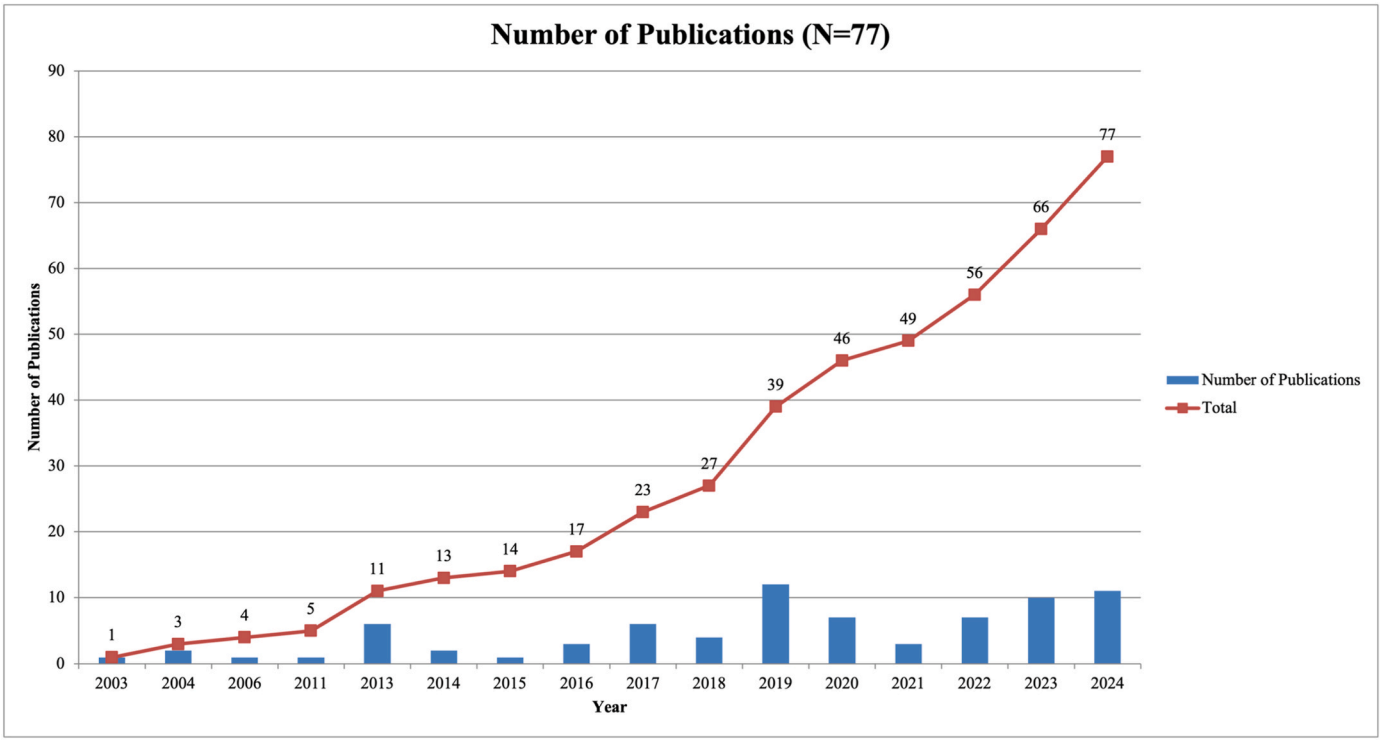


**Fig. 1.** Distribution of publications per year across the period studied.

attention.

The identified articles were published in 29 journals, reflecting the interdisciplinary nature of the research area (Fig. 2). These journals span diverse disciplines, including regional studies, entrepreneurship, innovation management, and economic geography. While many journals have only one or two publications on the topic, specific journals contribute more substantially to the existing body of literature (e.g., Journal of Rural Studies).

Regarding the research methodologies, the studies exhibit a diverse mix of approaches (see Fig. 3). Qualitative methods are the most prominent, used in 32 publications. For example, Marques et al. (2018) employed case study research on artisan entrepreneurship, while Rietmann (2024) illustrated a comparative case study approach to digital pioneers. Quantitative methods closely follow, appearing in 26 studies. For instance, Blanchard (2017) applied survey-based quantitative analysis. Mixed methods were employed in 8 studies. Additionally 6 literature reviews and 5 studies used other specific methods. This variety of methodologies suggests that researchers employ a range of strategies

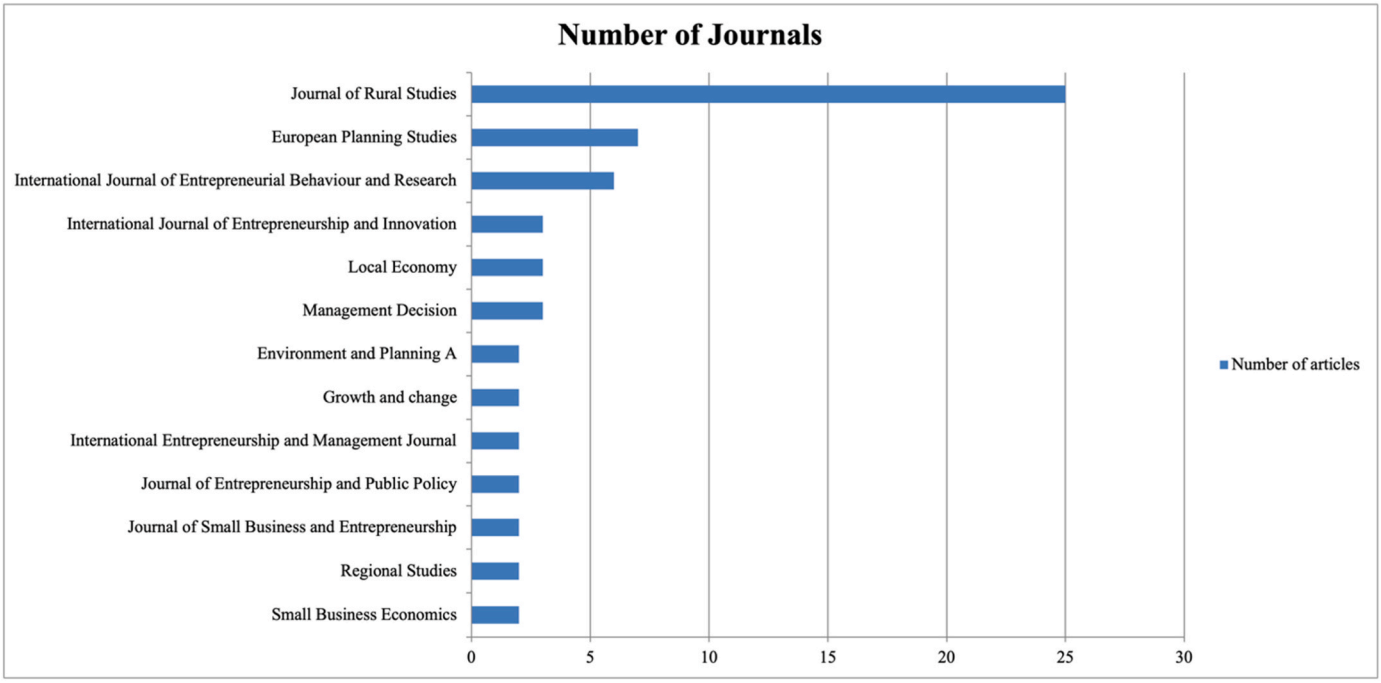


**Fig. 2.** Publication frequency in the main journals (≥2 articles).

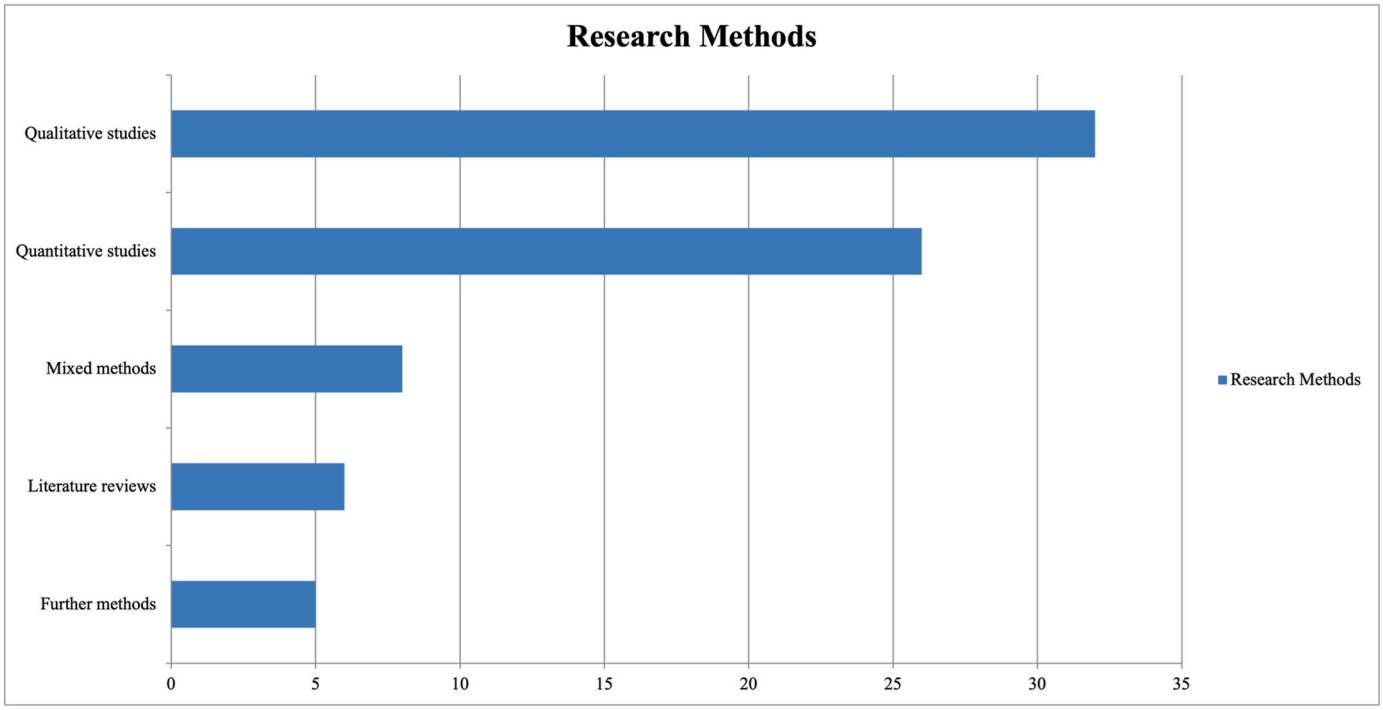


**Fig. 3.** Research methodologies employed.

to comprehensively explore the complexities of innovation in peripheral areas. This dispersion confirms the interdisciplinary nature of the field but also indicates a potential lack of consolidation around core academic outlets.

The geographical focus of the studies is predominantly on Europe, with 45 publications (Fig. 4). In particular, the United Kingdom accounts for the greatest number of articles on innovation in peripheral areas (18 publications). Other European countries receiving significant attention include Germany (7 publications), Spain (5), Italy (4), Portugal (3), Norway (2), Sweden (2), and Ireland (2). Outside Europe, the United States is the focus of 6 publications. A smaller number of studies (13) examined other regions, and 15 studies had a mixed geographical focus. This geographical distribution reflects a strong European focus, with relatively limited coverage of developing or non-Western contexts — an imbalance that deserves further exploration in future research.

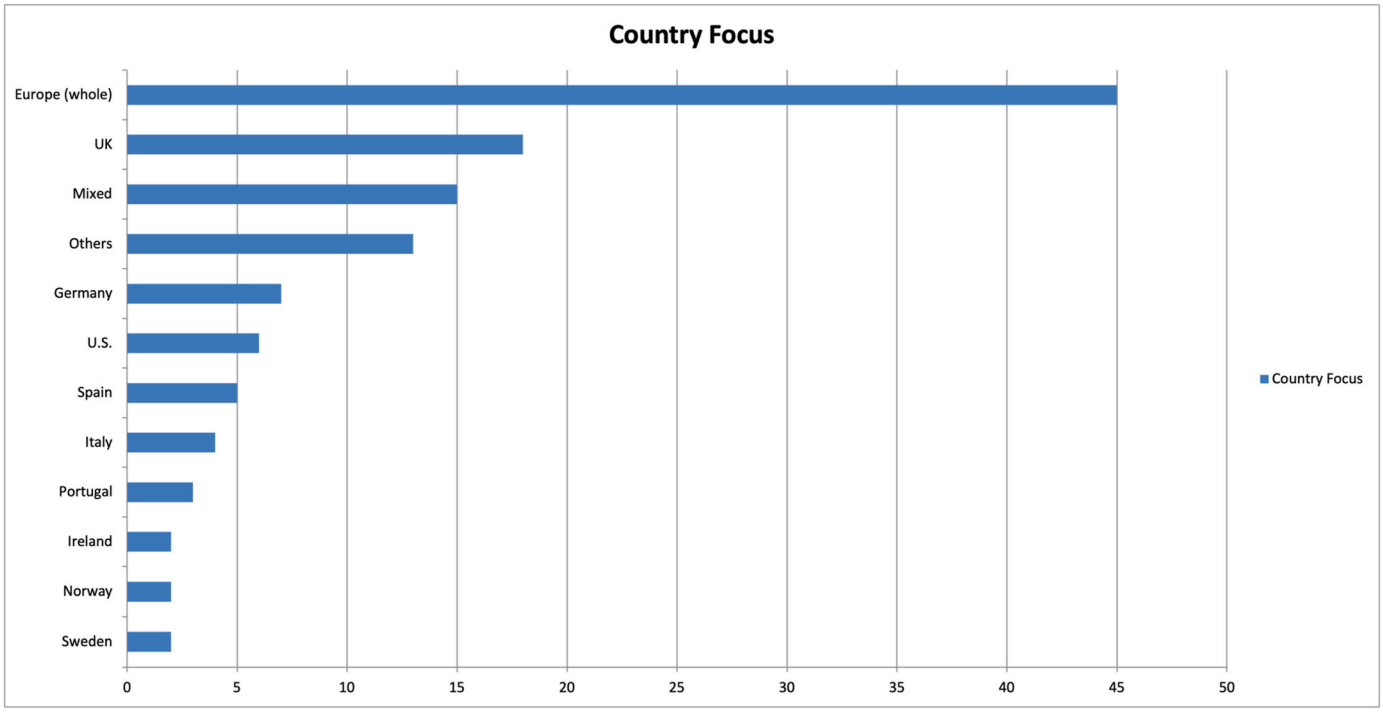


**Fig. 4.** Country focus of the identified publications (*other countries include Australia, Brazil, Canada, Chile, China, Czechia, Finland, Greece, Japan, Nigeria, Slovenia, and New Zeeland (all 1).

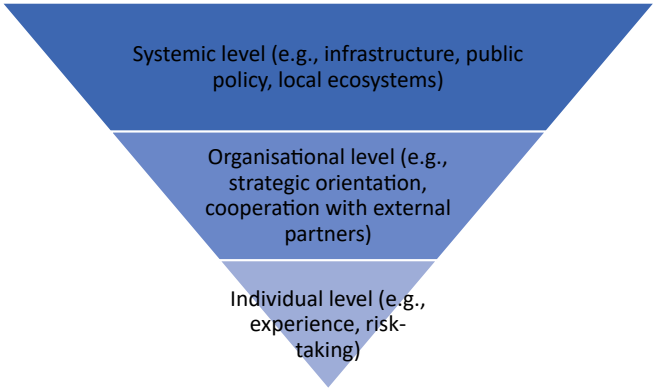


**Fig. 5.** Hierarchy of innovation enablers and constraints in peripheral areas.

### 4.2. Results per matrix quadrant

This section builds on the analytical framework outlined in Section 3.3, where the matrix structure was introduced as a methodological tool to systematically assess the interplay between contextual constraints and enabling factors shaping innovation in peripheral regions. In this way, the matrix serves as a structured tool to classify the determinants of innovation along multiple dimensions, incorporating firm-specific characteristics and regional-level conditions, and offering a complementary perspective to existing conceptual distinctions in the literature. A core premise of this analysis is that firms operating in peripheral areas navigate a dual landscape, where structural disadvantages - such as limited access to knowledge networks, infrastructural gaps, and market fragmentation - coexist with potential sources of resilience, including localised knowledge exchange, institutional support, and digital transformation strategies. The following analysis applies the matrix approach to evaluate these dynamics, providing a systematic assessment of the empirical findings and their implications for innovation policy and regional economic development.

#### 4.2.1. Territorial constraints (quadrant A)

This quadrant reflects the structural disadvantages of peripheral areas, including geographical remoteness, infrastructural deficits, and institutional weaknesses. These factors limit firms' access to knowledge flows, skilled labour, and external markets. Several studies discuss how these barriers interact with local development trajectories and innovation capabilities, often requiring compensatory strategies such as the use of digital tools or reliance on external networks (see Table 2).

The most frequently cited barriers to innovation at the local level are geographical isolation and market fragmentation, highlighted in several studies (see the following Table 3). For example, McAdam et al. (2014) and Fritsch and Wyrwich (2021) discuss how geographical isolation limits firms' access to larger markets and collaboration opportunities. The former emphasises that the spatial remoteness of these regions limits the flow of new information and technology as well as collaboration opportunities with other firms and R&D institutions. Firms in these areas face higher operational costs, such as increased expenses for accessing new technology and markets, which exacerbates their competitive disadvantage. The latter note that peripheral small and medium-sized cities, despite being geographically distant from major urban centres, benefit from strong regional networks and local institutional support, which enables firms to innovate successfully.

Limited social and knowledge spillover networks are another key constrain discussed by Thomä (2023) and Dotzel and Faggian (2019). In 12 articles, this constraint is linked to the lack of interaction between firms, research institutions, and universities, which often serve as a key sources of innovation in urban areas. A major infrastructural barrier identified by Bosworth et al. (2023) is the lack of digital infrastructure and poor internet connectivity, which was discussed in a total of 15 studies. This issue prevents firms from fully engaging in the digital economy, limits their access to global markets, and hinders their capacity for technological adoption. Exogenous shocks, such as economic crises or the COVID-19 pandemic, were mentioned in two articles (Anthopoulou et al., 2017; Schäfer & Henn, 2023). These external shocks disproportionately affect peripheral areas, deepening existing challenges. Anthopoulou et al. (2017) discussed the impact of the 2008 economic crisis in Greece, which intensified vulnerabilities in peripheral areas. The crisis led to underemployment, financial instability, and a wave of counter-urbanization, as urban residents moved back to peripheral areas, often struggling to find sustainable opportunities for innovation due to the lack of a national policy support. Similarly, Schäfer and Henn (2023) highlighted the effects of the COVID-19 pandemic on firms in Germany, particularly how it aggravated labour shortages and disrupted supply chains. These disruptions further hindered peripheral firms' innovation capacity, especially as they struggled to recruit highly-skilled workers and integrate into global value chains. Both studies underscore how peripheral areas, with weaker infrastructure and fewer resources, are more vulnerable to external shocks, constraining innovation and undermining economic resilience. These external constraints amplify pre-existing structural weaknesses, making peripheral firms particularly vulnerable to disruption and accelerating the need for both local institutional responses and firm-level adaptation.

**Table 2**
Literature Review's 2 × 2 Framework.

| | Local level | Firm level |
|---|---|---|
| **Constraining factors** | Geographical isolation<br>Market fragmentation/size<br>Limited social and knowledge networks<br>Lack of digital infrastructure<br>Poor internet connectivity<br>Lack of physical proximity to innovation hubs<br>Exogenous shocks | Lack of digital skills<br>Limited financial resources<br>Resistance to change<br>Risk aversion among local business owners<br>Limited access to R&D facilities<br>Limited access to high-quality business advise |
| **Enabling factors** | Public-private partnership<br>Presence of innovation hubs<br>Presence of universities/ research institutions<br>Cross regional collaboration<br>Local stakeholders' involvement<br>Broadband access<br>Presence of strong local networks<br>Local identity representation<br>Decentralized settlement structure | Formal/informal cooperation<br>Cooperation among firm with research institutions<br>Cooperation among firms<br>Leadership committed to digital transformation<br>Access to external expertise or consultant<br>Local identity attachment<br>Inherent flexibility of small firms<br>Involvement of younger generations |

While many studies, such as Schmidt et al. (2022) and Dotzel and Faggian (2019), highlight the advantages of digital technologies in reducing isolation, other authors emphasise the limitations of human resources and local knowledge spillovers. For instance, Thomä (2023) emphasises that, despite technological advancements, firms still struggle to access knowledge networks and expert consultants. These contrasting perspectives suggest that digital transformation alone may be insufficient without parallel investments in human capital and institutional support. Moreover, the reviewed studies differ in their methodological approaches. For example, quantitative studies often focus on R&D expenditure and patent applications as primary measures of innovation (e.g., Aryal et al., 2018), whereas qualitative studies emphasise the role of networks, social capital, and informal cooperation (see the study of McKitterick et al., 2016). Accordingly, quantitative studies tend to highlight the importance of financial and technical resources, whereas qualitative studies underscore the importance of community engagement and local identity. Future research should aim to integrate these methodological approaches.

In sum, territorial constraints in peripheral regions often reinforce

**Table 3**
Quadrant A – Local level/Constraining factors.

| Local level – Constraining factors | articles | n. articles |
|---|---|---|
| **Geographical isolation** | Keene et al. (2024), Varis et al. (2014), Mariotti et al. (2023), McAdam et al. (2014), Rae (2017), Steinerowska-Streb et al. (2024), Stephens et al. (2013), Pant and Hambly Odame (2017), Merrell et al. (2022), Morris et al. (2022), Garcìa-Cortijo et al. (2019), McKitterick et al. (2016), Tuitjer and Küpper (2022), Johnston and Prokop (2021), Bosworth et al. (2023), Dubois (2016), Hammer and Frimanslund (2022), Muñoz et al. (2024), Blanchard (2017), Richter (2017), Pato (2020), Rundel et al. (2024), Kalantaridis and Bika (2006), Eder and Trippl (2019). | 25 |
| **Market fragmentation/ size** | Fritsch and Wyrwich (2021), Mariotti et al. (2023), Dotzel and Faggian (2019), Anthopoulou et al. (2017), Santos et al. (2024), Merrell et al. (2022), Tuitjer and Küpper (2022), Milone and Ventura (2019), Hammer and Frimanslund (2022), Martinus et al. (2019), Kalantaridis and Bika (2011), Patterson and Anderson (2003), Arias-Vargas et al. (2022). | 13 |
| **Limited social and knowledge (spillover) networks** | Dotzel and Faggian (2019), McAdam et al. (2014), Stephens et al. (2013), Thomä (2023), Anthopoulou et al. (2017), Merrell et al. (2022), Tiwasing et al. (2023), Dubois (2016), Kalantaridis and Bika (2011), Deakins and Bensemann (2019), Huggins and Thompson (2015), Kalantaridis and Bika (2006) | 12 |
| **Lack of digital infrastructure (general)** | Santos et al. (2024), Bosworth et al. (2023), Philip et al. (2017), Rietmann (2024), Agwu (2020), Bradač Hojnik and Huđek (2023), Aria-Vargas et al. (2022), Dawson et al. (2024), Vas et al. (2024) | 9 |
| **Poor internet connectivity (e.g., lack of 5G, fiber)** | Rietmann (2023), Thomä (2023), Pant and Hambly Odame (2017), Philip and Williams (2019), Bowen and Morris (2019), Price et al. (2018). | 6 |
| **Lack of physical proximity to innovation hubs** | Keene et al. (2024), Johnston and Prokop (2021). | 2 |
| **Exogenous shocks** | Anthopoulou et al. (2017), Schäfer and Henn (2023) | 2 |

**Table 4**
Quadrant B – Local level/Enabling factors.

| Local level – Enabling factors | articles | n. articles |
|---|---|---|
| **Public-private partnership** | Rietmann (2023), Thornton et al. (2023), Sà et al. (2019), Steinerowska-Streb et al. (2024), Xu and Dobson (2019), Pant and Hambly Odame (2017), Wu et al. (2024), Crupi et al. (2020), Fitjar et al. (2013), Richter (2017), Deakins & Bensemann, J. (2019), Fearne et al. (2013). | 12 |
| **Presence of innovation hub** | Rietmann (2023), Mariotti et al. (2023), Steinerowska-Streb et al. (2024), Cowell et al. (2018), Santos et al. (2024), Merrell et al. (2022), Wu et al. (2024), Price et al. (2018), Martinus et al. (2019), Crupi et al. (2020), Fearne et al. (2013). | 11 |
| **Presence of universities or research institutions** | Fritsch and Wyrwich (2021), Varis et al. (2014), Mariotti et al. (2023), Dotzel and Faggian (2019), Cowell et al. (2018), Stephens et al. (2013), Garcìa-Cortijo (2019), Tuitjer & Küpper, P. (2022), Crupi et al. (2020), Garzoni et al. (2020), Eder (2018). | 11 |
| **Cross regional collaboration** | Varis et al. (2014), Schmidt et al. (2022), Dotzel and Faggian (2019), Thornton et al. (2023), Tuitjer and Küpper (2022), Dubois (2016), Martinus et al. (2019), Muñoz et al. (2024), Fitjar et al. (2013), Val et al. (2024), Eder (2018). | 11 |
| **Local stakeholders involvement** | Schmidt et al. (2022), Sà et al. (2019), Pant and Hambly Odame (2017), Wu et al. (2024), del Olmo-Garcìa et al. (2023), De Noronha Vaz (2004), Pato (2020), Kalantaridis and Bika (2006). | 8 |
| **Broadband access** | Keene et al. (2024), Philip and Williams (2019), Tiwasing et al. (2023), Bosworth et al. (2023), Ollerenshaw et al. (2021). | 5 |
| **Presence of strong local networks** | Schmidt et al. (2022), McAdam et al. (2014), Richter (2017), Deakins and Bensemann (2019), Fearne et al. (2013), Dawson et al. (2024). | 6 |
| **Local identity representation** | Marques et al. (2018), Wu et al. (2024), Bosworth et al. (2023), Beckmann et al. (2023), De Noronha Vaz (2004), | 5 |
| **Decentralized settlement structure** | Fritsch and Wyrwich (2021). | 1 |

each other. For example, geographical isolation may exacerbate digital divides, which in turn limit firms' integration into broader innovation networks (Tiwasing et al., 2022). These findings resonate with the "compensation" strategies discussed by Eder and Trippl (2019), whereby firms adopt external linkages or technological solutions to mitigate structural disadvantages. However, the persistence of these barriers indicates the need for systemic interventions that go beyond firm-level action.

#### *4.2.2. Territorial enablers (quadrant B)*

This quadrant refers to place-based resources and conditions that support innovation. These include local institutions, networks, and cultural assets that firms can leverage to offset structural disadvantages. These enablers reflect the embeddedness of firms in their regional context and align with the notion of "exploitation" strategies (Eder & Trippl, 2019), whereby firms use local distinctiveness as a competitive advantage.

Despite the challenges mentioned earlier, the literature has identified several local factors that promote innovation (see Table 4). Several studies emphasise the role of institutional and infrastructural enablers, including public-private partnerships, innovation hubs, and proximity to universities or research centres. For example, public-private partnerships are mentioned in about 12 articles, including those by Rietmann (2023), Deakins and Bensemann (2019), and Fearne et al. (2013). Rietmann (2023) shows how firms, especially Hidden Champions, drive digital infrastructure development by collaborating with local governments to overcome poor connectivity. Deakins and Bensemann (2019) show that public-private partnerships enable small firms to access resources and expertise otherwise unavailable in peripheral areas. Fearne et al. (2013) stress the importance of partnerships in boosting innovation by helping firms adopt new technologies and expanding markets. Collaborations between local governments, businesses, and other stakeholders help overcome infrastructural barriers by sharing resources and creating innovation ecosystems.

The presence of innovation hubs and universities or research institutions is a crucial enabler of innovation in peripheral areas. Merrell et al. (2022) demonstrate how firm hubs foster innovation by offering shared services, networking opportunities, and business support, thereby facilitating collaboration and knowledge exchange. Using regional innovation surveys, Martinus et al. (2019) highlight that proximity to universities significantly enhances innovation by promoting knowledge spillovers and providing access to skilled workers. They measured variables such as distance from universities and innovation

outputs, like patents and new product introductions. Similarly, Varis et al. (2014) show that universities drive R&D and support firms through collaborative projects, particularly in knowledge-based industries, thereby enhancing local firms' capacity to innovate. Dotzel and Faggian (2019), using data from the Rural Establishment Innovation Survey (US), find that collaborations with universities boost innovation outcomes, including product and process innovations as well as patent filings.

Another important stream of research highlights how cultural heritage and local identity can be mobilised as resources for innovation. One interesting local enabler, mentioned in five studies, is the representation of local identity. Firms that leverage local culture and traditions as part of their product offerings can differentiate themselves in the market by creating high-value products. For example, Marques et al. (2018) explore how small firms integrated traditional techniques with new designs and processes to enhance product appeal and competitiveness in niche markets. The study employed semi-structured interviews to understand how these entrepreneurs balance innovation with the preservation of cultural heritage, showing that cultural identity can boost product innovation and market differentiation (Marques et al., 2018). Wu et al. (2024) carried out a study on community transformation, showing how entrepreneurs returning to peripheral areas foster innovation by promoting a shared vision and collective identity within their communities. This process was analysed through micronarratives, revealing how local cultural values can be revitalised to stimulate innovation in peripheral firms. Beckmann et al. (2023) further underline the importance of relational collaboration and territorial identity in peripheral firms, noting that local cultural identity is often fundamental to creating products aligned with local traditions. Their study systematically reviews the literature, showing that firms incorporate cultural identity into their business models, thereby supporting innovation and reinforcing connections to the local community. De Noronha Vaz (2004) investigated small food firms in peripheral regions, finding that territorial identity played a crucial role in enabling them to create products tied to their geographical origin. Cluster analysis was used in the study to categorise firms based on their innovative behaviour.

Overall, territorial enablers show that place-based asset - whether institutional, relational, or cultural - play a crucial role in fostering innovation in peripheral contexts. These results highlight the relevance of "exploitation" strategies, in which firms leverage local embeddedness rather than relying on external compensation. This perspective is particularly important for policies that aim to promote endogenous development through heritage-based innovation and multi-actor collaboration.

#### 4.2.3. Organizational constraints (quadrant C)

This quadrant includes factors that inhibit innovation within the firm. These constraints reflect organisational weaknesses such as a lack of skills, limited resources, resistance to change, and risk aversion (Blanchard, 2017; Bensemann et al., 2019). They are often magnified in peripheral areas by isolation from support networks and a lack of exposure to best practices (Beckmann, 2023; Steinerowska-Streb, Peterková, & Steiner, 2024). These issues are not only internal deficiencies, but also symptoms of broader structural conditions that shape firm behaviour and strategic decision-making (Fritsch et al., 2021). At the same time, these weaknesses should not be seen as fixed. They evolve as new technologies emerge, markets change, and peripheral regions experience growth or decline (Rietmann, 2024; Bosworth, 2023). Recognising this dynamism is crucial to understanding how firms adapt their strategies in response to shifting external conditions.

Several studies point to a digital skills gap that undermines firms' ability to innovate, particularly when combined with limited internal expertise and poor access to training opportunities. Considering the constraining factors at the firm level (see Table 5), the lack of digital skills is frequently cited as a significant barrier to innovation in peripheral areas, affecting firms' ability to adopt new technologies. In the study by Rietmann (2024), this issue is addressed by focusing on peripheral Small and Medium Enterprises (SMEs). The research highlighted that a digital skills gap prevents many firms from exploiting digital transformation opportunities. The author also emphasises that peripheral firms lack the internal expertise to implement digital solutions effectively, which limits their competitive advantage and capacity for innovation. Blanchard (2017) similarly explores how remote and rural firms show lower digital competencies, restricting their innovative potential. His study, employing a mixed-methods approach focusing on quantitative surveys and qualitative interviews, finds that the lack of digital skills, combined with limited access to training and digital infrastructure, reduces these firms' abilities to integrate new technologies into their processes. The study also finds that firms whose leadership prioritises digital literacy or accessing external consultants are better positioned to innovation. Finally, the lack of access to external expertise, R&D facilities, and business advice represents a persistent obstacle to innovation among peripheral firms. This category of constraints reflects difficulties in mobilising external resources, especially in isolated areas with weak institutional ecosystems.

A second cluster of constraints concerns organisational culture, specifically resistance to change, risk aversion, and traditional management styles. Resistance to change and risk aversion among local firm owners emerge as significant constraints to innovation in peripheral areas, as discussed in several studies. For example, Varis et al. (2014) underlines how resistance to change among firms is linked to a preference for traditional methods, particularly in long-established firms where change is viewed as a threat to the stability of the local economies. The study therefore finds that firms tend to avoid adopting new technologies or innovative practices, as they are concerned about potential risks and disruptions. In this sense, Cowell et al. (2018) highlight how entrenched cultural attitudes in peripheral regions foster risk-averse behaviour, as firms hesitate to invest in innovation due to uncertain returns. This risk aversion is often compounded by limited

**Table 5**
Quadrant C – Firm level/Constraining factors.

| Firm level – Constraining factors | | |
|---|---|---|
| | articles | n. articles |
| **Lack of digital skills** | Rietnmann (2023), Steinerowska-Streb et al. (2024), Xu and Dobson (2019), Aryal et al. (2018), Tiwasing et al. (2023), Rietmann (2024), Peón and Martínez-Filgueira (2020), Price, L. et al. (2018), Blanchard (2017), del Olmo-Garcìa et al. (2023), Agwu (2020), Deakins and Bensemann (2019), Fearne et al. (2013), Patterson and Anderson (2003), Garzoni et al. (2020), Vas et al. (2024), Rundel et al. (2024), Kalantaridis and Bika (2006). | 16 |
| **Limited financial resources** | Schmidtet al. (2022), Appleton and Holt (2024), Quinnet al. (2013), Xu and Dobson (2019), Milone and Ventura (2019), Peón and Martínez-Filgueira (2020), Talbot (2016), del Olmo-Garcìa et al. (2023), Fearneet al. (2013), Aria-Vargas et al. (2022), Vas et al. (2024). | 11 |
| **Resistance to change** | Varis et al. (2014), Bouncken et al. (2020), Marques et al. (2018), Bosworth et al. (2024), Wu et al. (2024), Price et al. (2018), Fitjar et al. (2013), Garzoni et al. (2020), Dawson et al. (2024). | 9 |
| **Risk aversion among local business owners** | Cowell et al. (2018), Gaddefors et al. (2020), Talbot (2016), Ollerenshaw et al. (2021), Crupi et al. (2020). | 5 |
| **Limited access to R&D facilities** | Keene et al. (2024), Fritsch and Wyrwich (2021). | 2 |
| **Limited acces to high-quality business advise** | Martin, Warren-Smith, et al. (2013) | 1 |

exposure to external markets, reinforcing a focus on survival rather than growth through innovation. Similarly, Crupi et al. (2020) argue that a lack of organisational learning within firms can heighten risk-averse tendencies, as firms lack the necessary skills or knowledge.

#### 4.2.4. Organizational enablers (quadrant D)

This quadrant includes factors that originate within firms and positively influence their capacity to innovate. These include leadership, internal resources, entrepreneurial orientation, and organisational flexibility. In peripheral contexts, where external support may be limited, such organisational strengths are crucial. These enablers align with the resource-based view (Barney, 1991) and theories of dynamic capabilities (Teece, 2007), which stress the firm's internal capacity to adapt and renew its resources.

One of the most frequently discussed enabling factors is cooperation, both formal and informal, which enhances firms' access to knowledge, skills, and markets. Several studies (24) highlighted cooperation as an essential enabler of innovation at the firm level, especially in peripheral areas (see Table 6). Fritsch and Wyrwich (2021) emphasise that firms in geographically remote regions can overcome innovation barriers by establishing strong cooperative relationships. These firms improve their access to knowledge networks through formal and informal cooperation fostering their innovative capabilities. Quinn et al. (2013) note that firms can strengthen their capacity to cooperate with other businesses and institutions, such as universities or research centres, by effectively leveraging limited financial resources and seeking proximity to centres of expertise. Dubois (2016) suggests that informal networks in peripheral areas are helpful, and that expanding these networks beyond localised circles can connect firms to broader external innovation ecosystems. Blanchard (2017) further notes that firms can boost their growth and innovation potential by seeking formal institutional support that provides human resources and knowledge spillovers. Huggins and Thompson (2015) introduce the concept of "network capital", arguing that firms can develop strategic, knowledge-driven relationships to compete with urban-based firms by enhancing their connections to research institutions and markets. Steinerowska-Streb, Peterková, and Steiner (2024) provide a case study illustrating how establishing formalised cooperation mechanisms can stimulate innovation in peripheral and rural firms. McKitterick et al. (2016) highlight the importance of informal networks, such as family associations, alongside formal institutional networks. Exploring cooperation between firms and research institutions, Rietmann (2024) demonstrates that such collaboration improves firms' digital transformation and innovation. These partnerships bridge knowledge and resource gaps faced by peripheral firms face. Similarly, Huggins and Thompson (2015) argue that knowledge spillovers from research institutions are essential. They present a network theory linking firm-level cooperation with external knowledge sources to regional innovation. Additionally, Schäfer and Henn (2023) discuss how collaboration with research institutions helps firms overcome local skill shortages by integrating highly skilled migrants, and enhancing innovation (see Table 7).

Cooperation among firms is also identified as a key enabler of innovation at the firm level in peripheral areas. Schmidt et al. (2022) demonstrate that interactive innovation processes among firms are important for overcoming resource limitations. Through cooperation, firms gain access to shared resources such as knowledge, expertise, and technology, enabling them to compete in broader markets.

Another cluster of enablers relates to leadership and entrepreneurial agency (Martin et al., 2013). Firm-level commitment to digital transformation and innovation-oriented leadership can drive strategic renewal. Finally, some studies emphasise the role of local identity and cultural embeddedness as drivers of innovation. Rietmann (2023) investigates firms that leverage local identity and cultural ties to drive digitalisation efforts, balancing tradition with modern innovation. In this sense, Gaddefors et al. (2020) introduce the concept of "entrepreneurial exaptation", where firms creatively reinterpret local resources and identities for new purposes. This concept emphasises the flexibility and open-endedness of resources - such as historical, cultural, or material resources - particularly in regions where they may be scarce. Marques et al. (2018) provide a case study of firms that use local identity to preserve traditional craftsmanship while innovating in product design and market positioning. Wu et al. (2024) show how firms rooted in local culture can foster community transformation by embedding local values into their business models. These findings indicate that innovation in peripheral areas often emerges from context-specific knowledge bases that are not necessarily technological Panzer-Krauze (2019). In particular, artisanal traditions, intergenerational know-how, and rural embeddedness provide fertile ground for innovation.

In conclusion, firm-level enablers highlight how internal

**Table 6**
Quadrant D – Firm level/Enabling factors.

| Firm level – Enabling factors | articles | n. articles |
|---|---|---|
| **Formal/informal cooperation** | Fritsch & Wyrwich, M. (2021), Schmidt et al. (2022), Mariotti et al. (2023), Bouncken et al. (2020), Martin, Warren-Smith, et al. (2013), Steinerowska-Streb et al. (2024), Quinn et al. (2013), Cowell et al. (2018), Merrell et al. (2022), Bosworth et al. (2024), McKitterick et al. (2016), Milone and Ventura (2019), Johnston and Prokop (2021), Bosworth et al. (2023), Dubois (2016), Hammer and Frimanslund (2022), Martinus et al. (2019), Blanchard (2017), del Olmo-Garcìa et al. (2023), Agwu (2020), Huggins and Thompson (2015), Dawson et al. (2024), Hess (2004), Eder and Trippl (2019). | 24 |
| **Cooperation among firms with research institutions (e.g. universities)** | Fritsch and Wyrwich (2021), Sà et al. (2019), Steinerowska-Streb et al. (2024), Cowell et al. (2018), Xu and Dobson (2019), Aryal et al. (2018), Stephens et al. (2013), McKitterick et al. (2016), Tuitjer and Küpper (2022), Johnston and Prokop (2021), Schäfer and Henn (2023), Rietmann (2024), Peón and Martínez-Filgueira (2020), Crupi et al. (2020), Bradač Hojnik and Huđek (2023), Deakins and Bensemann (2019), Fearne et al. (2013), Garzoni el al. (2020), Huggins and Thompson (2015), Vas et al. (2024), Eder (2018). | 21 |
| **Cooperation among firms** | Schmidt et al. (2022), Dotzel and Faggian (2019), Thomton et al. (2023), Santos et al. (2024), Merrell et al. (2022), McKitterick et al. (2016), Milone and Ventura (2019), Bosworth et al. (2023), Dubois (2016), Rietmann (2024), Price et al. (2018), Crupi et al. (2020), Fitjar et al. (2013), Deakins and Bensemann (2019), De Noronha Vaz (2004), Kalantaridis and Bika (2006). | 16 |
| **Leadership committed to digital transformation** | Rietmann (2023), Steinerowska-Streb et al. (2024), Rietmann (2024), Blanchard (2017), Fitjar et al. (2013). | 5 |
| **Access to external expertise or consultant** | Schmidt et al. (2022), Dotzel and Faggian (2019), Fitjar et al. (2013). | 3 |
| **Local identity attachment** | Rietmann (2023), Bosworth et al. (2024), Gaddefors et al. (2020), | 3 |
| **Inherent flexibility of small firms** | Thomä (2023), Anthopoulou et al. (2017) | 2 |
| **Involvment of younger generations** | Marques et al. (2018), Milone and Ventura (2019). | 2 |

**Table 7**
Research questions and future research lines.

| Research Question(s)/Future research lines | Description |
|---|---|
| How do firms in peripheral areas incorporate local identity into their innovation strategies<br>? How do firms in peripheral contexts interpret and pursue innovation? | Innovation practices in peripheral context |
| How do individual, organizational, and territorial characteristics interact in shaping innovation outcomes? Do locally rooted CEOs influence innovation trajectories in firms? | Firm, individual, and territorial traits linked to innovation |
| How do firms reconcile the need to preserve local identity while engaging in technological and market innovations? | Local identity as an enabler or constraint to innovation |
| What types of public-private-academic partnerships are most effective in supporting innovation in peripheral regions? | Public-private partnerships and institutional support for innovation |

capabilities—leadership, learning orientation, and cultural alignment—are crucial to innovation in peripheral areas. These factors not only compensate for external deficits, but also shape firms' strategic behaviour. This confirms the relevance of dynamic capabilities (Teece, 2007), particularly when innovation relies on both internal flexibility and external cooperation. The interplay between identity, adaptability, and strategic agency emerges as a distinctive feature of successful firms in peripheral regions.

## 5. Discussion and future research lines

The reviewed literature provides a comprehensive overview of the factors that enable or constrain innovation in peripheral areas. This section synthesises key findings emerging from the two-dimensional matrix, which captures enabling and constraining factors at both systemic and organisational levels and offers directions for future research. As anticipated in the introduction, this systematic approach provides insights into how peripheral areas can overcome geographical isolation and infrastructure weaknesses to foster innovation. The synthesis shows that strategies such as leveraging local identity, building collaborative networks, and investing in digital capabilities are particularly effective in mitigating structural disadvantages. However, the existing literature shows gaps that merit further investigation. These include how local identity is integrated into innovation processes, the role of CEO characteristics in shaping firm-level innovation strategies, and how digital transformation intersects with cultural embeddedness in peripheral regions. Each of these gaps offers stimulating avenues for future research. Moreover, these gaps intersect with broader tensions surfaced by the matrix—such as embeddedness versus openness, and agency versus structural constraints—which guide the following discussion.

As highlighted earlier, innovation in peripheral areas should not be seen as a static condition but as a dynamic process shaped by evolving systemic, organisational, and individual factors. This dynamism frames the discussion of how local firms often leverage cultural and historical distinctiveness to gain legitimacy and differentiation, especially in niche markets (Gaddefors et al., 2020; Marques et al., 2018; Wu et al., 2024). These authors suggest that local identity can provide a competitive advantage by appealing to consumers who value roots and authenticity. Yet, this reliance on embeddedness raises questions about adaptability and long-term competitiveness, especially when tradition becomes a constraint. The literature also points to the risks of over-reliance on local identity as a foundation for innovation. Gaddefors et al. (2020), for example, introduce the concept of entrepreneurial exaptation - the creative reinterpretation of local resources for new purposes – to describe how firms adapt tradition to changing markets. Nonetheless, the sustainability of this strategy remains unclear. While firms may initially succeed by capitalising on local identity, it remains uncertain whether they can sustain this advantage as global competitors adopt similar approaches. This tension between rootedness and strategic flexibility reflects a broader challenge for peripheral firms: innovating without abandoning their identity.

Another key tension concerns the role of individual agency in shaping innovation outcomes within structurally constrained environments. The influence of leadership on firms' ability to balance tradition with innovation remains underexplored (Blanchard, 2017; Beckmann, 2023; Steinerowska-Streb et al., 2024). Emerging studies suggest that locally rooted CEOs can either reinforce conservative business models or act as catalysts for innovation, particularly when they engage with external actors and foster collaboration within regional ecosystems. Future research should explore whether the embeddedness of local CEOs influences firms' innovation trajectories and the extent to which their educational or professional backgrounds amplify or mitigate this influence. This issue intersects with the organisational layer of the matrix, where internal leadership capacity may compensate for or reinforce external systemic gaps.

Despite the growing body of research, several critical tensions highlighted by the matrix remain underexplored in the literature. These tensions concern the scalability of local innovation models, the interplay between leadership and local culture, and the integration of digital transformation in place-based innovation strategies – issues that our review identifies as priorities for future investigation.

A key research direction involves assessing whether entrepreneurial exaptation – while contextually adaptive – can support long-term transformation beyond niche or artisanal sectors. Investigating how firms balance tradition with the need for continuous innovation in fast-evolving sectors - such as high-tech industries and advanced manufacturing - could reveal how local identity operates as either a strength or a constraint. Firms that prioritise local identity may struggle to innovate if they are reluctant to adopt new technologies or engage with external markets for fear of losing their cultural authenticity. This raises an important question: how can firms in peripheral areas maintain local distinctiveness while remaining competitive in globalised markets? Comparative case studies could help identify the conditions under which local identity supports or hinders innovation across different regional and sectoral contexts. This would also clarify how different configurations of territorial and organisational factors—mapped in the matrix—shape innovation capacity in practice.

In addition, the review highlights a gap in understanding how digital transformation intersects with local identity in peripheral regions. Some cases, such as Rietmann's (2024) study on peripheral Hidden Champions, suggest that it is possible to integrate digital technologies while preserving strong local identity, thereby highlighting a fundamental tension between cultural embeddedness and technological modernisation. The literature lacks comprehensive analyses of how firms manage the tension between preserving local roots and embracing digitalisation (Bosworth et al., 2023; Rietmann, 2024). The digital divide in peripheral areas is a well-documented barrier, with many firms struggling to access the necessary infrastructure and digital skills to compete in global markets. The role of regional policymakers in bridging this gap is crucial yet underexplored. Future studies should assess how targeted policy interventions—such as public investment in digital infrastructure or incentives for firms to adopt Industry 4.0 technologies—shape innovation pathways in peripheral economies. Further research could investigate how digital tools and platforms enable firms to expand beyond local markets maintaining local distinctiveness. This line of research could also explore how regional stakeholders, for instance local governments and educational institutions, support firms in navigating the complexities of digital transformation. Clarifying this interplay is essential for assessing whether digital transformation acts as a bridge or a barrier within different innovation trajectories and for situating these dynamics within established theoretical frameworks. Our findings contribute to refining the conceptual distinction proposed by Eder and Trippl (2019),

who classify peripheral innovation strategies as either compensation, addressing structural disadvantages, or exploitation, leveraging contextual uniqueness. By engaging with this distinction, our contribution is not limited to categorising cases but aims to refine the theoretical understanding of how strategies evolve under different contextual conditions. While many of the cases identified in our review align with this dichotomy, our two-dimensional matrix enables a more nuanced classification. This structure reflects the need, expressed by Eder (2018), to move beyond binary classifications and adopt multi-level frameworks that capture the interplay of place, agency, and resources. The matrix thus serves not only as a classificatory tool, but also as a lens to reveal and interpret these layered tensions.

Building on the matrix structure developed in the previous section, we propose a conceptual hierarchy that organises the enabling and constraining factors of innovation in peripheral areas according to their level of influence. This hierarchy reflects a multi-level structure - systemic, organisational, and individual - that has emerged from the empirical patterns reported in the literature. For instance, systemic conditions such as infrastructure, broadband connectivity, and supportive policy environments are frequently described as fundamental prerequisites for innovation. Organisational factors—such as innovation strategy and internal capabilities—are positioned at an intermediate level, mediating the relationship between external conditions and firm behaviour. Finally, individual-level drivers - such as entrepreneurial vision, resilience, and digital literacy - are presented as enabling microfoundations of innovation, especially in resource-constrained contexts. While these levels are conceptually distinct, the literature shows they are often interdependent: weak systemic conditions may be partially offset by strong organisational adaptation or individual initiative. The hierarchy does not imply a rigid causality but provides a structured lens to interpret the complex interplay of innovation dynamics in peripheral settings. This synthesis is visualised in Fig. 5, which illustrates the vertical layering of these factors and their relative depth of influence. Although the literature does not always use this exact framing, our classification is grounded in the recurring configurations observed across the reviewed studies (e.g., Blanchard, 2017; Bosworth et al., 2023; Marques et al., 2018; Rietmann, 2024). By layering these conditions, the hierarchy also helps visualise how certain tensions—such as embeddedness versus openness or individual agency versus systemic constraint—are distributed across levels.

The literature on innovation in peripheral areas has made substantial progress in identifying key enabling and constraining factors. However, the matrix also reveals unresolved tensions that correspond to enduring knowledge gaps. Among the most studied elements, local identity clearly plays a central role. Yet, more research is needed to understand how it operates across diverse sectors, and how firms can balance tradition with technological advancement and global market integration. This challenge interacts with firm-level characteristics and external conditions in shaping innovation outcomes. The interplay between CEO characteristics, digital transformation, and regional innovation ecosystems also remains insufficiently understood, particularly in relation to how firms position themselves within evolving industrial contexts. In this sense, our contribution complements and extends existing frameworks by offering a structured lens to interpret innovation dynamics in peripheral areas—one that can be adapted to varying institutional and geographical settings.

Addressing these tensions can clarify how firms navigate innovation challenges in peripheral areas, and identify where targeted policy interventions can be most effective. One of the most urgent areas of intervention is the improvement of digital infrastructure. As shown by Bosworth et al. (2023), poor connectivity remains a major barrier to innovation. Without reliable high-speed internet, peripheral firms are unable to fully engage in the global digital economy. Another critical recommendation concerns the development of public-private partnerships that bring together local governments, universities, and firms. As noted by Fearne et al. (2013) and Rietmann (2023), such partnerships can help overcome institutional fragmentation and resource constraints. Equally important is investment in education and training. The lack of digital skills among employees in peripheral areas remains a major obstacle to innovation (Blanchard, 2017). Targeted programs to improve digital literacy and technical capacity could enhance innovation capabilities at the local level. These areas of intervention correspond to the systemic, organisational, and individual layers highlighted in the matrix, and suggest that multi-level coordination is essential to unlocking innovation potential in peripheral regions. For firms, strategically embedding local identity into products can offer differentiation but may also create tensions between cultural authenticity and market adaptability. Studies such as Marques et al. (2018) and Wu et al. (2024) show how this can create strong emotional connections, with niche markets. Given structural constraints, firms in peripheral areas are more likely to pursue incremental rather than radical innovation (Bensemann et al., 2019). As shown by Tuitjer and Küpper (2022), even small improvements can significantly enhance competitiveness and resilience in local markets. In many cases, these smaller innovations can be less risky and more reachable for resource-limited firms, while still delivering tangible benefits. Moreover, future research could explore how firms can combine incremental innovation with digital transformation to gradually expand their market reach, while maintaining local distinctiveness in an increasingly competitive global economy. This reflects the organisational layer of the matrix, where firms must reconcile internal capabilities with evolving external demands. Although digital innovation dominates mainstream discourse, the literature also reveals a wide range of alternative innovation modes that are rooted in local contexts. These include incremental changes to products or services, the adaptation of traditional practices for new markets, and forms of social or organisational innovation embedded in local networks. Such variety underscores the need to recognise innovation in peripheral areas as a diverse and context-specific phenomenon, not limited to technological adoption. These findings call for deeper investigation into how firms interpret and operationalise innovation within their specific institutional and territorial settings. Additionally, more systematic exploration is needed to understand how individual, firm-level, and territorial characteristics combine to influence innovation outcomes. Capturing these interactions is key to advancing multi-level frameworks, such as the matrix proposed in this review.

## 6. Conclusion

This systematic literature review investigated how innovation occurs in peripheral areas by analysing 77 peer-reviewed studies published between 2003 and 2024. We proposed and applied a 2 × 2 matrix framework to classify enabling and constraining factors along two dimensions: territorial (context-related) and organisational (firm-related). The findings reveal that innovation in peripheral areas is shaped by both structural disadvantages — such as infrastructural gaps and institutional weaknesses — and by firm-level capacities such as leadership, strategic orientation, and cultural embeddedness. While some firms adopt compensation strategies to overcome contextual limitations, others build exploitation strategies based on local embeddedness and cultural specificity. The review highlights the central role of digitalisation, cooperation, and entrepreneurial learning in shaping innovation trajectories in rural and remote areas. However, it also identifies important research gaps, particularly regarding the long-term impact of identity-based innovation strategies, the role of leadership, and the need for more comparative, context-sensitive studies. By structuring existing evidence through the matrix, this study offers a conceptual tool for both researchers and practitioners interested in understanding the mechanisms behind peripheral innovation. These insights call for policy approaches that not only reduce external constraints but also actively nurture internal capabilities and place-based potential across diverse peripheral contexts. Future research could further examine how innovation is practiced and understood by firms in peripheral areas, and how

observable characteristics of firms, managers, and territories relate to diverse innovation patterns.

## CRediT authorship contribution statement

**Giulio Pappa:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Stefano Amato:** Visualization, Validation, Supervision, Conceptualization. **Nicola Lattanzi:** Visualization.

## Data availability statement

No new data were created or analysed in this study. Data sharing is not applicable to this article.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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