Open innovation in tourism micro-firms: evidence from the Italian Alps

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This study examines the relationship between openness to external collaborations and innovation outcomes in tourism micro-firms, considering the variety of partners, the geographical outreach of the relationships, and the number of implemented innovation types. A quantitative analysis of tourism micro-firms located in the Italian Alps is complemented with rich qualitative evidence gathered through follow-up interviews. Our findings show that higher openness to external collaborations leads to a higher probability of introducing an innovation and to higher innovation performances. However, above a certain threshold, the returns from open innovation decrease as a firm's openness increases. This assumption does not hold when considering openness to national and international partners, which is positively and significantly related to innovation performance. The results suggest that the purposive management of external collaborations is a central issue for tourism entrepreneurs and highlight the positive role that intermediaries can play in facilitating such dynamics.

Keywords: tourism micro-firms, open innovation, openness, tourism innovation, rural tourism

1. Introduction

Creativity and innovation are key factors for the development and long-term growth of tourism enterprises (Bhaskara et al., 2023; Pikkemaat et al., 2019), as they allow such enterprises to explore new market segments, enhance service quality and reduce demand uncertainty, thereby enhancing efficiency and productivity (Zach, 2016; Nguyen et al., 2021).

Collaborative innovation is recognized as a significant antecedent of innovation performance in this context (Divisekera & Nguyen, 2018; Tajeddini et al., 2020). In particular, external knowledge sourcing from other organizational actors enhances

learning processes (Melis et al., 2023; Xie et al., 2020) and positively influences co-creation and innovation in the tourism industry (Santos-Vijande et al., 2018). Considering the intrinsic diversity of the tourism supply (Czernek, 2017) and the interrelated nature of touristic products and services (Pikkemaat et al., 2019), establishing collaborations with external stakeholders allows tourism firms to achieve greater diversity in innovation outputs, which in turn leads to higher performances (Verreynne et al., 2019).

External collaborations can benefit tourism micro-firms, as their inherited liabilities, limited resources and managerial capabilities hinder their growth potential (Gherhes, 2016; Yachin, 2021). The scant human resources of micro-firms affect their adaptive capacities (Kelly et al., 2020), limit their control over the external environment and make them vulnerable to market forces (Tu et al., 2014). In this context, opening up to external sources of critical knowledge for innovation allows tourism entrepreneurs to access innovation assets and enhance internal capacities (Kelliher et al.,, 2018; Kelly et al., 2020). Collaborative innovation becomes an issue of utmost importance when micro-firms operate in geographically dispersed contexts. As such firms are less exposed to information, external resources and critical market knowledge, their 'overembeddedness' in a local context may lead to a lack of innovation diversity, thereby reducing the inflow and use of relevant external ideas and opportunities (Czernek, 2017; Czernek-Marszałek, 2020). The interest of the literature in innovation in tourism has recently increased concerning the dynamics of interorganizational relationships and external collaborations in tourism (Hurtado-Palomino et al., 2022; Kallmuenzer et al., 2021). Recent research agendas have explicitly called for more elaboration on collaborative (open) innovation in the tourism industry (Marasco et al., 2018; Shin & Perdue, 2022) and, in particular, in the micro-firm context (Kelly et al.,

2020; Yachin, 2021), where research is still underdeveloped. Specifically, in-depth empirical evidence within the population of SMEs is needed on the innovation behaviour of micro-firms and on the antecedents and outcomes of their collaborative innovation activities.

Moreover, while expanding external relationships to more diversified stakeholders is recognized as a driver of innovation in the tourism industry (Melis et al., 2023; Favre-Bonté et al., 2016), scant research has explored the variety of partners involved at the firm level, the geographical outreach of external relationships, and their relationship with innovation performance.

This study bridges the literature on innovation in tourism and the open innovation (OI) framework (Chesbrough, 2003) to explore this gap. Specifically, the relationship between openness to external collaborations and innovation outcomes in tourism micro-firms is explored, considering the variety of partners, the geographical outreach of the relationships, and the number of implemented innovation types.

Survey data have been collected on a sample of micro-enterprises operating in rural tourism destinations in Italy; the regression analysis results have been complemented with detailed insights from field interviews.

Our findings suggest that higher innovation outcomes are achieved as tourism micro-firms increase their collaborative efforts towards a larger variety of knowledge sources and with a higher geographical outreach of external relationships. However, openness to external collaborations may increase managerial complexity above a certain threshold, resulting in a curvilinear relationship with innovation performance.

The study complements recent literature that has emphasized the potential of the OI paradigm in tourism research (Pikkemaat et al., 2019; Shin & Perdue, 2022) by providing rich empirical evidence on the importance of establishing diversified external

collaborations, even in terms of geographical outreach, to achieve innovation performance in tourism micro-firms. At the same time, the study highlights the managerial challenges of OI in tourism as crucial issues that need to be overcome in the micro-firm context.

2. Theoretical background and hypotheses

2.1 External collaborations as drivers of tourism innovation

A growing amount of literature has identified external collaborations as significant antecedents of innovation outcomes in the tourism context (Divisekera & Nguyen, 2018; Nguyen et al., 2021; Tajeddini et al., 2020).

From a theoretical perspective, the concept of strategic entrepreneurship - a firm's "pursuit of superior performance via opportunity-seeking and advantage-seeking activities" (Ketchen et al., 2007, p. 371) - emphasizes collaborative innovation as an activity of significant benefit for small and micro-firms, which typically face impediments while pursuing innovation (Van de Vrande et al., 2009).

At the same time, the OI paradigm, namely "the purposive use of external knowledge inflows and internal knowledge outflows to accelerate innovation and to expand the market for its external use" (Chesbrough et al., 2006, p. 1), has been regarded as a factor that enables small firms to preserve their creativity and flexibility while overcoming resource constraints (Ketchen et al., 2007; Marullo et al., 2018). In the context of tourism firms, one of the main benefits of external collaborations is the potential access to skilled human resources and other external innovation assets, which are of utmost importance in developing innovative products and services. Firms' exposure to external knowledge, through the pursuit of OI, nurtures their ability to mobilize external resources, identify and deploy new relevant knowledge, and extract

value from their internal capabilities. For instance, collaborations can make tourism destinations more appealing, since firms can obtain information and build on accumulated knowledge, practice, experience, and the partners' skills in co-developing integrated services (Wang & Fesenmaier, 2007). Furthermore, the extent of collaboration plays a critical role in developing tourism destinations (Baggio, 2011). As the literature on knowledge transfer and network structure in tourism destinations suggests, expanding the range of external relationships to diversified stakeholders (Martínez-Pérez et al., 2019), even those operating in non-proximate locations, offers support to the development of innovations of a more radical nature (Brandão et al., 2019; Favre-Bonté et al., 2016).

To date, the empirical literature has emphasized the value of strategic collaborations between tourism firms and their clients and customers to create new services and obtain higher competitive advantages (Santos-Vijande et al., 2018; Xie et al., 2020). Customer co-creation enables the collection, analysis, and integration of market insights, thereby mitigating the risks associated with innovation and accelerating the rate of development of new products and services (Santos-Vijande et al., 2018; Xie et al., 2020). On the other hand, collaboration between tourism firms and universities frequently consists of human resources transfer (Yayla & Çatir, 2023) and has been positively associated with marketing innovations, such as new media, product promotion strategies, and new distribution and pricing systems (Olszewski, 2021). Finally, in the context of tourism innovation, intermediaries and government bodies, including destination management organizations (DMOs), help strengthen entrepreneurial capacities (Baggio, 2011; Yachin, 2021) and provide support when firms face legal or contract enforcement issues (Lin et al., 2023).

Hence, the literature clearly shows that the issue of external collaboration for innovation is particularly relevant in tourism micro-firms. Micro-firms face huge constraints on innovation activities that arise from their limited development in different business domains (Gherhes, 2016). These constraints hinder their capacity to build advanced managerial capabilities, which, in turn, could stimulate and facilitate their growth. Limited human resources and underdeveloped skills hinder the development of adaptive capacities in tourism micro-firms, where operational capacities prevail (Kelly et al., 2020). As technological advancements have significantly changed the marketing landscape of hospitality micro-firms, establishing collaborations with external partners has become important to seek external sources and gather new ideas and relevant knowledge (Kelliher et al., 2018; Yachin, 2021).

Furthermore, many tourism micro-firms operate in rural contexts that may be geographically dispersed and far apart. This condition typically hinders knowledge transfer and leads to neglecting external collaborations for innovation (Czernek, 2017). The closest enterprises may be other micro-firms that lack the knowledge and resources necessary to facilitate innovation. Although micro-enterprises represent the majority of tourism and hospitality firms in many countries, they have seldom been studied in detail within the field of tourism innovation. Extant literature shows a positive association between external collaboration and the growth of tourism micro-firms through resource transfer (Yachin & Ioannides, 2020), the development of entrepreneurial capacities (Kelly et al., 2020), and access to external resources and the supplemental services of specific market segments (Yachin, 2021). Notably, as micro-firms are typically run by single owner-manager-entrepreneurs (Gherhes, 2016), their growth heavily depends on such individuals' efforts, ambitions, and skills (Carson et al., 2017; Kelly et al., 2020). Indeed, in this context, the entrepreneur's knowledge and personal contacts influence

the generation of new ideas and the development of new products significantly (Yachin, 2021). Thus, it has been argued that establishing an innovation culture is essential to maintain a dynamic and consistent process. This primarily involves the active interaction and utilization of external sources of innovation through engaging with stakeholders, policymakers, and a broader professional community (Kelliher et al., 2018).

2.2 Openness to external collaborations and tourism innovation

The OI concept, that is, "a distributed innovation process based on purposefully managed knowledge flow across organizational boundaries" (Chesbrough & Bogers, 2014, p. 17), provides a powerful theoretical framework to investigate the relevance of external collaborations in tourism and their relationship with innovation outcomes.

By nature, innovation in tourism typically unfolds at multiple levels, involves diverse types of actors and generates different outcomes (Verreynne et al., 2019). Networks have been the focus of research on destination competitiveness (Brandão et al., 2019; Valeri & Baggio, 2022), thus suggesting the importance of diverse inter-organizational relationships and cross-industry collaborations to develop innovations of a radical nature (Martínez-Pérez et al., 2019; Kofler et al., 2018).

The OI framework provides solid arguments to this point on the role that the variety of inter-organizational linkages may assume as a success factor for tourism enterprises.

Given the diversity of the tourism supply (Czernek, 2017), and the interrelated nature of touristic services and products (Pikkemaat et al., 2019), interactions and networking with a variety of external partners are vital for the successful development of innovative products and services. A greater variety of external collaborations can provide tourism firms with access to diversified knowledge and resources that can be

transferred, complemented and exploited to foster internal innovation activities. Martínez-Pérez et al. (2019) recommended establishing a network with a wide diversity of relationships for external knowledge sourcing as a critical issue for developing innovation in the tourism context. The contribution of several different partners is also significant in the case of micro-firms in the tourism industry (Zach, 2016). According to this literature, openness to collaboration with a variety of external partners should have a positive influence on innovation outcomes.

Literature on OI in the context of SMEs has observed that the degree of 'openness', measured as the extent to which a firm can benefit from external knowledge for innovation, is contingent on the number of ties and the typology of the involved partners (Brunswicker & Van de Vrande, 2014). According to Leiponen and Helfat (2010), a higher openness to external collaborations enhances the likelihood of acquiring relevant external knowledge that can be coupled with the firm's internal knowledge to develop innovation. Moreover, experience from prior collaborations can be successfully employed with more diversified groups of partners. Indeed, after being assimilated, external knowledge can be used to reconfigure the existing internal resources and exploited to develop new products or services. Firms accessing a greater variety of knowledge sources, by interacting and building collaborations with external partners, are therefore considered more open than those that do not (Laursen & Salter, 2006) and generally reach higher levels of innovation performance (Brunswicker & Vanhaverbeke, 2015; Audretsch et al., 2023; Tsai, 2009), as openness provides a foundation for learning effects (Love, 2014). This contention is further supported by the social capital theory, which emphasises the value of tangible and potential resources accessible to a company through its network of relationships (Nahapiet & Ghoshal, 1998). Firms' social capital represents a crucial component for developing innovations

and attaining competitive advantages in the tourism industry (Kim & Shim, 2018), and plays a critical role in remote destinations (Bhaskara et al., 2023).

The hospitality and tourism industry holds significant promise for OI effectiveness, and some studies on this topic have begun to emerge. Support has been found for the positive relationship between firms' OI approaches and performance (Hameed et al., 2021; Lim et al., 2021).

On the basis of these arguments, we hypothesize the following:

> **H1:** A higher degree of openness to external collaborations in tourism micro-firms is positively related to the likelihood of introducing an innovation.

Literature on OI also highlights the significantly positive relationship between openness to external collaborations and the diversity of innovation outcomes (Love et al., 2011). Innovation diversity is a central issue for service industries, especially for the tourism industry. As tourism activities are characterized by seasonal factors and vulnerability to climate change, higher uncertainty increases the pressure to innovate across diverse innovation types (Camisón & Monfort-Mir, 2012; Nguyen et al., 2021; Verreynne et al., 2019).

According to Nguyen et al. (2021), micro-firms in the tourism industry should approach different types of innovation to increase productivity and be more competitive. Collaborating with different types of partners can give them access to the stimuli, knowledge and resources needed to implement such a strategy. Nevertheless, establishing and maintaining multiple collaborations can be even more costly, and may require more time, resources and managerial skills for micro-firms than for their larger counterparts.

Managing a network of diverse partners requires high levels of managerial expertise, as the increased complexity of managing various external relationships leads

to higher search and coordination costs (Marullo et al., 2020). As far as this point is concerned, the OI theory shows that an unfocused knowledge search that simultaneously relies on multiple partners is expensive and may divert managerial attention, thereby raising costs (Laursen & Salter, 2006). The costs of collaboration are particularly manifest in the tourism context as the utilization of external knowledge extends beyond a firm's operations. Higher openness to external collaborations encompasses such activities as searching for and selecting ideas and applying external knowledge to the internal innovation process. Therefore, it is essential to purposively manage any relevant knowledge received from external partners to extract valuable insights (Hameed et al., 2021). Other OI challenges arise while collaborative relationships unfold (Marullo et al., 2020). This stage encompasses the increased costs associated with planning and the difficulties of identifying legitimate stakeholders, evaluating each stakeholder's capacity to participate and aligning the partners' incentives (Marullo et al., 2020). Valeri and Baggio (2022) identified various factors in the tourism network literature that hinder knowledge transfer among actors. These include supply fragmentation, vocational constraints, ownership specificity, lack of trust, inadequate human resources, and the absence of measuring intangible knowledge resources.

Furthermore, considering firms embedded in remote regions, an excessive commitment to any collaboration that involves significant investments of time, energy, and capital can be even more problematic, as it impacts a firm's operation efficiency. Collaboration costs may arise as firms devote additional resources (e.g., time, energy or capital) to gain the trust of local entrepreneurs and ensure a successful knowledge transfer (Czernek-Marszałek, 2020).

These obstacles are significant in the case of micro-enterprises, due to scant resources and a low organizational capacity. Furthermore, the lack of human resources and limited time available to owner-manager-entrepreneurs could raise the costs of collaborations, acting as a deterring barrier. Hence, although a greater variety of external linkages is beneficial for tourism micro-firms, relying on many different partners at once could lower the innovation outcomes. The combined effect of these two opposing forces suggests a curvilinear (inverted U-shaped) relationship between openness to external collaborations and innovation performance:

> **H2:** A higher degree of openness to external collaborations in tourism micro-firms is curvilinearly related to innovation performance.

Prior research has also addressed the relevance of the spatial dimension of tourism innovation. As smaller enterprises encounter challenges when collaborating with global partners, they typically focus on local efficiencies (Patel et al., 2014). As geographical proximity helps firms cope with the costs and risks associated with innovation (Kapetaniou & Lee, 2019; Kallmuenzer et al., 2021; Czernek-Marszałek, 2020), entrepreneurs in the tourism industry depend significantly on local contacts (Kelliher et al., 2018), and informal networks (Teixeira et al., 2019). Nevertheless, the successful development of innovation for tourism firms located in remote regions often requires knowledge that is unavailable at the local level. A higher geographical outreach of a firm’s openness to external collaborations, in particular the creation of international links with other actors, can provide access to new ideas and complementary resources, lower the costs and the risks of new product development, extend new markets, and boost the destination's competitiveness (Kapetaniou & Lee, 2019).

Thus, while local embeddedness can foster innovation by providing governance benefits and fostering mutual adaptation (Ahuja, 2000), its beneficial effects decrease

above a certain threshold, and this can lead to lock-in effects and stifle innovation (Kofler et al., 2018). Regarding this point, Brandão et al. (2019) and Pikkemat (2019) emphasized the role of the geographical diversity of external stakeholders in tourism networks to avoid lock-in effects.

On the basis of these arguments, we hypothesize that as openness to external collaborations increases geographical outreach, so does innovation performance.

> **H3:** A higher geographical outreach of openness to external collaborations in tourism micro-firms is positively related to innovation performance.

3. Materials and methods

3.1 Data collection

The study is based on survey data collected from micro-firms[1] operating in the Piedmontese cross-border territory between Italy and France. The territory includes the Susa Valley, the Sangone Valley and the Pinerolo valleys. Tourism in Italy vastly contributes to the country's economy: in 2019, 6.2% of the GVA was primarily attributable to tourism, which contributed by 8.8% to the total employment (OECD, 2022). As 95% of Italian SMEs employ fewer than ten people, micro-firms dominate the SMEs sector in the country, generating 44.9% of employment, compared to the EU average of 29.7% (European Commission, 2019).

The NACE Rev. 2 classification of economic activities was used to identify the companies that operate in the tourism industry. Specifically, the following economic activities were considered: hospitality (NACE code 55); food and beverage services

[1] Micro-firms are defined as enterprises with fewer than ten employees and an annual turnover of two million euros at most (European Commission, 2015).

(NACE code 56); human transportation (NACE codes 49.1- 49.3, 50.1, 50.3, 51.3); travel agencies, tour operators, other reservation services and related activities (NACE code 79); entertainment, recreation and sports activities (NACE codes 90- 93). We adopted a broad perspective of the tourism value chain by integrating such activities as local food production (NACE code 10). According to the identified NACE codes, the reference population comprised 1,569 tourism businesses.

The survey was administered through computer-assisted telephone interviews between December 2021 and March 2022. The firms were contacted by phone, and the operator provided an adequate explanation of the scope of the survey and the main concepts, including the operational definition of innovation. Four innovation typologies were considered on the basis of the official definition of the Community Innovation Survey (CIS2016), Schumpeter (1934) and the Oslo Manual (OECD, 2005): a) product innovation, encompassing both new products and services with increased performance features; b) process innovation, including significant changes in techniques, equipment, and software (:53) c) organizational innovation, consisting of a new organizational method in commercial applications (:55), and d) marketing innovation, such as new marketing methods that include important changes in product design and packaging, product positioning, and description or pricing (: 53).

A total of 897 companies in the sample were found to be reachable by phone after recalls, and 248 questionnaires were collected (response rate: 27.65%). After the screening phase, 216 questionnaires were considered valid for the analysis. The sample distribution is reported in Table 1.

[Table 1 here]

In June 2023, a sample of respondents from the survey was contacted for a follow-up interview, to gather context-rich qualitative data on the mechanisms that can

explain the positive link between openness to external collaborations (and its geographical outreach) and innovation performance. Six tourism micro-firms that had introduced various types of innovation and collaborated with different external partners were approached, and the contacted firms all agreed to participate. As a result, six in-depth semi-structured interviews with owners-managers-entrepreneurs were conducted between June and July 2023. The interviews lasted 30 minutes on average and were conducted following a semi-structured protocol. The questions included why and how firms engaged (or not) in collaborations with different types of external partners to achieve innovation, and on the motivations and managerial challenges that characterized such collaborations. The interviews then focused on the motivation for choosing national and international partners, and on the mechanisms that linked such collaborations to the introduction of innovations of different types. Once completed, the interviews were transcribed and structured into meaningful text units. The data and analysis were based on the original data in Italian; key quotes were translated into English. The findings from the interviews were used to complement the survey results in the discussion section.

3.2 Definition and operationalisation of the variables

3.2.1 Dependent variables

Three types of dependent variables were operationalized to test our hypotheses. INNO_D is a binary variable that indicates whether a company had introduced at least one of the four types of innovation (product innovation, process innovation, organizational innovation, market innovation) in the previous three years (2019-2021). INNO_D is independent of the type(s) of innovation introduced by the company; therefore, the variable reflects whether a company had innovated (INNO_D = 1), or not

(INNO_D = 0), in the considered three-year period.

Four additional binary variables were operationalized for each innovation typology: PROD_INNO_D (product innovation), PROC_INNO_D (process innovation), ORG_INNO_D (organizational innovation) and MKT_INNO_D (marketing innovation). The variable took on the value of "1" for each typology if the company had introduced an innovation in the three years, and "0" otherwise. Product and process innovation were the most frequent innovation typologies in our sample (65.3% and 60.6% of firms in the sample, respectively), while organizational innovation (39.3%) and marketing innovation (19.4%) were far less diffused.

Finally, INNOPERF was operationalized as a count variable based on the number of types of innovation each firm had introduced in the three years (product innovation, process innovation, organizational innovation, marketing innovation). According to the concept of innovation diversity (Love et al., 2011), this variable is a proxy of the combinative outcome of different innovation activities (Verreynne et al., 2019). The internal consistency of the proposed construct was confirmed by means of Cronbach's Alpha test (α=0.78).

3.2.2 Independent variables

A firm's openness to external collaborations was the key predictor in the analysis. Considering the stream of research that has investigated the specific actions of a firm regarding OI (external search and knowledge sourcing) (Laursen & Salter, 2006), we operationalized each firm's openness to external collaborations considering the breadth of the firm's collaborative networks (Tsai, 2009).

In the survey, firms were asked to assess their ranges of external collaborations with different types of partners (SMEs, large companies, universities and research centres, government and public institutions, and other entities) to achieve innovation

and the geographical outreach of each collaboration (local, regional, national, international partner).

Consistent with Laursen & Salter (2006), openness was defined as the extent to which each firm draws on different types of external partners (breadth of external collaborations, C_BREADTH). For this purpose, each partner type was coded as a binary variable at the firm level, with "0" standing for no collaboration with that type of partner and "1" indicating collaboration with that type of partner. C_BREADTH was then operationalized by summing up the different types of partners, assuming that firms that draw on a higher number of partners are more open to external collaborations than firms that do not. Four additional measures of the breadth of external collaborations were operationalized on the basis of their geographical outreach. Specifically, C_BREADTH_local, C_BREADTH_regional, C_BREADTH_national, and C_BREADTH_international were used to represent, at the firm level, the number of types of external partners on a local, regional, national or international basis.

3.3.3 Control variables

Our hypotheses are based on the relationship between the breadth and the geographical extension of collaborations of tourism micro-firms, and a) the probability of introducing a product, process, organizational or marketing innovation; b) innovation performance. Empirical literature largely agrees on the positive influence of human resources and ICT infrastructures as innovation inputs in the tourism industry (Divisekera & Nguyen, 2018; Nguyen et al., 2021; Tajeddini et al., 2020). Consistently, we introduced two control variables, related to employee training and access to a fast internet connection, to control for their possible positive influence on the probability of innovating and innovation outcomes of micro-firms in tourism. Specifically, HR is a binary variable that indicates whether a firm had provided extra training to its employees in the

previous three years ("1"), or not ("0"). Similarly, ICT was operationalized as a binary variable to indicate whether a firm was endowed with a fast internet connection ("1"), or not ("0"). CITY was operationalized as a binary variable to control for the influence of agglomeration economies on the innovation activities of tourism micro-firms, where "1" indicates the firm is located in an urban centre, and "0" otherwise. Finally, we controlled for age (AGE) and size of the firm (SIZE) and introduced seven industry dummies. Table 2 details the definition and operationalization of the variables, while descriptive statistics and the correlation matrix can be found in Table 3.

[Table 2 here]

[Table 3 here]

3.3.4 Empirical strategy

We used logistic regression analysis to test the hypothesis related to the probability of introducing an innovation (H1) and included details about the different innovation typologies. Six logit regression models were run, and the dependent variable was defined differently for each regression (INNO_D, PROD_INNO_D, PROC_INNO_D, ORG_INNO_D, MKT_INNO_D).

We employed a Poisson estimator, using a logit link, to test the hypotheses related to the relationship between openness to external collaborations and innovation performance (H2-H3). As INNOPERF assumed the form of count data with a small number of zeros and low overdispersion, the Poisson distribution assumption was accepted, thus indicating that the Poisson estimator was the most suitable for the analysis.

Considering the observed correlations, and as our models included a test for curvilinear relationships, the independent variables were mean-centred to exclude multicollinearity issues and to interpret first-order effects in the presence of quadratic

terms (Aguinis & Gottfredson, 2010). Such mean-centred variables also allowed us to compare the magnitude of the estimated coefficients by removing the influence of different units of measurement. After mean centring, all the variables were evaluated for multicollinearity by estimating the variance inflation factors (VIF). Our models did not detect multicollinearity, as all the VIF values fell below 1.5.

4. Results

Table 4 reports the results of the logistic regressions used to test the relationship between openness to external collaborations (C_BREADTH) and the probability of introducing an innovation (INNO_D, Model 1). Models 2-5 consider the different innovation typologies as dependent variables.

Our results show that openness to external collaborations in tourism micro-firms is significantly associated with the probability of introducing an innovation. This probability remains positive and significant across the innovation typologies, except for organizational innovation. More in detail, the coefficient for C_BREADTH has a significantly positive value in Model 1, estimating the probability of innovation (INNO_D, $\beta=0.409$, $p<0.01$), and in Model 2, estimating the probability of introducing a product innovation (PROD_INNO_D, $\beta=0.435$, $p<0.01$), thus supporting H1. The value of the coefficient is also positive and statistically significant in Model 3 (PROC_INNO_D, $\beta=0.295$, $p<0.05$) and Model 6 (MKT_INNO_D, $\beta=0.277$, $p<0.1$), but with a lower value, while it is not significant in model 5 (ORG_INNO_D). These first findings confirm the positive influence of openness to external collaboration for innovation in tourism micro-firms.

[Table 4 here]

Table 5 presents the results of the Poisson regression analysis, in which INNOPERF was used as the dependent variable. Model 6 provides the evaluation of the

effects of openness to external collaborations on innovation performance, while Model 7 tests the hypothesized curvilinear relationship between C_BREADTH and INNOPERF (H2). Finally, Model 8 evaluates the relationship between the geographical outreach of openness to external collaboration and innovation performance (H3).

Model 6 shows that openness to external collaborations is positively and significantly related to innovation performance (β=0.112, $p<0.01$). This means that the higher the breadth of external collaboration partners is, the higher the number of types of innovation (e.g., diversity in innovation) of micro-firms operating in the tourism industry. Furthermore, all the control variables in this model pertaining to the main effects are positively and significantly associated with innovation performance. In Model 7, we tested the hypothesized curvilinear relationship between INNOPERF and C_BREADTH (H2) by introducing the quadratic term C_BREADTH_sq. The predicted coefficient for C_BREADTH_sq is negative and significant (β=-0.069, $p<0.05$), thus supporting H2.

We ran robustness checks to confirm this result (see the Appendix).

[Table 5 here]

Figure 1 illustrates the predicted relationship between C_BREADTH and INNOPERF. The turning point of the curve is quite close to C_BREADTHL, and the slope of the curve at C_BREADTHH is negative, steep and statistically significant. Figure 1 shows that the point where openness to external collaborations appears to have negative consequences for innovation performance in tourism firms (the turning point) is at two different types of partners. Thus, when micro-firms collaborate with more than two partners, negative returns on innovation performance may appear. The appropriate U-test in the Appendix supports this result, as the downward slope of the curve is

negative and statistically significant. We conclude that there is a significant inverted U-shaped relationship over the range of the data and that the results support H2.

[Figure 1 here]

Finally, Model 8 tests the influence of the geographical outreach of a micro-firm's openness to external collaborations by introducing four measures of C_BREADTH, according to the partners' locations. The estimations show that micro-firms open to collaborative relationships with partners outside their region will be more likely to benefit, in terms of innovation diversity. Indeed, the estimated coefficients show that the relationship between C_BREADTH and INNOPERF becomes stronger as the geographical distance of the partners increases. Specifically, the estimated coefficients for C_BREADTH_national (β=0.169, $p<0.05$) and C_BREADTH_international (β=0.414, $p<0.01$) are both positive and significant, while the coefficients for C_BREADTH_local and C_BREADTH_regional are positive with smaller values and lower significance.

5. Discussion and conclusions

Our findings support the relevance of the OI framework in investigating the innovation behaviour of tourism micro-firms and its link with performance. The higher degree of openness to external collaborations of the micro-firms in the sample is positively and significantly associated with the likelihood of introducing an innovation. Specifically, the variety of external collaboration partners (including SMEs, large firms, universities and public institutions, as well as other entities, such as intermediaries and trade associations) is positively associated with product, process, and marketing innovation in tourism micro-firms.

Thus, in line with the OI framework (Chesbrough & Bogers, 2014), the study supports the contention that the purposive management of external collaborations -e.g.,

through the development of catalogues of innovation partners (Zach, 2016) - would be highly beneficial to the innovation processes of tourism micro-firms.

Follow-up interviews confirmed that the variety of external collaborations is a critical issue in fostering innovation in the tourism industry. In the words of a hotel-restaurant owner-manager-entrepreneur:

> A local institution with whom I interacted in the past informed me about the possibility of participating in two calls for proposals to receive funding for innovation projects. The institution supported us during the bureaucratic part. The proposals were written in collaboration with companies that had the skills and resources to implement the proposed activities, including creating spaces for smart workers, a charging zone for e-bikes, and strengthening the internet connection. (1)

The interviews provided further evidence of the positive role of institutional intermediaries in facilitating networking for innovation in tourism (Lin et al., 2023). A typical local food producer revealed that the benefits of collaborating with trade associations helped reduce search and coordination costs in the partner selection process:

> A trade association brokered a collaboration with a regional start-up that brings agri-food products from rural producers to the markets in Turin and includes them in the market's e-commerce platform. I needed to collaborate with other local producers who participate in the project for a cheaper transportation of goods to the city warehouse. (2)

However, what is novel and more interesting in our results is that, in the context of tourism micro-firms, a higher openness to external collaborations positively influences diversity in the types of innovation introduced. Thus, this study complements empirical research on OI in SMEs by showing that creating a varied portfolio of external partners is highly beneficial for innovation outcomes in the tourism industry, as it allows micro-firms to benefit from external managerial competencies, to align with

the market evolution and to respond to the emerging needs of customers (Favre-Bonté et al., 2016). In the words of the interviewees:

> In addition to the innovative activities, I made further changes to my business by collaborating with other partners. For instance, I improved order management in the restaurant with knowledge from a start-up. In addition, a large company made its expertise available to create software for booking hotel rooms. (1)

> We generally collaborate with leading organizations, associations and university faculties in the agri-food sector to disseminate our philosophy and craft beer by organizing workshops, craft laboratories, tastings and guided tours. (2)

In line with the concept of the "paradox of openness" (see, e.g., Laursen & Salter, 2006; Wang et al., 2020), our findings also show that, above a certain threshold, micro-firms in the tourism industry face increasing costs for openness to external collaborations, which determine decreasing returns on innovation performance (Figure 1). This finding suggests that although increasing openness to external collaborations initially benefits tourism micro-firms, relying on too many different partners will lead to OI challenges (Marullo et al., 2020). Our interviewees highlighted that the limits of external collaborations are associated with the required managerial efforts in planning and development, as well as the difficulty of identifying legitimate stakeholders (search costs) and actively assessing the stakeholders' contribution (coordination costs). These obstacles are even more significant in the case of micro-enterprises, because of their scant resources and a shortage of managerial competencies, which may undermine the advantages of the external knowledge sourcing (Gherhes, 2016; Grigoriou & Rothaermel, 2017; Yachin, 2021). Hence, it is crucial to select the most appropriate collaborations to put effort into:

> I need help in keeping up with the calls for funding to introduce innovations in my enterprise. The institution's role was also crucial in searching for and guiding

> relations with other partners. Even if I had identified the right call for proposals on my own, it would have been tough to reach out to possible collaboration partners and manage the project. Indeed, I lack the time to perform these activities and I do not have the human resources to devote to innovative projects. Moreover, I need to attain the necessary skills and reputation to manage an innovative project. Contacting potential partner companies to involve them is a matter of credibility; intermediaries, such as public institutions or business associations, are more convincing and compelling. Above all, reaching out to and persuading larger and geographically distant companies to collaborate becomes even more difficult. (1)

As highlighted by different interviewees, the typical OI challenges in the tourism context were overcome with the help of institutional bodies, or trade and business associations. Such intermediaries acted as coordinators in the partner search stages, in the selection of the relevant information (e.g., legal support, information on business regulations and funding opportunities) and in the management of the relationships, thereby playing a pivotal role as enablers of OI projects between micro-firms and other actors.

Finally, our results suggest that micro-firms that are open to collaborative relationships with partners outside their region will be more likely to benefit in terms of innovation outcomes. In particular, the relationship between openness and innovation performance becomes stronger as the geographical distance of the partners increases. In our sample, and in line with prior evidence (Kofler et al., 2018; Peters & Kallmuenzer, 2018), firms mainly engage in collaborations with other SMEs on a local basis. At the same time, we show that those micro-firms who open up to collaborative relationships with partners outside their region will be more likely to benefit in terms of innovation diversity.

This finding is aligned with those of the existing literature on OI in SMEs, focusing on the role of global collaborations in gaining access to new and advanced knowledge to guide new-to-the-market products and services (Kapetaniou & Lee,

2019). Qualitative evidence supporting this result was also obtained from the interviews. When asked why and how they identified national and international stakeholders as partners, several entrepreneurs answered that the initiative for the collaborative relationship started from international actors. Other interviewees justified that no actors at the local level had the competencies they were interested in or had the necessary knowledge or expertise to collaborate on innovative projects. Moreover, the interviewees found significant benefits in expanding their market and gaining better insights into potential foreign customers. The owner-manager-entrepreneur of a mountain hotel clearly illustrated this:

> We started with a foreign tour operator who came forward to collaborate. We had to adapt our ICT infrastructure to be able to communicate better. Following the success of this collaboration, we looked for other foreign partners to collaborate with. Subsequent partners stimulated and guided us in innovating and adapting our business to international standards and the preferences of international customers. Thus, we introduced marketing innovations and invested in international staff training. This led us to expand our market and increase our economic performance. (3)

In this case, openness improved innovation performance and provided a foundation for learning effects, allowing the development of long-term linkages (Love, 2014). Similarly, the owner-manager-entrepreneur of an alpine refuge explained:

> I renovated an empty, multifunctional room into a smart working space. I had already considered doing this some time ago, but the project only materialized when an international organization approached me during the pandemic to host a smart working event. The internet infrastructure had to be improved. Subsequently, I established partnerships with several local companies and organizations to introduce complementary services for smart working customers. (4)

On the other hand, a travel agency emphasized the importance of partnerships with varying geographical scope (Brandão et al., 2019; Favre-Bonté et al., 2016):

> The variety of our local and international collaborations allowed us to introduce a new business strategy, namely the high degree of customization of the trip. We collaborate with various small and medium-sized local companies to continuously improve our tour package offerings and promote the region. We also collaborate with a large local company to develop packages for companies such as corporate travel. (5)

This study extends the literature on tourism micro-firms and provides evidence on the value of OI in the tourism context. Our findings suggest, to tourism enterprises, owner-manager-entrepreneurs, and intermediaries, especially those operating in remote regions, that being open to different types of external collaboration partners is an issue of strategic importance. Furthermore, being open to partners beyond the regional borders allows access to relevant knowledge and information, which helps to stimulate ideas and develop managerial competencies.

The study also underlines that intermediaries play a crucial role in helping micro-firms to overcome the rising search and coordination costs due to higher openness and in accessing external resources and managerial competencies.

A crucial factor in the tourism context is proactivity: on the one hand, intermediaries should actively involve micro-enterprises and other organizational actors in more extensive networks, to include firms from different industries; on the other, micro-enterprises should proactively put more effort into reaching out to other organizational actors to develop new ideas or innovative projects. Establishing a collaboration network with a broader geographical reach and disseminating opportunities, initiatives and information through seminars, fairs and events, can represent important assets that facilitate connections and knowledge sharing among enterprises of various sizes, industries, and geographical locations.

DMOs play a pivotal role in importing and disseminating knowledge within a destination. In this context, emphasis should be placed on establishing effective

communication channels with a variety of companies, including micro-firms. In remote regions, such coordination efforts should involve other intermediaries operating within the region.

6. Limitations and future research

The first limitation of this study is of a methodological nature, and it refers to the dichotomous nature of innovation variables. This limitation was due to the difficulties of collecting economic and financial data in the context of micro-enterprises (e.g., the share of revenues from new products and services). Future research should collect detailed information on the economic and financial performance of innovations to provide a more detailed overview of OI effectiveness in the tourism industry. As there is a lack of consensus in the tourist literature on the measurement of innovation (Verreynne et al., 2019), our study has built on the OI framework to provide a measure of openness. Future research could move forward in this approach by analysing the dynamics and development of external collaborations and including further details on the barriers firms encounter in this process.

A second limitation of this study is that the data collection was conducted immediately after the COVID-19 pandemic. As a result of the pandemic, uncertainty and risks of investments may have led some companies to postpone innovation activities. Future research could benefit from a comparative study between innovative micro-firms that engage in external collaborations and those that do not. Exploring the cultural and economic dimensions characterizing the social embeddedness of tourism entrepreneurs and their propensity to external collaboration for innovation could represent a promising avenue of research.

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Disclosure statement

The authors report there are no competing interests to declare.

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Table 1. Sample distribution by industry and size

	0 (no employees)	1 to-2	3 to 5	6 to 9	Total
Accommodation	8	13	15	7	43
Food & Beverage	15	49	29	3	96
Recreation	9	6	8	2	25
Food Production	4	11	5	5	25
Transportation	5	3	0	2	10
Associations	1	2	1	1	5
Travel Agencies	2	9	1	0	12
Total	44	93	59	20	216

Table 2. Variables definition and operationalization

Variable name	Variable definition	Variable operationalization
INNO_D	The firm has introduced an innovation in the past three years	Dummy variable (1=yes; 0=no)
PROD_INNO_D	The firm has introduced a product innovation	Dummy variable (1=yes; 0=no)
PROC_INNO_D	The firm has introduced a process innovation	Dummy variable (1=yes; 0=no)
ORG_INNO_D	The firm has introduced an organizational innovation	Dummy variable (1=yes; 0=no)
MKT_INNO_D	The firm has introduced an organizational innovation	Dummy variable (1=yes; 0=no)
INNOPERF	Innovation diversity	Number of types of innovations introduced in the past three years
C_BREADTH	Breadth of collaborations	Number of types of collaborations for innovation
C_BREADTH_local	Breadth of local collaborations	Number of types of local collaborations
C_BREADTH_regional	Breadth of regional collaborations	Number of types of regional collaborations
C_BREADTH_national	Breadth of national collaborations	Number of types of national collaborations
C_BREADTH_international	Breadth of international collaborations	Number of types of International collaborations
HR	Human capital training	Dummy variable (1=yes; 0=no)
ICT	The firm uses ICTs with a fast internet connection	Dummy variable (1=yes; 0=no)
CITY	The firm is located in a city/urban center	Dummy variable (1=yes; 0=no)
Age	Firm age	Number of years since incorporation
Size	Firm size	Number of employees
Industry	Firm industry	Dummy variables (7 industries)

Table 3. Descriptive statistics and correlations

	Variable	Obs	Mean	Std. Dev.	1	2	3	4	5	6	7	8
1	INNOPERF	216	1.85	1.44	1							
2	C_BREADTH	216	1.08	1.21	0.21	1						
3	C_BREADTH_local	216	0.61	0.92	-0.02	0.66	1					
4	C_BREADTH_regional	216	0.22	0.59	0.12	0.47	-0.03	1				
5	C_BREADTH_national	216	0.17	0.55	0.22	0.40	-0.15	-0.03	1			
6	C_BREADTH_international	216	0.08	0.31	0.28	0.34	-0.10	0.05	0.30	1		
7	Age	216	17.84	18.14	0.05	-0.04	-0.04	0.06	-0.08	-0.02	1	
8	Size	216	2.30	2.09	0.19	0.07	-0.05	0.08	0.04	0.21	0.10	1

Table 4. Logistic regression models (dependent variable: probability to introduce an innovation)

Dependent variables	(1) INNO_D	(2) PROD_ INNO_D	(3) PROC_ INNO_D	(4) ORG_ INNO_D	(5) MKT_ INNO_D
C_BREADTH	0.409**	0.435***	0.295**	0.190	0.277*
HR	1.397***	0.761**	0.616*	0.510	0.083
ICT	0.765*	0.440	0.784**	0.513	0.188
CITY	0.559	0.717*	0.778*	0.741*	0.880*
AGE	0.000	-0.001	0.011	0.002	-0.017
SIZE	0.030	0.029	0.173**	0.168*	0.180*
Industry dummies	YES	YES	YES	YES	YES
Constant	-0.015	-0.146	-1.210**	-0.600	-1.419
N	216	216	216	216	216
Pseudo R-squared	0.14	0.10	0.14	0.11	0.11
Chi-square	34.10***	27.66***	39.71***	30.46***	22.38**
AIC	237.01	277.28	275.86	278.03	216.43
BIC	280.88	321.16	319.74	318.25	260.31

**** p<.01, ** p<.05, * p<.1*

Table 5. Poisson regression models (dependent variable: innovation performance)

	(6)	(7)	(8)
C_BREADTH	0.112***	0.235***	
C_BREADTH_sq		-0.069**	
C_BREADTH_local			0.027
C_BREADTH_regional			0.085
C_BREADTH_national			0.169**
C_BREADTH_international			0.414***
HR	0.211*	0.199*	0.205*
ICT	0.194*	0.184*	0.211*
City	0.315**	0.290**	0.306**
Age	0.000	0.000	0.001
Size	0.045*	0.037	0.032
Industry dummies	YES	YES	YES
Constant	0.328**	0.429***	0.219
N	216	216	216
Pseudo R-squared	0.055	0.064	0.068
Chi-square	41.65***	48.43***	51.53***
AIC	744.75	739.97	740.88
BIC	788.62	787.22	794.88

**** p<.01, ** p<.05, * p<.1*

Figure 1. Predicted relationship between C_BREADTH and INNOPERF

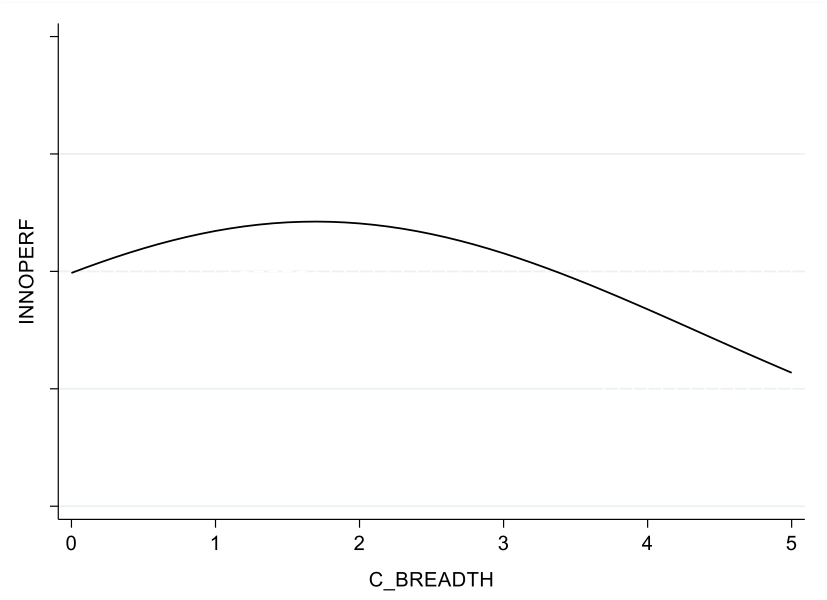

Figure list

Figure 1 Caption: Predicted relationship between C_BREADTH and INNOPERF

Figure 1 Alt Text: U-shaped curve, showing the curvilinear relationship between innovation performance and collaboration breadth